



# OSG INDIA

*shaping your dreams*



**OSG INDIA PRIVATE LIMITED**

[www.osg-india.com](http://www.osg-india.com)

Catalogue No. 3

# Guide to (Tool Specification) Icons

## 1 Tool Materials



High grade Powder Metallurgy HSS (XPM)



Powder Metallurgy HSS (CPM)



Tungsten Carbide



Cobalt HSS



High Vanadium HSS



HSS

## 2 Surface Treatment



EgiAs Coating



DUARISE Coating



WXL Coating



WX Super Coating



V (composite multi-layered) Coating



Steam Oxide



IchAda Coating



DURAREY Coating



HPL Coating



HP Super Coating



TiN Coating

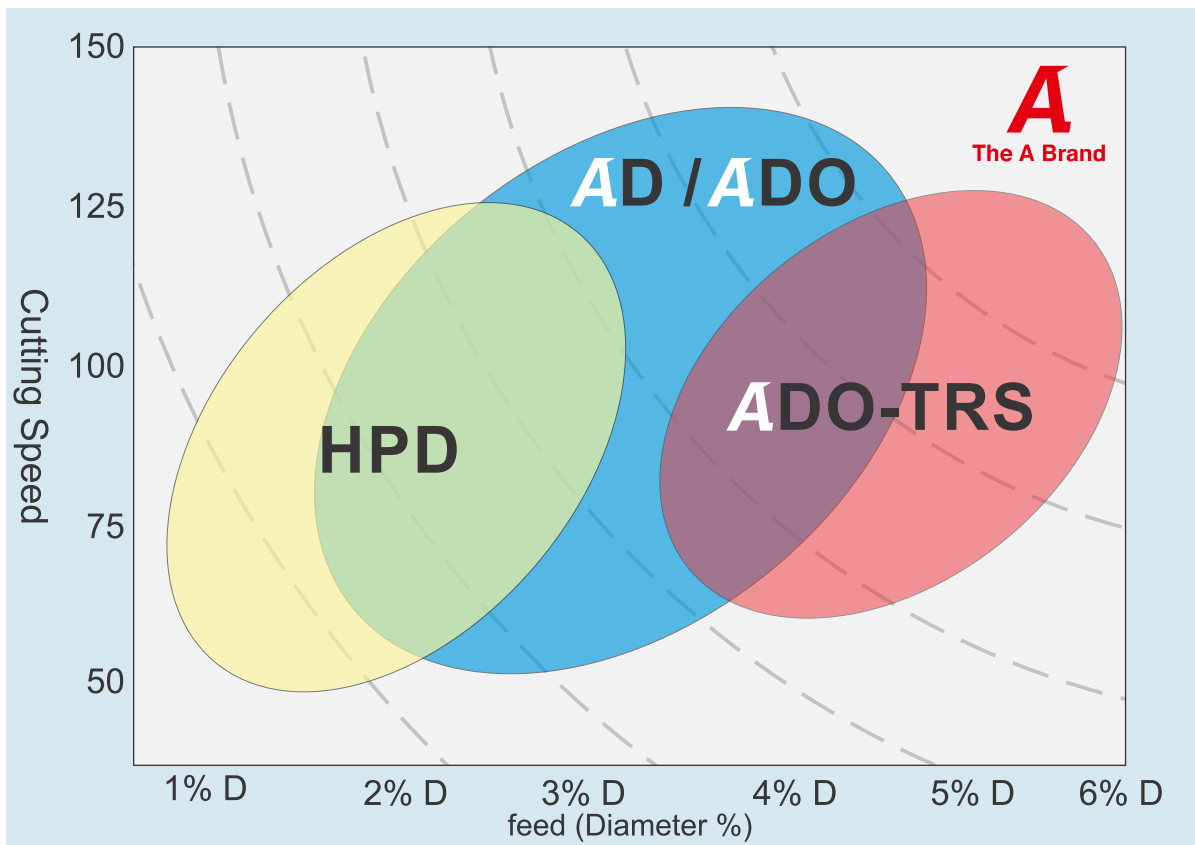
## ★ Selection Chart according to work material

○ Excellent

○ Good

△ Can use

| Page No. | Tool Abbreviation | Specification                                                                       | Surface Treatment | Stocked Size   |                             |                     |                   |             |                |                |                             |
|----------|-------------------|-------------------------------------------------------------------------------------|-------------------|----------------|-----------------------------|---------------------|-------------------|-------------|----------------|----------------|-----------------------------|
|          |                   |                                                                                     |                   |                | Low Carbon Steel Mild Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Hardened Steel | Quenched and Tempered Steel |
|          |                   |                                                                                     |                   |                | C ~ 0.25%                   | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC    | 45 ~ 50 HRC                 |
| 1.       | 2090              | Chamfering Drill Point Angle 90°                                                    | -                 | φ3 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | △              |                             |
| 1.       | 2120              | Chamfering Drill Point Angle 120°                                                   | -                 | φ3 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | △              |                             |
| 2.       | 2021 2022         | Carbide Drill General Purpose, Jobber Drill                                         | -                 | φ1 ~ φ12.7     | ○                           | ○                   | ○                 | ○           |                |                |                             |
| 14.      | AD-2D             | Carbide Drill (2D type)                                                             | EgiAs             | φ2 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              |                |                             |
| 5.       | HPD-3D            | 3103 Carbide Drill (3D type)                                                        | WD1               | φ1 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 5.       | HO-HPD-3D         | 3113 Carbide Drill with Internal Coolant Supply (3D type)                           | WD1               | φ3 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 20.      | ADO-3D            | Carbide Drill with Internal Coolant Supply (3D type)                                | EgiAs             | φ2 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 35.      | ADO-SUS-3D        | Carbide Drill with Internal Coolant Supply (3D type)                                | WXL               | φ2 ~ φ20       | ○                           | ○                   | ○                 | ○           |                |                |                             |
| 40.      | ADO-TRS-3D        | 3Flutes Carbide Drill with Internal Coolant Supply (3D type)                        | EgiAs             | φ3 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 17.      | AD-4D             | Carbide Drill (4D type)                                                             | EgiAs             | φ2 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              |                |                             |
| 8.       | HPD-5D            | 3105 Carbide Drill (5D type)                                                        | WD1               | φ5.6 ~ φ20     | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 8.       | HO-HPD-5D         | 3115 Carbide Drill with Internal Coolant Supply (5D type)                           | WD1               | φ5.6 ~ φ20     | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 23.      | ADO-5D            | Carbide Drill with Internal Coolant Supply (5D type)                                | EgiAs             | φ2 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 37.      | ADO-SUS-5D        | Carbide Drill with Internal Coolant Supply (5D type)                                | WXL               | φ2 ~ φ20       | ○                           | ○                   | ○                 | ○           |                |                |                             |
| 41.      | ADO-TRS-5D        | 3Flutes Carbide Drill with Internal Coolant Supply (5D type)                        | EgiAs             | φ3 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              |                             |
| 42.      | WH055-5D          | Carbide Drill for High Hardened Steel with Internal Coolant Supply (~55HRC・5D type) | WXS               | φ3.3 ~ φ12     |                             |                     |                   |             |                | ○              | ○                           |
| 43.      | WH70-DRL          | Carbide Drill for High Hardened Steel (~70HRC)                                      | WXS               | φ2 ~ φ12       |                             |                     |                   |             |                |                |                             |
| 11.      | HO-HPD-8D         | 3118 Carbide Drill with Internal Coolant Supply (8D type)                           | WD1               | φ3 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 26.      | ADO-8D            | Carbide Drill with Internal Coolant Supply (8D type)                                | EgiAs             | φ2 ~ φ16       | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 39.      | ADO-SUS-8D        | Carbide Drill with Internal Coolant Supply (8D type)                                | WXL               | φ2 ~ φ12       | ○                           | ○                   | ○                 | ○           |                |                |                             |
| -        | TRS-HO-10D        | 3Flutes Carbide Drill with Internal Coolant Supply (10D type)                       | WD1               | φ5 ~ φ12       | ○                           | ○                   | ○                 | ○           |                |                |                             |
| 32.      | ADO-PLT           | Pilot Drill for Extra Long Drill                                                    | EgiAs             | φ3.03 ~ φ12.03 | ○                           | ○                   | ○                 | ○           | ○              | ○              | ○                           |
| 27.      | ADO-10D           | Carbide Drill with Internal Coolant Supply (10D type)                               | EgiAs             | φ2 ~ φ12.5     | ○                           | ○                   | ○                 | ○           | ○              |                |                             |
| 28.      | ADO-15D           | Carbide Drill with Internal Coolant Supply (15D type)                               | EgiAs             | φ3 ~ φ12.5     | ○                           | ○                   | ○                 | ○           | ○              |                |                             |
| 29.      | ADO-20D           | Carbide Drill with Internal Coolant Supply (20D type)                               | EgiAs             | φ3 ~ φ12.5     | ○                           | ○                   | ○                 | ○           | ○              |                |                             |
| 30.      | ADO-25D           | Carbide Drill with Internal Coolant Supply (25D type)                               | EgiAs             | φ3 ~ φ12       | ○                           | ○                   | ○                 | ○           | ○              |                |                             |
| 31.      | ADO-30D           | Carbide Drill with Internal Coolant Supply (30D type)                               | EgiAs             | φ3 ~ φ10       |                             | ○                   | ○                 | ○           | ○              | ○              |                             |
| 44.      | ADF-2D            | Carbide Flat Drill (2D type)                                                        | EgiAs<br>IchAda   | φ0.2 ~ φ20     | ○                           | ○                   | ○                 | ○           | ○              | ○              |                             |
| 51.      | ADFLS-2D          | Carbide Flat Drill・Long Shank (2D type)                                             | EgiAs             | φ3 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              |                             |
| 50.      | ADFO-3D           | Carbide Flat Drill with Internal Coolant Supply (3D type)                           | EgiAs             | φ3 ~ φ20       | ○                           | ○                   | ○                 | ○           | ○              | ○              |                             |
| 52.      | EX-SUS-GDS        | HSSE Stub for Stainless and Mild Steels                                             | TiN               | φ0.5 ~ φ32     | ○                           | ○                   |                   |             |                |                |                             |
| 55.      | EX-SUS-GDR        | HSSE Regular for Stainless and Mild Steels                                          | TiN               | φ2 ~ φ32       | ○                           | ○                   |                   |             |                |                |                             |
| 58.      | TDXL-10D          | HSS Extra-Long Drill (10D type)                                                     | WXL               | φ1.5 ~ φ12     | ○                           | ○                   | ○                 | ○           |                |                |                             |
| 59.      | TDXL-15D          | HSS Extra-Long (15D type)                                                           | WXL               | φ1.5 ~ φ12     | ○                           | ○                   | ○                 | ○           |                |                |                             |
| 60.      | TDXL-20D          | HSS Extra-Long (20D type)                                                           | WXL               | φ1.5 ~ φ12     | ○                           | ○                   | ○                 | ○           |                |                |                             |



★ Selection Chart according to work material

⊙ Excellent

○ Good

△ Can use

| WORK MATERIAL               |                             |                 |            |           |                   |              |          |                        |                |         |
|-----------------------------|-----------------------------|-----------------|------------|-----------|-------------------|--------------|----------|------------------------|----------------|---------|
| Quenched and Tempered Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel | Cast Iron | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel |
| 50 ~ 62 HRC                 | 62 ~ 70 HRC                 | SUS             | SKD SKS    | FC        | FCD               | Cu           | AL       | AC                     |                |         |
|                             |                             |                 |            | ⊙         | ⊙                 | ○            |          | ○                      | △              | △       |
|                             |                             |                 |            | ⊙         | ⊙                 | ○            |          | ○                      | △              | △       |
|                             |                             | ○               |            | ○         | ○                 |              |          | ○                      |                |         |
|                             |                             |                 |            | ⊙         | ⊙                 |              |          |                        |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 | ○            |          | ○                      |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 | ○            |          | ○                      |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 | ○            |          | ○                      | ○              | ○       |
|                             |                             | ⊙               |            | ○         | ○                 | ⊙            |          | ○                      | ⊙              | ⊙       |
|                             |                             | ○               |            | ⊙         | ⊙                 |              |          |                        | ○              |         |
|                             |                             |                 |            | ⊙         | ⊙                 |              |          |                        |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 | ○            |          | ○                      |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 | ○            |          | ○                      |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 | ○            |          | ○                      | ○              |         |
|                             |                             | ⊙               |            | ○         | ○                 | ⊙            |          | ○                      | ⊙              | ⊙       |
|                             |                             | ○               |            | ⊙         | ⊙                 |              |          |                        |                |         |
| ○                           |                             | ○               |            | ⊙         | ⊙                 |              |          |                        |                | ⊙       |
| ⊙                           | ⊙                           |                 |            |           |                   |              |          |                        |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 | ○            |          | ○                      |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 | ○            |          | ○                      | ○              |         |
|                             |                             | ⊙               |            | ○         | ○                 | ⊙            |          | ○                      | ⊙              | ⊙       |
|                             |                             |                 |            | ⊙         | ⊙                 |              |          |                        |                |         |
|                             |                             | ○               | ○          | ⊙         | ⊙                 |              |          | ○                      |                |         |
|                             |                             | △               | ○          | ⊙         | ⊙                 |              |          |                        |                |         |
|                             |                             | △               | ○          | ⊙         | ⊙                 |              |          |                        |                |         |
|                             |                             | △               | ○          | ⊙         | ⊙                 |              |          |                        |                |         |
|                             |                             | △               | ○          | ⊙         | ⊙                 |              |          |                        |                |         |
|                             |                             |                 | △          | ○         | ⊙                 | ⊙            |          |                        |                |         |
|                             |                             | △               |            | ⊙         | ⊙                 |              |          |                        |                |         |
|                             |                             |                 |            | ⊙         | ⊙                 |              | ○        | ○                      |                |         |
|                             |                             | ⊙               |            | ○         | ○                 |              | ○        | ○                      |                |         |
|                             |                             | ⊙               |            | ⊙         | ⊙                 |              | ○        | ○                      |                |         |
|                             |                             | ⊙               |            |           |                   | ⊙            | ⊙        | ⊙                      |                |         |
|                             |                             | ⊙               |            |           |                   | ⊙            | ⊙        | ⊙                      |                |         |
|                             |                             |                 | ○          | ⊙         | ⊙                 |              |          | ○                      |                |         |
|                             |                             |                 | ○          | ⊙         | ⊙                 |              |          | ○                      |                |         |
|                             |                             |                 | ○          | ⊙         | ⊙                 |              |          | ○                      |                |         |

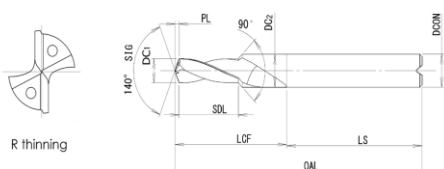


| 2090 90°point | Drill Diameter | OAL | Flute Length | Shank Diameter |
|---------------|----------------|-----|--------------|----------------|
| EDP No.       | DC             | OAL | LCF          | DCON           |
| 20900300      | 3              | 35  | 8            | 3              |
| 20900400      | 4              | 40  | 10           | 4              |
| 20900600      | 6              | 50  | 16           | 6              |
| 20900800      | 8              | 60  | 23           | 8              |
| 20901000      | 10             | 70  | 24           | 10             |
| 20901200      | 12             | 70  | 25           | 12             |
| 20901600      | 16             | 80  | 33           | 16             |
| 20902000      | 20             | 100 | 35           | 20             |

| 2120 120°point | Drill Diameter | OAL | Flute Length | Shank Diameter |
|----------------|----------------|-----|--------------|----------------|
| EDP No.        | DC             | OAL | LCF          | DCON           |
| 21200300       | 3              | 35  | 8            | 3              |
| 21200400       | 4              | 40  | 10           | 4              |
| 21200600       | 6              | 50  | 16           | 6              |
| 21200800       | 8              | 60  | 23           | 8              |
| 21201000       | 10             | 70  | 24           | 10             |
| 21201200       | 12             | 70  | 25           | 12             |
| 21201600       | 16             | 80  | 33           | 16             |
| 21202000       | 20             | 100 | 35           | 20             |

## SC-HO-HPD-3D



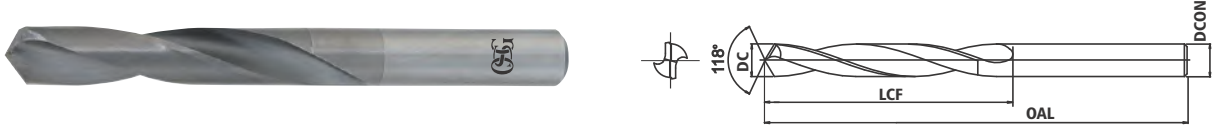
| EDP No.     | TAP SIZE       | L/D | DC    | SDL  | OAL | LCF | DCON | PL  |
|-------------|----------------|-----|-------|------|-----|-----|------|-----|
| SC311503351 | M4 x 0.7       | 3   | 3.35  | 9.4  | 66  | 19  | 6    | 0.5 |
| SC311504251 | M5 x 0.8       | 3   | 4.25  | 12.2 | 66  | 24  | 6    | 0.6 |
| SC311505501 | M6 x 1 Forming | 3   | 5.5   | 14.1 | 79  | 28  | 8    | 0.7 |
| SC311505001 | M6 x 1         | 3   | 5     | 14.1 | 79  | 28  | 8    | 0.7 |
| SC311505101 | M6 x 1         | 3   | 5.1   | 14.1 | 79  | 28  | 8    | 0.7 |
| SC311506851 | M8 x 1.25      | 3   | 6.85  | 19.8 | 89  | 37  | 10   | 1   |
| SC311508501 | M10 x 1.25     | 3   | 8.5   | 24.5 | 102 | 46  | 12   | 1.3 |
| SC311508751 | M10 x 1.25     | 3   | 8.75  | 24.5 | 102 | 46  | 12   | 1.3 |
| SC311510251 | M12 x 1.75     | 3   | 10.25 | 29.2 | 124 | 55  | 14   | 1.5 |

| Work Material                                     |            |          |           |                  |                   |                   |             |            |               |                   |                  |     |        |            |           |
|---------------------------------------------------|------------|----------|-----------|------------------|-------------------|-------------------|-------------|------------|---------------|-------------------|------------------|-----|--------|------------|-----------|
| Chart applies to all series numbers on this page. | Aluminum   |          | Cast Iron | Low Carbon Steel | Med. Carbon Steel | High Carbon Steel | Alloy Steel | Die Steels | Titanium      | High Nickel Alloy | Stainless Steels |     |        | Die Steels |           |
|                                                   | 6061, 7075 | Castings |           | 1010, 1018       | 1035, 1045        | 1065              | 4140, 4340  | 20 Hrc     | 6AL4V (30Hrc) | 20 Hrc            | 300              | 400 | 17-4PH | -35 Hrc    | 35-45 Hrc |
|                                                   | ○          | ○        | ⊗         | ⊗                | ⊗                 | ⊗                 | ⊗           | ⊗          | △             | △                 | ○                | ○   | ○      | ○          | △         |





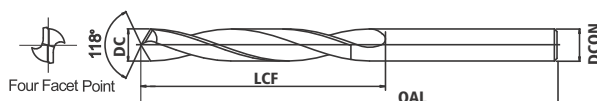
Tolerance for cutter Diameter  
Dia 1mm-2.9 mm 0.000/-0.010



| 2021      | Drill Diameter | OAL | Flute Length | Shank Diameter |
|-----------|----------------|-----|--------------|----------------|
| EDP No.   | DC             | OAL | LCF          | DCON           |
| 202101000 | 1              | 30  | 11           | 1              |
| 202101100 | 1.1            | 30  | 11           | 1.1            |
| 202101200 | 1.2            | 30  | 13           | 1.2            |
| 202101300 | 1.3            | 30  | 13           | 1.3            |
| 202101400 | 1.4            | 30  | 13           | 1.4            |
| 202101500 | 1.5            | 30  | 13           | 1.5            |
| 202101600 | 1.6            | 40  | 17.5         | 1.6            |
| 202101700 | 1.7            | 40  | 17.5         | 1.7            |
| 202101800 | 1.8            | 40  | 17.5         | 1.8            |
| 202101900 | 1.9            | 40  | 17.5         | 1.9            |
| 202102000 | 2              | 40  | 17.5         | 2              |
| 202102100 | 2.1            | 40  | 17.5         | 2.1            |
| 202102200 | 2.2            | 40  | 17.5         | 2.2            |
| 202102300 | 2.3            | 40  | 17.5         | 2.3            |
| 202102400 | 2.4            | 40  | 17.5         | 2.4            |
| 202102500 | 2.5            | 40  | 17.5         | 2.5            |
| 202102600 | 2.6            | 45  | 20           | 2.6            |
| 202102700 | 2.7            | 45  | 20           | 2.7            |
| 202102800 | 2.8            | 45  | 20           | 2.8            |
| 202102900 | 2.9            | 45  | 20           | 2.9            |



| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| Dia 3mm                       | +0.000/-0.010 |
| Dia 3.1mm-6mm                 | +0.000/-0.012 |
| Dia 6.1mm-12.7mm              | +0.000/-0.015 |

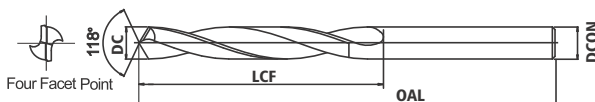


| 2022      | Drill Diameter | OAL | Flute Length | Shank Diameter |
|-----------|----------------|-----|--------------|----------------|
| EDP No.   | DC             | OAL | LCF          | DCON           |
| 202203000 | 3              | 61  | 33           | 3              |
| 202203100 | 3.1            | 65  | 36           | 3.1            |
| 202203200 | 3.2            | 65  | 36           | 3.2            |
| 202203300 | 3.3            | 65  | 36           | 3.3            |
| 202203400 | 3.4            | 70  | 39           | 3.4            |
| 202203500 | 3.5            | 70  | 39           | 3.5            |
| 202203600 | 3.6            | 70  | 39           | 3.6            |
| 202203700 | 3.7            | 70  | 39           | 3.7            |
| 202203800 | 3.8            | 75  | 43           | 3.8            |
| 202203900 | 3.9            | 75  | 43           | 3.9            |
| 202204000 | 4              | 75  | 43           | 4              |
| 202204100 | 4.1            | 75  | 43           | 4.1            |
| 202204200 | 4.2            | 75  | 43           | 4.2            |
| 202204300 | 4.3            | 80  | 47           | 4.3            |
| 202204400 | 4.4            | 80  | 47           | 4.4            |
| 202204500 | 4.5            | 80  | 47           | 4.5            |
| 202204600 | 4.6            | 80  | 47           | 4.6            |
| 202204700 | 4.7            | 86  | 47           | 4.7            |
| 202204800 | 4.8            | 86  | 47           | 4.8            |
| 202204900 | 4.9            | 86  | 52           | 4.9            |
| 202205000 | 5              | 86  | 52           | 5              |
| 202205100 | 5.1            | 86  | 52           | 5.1            |
| 202205200 | 5.2            | 86  | 52           | 5.2            |
| 202205300 | 5.3            | 86  | 52           | 5.3            |
| 202205400 | 5.4            | 93  | 57           | 5.4            |
| 202205500 | 5.5            | 93  | 57           | 5.5            |
| 202205600 | 5.6            | 93  | 57           | 5.6            |
| 202205700 | 5.7            | 93  | 57           | 5.7            |
| 202205800 | 5.8            | 93  | 57           | 5.8            |
| 202205900 | 5.9            | 93  | 57           | 5.9            |
| 202206000 | 6              | 93  | 57           | 6              |
| 202206100 | 6.1            | 101 | 63           | 6.1            |
| 202206200 | 6.2            | 101 | 63           | 6.2            |
| 202206300 | 6.3            | 101 | 63           | 6.3            |
| 202206400 | 6.4            | 101 | 63           | 6.4            |
| 202206500 | 6.5            | 101 | 63           | 6.5            |
| 202206600 | 6.6            | 101 | 63           | 6.6            |
| 202206700 | 6.7            | 101 | 63           | 6.7            |
| 202206800 | 6.8            | 109 | 69           | 6.8            |
| 202206900 | 6.9            | 109 | 69           | 6.9            |
| 202207000 | 7              | 109 | 69           | 7              |
| 202207100 | 7.1            | 109 | 69           | 7.1            |
| 202207200 | 7.2            | 109 | 69           | 7.2            |
| 202207300 | 7.3            | 109 | 69           | 7.3            |
| 202207400 | 7.4            | 109 | 69           | 7.4            |
| 202207500 | 7.5            | 109 | 69           | 7.5            |
| 202207600 | 7.6            | 117 | 75           | 7.6            |
| 202207700 | 7.7            | 117 | 75           | 7.7            |
| 202207800 | 7.8            | 117 | 75           | 7.8            |
| 202207900 | 7.9            | 117 | 75           | 7.9            |

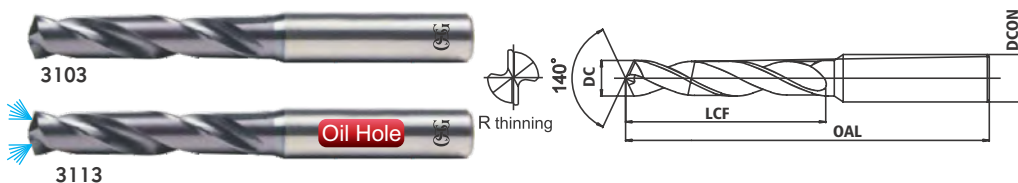




| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| Dia 3mm                       | +0.000/-0.010 |
| Dia 3.1mm-6mm                 | +0.000/-0.012 |
| Dia 6.1mm-12.7mm              | +0.000/-0.015 |



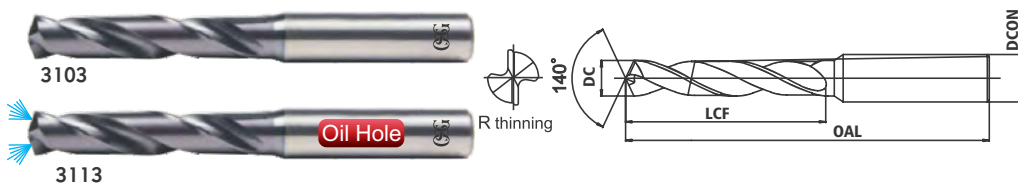
| 2022      | Drill Diameter | OAL | Flute Length | Shank Diameter |
|-----------|----------------|-----|--------------|----------------|
| EDP No.   | DC             | OAL | LCF          | DCON           |
| 202208000 | 8              | 117 | 75           | 8              |
| 202208100 | 8.1            | 117 | 75           | 8.1            |
| 202208200 | 8.2            | 117 | 75           | 8.2            |
| 202208300 | 8.3            | 117 | 75           | 8.3            |
| 202208400 | 8.4            | 117 | 75           | 8.4            |
| 202208500 | 8.5            | 117 | 75           | 8.5            |
| 202208600 | 8.6            | 125 | 81           | 8.6            |
| 202208700 | 8.7            | 125 | 81           | 8.7            |
| 202208800 | 8.8            | 125 | 81           | 8.8            |
| 202208900 | 8.9            | 125 | 81           | 8.9            |
| 202209000 | 9              | 125 | 81           | 9              |
| 202209100 | 9.1            | 125 | 81           | 9.1            |
| 202209200 | 9.2            | 125 | 81           | 9.2            |
| 202209300 | 9.3            | 125 | 81           | 9.3            |
| 202209400 | 9.4            | 125 | 81           | 9.4            |
| 202209500 | 9.5            | 125 | 81           | 9.5            |
| 202209600 | 9.6            | 133 | 87           | 9.6            |
| 202209700 | 9.7            | 133 | 87           | 9.7            |
| 202209800 | 9.8            | 133 | 87           | 9.8            |
| 202209900 | 9.9            | 133 | 87           | 9.9            |
| 202210000 | 10             | 133 | 87           | 10             |
| 202210100 | 10.1           | 133 | 87           | 10.1           |
| 202210200 | 10.2           | 133 | 87           | 10.2           |
| 202210300 | 10.3           | 133 | 87           | 10.3           |
| 202210400 | 10.4           | 133 | 87           | 10.4           |
| 202210500 | 10.5           | 142 | 87           | 10.5           |
| 202210600 | 10.6           | 142 | 87           | 10.6           |
| 202210700 | 10.7           | 142 | 94           | 10.7           |
| 202210800 | 10.8           | 142 | 94           | 10.8           |
| 202210900 | 10.9           | 142 | 94           | 10.9           |
| 202211000 | 11             | 142 | 94           | 11             |
| 202211100 | 11.1           | 142 | 94           | 11.1           |
| 202211200 | 11.2           | 142 | 94           | 11.2           |
| 202211300 | 11.3           | 142 | 94           | 11.3           |
| 202211400 | 11.4           | 142 | 94           | 11.4           |
| 202211500 | 11.5           | 142 | 94           | 11.5           |
| 202211600 | 11.6           | 142 | 94           | 11.6           |
| 202211700 | 11.7           | 142 | 94           | 11.7           |
| 202211800 | 11.8           | 142 | 94           | 11.8           |
| 202211900 | 11.9           | 151 | 101          | 11.9           |
| 202212000 | 12             | 151 | 101          | 12             |
| 202212100 | 12.1           | 151 | 101          | 12.1           |
| 202212200 | 12.2           | 151 | 101          | 12.2           |
| 202212300 | 12.3           | 151 | 101          | 12.3           |
| 202212400 | 12.4           | 151 | 101          | 12.4           |
| 202212500 | 12.5           | 151 | 101          | 12.5           |
| 202212600 | 12.6           | 151 | 101          | 12.6           |
| 202212700 | 12.7           | 151 | 101          | 12.7           |



| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

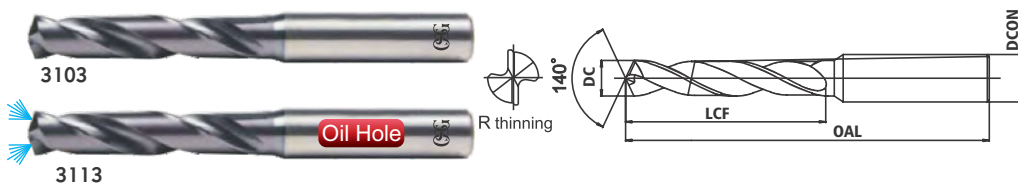
| 3103 HPD - 3D | 3113 HO - HPD - 3D       | Drill Diameter | OAL | Flute Length | Shank Diameter |
|---------------|--------------------------|----------------|-----|--------------|----------------|
| EDP No.       | EDP No.                  | DC             | OAL | LCF          | DCON           |
| 310301001     | Not available this size. | 1              | 35  | 7            | 3              |
| 310301101     | Not available this size. | 1.1            | 35  | 7            | 3              |
| 310301201     | Not available this size. | 1.2            | 35  | 8            | 3              |
| 310301301     | Not available this size. | 1.3            | 35  | 8            | 3              |
| 310301401     | Not available this size. | 1.4            | 35  | 9            | 3              |
| 310301501     | Not available this size. | 1.5            | 40  | 9            | 3              |
| 310301601     | Not available this size. | 1.6            | 40  | 10           | 3              |
| 310301701     | Not available this size. | 1.7            | 40  | 10           | 3              |
| 310301801     | Not available this size. | 1.8            | 40  | 11           | 3              |
| 310301901     | Not available this size. | 1.9            | 40  | 11           | 3              |
| 310302001     | Not available this size. | 2              | 45  | 13           | 3              |
| 310302101     | Not available this size. | 2.1            | 45  | 13           | 3              |
| 310302201     | Not available this size. | 2.2            | 45  | 13           | 3              |
| 310302301     | Not available this size. | 2.3            | 45  | 13           | 3              |
| 310302401     | Not available this size. | 2.4            | 45  | 15           | 3              |
| 310302501     | Not available this size. | 2.5            | 50  | 15           | 3              |
| 310302601     | Not available this size. | 2.6            | 50  | 15           | 3              |
| 310302701     | Not available this size. | 2.7            | 50  | 17           | 3              |
| 310302801     | Not available this size. | 2.8            | 50  | 17           | 3              |
| 310302901     | Not available this size. | 2.9            | 50  | 17           | 3              |
| 310303001     | 311303001                | 3              | 62  | 20           | 6              |
| 310303101     | 311303101                | 3.1            | 62  | 20           | 6              |
| 310303171     | 311303171                | 3.17 (1/8)     | 62  | 20           | 6              |
| 310303201     | 311303201                | 3.2            | 62  | 20           | 6              |
| 310303301     | 311303301                | 3.3            | 62  | 20           | 6              |
| 310303401     | 311303401                | 3.4            | 62  | 20           | 6              |
| 310303501     | 311303501                | 3.5            | 62  | 20           | 6              |
| 310303571     | 311303571                | 3.57 (9/64)    | 62  | 20           | 6              |
| 310303601     | 311303601                | 3.6            | 62  | 20           | 6              |
| 310303701     | 311303701                | 3.7            | 62  | 20           | 6              |
| 310303801     | 311303801                | 3.8            | 66  | 24           | 6              |
| 310303901     | 311303901                | 3.9            | 66  | 24           | 6              |
| 310303971     | 311303971                | 3.97 (5/32)    | 66  | 24           | 6              |
| 310304001     | 311304001                | 4              | 66  | 24           | 6              |
| 310304101     | 311304101                | 4.1            | 66  | 24           | 6              |
| 310304201     | 311304201                | 4.2            | 66  | 24           | 6              |
| 310304301     | 311304301                | 4.3            | 66  | 24           | 6              |
| 310304371     | 311304371                | 4.37 (11/64)   | 66  | 24           | 6              |
| 310304401     | 311304401                | 4.4            | 66  | 24           | 6              |
| 310304501     | 311304501                | 4.5            | 66  | 24           | 6              |
| 310304601     | 311304601                | 4.6            | 66  | 24           | 6              |
| 310304701     | 311304701                | 4.7            | 66  | 24           | 6              |
| 310304761     | 311304761                | 4.76 (3/16)    | 66  | 28           | 6              |
| 310304801     | 311304801                | 4.8            | 66  | 28           | 6              |
| 310304901     | 311304901                | 4.9            | 66  | 28           | 6              |
| 310305001     | 311305001                | 5              | 66  | 28           | 6              |
| 310305101     | 311305101                | 5.1            | 66  | 28           | 6              |
| 310305161     | 311305161                | 5.16 (13/64)   | 66  | 28           | 6              |
| 310305201     | 311305201                | 5.2            | 66  | 28           | 6              |
| 310305301     | 311305301                | 5.3            | 66  | 28           | 6              |
| 310305401     | 311305401                | 5.4            | 66  | 28           | 6              |
| 310305501     | 311305501                | 5.5            | 66  | 28           | 6              |





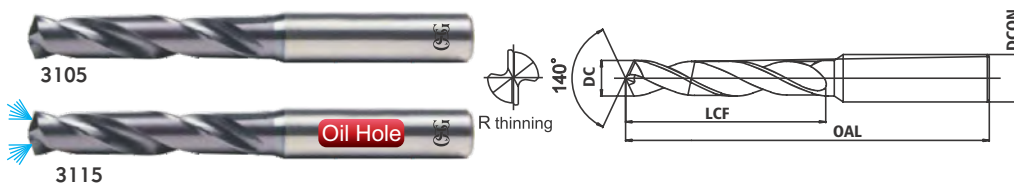
| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

| 3103 HPD - 3D | 3113 HO - HPD - 3D | Drill Diameter | OAL | Flute Length | Shank Diameter |
|---------------|--------------------|----------------|-----|--------------|----------------|
| EDP No.       | EDP No.            | DC             | OAL | LCF          | DCON           |
| 310305561     | 311305561          | 5.56 (7/32)    | 66  | 28           | 6              |
| 310305601     | 311305601          | 5.6            | 66  | 28           | 6              |
| 310305701     | 311305701          | 5.7            | 66  | 28           | 6              |
| 310305801     | 311305801          | 5.8            | 66  | 28           | 6              |
| 310305901     | 311305901          | 5.9            | 66  | 28           | 6              |
| 310305951     | 311305951          | 5.95 (15/64)   | 66  | 28           | 6              |
| 310306001     | 311306001          | 6              | 66  | 28           | 6              |
| 310306101     | 311306101          | 6.1            | 79  | 34           | 8              |
| 310306201     | 311306201          | 6.2            | 79  | 34           | 8              |
| 310306301     | 311306301          | 6.3            | 79  | 34           | 8              |
| 310306351     | 311306351          | 6.35 (1/4)     | 79  | 34           | 8              |
| 310306401     | 311306401          | 6.4            | 79  | 34           | 8              |
| 310306501     | 311306501          | 6.5            | 79  | 34           | 8              |
| 310306601     | 311306601          | 6.6            | 79  | 34           | 8              |
| 310306701     | 311306701          | 6.7            | 79  | 34           | 8              |
| 310306751     | 311306751          | 6.75 (17/64)   | 79  | 34           | 8              |
| 310306801     | 311306801          | 6.8            | 79  | 34           | 8              |
| 310306901     | 311306901          | 6.9            | 79  | 34           | 8              |
| 310307001     | 311307001          | 7              | 79  | 34           | 8              |
| 310307101     | 311307101          | 7.1            | 79  | 41           | 8              |
| 310307141     | 311307141          | 7.14 (9/32)    | 79  | 41           | 8              |
| 310307201     | 311307201          | 7.2            | 79  | 41           | 8              |
| 310307301     | 311307301          | 7.3            | 79  | 41           | 8              |
| 310307401     | 311307401          | 7.4            | 79  | 41           | 8              |
| 310307501     | 311307501          | 7.5            | 79  | 41           | 8              |
| 310307541     | 311307541          | 7.54 (19/64)   | 79  | 41           | 8              |
| 310307601     | 311307601          | 7.6            | 79  | 41           | 8              |
| 310307701     | 311307701          | 7.7            | 79  | 41           | 8              |
| 310307801     | 311307801          | 7.8            | 79  | 41           | 8              |
| 310307901     | 311307901          | 7.9            | 79  | 41           | 8              |
| 310307941     | 311307941          | 7.94 (5/16)    | 79  | 41           | 8              |
| 310308001     | 311308001          | 8              | 79  | 41           | 8              |
| 310308101     | 311308101          | 8.1            | 89  | 47           | 10             |
| 310308201     | 311308201          | 8.2            | 89  | 47           | 10             |
| 310308301     | 311308301          | 8.3            | 89  | 47           | 10             |
| 310308331     | 311308331          | 8.33 (21/64)   | 89  | 47           | 10             |
| 310308401     | 311308401          | 8.4            | 89  | 47           | 10             |
| 310308501     | 311308501          | 8.5            | 89  | 47           | 10             |
| 310308601     | 311308601          | 8.6            | 89  | 47           | 10             |
| 310308701     | 311308701          | 8.7            | 89  | 47           | 10             |
| 310308731     | 311308731          | 8.73 (11/32)   | 89  | 47           | 10             |
| 310308801     | 311308801          | 8.8            | 89  | 47           | 10             |
| 310308901     | 311308901          | 8.9            | 89  | 47           | 10             |
| 310309001     | 311309001          | 9              | 89  | 47           | 10             |
| 310309101     | 311309101          | 9.1            | 89  | 47           | 10             |
| 310309131     | 311309131          | 9.13 (23/64)   | 89  | 47           | 10             |
| 310309201     | 311309201          | 9.2            | 89  | 47           | 10             |
| 310309301     | 311309301          | 9.3            | 89  | 47           | 10             |
| 310309401     | 311309401          | 9.4            | 89  | 47           | 10             |
| 310309501     | 311309501          | 9.5            | 89  | 47           | 10             |
| 310309521     | 311309521          | 9.52 (3/8)     | 89  | 47           | 10             |



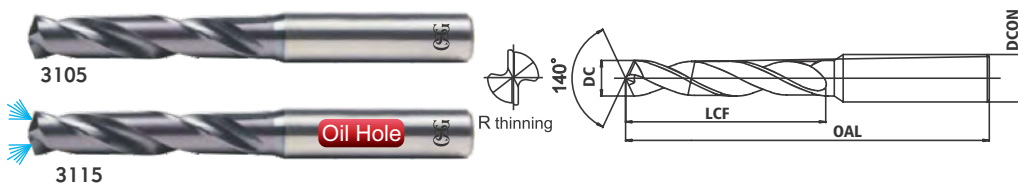
| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

| 3103 HPD - 3D | 3113 HO - HPD - 3D | Drill Diameter | OAL | Flute Length | Shank Diameter |
|---------------|--------------------|----------------|-----|--------------|----------------|
| EDP No.       | EDP No.            | DC             | OAL | LCF          | DCON           |
| 310309601     | 311309601          | 9.6            | 89  | 47           | 10             |
| 310309701     | 311309701          | 9.7            | 89  | 47           | 10             |
| 310309801     | 311309801          | 9.8            | 89  | 47           | 10             |
| 310309901     | 311309901          | 9.9            | 89  | 47           | 10             |
| 310309921     | 311309921          | 9.92 (25/64)   | 89  | 47           | 10             |
| 310310001     | 311310001          | 10             | 89  | 47           | 10             |
| 310310101     | 311310101          | 10.1           | 102 | 55           | 12             |
| 310310201     | 311310201          | 10.2           | 102 | 55           | 12             |
| 310310301     | 311310301          | 10.3           | 102 | 55           | 12             |
| 310310321     | 311310321          | 10.32 (13/32)  | 102 | 55           | 12             |
| 310310401     | 311310401          | 10.4           | 102 | 55           | 12             |
| 310310501     | 311310501          | 10.5           | 102 | 55           | 12             |
| 310310601     | 311310601          | 10.6           | 102 | 55           | 12             |
| 310310701     | 311310701          | 10.7           | 102 | 55           | 12             |
| 310310721     | 311310721          | 10.72 (27/64)  | 102 | 55           | 12             |
| 310310801     | 311310801          | 10.8           | 102 | 55           | 12             |
| 310310901     | 311310901          | 10.9           | 102 | 55           | 12             |
| 310311001     | 311311001          | 11             | 102 | 55           | 12             |
| 310311101     | 311311101          | 11.1           | 102 | 55           | 12             |
| 310311111     | 311311111          | 11.11 (7/16)   | 102 | 55           | 12             |
| 310311201     | 311311201          | 11.2           | 102 | 55           | 12             |
| 310311301     | 311311301          | 11.3           | 102 | 55           | 12             |
| 310311401     | 311311401          | 11.4           | 102 | 55           | 12             |
| 310311501     | 311311501          | 11.5           | 102 | 55           | 12             |
| 310311511     | 311311511          | 11.51 (29/64)  | 102 | 55           | 12             |
| 310311601     | 311311601          | 11.6           | 102 | 55           | 12             |
| 310311701     | 311311701          | 11.7           | 102 | 55           | 12             |
| 310311801     | 311311801          | 11.8           | 102 | 55           | 12             |
| 310311901     | 311311901          | 11.9           | 102 | 55           | 12             |
| 310311911     | 311311911          | 11.91 (15/32)  | 102 | 55           | 12             |
| 310312001     | 311312001          | 12             | 102 | 55           | 12             |
| 310312301     | 311312301          | 12.30 (31/64)  | 107 | 60           | 14             |
| 310312501     | 311312501          | 12.5           | 107 | 60           | 14             |
| 310312701     | 311312701          | 12.70 (1/2)    | 107 | 60           | 14             |
| 310313001     | 311313001          | 13             | 107 | 60           | 14             |
| 310313501     | 311313501          | 13.5           | 107 | 60           | 14             |
| 310314001     | 311314001          | 14             | 107 | 60           | 14             |
| 310314291     | 311314291          | 14.29 (9/16)   | 115 | 65           | 16             |
| 310314501     | 311314501          | 14.5           | 115 | 65           | 16             |
| 310315001     | 311315001          | 15             | 115 | 65           | 16             |
| 310315501     | 311315501          | 15.5           | 115 | 65           | 16             |
| 310315871     | 311315871          | 15.87 (5/8)    | 115 | 65           | 16             |
| 310316001     | 311316001          | 16             | 115 | 65           | 16             |
| 310316501     | 311316501          | 16.5           | 123 | 73           | 18             |
| 310317001     | 311317001          | 17             | 123 | 73           | 18             |
| 310317501     | 311317501          | 17.5           | 123 | 73           | 18             |
| 310318001     | 311318001          | 18             | 123 | 73           | 18             |
| 310318501     | 311318501          | 18.5           | 131 | 79           | 20             |
| 310319001     | 311319001          | 19             | 131 | 79           | 20             |
| 310319051     | 311319051          | 19.05 (3/4)    | 131 | 79           | 20             |
| 310319501     | 311319501          | 19.5           | 131 | 79           | 20             |
| 310320001     | 311320001          | 20             | 131 | 79           | 20             |



| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

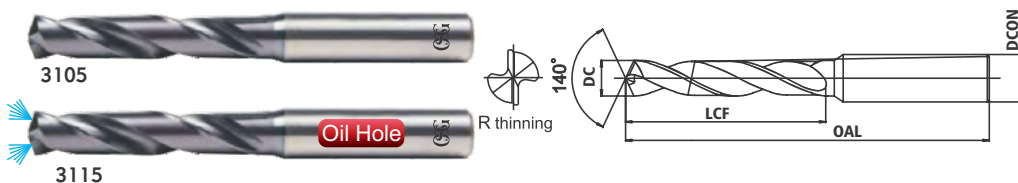
| 3105 HPD - 5D | 3115 HO-HPD - 5D         | Drill Diameter | OAL | Flute Length | Shank Diameter |
|---------------|--------------------------|----------------|-----|--------------|----------------|
| EDP No.       | EDP No.                  | DC             | OAL | LCF          | DCON           |
| 310501001     | Not available this size. | 1              | 38  | 9            | 3              |
| 310501101     | Not available this size. | 1.1            | 38  | 9            | 3              |
| 310501201     | Not available this size. | 1.2            | 38  | 11           | 3              |
| 310501301     | Not available this size. | 1.3            | 38  | 11           | 3              |
| 310501401     | Not available this size. | 1.4            | 38  | 12           | 3              |
| 310501501     | Not available this size. | 1.5            | 45  | 12           | 3              |
| 310501601     | Not available this size. | 1.6            | 45  | 14           | 3              |
| 310501701     | Not available this size. | 1.7            | 45  | 14           | 3              |
| 310501801     | Not available this size. | 1.8            | 45  | 16           | 3              |
| 310501901     | Not available this size. | 1.9            | 45  | 16           | 3              |
| 310502001     | Not available this size. | 2              | 52  | 18           | 3              |
| 310502101     | Not available this size. | 2.1            | 52  | 18           | 3              |
| 310502201     | Not available this size. | 2.2            | 52  | 20           | 3              |
| 310502301     | Not available this size. | 2.3            | 52  | 20           | 3              |
| 310502401     | Not available this size. | 2.4            | 52  | 22           | 3              |
| 310502501     | Not available this size. | 2.5            | 56  | 22           | 3              |
| 310502601     | Not available this size. | 2.6            | 56  | 22           | 3              |
| 310502701     | Not available this size. | 2.7            | 56  | 23           | 3              |
| 310502801     | Not available this size. | 2.8            | 56  | 23           | 3              |
| 310502901     | Not available this size. | 2.9            | 56  | 23           | 3              |
| 310503001     | 311503001                | 3              | 66  | 28           | 6              |
| 310503101     | 311503101                | 3.1            | 66  | 28           | 6              |
| 310503171     | 311503171                | 3.17 (1/8)     | 66  | 28           | 6              |
| 310503201     | 311503201                | 3.2            | 66  | 28           | 6              |
| 310503301     | 311503301                | 3.3            | 66  | 28           | 6              |
| 310503401     | 311503401                | 3.4            | 66  | 28           | 6              |
| 310503501     | 311503501                | 3.5            | 66  | 28           | 6              |
| 310503571     | 311503571                | 3.57 (9/64)    | 66  | 28           | 6              |
| 310503601     | 311503601                | 3.6            | 66  | 28           | 6              |
| 310503701     | 311503701                | 3.7            | 66  | 28           | 6              |
| 310503801     | 311503801                | 3.8            | 74  | 36           | 6              |
| 310503901     | 311503901                | 3.9            | 74  | 36           | 6              |
| 310503971     | 311503971                | 3.97 (5/32)    | 74  | 36           | 6              |
| 310504001     | 311504001                | 4              | 74  | 36           | 6              |
| 310504101     | 311504101                | 4.1            | 74  | 36           | 6              |
| 310504201     | 311504201                | 4.2            | 74  | 36           | 6              |
| 310504301     | 311504301                | 4.3            | 74  | 36           | 6              |
| 310504371     | 311504371                | 4.37 (11/64)   | 74  | 36           | 6              |
| 310504401     | 311504401                | 4.4            | 74  | 36           | 6              |
| 310504501     | 311504501                | 4.5            | 74  | 36           | 6              |
| 310504601     | 311504601                | 4.6            | 74  | 36           | 6              |
| 310504701     | 311504701                | 4.7            | 74  | 36           | 6              |
| 310504761     | 311504761                | 4.76 (3/16)    | 82  | 44           | 6              |
| 310504801     | 311504801                | 4.8            | 82  | 44           | 6              |
| 310504901     | 311504901                | 4.9            | 82  | 44           | 6              |
| 310505001     | 311505001                | 5              | 82  | 44           | 6              |
| 310505101     | 311505101                | 5.1            | 82  | 44           | 6              |
| 310505161     | 311505161                | 5.16 (13/64)   | 82  | 44           | 6              |
| 310505201     | 311505201                | 5.2            | 82  | 44           | 6              |
| 310505301     | 311505301                | 5.3            | 82  | 44           | 6              |
| 310505401     | 311505401                | 5.4            | 82  | 44           | 6              |
| 310505501     | 311505501                | 5.5            | 82  | 44           | 6              |
| 310505561     | 311505561                | 5.56 (7/32)    | 82  | 44           | 6              |



| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

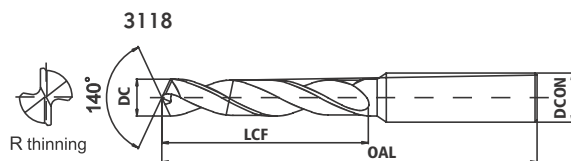
| 3105 HPD - 5D | 3115 HO-HPD - 5D | Drill Diameter | OAL | Flute Length | Shank Diameter |
|---------------|------------------|----------------|-----|--------------|----------------|
| EDP No.       | EDP No.          | DC             | OAL | LCF          | DCON           |
| 310505601     | 311505601        | 5.6            | 82  | 44           | 6              |
| 310505701     | 311505701        | 5.7            | 82  | 44           | 6              |
| 310505801     | 311505801        | 5.8            | 82  | 44           | 6              |
| 310505901     | 311505901        | 5.9            | 82  | 44           | 6              |
| 310505951     | 311505951        | 5.95 (15/64)   | 82  | 44           | 6              |
| 310506001     | 311506001        | 6              | 82  | 44           | 6              |
| 310506101     | 311506101        | 6.1            | 91  | 53           | 8              |
| 310506201     | 311506201        | 6.2            | 91  | 53           | 8              |
| 310506301     | 311506301        | 6.3            | 91  | 53           | 8              |
| 310506351     | 311506351        | 6.35 (1/4)     | 91  | 53           | 8              |
| 310506401     | 311506401        | 6.4            | 91  | 53           | 8              |
| 310506501     | 311506501        | 6.5            | 91  | 53           | 8              |
| 310506601     | 311506601        | 6.6            | 91  | 53           | 8              |
| 310506701     | 311506701        | 6.7            | 91  | 53           | 8              |
| 310506751     | 311506751        | 6.75 (17/64)   | 91  | 53           | 8              |
| 310506801     | 311506801        | 6.8            | 91  | 53           | 8              |
| 310506901     | 311506901        | 6.9            | 91  | 53           | 8              |
| 310507001     | 311507001        | 7              | 91  | 53           | 8              |
| 310507101     | 311507101        | 7.1            | 91  | 53           | 8              |
| 310507141     | 311507141        | 7.14 (9/32)    | 91  | 53           | 8              |
| 310507201     | 311507201        | 7.2            | 91  | 53           | 8              |
| 310507301     | 311507301        | 7.3            | 91  | 53           | 8              |
| 310507401     | 311507401        | 7.4            | 91  | 53           | 8              |
| 310507501     | 311507501        | 7.5            | 91  | 53           | 8              |
| 310507541     | 311507541        | 7.54 (19/64)   | 91  | 53           | 8              |
| 310507601     | 311507601        | 7.6            | 91  | 53           | 8              |
| 310507701     | 311507701        | 7.7            | 91  | 53           | 8              |
| 310507801     | 311507801        | 7.8            | 91  | 53           | 8              |
| 310507901     | 311507901        | 7.9            | 91  | 53           | 8              |
| 310507941     | 311507941        | 7.94 (5/16)    | 91  | 53           | 8              |
| 310508001     | 311508001        | 8              | 91  | 53           | 8              |
| 310508101     | 311508101        | 8.1            | 103 | 61           | 10             |
| 310508201     | 311508201        | 8.2            | 103 | 61           | 10             |
| 310508301     | 311508301        | 8.3            | 103 | 61           | 10             |
| 310508331     | 311508331        | 8.33 (21/64)   | 103 | 61           | 10             |
| 310508401     | 311508401        | 8.4            | 103 | 61           | 10             |
| 310508501     | 311508501        | 8.5            | 103 | 61           | 10             |
| 310508601     | 311508601        | 8.6            | 103 | 61           | 10             |
| 310508701     | 311508701        | 8.7            | 103 | 61           | 10             |
| 310508731     | 311508731        | 8.73 (11/32)   | 103 | 61           | 10             |
| 310508801     | 311508801        | 8.8            | 103 | 61           | 10             |
| 310508901     | 311508901        | 8.9            | 103 | 61           | 10             |
| 310509001     | 311509001        | 9              | 103 | 61           | 10             |
| 310509101     | 311509101        | 9.1            | 103 | 61           | 10             |
| 310509131     | 311509131        | 9.13 (23/64)   | 103 | 61           | 10             |
| 310509201     | 311509201        | 9.2            | 103 | 61           | 10             |
| 310509301     | 311509301        | 9.3            | 103 | 61           | 10             |
| 310509401     | 311509401        | 9.4            | 103 | 61           | 10             |
| 310509501     | 311509501        | 9.5            | 103 | 61           | 10             |
| 310509521     | 311509521        | 9.52 (3/8)     | 103 | 61           | 10             |
| 310509601     | 311509601        | 9.6            | 103 | 61           | 10             |
| 310509701     | 311509701        | 9.7            | 103 | 61           | 10             |
| 310509801     | 311509801        | 9.8            | 103 | 61           | 10             |





| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

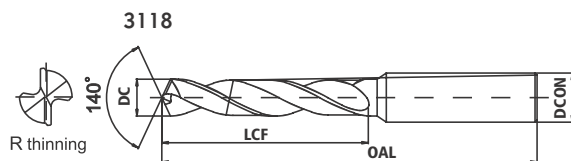
| 3105 HPD - 5D | 3115 HO-HPD - 5D | Drill Diameter | OAL | Flute Length | Shank Diameter |
|---------------|------------------|----------------|-----|--------------|----------------|
| EDP No.       | EDP No.          | DC             | OAL | LCF          | DCON           |
| 310509901     | 311509901        | 9.9            | 103 | 61           | 10             |
| 310509921     | 311509921        | 9.92 (25/64)   | 103 | 61           | 10             |
| 310510001     | 311510001        | 10             | 103 | 61           | 10             |
| 310510101     | 311510101        | 10.1           | 118 | 71           | 12             |
| 310510201     | 311510201        | 10.2           | 118 | 71           | 12             |
| 310510301     | 311510301        | 10.3           | 118 | 71           | 12             |
| 310510321     | 311510321        | 10.31 (13/32)  | 118 | 71           | 12             |
| 310510401     | 311510401        | 10.4           | 118 | 71           | 12             |
| 310510501     | 311510501        | 10.5           | 118 | 71           | 12             |
| 310510601     | 311510601        | 10.6           | 118 | 71           | 12             |
| 310510701     | 311510701        | 10.7           | 118 | 71           | 12             |
| 310510721     | 311510721        | 10.72 (27/64)  | 118 | 71           | 12             |
| 310510801     | 311510801        | 10.8           | 118 | 71           | 12             |
| 310510901     | 311510901        | 10.9           | 118 | 71           | 12             |
| 310511001     | 311511001        | 11             | 118 | 71           | 12             |
| 310511101     | 311511101        | 11.1           | 118 | 71           | 12             |
| 310511111     | 311511111        | 11.11 (7/16)   | 118 | 71           | 12             |
| 310511201     | 311511201        | 11.2           | 118 | 71           | 12             |
| 310511301     | 311511301        | 11.3           | 118 | 71           | 12             |
| 310511401     | 311511401        | 11.4           | 118 | 71           | 12             |
| 310511501     | 311511501        | 11.5           | 118 | 71           | 12             |
| 310511511     | 311511511        | 11.50 (29/64)  | 118 | 71           | 12             |
| 310511601     | 311511601        | 11.6           | 118 | 71           | 12             |
| 310511701     | 311511701        | 11.7           | 118 | 71           | 12             |
| 310511801     | 311511801        | 11.8           | 118 | 71           | 12             |
| 310511901     | 311511901        | 11.9           | 118 | 71           | 12             |
| 310511911     | 311511911        | 11.90 (15/32)  | 118 | 71           | 12             |
| 310512001     | 311512001        | 12             | 118 | 71           | 12             |
| 310512301     | 311512301        | 12.30 (31/64)  | 124 | 77           | 14             |
| 310512501     | 311512501        | 12.5           | 124 | 77           | 14             |
| 310512701     | 311512701        | 12.70 (1/2)    | 124 | 77           | 14             |
| 310513001     | 311513001        | 13             | 124 | 77           | 14             |
| 310513501     | 311513501        | 13.5           | 124 | 77           | 14             |
| 310514001     | 311514001        | 14             | 124 | 77           | 14             |
| 310514291     | 311514291        | 14.28 (9/16)   | 133 | 83           | 16             |
| 310514501     | 311514501        | 14.5           | 133 | 83           | 16             |
| 310515001     | 311515001        | 15             | 133 | 83           | 16             |
| 310515501     | 311515501        | 15.5           | 133 | 83           | 16             |
| 310515871     | 311515871        | 15.87 (5/8)    | 133 | 83           | 16             |
| 310516001     | 311516001        | 16             | 133 | 83           | 16             |
| 310516501     | 311516501        | 16.5           | 143 | 93           | 18             |
| 310517001     | 311517001        | 17             | 143 | 93           | 18             |
| 310517501     | 311517501        | 17.5           | 143 | 93           | 18             |
| 310518001     | 311518001        | 18             | 143 | 93           | 18             |
| 310518501     | 311518501        | 18.5           | 153 | 101          | 20             |
| 310519001     | 311519001        | 19             | 153 | 101          | 20             |
| 310519051     | 311519051        | 19.05 (3/4)    | 153 | 101          | 20             |
| 310519501     | 311519501        | 19.5           | 153 | 101          | 20             |
| 310520001     | 311520001        | 20             | 153 | 101          | 20             |



| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

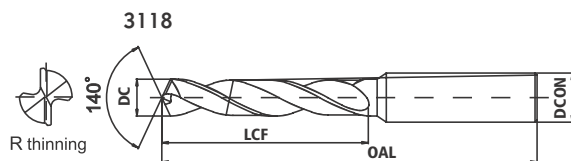
| 3118 HO- HPD 8D | Drill Diameter       | OAL | Flute Length | Shank Diameter |  |
|-----------------|----------------------|-----|--------------|----------------|--|
| EDP No.         | DC                   | OAL | LCF          | DCON           |  |
| 311803001       | 3                    | 72  | 34           | 4              |  |
| 311803101       | 3.1                  | 81  | 43           | 4              |  |
| 311803171       | 3.17 (1/8)           | 81  | 43           | 4              |  |
| 311803201       | 3.2                  | 81  | 43           | 4              |  |
| 311803301       | 3.3                  | 81  | 43           | 4              |  |
| 311803401       | 3.4                  | 81  | 43           | 4              |  |
| 311803501       | 3.5                  | 81  | 43           | 4              |  |
| 311803571       | 3.57 (9/64)          | 81  | 43           | 4              |  |
| 311803601       | 3.6                  | 81  | 43           | 4              |  |
| 311803701       | 3.7                  | 81  | 43           | 4              |  |
| 311803801       | 3.8                  | 81  | 43           | 4              |  |
| 311803901       | 3.9                  | 81  | 43           | 4              |  |
| 311803971       | 3.97 (5/32)          | 81  | 43           | 4              |  |
| 311804001       | 4                    | 81  | 43           | 4              |  |
| 311804091       | 4.09 (Wire Gauge 20) | 90  | 50           | 6              |  |
| 311804101       | 4.1                  | 90  | 50           | 6              |  |
| 311804201       | 4.2                  | 90  | 50           | 6              |  |
| 311804301       | 4.3                  | 90  | 50           | 6              |  |
| 311804371       | 4.37 (11/64)         | 90  | 50           | 6              |  |
| 311804401       | 4.4                  | 90  | 50           | 6              |  |
| 311804501       | 4.5                  | 90  | 50           | 6              |  |
| 311804601       | 4.6                  | 90  | 50           | 6              |  |
| 311804701       | 4.7                  | 90  | 50           | 6              |  |
| 311804761       | 4.76 (3/16)          | 90  | 50           | 6              |  |
| 311804801       | 4.8                  | 90  | 50           | 6              |  |
| 311804901       | 4.9                  | 90  | 50           | 6              |  |
| 311805001       | 5                    | 90  | 50           | 6              |  |
| 311805101       | 5.1                  | 97  | 57           | 6              |  |
| 311805161       | 5.16 (13/64)         | 97  | 57           | 6              |  |
| 311805201       | 5.2                  | 97  | 57           | 6              |  |
| 311805301       | 5.3                  | 97  | 57           | 6              |  |
| 311805401       | 5.4                  | 97  | 57           | 6              |  |
| 311805411       | 5.41 (Wire Gauge 3)  | 97  | 57           | 6              |  |
| 311805501       | 5.5                  | 97  | 57           | 6              |  |
| 311805561       | 5.56 (7/32)          | 97  | 57           | 6              |  |
| 311805601       | 5.6                  | 97  | 57           | 6              |  |
| 311805701       | 5.7                  | 97  | 57           | 6              |  |
| 311805801       | 5.8                  | 97  | 57           | 6              |  |
| 311805901       | 5.9                  | 97  | 57           | 6              |  |
| 311805951       | 5.95 (15/64)         | 97  | 57           | 6              |  |
| 311806001       | 6                    | 97  | 57           | 6              |  |
| 311806101       | 6.1                  | 106 | 66           | 8              |  |
| 311806201       | 6.2                  | 106 | 66           | 8              |  |
| 311806301       | 6.3                  | 106 | 66           | 8              |  |
| 311806351       | 6.35 (1/4 E)         | 106 | 66           | 8              |  |
| 311806401       | 6.4                  | 106 | 66           | 8              |  |
| 311806501       | 6.5                  | 106 | 66           | 8              |  |
| 311806531       | 6.53 (F)             | 106 | 66           | 8              |  |
| 311806601       | 6.6                  | 106 | 66           | 8              |  |
| 311806701       | 6.7                  | 106 | 66           | 8              |  |
| 311806751       | 6.75 (17/64)         | 106 | 66           | 8              |  |
| 311806801       | 6.8                  | 106 | 66           | 8              |  |





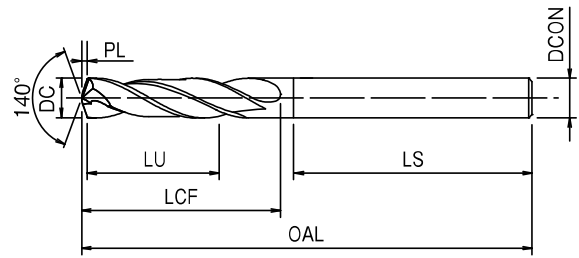
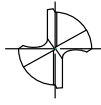
| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

| 3118 HO- HPD 8D | Drill Diameter | OAL | Flute Length | Shank Diameter |  |
|-----------------|----------------|-----|--------------|----------------|--|
| EDP No.         | DC             | OAL | LCF          | DCON           |  |
| 311806901       | 6.9            | 116 | 76           | 8              |  |
| 311807001       | 7              | 116 | 76           | 8              |  |
| 311807101       | 7.1            | 116 | 76           | 8              |  |
| 311807141       | 7.14 (9/32)    | 116 | 76           | 8              |  |
| 311807201       | 7.2            | 116 | 76           | 8              |  |
| 311807301       | 7.3            | 116 | 76           | 8              |  |
| 311807401       | 7.4            | 116 | 76           | 8              |  |
| 311807501       | 7.5            | 116 | 76           | 8              |  |
| 311807541       | 7.54 (19/64)   | 116 | 76           | 8              |  |
| 311807601       | 7.6            | 116 | 76           | 8              |  |
| 311807701       | 7.7            | 116 | 76           | 8              |  |
| 311807801       | 7.8            | 116 | 76           | 8              |  |
| 311807901       | 7.9            | 116 | 76           | 8              |  |
| 311807941       | 7.94 (5/16)    | 116 | 76           | 8              |  |
| 311808001       | 8              | 116 | 76           | 8              |  |
| 311808101       | 8.1            | 131 | 87           | 10             |  |
| 311808201       | 8.2            | 131 | 87           | 10             |  |
| 311808301       | 8.3            | 131 | 87           | 10             |  |
| 311808331       | 8.33 (21/64)   | 131 | 87           | 10             |  |
| 311808401       | 8.4            | 131 | 87           | 10             |  |
| 311808501       | 8.5            | 131 | 87           | 10             |  |
| 311808601       | 8.6            | 131 | 87           | 10             |  |
| 311808701       | 8.7            | 131 | 87           | 10             |  |
| 311808731       | 8.73 (11/32)   | 131 | 87           | 10             |  |
| 311808801       | 8.8            | 131 | 87           | 10             |  |
| 311808901       | 8.9            | 131 | 87           | 10             |  |
| 311809001       | 9              | 131 | 87           | 10             |  |
| 311809101       | 9.1            | 139 | 95           | 10             |  |
| 311809131       | 9.13 (23/64)   | 139 | 95           | 10             |  |
| 311809201       | 9.2            | 139 | 95           | 10             |  |
| 311809301       | 9.3            | 139 | 95           | 10             |  |
| 311809401       | 9.4            | 139 | 95           | 10             |  |
| 311809501       | 9.5            | 139 | 95           | 10             |  |
| 311809521       | 9.52 (3/8)     | 139 | 95           | 10             |  |
| 311809601       | 9.6            | 139 | 95           | 10             |  |
| 311809701       | 9.7            | 139 | 95           | 10             |  |
| 311809801       | 9.8            | 139 | 95           | 10             |  |
| 311809901       | 9.9            | 139 | 95           | 10             |  |
| 311809921       | 9.92 (25/64)   | 139 | 95           | 10             |  |
| 311810001       | 10             | 139 | 95           | 10             |  |
| 311810101       | 10.1           | 155 | 106          | 12             |  |
| 311810201       | 10.2           | 155 | 106          | 12             |  |
| 311810301       | 10.3           | 155 | 106          | 12             |  |
| 311810321       | 10.32 (13/32)  | 155 | 106          | 12             |  |
| 311810401       | 10.4           | 155 | 106          | 12             |  |
| 311810501       | 10.5           | 155 | 106          | 12             |  |
| 311810601       | 10.6           | 155 | 106          | 12             |  |
| 311810701       | 10.7           | 155 | 106          | 12             |  |
| 311810721       | 10.72          | 155 | 106          | 12             |  |
| 311810801       | 10.8           | 155 | 106          | 12             |  |
| 311810901       | 10.9           | 155 | 106          | 12             |  |
| 311811001       | 11             | 155 | 106          | 12             |  |
| 311811101       | 11.1 (27/64)   | 163 | 114          | 12             |  |



| Tolerance for cutter Diameter |               |
|-------------------------------|---------------|
| up to Dia 3mm                 | +0.012/+0.002 |
| Dia 3.1mm-6mm                 | +0.016/+0.004 |
| Dia 6.1mm-10mm                | +0.021/+0.006 |
| Dia 10.1mm-18mm               | +0.025/+0.007 |
| Dia 18.1mm-20mm               | +0.029/+0.008 |

| 3118 HO- HPD 8D | Drill Diameter | OAL | Flute Length | Shank Diameter |  |
|-----------------|----------------|-----|--------------|----------------|--|
| EDP No.         | DC             | OAL | LCF          | DCON           |  |
| 311811111       | 11.11 (7/16)   | 163 | 114          | 12             |  |
| 311811201       | 11.2           | 163 | 114          | 12             |  |
| 311811301       | 11.3           | 163 | 114          | 12             |  |
| 311811401       | 11.4           | 163 | 114          | 12             |  |
| 311811501       | 11.5           | 163 | 114          | 12             |  |
| 311811511       | 11.51 (29/64)  | 163 | 114          | 12             |  |
| 311811601       | 11.6           | 163 | 114          | 12             |  |
| 311811701       | 11.7           | 163 | 114          | 12             |  |
| 311811801       | 11.8           | 163 | 114          | 12             |  |
| 311811901       | 11.9           | 163 | 114          | 12             |  |
| 311811911       | 11.91 (15/32)  | 163 | 114          | 12             |  |
| 311812001       | 12             | 163 | 114          | 12             |  |
| 311812301       | 12.3 (31/64)   | 182 | 133          | 14             |  |
| 311812501       | 12.5           | 182 | 133          | 14             |  |
| 311812701       | 12.7 (1/20)    | 182 | 133          | 14             |  |
| 311813001       | 13             | 182 | 133          | 14             |  |
| 311813101       | 13.1 (33/64)   | 182 | 133          | 14             |  |
| 311813491       | 13.49 (17/32)  | 182 | 133          | 14             |  |
| 311813501       | 13.5           | 182 | 133          | 14             |  |
| 311814001       | 14             | 182 | 133          | 14             |  |
| 311814291       | 14.29 (9/16)   | 204 | 152          | 16             |  |
| 311814501       | 14.5           | 204 | 152          | 16             |  |
| 311814681       | 14.68 (37/64)  | 204 | 152          | 16             |  |
| 311815001       | 15             | 204 | 152          | 16             |  |
| 311815081       | 15.08 (19/32)  | 204 | 152          | 16             |  |
| 311815501       | 15.5           | 204 | 152          | 16             |  |
| 311815701       | 15.7           | 204 | 152          | 16             |  |
| 311815871       | 15.87 (5/8)    | 204 | 152          | 16             |  |
| 311816001       | 16             | 204 | 152          | 16             |  |
| 311816501       | 16.5           | 223 | 171          | 18             |  |
| 311816671       | 16.67 (21/32)  | 223 | 171          | 18             |  |
| 311817001       | 17             | 223 | 171          | 18             |  |
| 311817501       | 17.5           | 223 | 171          | 18             |  |
| 311818001       | 18             | 223 | 171          | 18             |  |
| 311818501       | 18.5           | 244 | 190          | 20             |  |
| 311819001       | 19             | 244 | 190          | 20             |  |
| 311819051       | 19.05 (3/4)    | 244 | 190          | 20             |  |
| 311819501       | 19.5           | 244 | 190          | 20             |  |
| 311820001       | 20             | 244 | 190          | 20             |  |



**SPEED  
FEED**  
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**CARBIDE**

**EgiAs**

**h8**

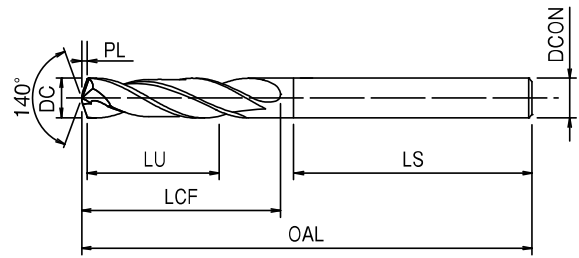
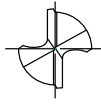
**30°**

**SHRINK  
FIT**

| EDP No. | DC - DCON | LU | LCF | OAL | DCON | LS   | PL   |      |    |    |   |      |     |
|---------|-----------|----|-----|-----|------|------|------|------|----|----|---|------|-----|
| 8675200 | 2 - 3     | 10 | 14  | 62  | 3    | 37.9 | 0.4  |      |    |    |   |      |     |
| 8670200 | 2         |    |     |     | 4    | 36   |      |      |    |    |   |      |     |
| 8675210 | 2.1 - 3   |    |     |     | 3    | 37.9 |      |      |    |    |   |      |     |
| 8670210 | 2.1       |    |     |     | 4    | 36   |      |      |    |    |   |      |     |
| 8675220 | 2.2 - 3   |    |     |     | 3    | 37.9 |      |      |    |    |   |      |     |
| 8670220 | 2.2       |    |     |     | 4    | 36   |      |      |    |    |   |      |     |
| 8675230 | 2.3 - 3   | 9  |     |     | 3    | 37.9 | 4    | 36   |    |    |   |      |     |
| 8670230 | 2.3       |    |     |     | 4    | 36   |      |      |    |    |   |      |     |
| 8675240 | 2.4 - 3   |    |     |     | 3    | 37.9 |      |      |    |    |   |      |     |
| 8670240 | 2.4       |    |     |     | 4    | 36   |      |      |    |    |   |      |     |
| 8675250 | 2.5 - 3   |    |     |     | 3    | 37.9 |      |      |    |    |   |      |     |
| 8670250 | 2.5       |    |     |     | 4    | 36   |      |      |    |    |   |      |     |
| 8675260 | 2.6 - 3   | 8  |     |     | 3    | 37.9 | 4    | 36   |    |    |   |      |     |
| 8670260 | 2.6       |    |     |     | 4    | 36   |      |      |    |    |   |      |     |
| 8675270 | 2.7 - 3   |    |     |     | 3    | 37.9 |      |      |    |    |   |      |     |
| 8670270 | 2.7       |    |     |     | 4    | 36   | 0.5  |      |    |    |   |      |     |
| 8670276 | 2.76      |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670278 | 2.78      |    |     |     |      |      |      |      |    |    |   |      |     |
| 8675280 | 2.8 - 3   | 3  |     |     |      |      |      | 37.9 |    |    |   |      |     |
| 8670280 | 2.8       | 4  |     |     |      |      |      | 36   |    |    |   |      |     |
| 8675290 | 2.9 - 3   | 3  |     |     |      |      |      | 37.9 |    |    |   |      |     |
| 8670290 | 2.9       | 4  |     |     | 36   |      |      |      |    |    |   |      |     |
| 8675300 | 3 - 3     | 14 |     |     | 66   | 3    | 37.9 | 0.6  |    |    |   |      |     |
| 8670300 | 3         |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670310 | 3.1       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670320 | 3.2       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670330 | 3.3       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670340 | 3.4       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670350 | 3.5       | 13 | 4   | 36  |      |      |      |      |    |    |   |      |     |
| 8670360 | 3.6       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670366 | 3.66      |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670368 | 3.68      |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670370 | 3.7       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670380 | 3.8       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8670390 | 3.9       | 16 | 24  | 5   |      | 37.9 | 0.7  |      |    |    |   |      |     |
| 8670400 | 4         |    |     |     |      |      |      |      |    |    |   |      |     |
| 8675410 | 4.1 - 5   |    |     |     |      |      |      | 15   | 6  | 36 |   |      |     |
| 8670410 | 4.1       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8675420 | 4.2 - 5   |    |     |     |      |      |      |      |    |    | 5 | 37.9 | 0.8 |
| 8670420 | 4.2       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8675430 | 4.3 - 5   | 6  |     | 36  |      |      |      |      |    |    |   |      |     |
| 8670430 | 4.3       |    |     |     |      |      |      |      |    |    |   |      |     |
| 8675440 | 4.4 - 5   |    |     |     |      | 5    | 37.9 |      |    |    |   |      |     |
| 8670440 | 4.4       |    |     |     |      |      |      | 6    | 36 |    |   |      |     |

| EDP No. | DC - DCON | LU | LCF  | OAL | DCON | LS   | PL   |     |  |  |   |      |
|---------|-----------|----|------|-----|------|------|------|-----|--|--|---|------|
| 8675450 | 4.5 - 5   | 15 | 24   |     | 5    | 37.9 | 0.8  |     |  |  |   |      |
| 8670450 | 4.5       |    |      |     | 6    | 36   |      |     |  |  |   |      |
| 8675460 | 4.6 - 5   |    |      |     | 5    | 37.9 |      |     |  |  |   |      |
| 8670460 | 4.6       |    |      |     | 6    | 36   |      |     |  |  |   |      |
| 8670462 | 4.62      |    |      |     |      |      |      |     |  |  |   |      |
| 8670464 | 4.64      |    |      |     |      |      |      |     |  |  |   |      |
| 8675470 | 4.7 - 5   | 18 |      | 66  | 5    | 37.9 | 0.9  |     |  |  |   |      |
| 8670470 | 4.7       |    |      |     | 6    | 36   |      |     |  |  |   |      |
| 8675480 | 4.8 - 5   |    |      |     | 5    | 37.9 |      |     |  |  |   |      |
| 8670480 | 4.8       |    |      |     | 6    | 36   |      |     |  |  |   |      |
| 8675490 | 4.9 - 5   |    |      |     | 5    | 37.9 |      |     |  |  |   |      |
| 8670490 | 4.9       |    |      |     | 6    | 36   |      |     |  |  |   |      |
| 8675500 | 5 - 5     | 17 |      |     | 5    | 37.9 | 1    |     |  |  |   |      |
| 8670500 | 5         |    |      |     | 6    | 36   |      |     |  |  |   |      |
| 8670510 | 5.1       |    |      |     |      |      |      |     |  |  |   |      |
| 8670520 | 5.2       |    |      |     |      |      |      |     |  |  |   |      |
| 8670530 | 5.3       |    |      |     |      |      |      |     |  |  |   |      |
| 8670540 | 5.4       |    |      |     |      |      |      |     |  |  |   |      |
| 8670550 | 5.5       | 28 |      |     |      |      | 6    | 36  |  |  |   |      |
| 8670552 | 5.52      |    |      |     |      |      |      |     |  |  |   |      |
| 8670554 | 5.54      |    |      |     |      |      |      |     |  |  |   |      |
| 8670560 | 5.6       |    |      |     |      |      |      |     |  |  |   |      |
| 8670570 | 5.7       |    |      |     |      |      |      |     |  |  |   |      |
| 8670580 | 5.8       |    |      |     |      |      |      |     |  |  |   |      |
| 8670590 | 5.9       | 16 |      |     |      |      | 1.1  |     |  |  |   |      |
| 8670600 | 6         |    |      |     |      |      |      |     |  |  |   |      |
| 8675610 | 6.1 - 7   |    |      |     |      |      |      | 22  |  |  | 7 | 37.9 |
| 8670610 | 6.1       |    |      |     |      |      |      |     |  |  | 8 | 36   |
| 8675620 | 6.2 - 7   |    |      |     |      |      |      |     |  |  | 7 | 37.9 |
| 8670620 | 6.2       |    |      |     |      |      |      |     |  |  | 8 | 36   |
| 8675630 | 6.3 - 7   | 7  | 37.9 |     |      |      |      |     |  |  |   |      |
| 8670630 | 6.3       | 8  | 36   |     |      |      |      |     |  |  |   |      |
| 8675640 | 6.4 - 7   | 21 |      | 34  | 79   | 7    | 37.9 | 1.2 |  |  |   |      |
| 8670640 | 6.4       |    |      |     |      | 8    | 36   |     |  |  |   |      |
| 8675650 | 6.5 - 7   |    |      |     |      | 7    | 37.9 |     |  |  |   |      |
| 8670650 | 6.5       |    |      |     |      | 8    | 36   |     |  |  |   |      |
| 8675660 | 6.6 - 7   |    |      |     |      | 7    | 37.9 |     |  |  |   |      |
| 8670660 | 6.6       |    |      |     |      | 8    | 36   |     |  |  |   |      |
| 8675670 | 6.7 - 7   | 20 |      |     |      | 7    | 37.9 | 1.3 |  |  |   |      |
| 8670670 | 6.7       |    |      |     |      | 8    | 36   |     |  |  |   |      |
| 8675680 | 6.8 - 7   |    |      |     |      | 7    | 37.9 |     |  |  |   |      |
| 8670680 | 6.8       |    |      |     |      | 8    | 36   |     |  |  |   |      |
| 8675690 | 6.9 - 7   |    |      |     |      | 7    | 37.9 |     |  |  |   |      |
| 8670690 | 6.9       |    |      |     |      | 8    | 36   |     |  |  |   |      |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| AD-2D         | ○                | ○                   | ○                 | ○           | ○              |                             |                 |             |             |                   | ○            | ○        |                        |                |         |                         |                 |                               |



**SPEED  
FEED**  
P.153

**CARBIDE**

**EgiAs**

**h8**

**30°**

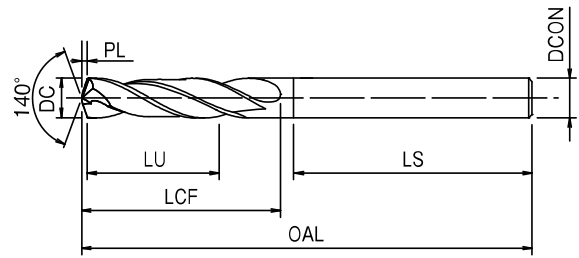
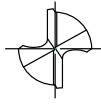
**SHRINK  
FIT**

| EDP No. | DC - DCON | LU | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|----|-----|-----|------|------|-----|
| 8675700 | 7 - 7     | 20 | 34  |     | 7    | 37.9 |     |
| 8670700 | 7         |    |     |     |      |      |     |
| 8670710 | 7.1       |    |     |     |      |      |     |
| 8670720 | 7.2       | 27 |     |     |      |      | 1.3 |
| 8670730 | 7.3       |    |     |     |      |      |     |
| 8670736 | 7.36      |    |     |     |      |      |     |
| 8670738 | 7.38      |    |     |     |      |      |     |
| 8670740 | 7.4       |    |     |     |      |      |     |
| 8670750 | 7.5       |    |     |     |      |      |     |
| 8670752 | 7.52      | 26 | 41  | 79  | 8    | 36   |     |
| 8670754 | 7.54      |    |     |     |      |      |     |
| 8670760 | 7.6       |    |     |     |      |      | 1.4 |
| 8670770 | 7.7       |    |     |     |      |      |     |
| 8670780 | 7.8       |    |     |     |      |      |     |
| 8670790 | 7.9       | 25 |     |     |      |      |     |
| 8670800 | 8         |    |     |     |      |      |     |
| 8675810 | 8.1 - 9   |    |     |     | 9    | 41.9 |     |
| 8670810 | 8.1       |    |     |     | 10   | 40   |     |
| 8675820 | 8.2 - 9   |    |     |     | 9    | 41.9 |     |
| 8670820 | 8.2       | 31 |     |     | 10   | 40   |     |
| 8675830 | 8.3 - 9   |    |     |     | 9    | 41.9 | 1.5 |
| 8670830 | 8.3       |    |     |     | 10   | 40   |     |
| 8675840 | 8.4 - 9   |    |     |     | 9    | 41.9 |     |
| 8670840 | 8.4       |    |     |     | 10   | 40   |     |
| 8675850 | 8.5 - 9   |    |     |     | 9    | 41.9 |     |
| 8670850 | 8.5       |    |     |     | 10   | 40   |     |
| 8675860 | 8.6 - 9   |    |     |     | 9    | 41.9 |     |
| 8670860 | 8.6       | 30 |     |     | 10   | 40   |     |
| 8675870 | 8.7 - 9   |    |     |     | 9    | 41.9 |     |
| 8670870 | 8.7       |    | 47  | 89  | 10   | 40   |     |
| 8675880 | 8.8 - 9   |    |     |     | 9    | 41.9 |     |
| 8670880 | 8.8       |    |     |     | 10   | 40   | 1.6 |
| 8675890 | 8.9 - 9   |    |     |     | 9    | 41.9 |     |
| 8670890 | 8.9       |    |     |     | 10   | 40   |     |
| 8675900 | 9 - 9     |    |     |     | 9    | 41.9 |     |
| 8670900 | 9         |    |     |     |      |      |     |
| 8670910 | 9.1       | 29 |     |     |      |      |     |
| 8670920 | 9.2       |    |     |     |      |      |     |
| 8670984 | 9.24      |    |     |     | 10   | 40   |     |
| 8670926 | 9.26      |    |     |     |      |      | 1.7 |
| 8670930 | 9.3       |    |     |     |      |      |     |
| 8670936 | 9.36      |    |     |     |      |      |     |
| 8670938 | 9.38      | 28 |     |     |      |      |     |

| EDP No. | DC - DCON | LU | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|----|-----|-----|------|------|-----|
| 8670940 | 9.4       |    |     |     |      |      |     |
| 8670950 | 9.5       |    |     |     |      |      |     |
| 8670952 | 9.52      |    |     |     |      |      | 1.7 |
| 8670954 | 9.54      | 28 | 47  | 89  | 10   | 40   |     |
| 8670960 | 9.6       |    |     |     |      |      |     |
| 8670970 | 9.7       |    |     |     |      |      |     |
| 8670980 | 9.8       |    |     |     |      |      |     |
| 8670990 | 9.9       | 27 |     |     |      |      | 1.8 |
| 8671000 | 10        |    |     |     |      |      |     |
| 8676010 | 10.1 - 11 |    |     |     | 11   | 46.9 |     |
| 8671010 | 10.1      |    |     |     | 12   | 45   |     |
| 8676020 | 10.2 - 11 | 35 |     |     | 11   | 46.9 |     |
| 8671020 | 10.2      |    |     |     | 12   | 45   |     |
| 8676030 | 10.3 - 11 |    |     |     | 11   | 46.9 |     |
| 8671030 | 10.3      |    |     |     | 12   | 45   |     |
| 8676040 | 10.4 - 11 |    |     |     | 11   | 46.9 |     |
| 8671040 | 10.4      |    |     |     | 12   | 45   |     |
| 8676050 | 10.5 - 11 |    |     |     | 11   | 46.9 | 1.9 |
| 8671050 | 10.5      |    |     |     | 12   | 45   |     |
| 8676060 | 10.6 - 11 | 34 |     |     | 11   | 46.9 |     |
| 8671060 | 10.6      |    |     |     | 12   | 45   |     |
| 8676070 | 10.7 - 11 |    |     |     | 11   | 46.9 |     |
| 8671070 | 10.7      |    |     |     | 12   | 45   |     |
| 8676080 | 10.8 - 11 |    |     |     | 11   | 46.9 |     |
| 8670080 | 10.8      |    |     |     | 12   | 45   |     |
| 8676090 | 10.9 - 11 | 55 | 102 |     | 11   | 46.9 |     |
| 8671090 | 10.9      |    |     |     | 12   | 45   |     |
| 8676100 | 11 - 11   |    |     |     | 11   | 46.9 | 2   |
| 8671100 | 11        |    |     |     |      |      |     |
| 8671110 | 11.1      | 33 |     |     |      |      |     |
| 8671120 | 11.2      |    |     |     |      |      |     |
| 8671122 | 11.22     |    |     |     |      |      |     |
| 8671124 | 11.24     |    |     |     |      |      |     |
| 8671130 | 11.3      |    |     |     |      |      |     |
| 8671136 | 11.36     |    |     |     |      |      |     |
| 8671138 | 11.38     |    |     |     | 12   | 45   |     |
| 8671140 | 11.4      |    |     |     |      |      |     |
| 8671150 | 11.5      | 32 |     |     |      |      | 2.1 |
| 8671160 | 11.6      |    |     |     |      |      |     |
| 8671170 | 11.7      |    |     |     |      |      |     |
| 8671180 | 11.8      |    |     |     |      |      |     |
| 8671190 | 11.9      | 31 |     |     |      |      |     |
| 8671200 | 12        |    |     |     |      |      |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| AD-2D         | ○                | ○                   | ○                 | ○           | ○              |                             |                 |             |             |                   | ○            | ○        |                        |                |         |                         |                 |                               |





**SPEED  
FEED**  
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**CARBIDE**

**EgiAs**

**h8**

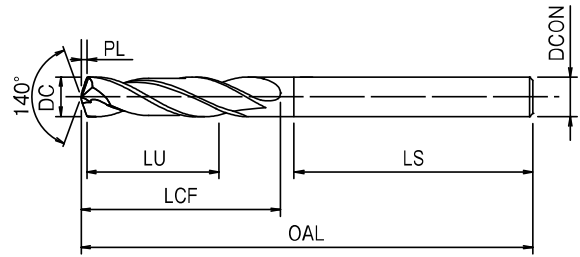
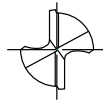
**30°**

**SHRINK  
FIT**

| EDP No. | DC - DCON | LU | LCF | OAL | DCON | LS | PL  |
|---------|-----------|----|-----|-----|------|----|-----|
| 8671210 | 12.1      |    |     |     |      |    |     |
| 8671220 | 12.2      | 36 |     |     |      |    | 2.2 |
| 8671230 | 12.3      |    |     |     |      |    |     |
| 8671240 | 12.4      |    |     |     |      |    |     |
| 8671250 | 12.5      |    |     |     |      |    |     |
| 8671260 | 12.6      | 35 |     |     |      |    | 2.3 |
| 8671270 | 12.7      |    |     |     |      |    |     |
| 8671280 | 12.8      |    |     |     |      |    |     |
| 8671290 | 12.9      |    |     |     |      |    |     |
| 8671300 | 13        |    |     |     |      |    |     |
| 8671310 | 13.1      | 34 | 60  | 107 | 14   | 45 |     |
| 8671320 | 13.2      |    |     |     |      |    | 2.4 |
| 8671330 | 13.3      |    |     |     |      |    |     |
| 8671340 | 13.4      |    |     |     |      |    |     |
| 8671350 | 13.5      |    |     |     |      |    |     |
| 8671360 | 13.6      | 33 |     |     |      |    |     |
| 8671370 | 13.7      |    |     |     |      |    | 2.5 |
| 8671380 | 13.8      |    |     |     |      |    |     |
| 8671390 | 13.9      | 32 |     |     |      |    |     |
| 8671400 | 14        |    |     |     |      |    |     |
| 8671410 | 14.1      |    |     |     |      |    |     |
| 8671420 | 14.2      | 37 |     |     |      |    | 2.6 |
| 8671430 | 14.3      |    |     |     |      |    |     |
| 8671440 | 14.4      |    |     |     |      |    |     |
| 8671450 | 14.5      |    |     |     |      |    |     |
| 8671460 | 14.6      | 36 |     |     |      |    |     |
| 8671470 | 14.7      |    |     |     |      |    |     |
| 8671480 | 14.8      |    |     |     |      |    | 2.7 |
| 8671490 | 14.9      |    |     |     |      |    |     |
| 8671500 | 15        |    |     |     |      |    |     |
| 8671510 | 15.1      | 35 | 65  | 115 | 16   | 48 |     |
| 8671520 | 15.2      |    |     |     |      |    |     |
| 8671530 | 15.3      |    |     |     |      |    |     |
| 8671540 | 15.4      |    |     |     |      |    | 2.8 |
| 8671550 | 15.5      |    |     |     |      |    |     |
| 8671560 | 15.6      | 34 |     |     |      |    |     |
| 8671570 | 15.7      |    |     |     |      |    |     |
| 8671580 | 15.8      |    |     |     |      |    |     |
| 8671590 | 15.9      |    |     |     |      |    | 2.9 |
| 8671600 | 16        | 33 |     |     |      |    |     |

| EDP No.    | DC - DCON | LU | LCF | OAL | DCON | LS | PL  |
|------------|-----------|----|-----|-----|------|----|-----|
| 5560594920 | 16.1      |    |     |     |      |    |     |
| 5560594930 | 16.2      | 41 |     |     |      |    | 2.9 |
| 5560594940 | 16.3      |    |     |     |      |    |     |
| 5560594950 | 16.4      |    |     |     |      |    |     |
| 8671650    | 16.5      |    |     |     |      |    | 3   |
| 5560594960 | 16.6      | 40 |     |     |      |    |     |
| 5560594970 | 16.7      |    |     |     |      |    |     |
| 5560594980 | 16.8      |    |     |     |      |    |     |
| 5560594990 | 16.9      |    |     |     |      |    |     |
| 8671700    | 17        |    | 73  | 123 | 18   | 48 | 3.1 |
| 5560595000 | 17.1      | 39 |     |     |      |    |     |
| 5560595010 | 17.2      |    |     |     |      |    |     |
| 5560595020 | 17.3      |    |     |     |      |    |     |
| 5560595030 | 17.4      |    |     |     |      |    |     |
| 8671750    | 17.5      |    |     |     |      |    |     |
| 5560595040 | 17.6      | 38 |     |     |      |    | 3.2 |
| 5560595050 | 17.7      |    |     |     |      |    |     |
| 5560595060 | 17.8      |    |     |     |      |    |     |
| 5560595070 | 17.9      |    |     |     |      |    |     |
| 8671800    | 18        | 37 |     |     |      |    |     |
| 5560595080 | 18.1      |    |     |     |      |    |     |
| 5560595090 | 18.2      | 43 |     |     |      |    | 3.3 |
| 5560595100 | 18.3      |    |     |     |      |    |     |
| 5560595110 | 18.4      |    |     |     |      |    |     |
| 8671850    | 18.5      |    |     |     |      |    |     |
| 5560595120 | 18.6      | 42 |     |     |      |    | 3.4 |
| 5560595130 | 18.7      |    |     |     |      |    |     |
| 5560595140 | 18.8      |    |     |     |      |    |     |
| 5560595150 | 18.9      |    |     |     |      |    |     |
| 8671900    | 19        | 79 | 131 | 20  | 50   |    |     |
| 5560595160 | 19.1      | 41 |     |     |      |    | 3.5 |
| 5560595170 | 19.2      |    |     |     |      |    |     |
| 5560595180 | 19.3      |    |     |     |      |    |     |
| 5560595190 | 19.4      |    |     |     |      |    |     |
| 8671950    | 19.5      | 40 |     |     |      |    |     |
| 5560595200 | 19.6      |    |     |     |      |    |     |
| 5560595210 | 19.7      |    |     |     |      |    | 3.6 |
| 5560595220 | 19.8      |    |     |     |      |    |     |
| 5560595230 | 19.9      |    |     |     |      |    |     |
| 8672000    | 20        | 39 |     |     |      |    |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| AD-2D         | ○                | ○                   | ○                 | ○           | ○              |                             |                 |             |             |                   | ○            | ○        |                        |                |         |                         |                 |                               |



**SPEED  
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**CARBIDE**

**EgiAs**

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**30°**

**SHRINK  
FIT**

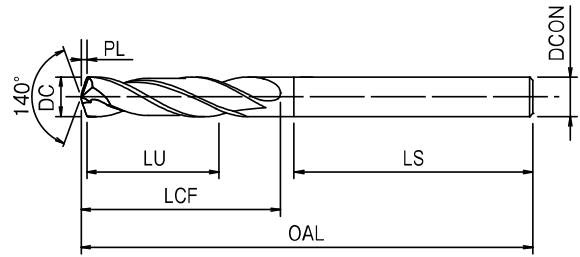
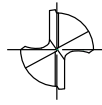
| EDP No.  | DC - DCON | LU | LCF | OAL | DCON | LS   | PL   |      |     |
|----------|-----------|----|-----|-----|------|------|------|------|-----|
| 8677200  | 2 - 3     | 16 | 20  | 66  | 3    | 37.9 | 0.4  |      |     |
| 8672200  | 2         |    |     |     | 4    | 36   |      |      |     |
| 8677210  | 2.1 - 3   |    |     |     | 3    | 37.9 |      |      |     |
| 8672210  | 2.1       |    |     |     | 4    | 36   |      |      |     |
| 8677220  | 2.2 - 3   |    |     |     | 3    | 37.9 |      |      |     |
| 8672220  | 2.2       |    |     |     | 4    | 36   |      |      |     |
| 8677230  | 2.3 - 3   | 15 |     |     | 3    | 37.9 | 4    | 36   | 0.5 |
| 8672230  | 2.3       |    |     |     | 4    | 36   |      |      |     |
| 8677240  | 2.4 - 3   |    |     |     | 3    | 37.9 |      |      |     |
| 8672240  | 2.4       |    |     |     | 4    | 36   |      |      |     |
| 8677250  | 2.5 - 3   |    |     |     | 3    | 37.9 |      |      |     |
| 8672250  | 2.5       |    |     |     | 4    | 36   |      |      |     |
| 8677260  | 2.6 - 3   | 14 |     |     | 3    | 37.9 | 4    | 36   | 0.6 |
| 8672260  | 2.6       |    |     |     | 4    | 36   |      |      |     |
| 8677270  | 2.7 - 3   |    |     |     | 3    | 37.9 |      |      |     |
| 8672270  | 2.7       |    |     |     | 4    | 36   |      |      |     |
| 8677280  | 2.8 - 3   |    |     |     | 3    | 37.9 |      |      |     |
| 8672280  | 2.8       |    |     |     | 4    | 36   |      |      |     |
| 8677290  | 2.9 - 3   | 22 |     |     | 74   | 3    | 37.9 | 0.7  |     |
| 8672290  | 2.9       |    |     |     |      | 4    | 36   |      |     |
| 8677300  | 3 - 3     |    |     |     |      | 3    | 37.9 |      |     |
| 8672300  | 3         |    |     |     |      |      |      |      |     |
| 86772310 | 3.1       |    |     |     |      |      |      |      |     |
| 8672310  | 3.2       |    |     |     |      |      |      |      |     |
| 86772330 | 3.3       | 21 |     |     |      | 28   | 4    | 36   | 0.8 |
| 8672330  | 3.3       |    |     |     |      |      |      |      |     |
| 86772340 | 3.4       |    |     |     |      |      |      |      |     |
| 8672340  | 3.4       |    |     |     |      |      |      |      |     |
| 86772350 | 3.5       |    |     |     |      |      |      |      |     |
| 8672350  | 3.5       |    |     |     |      |      |      |      |     |
| 86772360 | 3.6       | 28 |     |     |      | 36   | 5    | 37.9 | 0.9 |
| 8672360  | 3.6       |    |     |     |      |      |      |      |     |
| 86772370 | 3.7       |    |     |     |      |      |      |      |     |
| 8672370  | 3.7       |    |     |     |      |      |      |      |     |
| 86772380 | 3.8       |    |     |     |      |      |      |      |     |
| 8672380  | 3.8       |    |     |     |      |      |      |      |     |
| 86772390 | 3.9       | 27 |     |     |      | 36   | 5    | 37.9 | 1.0 |
| 8672390  | 3.9       |    |     |     |      |      |      |      |     |
| 86772400 | 4         |    |     |     |      |      |      |      |     |
| 8672400  | 4         |    |     |     |      |      |      |      |     |
| 8677410  | 4.1 - 5   |    |     |     |      |      |      |      |     |
| 8672410  | 4.1       |    |     |     |      |      |      |      |     |
| 8677420  | 4.2 - 5   | 27 |     |     |      | 36   | 5    | 37.9 | 1.1 |
| 8672420  | 4.2       |    |     |     |      |      |      |      |     |
| 8677430  | 4.3 - 5   |    |     |     |      |      |      |      |     |
| 8672430  | 4.3       |    |     |     |      |      |      |      |     |
| 8677440  | 4.4 - 5   |    |     |     |      |      |      |      |     |
| 8672440  | 4.4       |    |     |     |      |      |      |      |     |
| 8677450  | 4.5 - 5   | 27 |     |     |      | 36   | 5    | 37.9 | 1.2 |
| 8672450  | 4.5       |    |     |     |      |      |      |      |     |
| 8677460  | 4.6 - 5   |    |     |     |      |      |      |      |     |
| 8672460  | 4.6       |    |     |     |      |      |      |      |     |
|          |           |    |     |     |      |      |      |      |     |
|          |           |    |     |     |      |      |      |      |     |

| EDP No. | DC - DCON | LU | LCF | OAL | DCON | LS   | PL  |     |      |
|---------|-----------|----|-----|-----|------|------|-----|-----|------|
| 8677470 | 4.7 - 5   | 27 | 36  | 74  | 5    | 37.9 | 0.9 |     |      |
| 8672470 | 4.7       |    |     |     | 6    | 36   |     |     |      |
| 8677480 | 4.8 - 5   | 34 |     |     | 5    | 37.9 |     |     |      |
| 8672480 | 4.8       |    |     |     | 6    | 36   |     |     |      |
| 8677490 | 4.9 - 5   |    |     |     | 5    | 37.9 |     |     |      |
| 8672490 | 4.9       |    |     |     | 6    | 36   |     |     |      |
| 8677500 | 5 - 5     |    |     |     | 5    | 37.9 |     |     |      |
| 8672500 | 5         |    |     |     | 44   | 82   |     |     |      |
| 8672510 | 5.1       |    |     |     |      |      |     |     |      |
| 8672520 | 5.2       |    |     |     |      |      |     |     |      |
| 8672530 | 5.3       |    |     |     |      |      |     |     |      |
| 8672540 | 5.4       |    |     |     |      |      |     |     |      |
| 8672550 | 5.5       |    |     |     |      |      |     |     |      |
| 8672560 | 5.6       | 33 |     |     | 6    | 36   | 1   |     |      |
| 8672570 | 5.7       |    |     |     |      |      |     |     |      |
| 8672580 | 5.8       |    |     |     |      |      |     |     |      |
| 8672590 | 5.9       |    |     |     |      |      |     |     |      |
| 8672600 | 6         | 32 |     |     |      |      |     |     |      |
| 8677610 | 6.1 - 7   | 41 |     |     |      |      |     | 7   | 37.9 |
| 8672610 | 6.1       |    |     |     |      |      |     | 8   | 36   |
| 8677620 | 6.2 - 7   |    |     |     |      |      |     | 7   | 37.9 |
| 8672620 | 6.2       |    |     |     |      |      |     | 8   | 36   |
| 8677630 | 6.3 - 7   |    |     |     |      |      |     | 7   | 37.9 |
| 8672630 | 6.3       |    | 8   | 36  |      |      |     |     |      |
| 8677640 | 6.4 - 7   | 40 |     |     | 7    | 37.9 | 1.2 |     |      |
| 8672640 | 6.4       |    |     |     | 8    | 36   |     |     |      |
| 8677650 | 6.5 - 7   |    |     |     | 7    | 37.9 |     |     |      |
| 8672650 | 6.5       |    |     |     | 8    | 36   |     |     |      |
| 8677660 | 6.6 - 7   |    |     |     | 7    | 37.9 |     |     |      |
| 8672660 | 6.6       |    |     |     | 8    | 36   |     |     |      |
| 8677670 | 6.7 - 7   | 53 | 91  |     | 7    | 37.9 |     |     |      |
| 8672670 | 6.7       |    |     |     | 8    | 36   |     |     |      |
| 8677680 | 6.8 - 7   |    |     |     | 7    | 37.9 |     |     |      |
| 8672680 | 6.8       |    |     |     | 8    | 36   |     |     |      |
| 8677690 | 6.9 - 7   |    |     |     | 7    | 37.9 |     |     |      |
| 8672690 | 6.9       |    |     |     | 8    | 36   |     |     |      |
| 8677700 | 7 - 7     | 39 |     |     | 7    | 37.9 | 1.3 |     |      |
| 8672700 | 7         |    |     |     | 8    | 36   |     |     |      |
| 8672710 | 7.1       |    |     |     |      |      |     |     |      |
| 8672720 | 7.2       |    |     |     |      |      |     |     |      |
| 8672730 | 7.3       |    |     |     |      |      |     |     |      |
| 8672740 | 7.4       |    |     |     |      |      |     |     |      |
| 8672750 | 7.5       | 38 |     |     |      |      |     | 1.4 |      |
| 8672760 | 7.6       |    |     |     |      |      |     |     |      |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| AD-4D         | ⊗                | ⊗                   | ⊗                 | ⊙           | ⊙              |                             |                 |             |             |                   | ⊗            | ⊗        |                        |                |         |                         |                 |                               |






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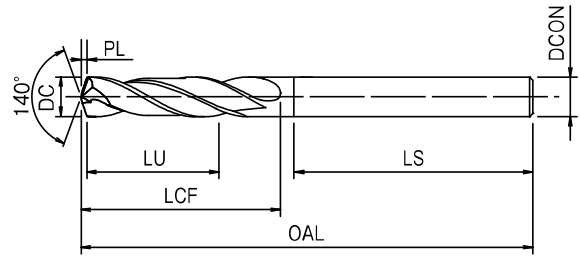
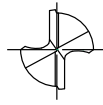
**CARBIDE**
**EgiAs**
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**30°**
**SHRINK  
FIT**

| EDP No. | DC - DCON | LU | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|----|-----|-----|------|------|-----|
| 8672770 | 7.7       | 38 |     |     |      |      |     |
| 8672780 | 7.8       |    | 53  | 91  | 8    | 36   | 1.4 |
| 8672790 | 7.9       | 37 |     |     |      |      |     |
| 8672800 | 8         |    |     |     |      |      |     |
| 8677810 | 8.1 - 9   |    |     |     | 9    | 41.9 |     |
| 8672810 | 8.1       |    |     |     | 10   | 40   |     |
| 8677820 | 8.2 - 9   |    |     |     | 9    | 41.9 |     |
| 8672820 | 8.2       | 45 |     |     | 10   | 40   |     |
| 8677830 | 8.3 - 9   |    |     |     | 9    | 41.9 | 1.5 |
| 8672830 | 8.3       |    |     |     | 10   | 40   |     |
| 8677840 | 8.4 - 9   |    |     |     | 9    | 41.9 |     |
| 8672840 | 8.4       |    |     |     | 10   | 40   |     |
| 8677850 | 8.5 - 9   |    |     |     | 9    | 41.9 |     |
| 8672850 | 8.5       |    |     |     | 10   | 40   |     |
| 8677860 | 8.6 - 9   |    |     |     | 9    | 41.9 |     |
| 8672860 | 8.6       | 44 |     |     | 10   | 40   |     |
| 8677870 | 8.7 - 9   |    |     |     | 9    | 41.9 |     |
| 8672870 | 8.7       |    |     |     | 10   | 40   |     |
| 8677880 | 8.8 - 9   |    |     |     | 9    | 41.9 |     |
| 8672880 | 8.8       |    |     |     | 10   | 40   | 1.6 |
| 8677890 | 8.9 - 9   |    |     |     | 9    | 41.9 |     |
| 8672890 | 8.9       |    |     |     | 10   | 40   |     |
| 8677900 | 9 - 9     |    |     |     | 9    | 41.9 |     |
| 8672900 | 9         | 43 |     |     |      |      |     |
| 8672910 | 9.1       |    |     |     |      |      |     |
| 8672920 | 9.2       |    |     |     |      |      |     |
| 8672930 | 9.3       |    |     |     |      |      |     |
| 8672940 | 9.4       |    |     |     |      |      |     |
| 8672950 | 9.5       |    |     |     | 10   | 40   |     |
| 8672960 | 9.6       | 42 |     |     |      |      |     |
| 8672970 | 9.7       |    |     |     |      |      |     |
| 8672980 | 9.8       |    |     |     |      |      |     |
| 8677990 | 9.9       | 41 |     |     |      |      | 1.8 |
| 8673000 | 10        |    |     |     |      |      |     |
| 8678010 | 10.1 - 11 |    |     |     | 11   | 46.9 |     |
| 8673010 | 10.1      |    |     |     | 12   | 45   |     |
| 8678020 | 10.2 - 11 |    |     |     | 11   | 46.9 |     |
| 8673020 | 10.2      | 51 |     |     | 12   | 45   |     |
| 8678030 | 10.3 - 11 |    |     |     | 11   | 46.9 |     |
| 8673030 | 10.3      |    |     |     | 12   | 45   |     |
| 8678040 | 10.4 - 11 |    |     |     | 11   | 46.9 |     |
| 8673040 | 10.4      | 50 |     |     | 12   | 45   |     |

| EDP No. | DC - DCON | LU | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|----|-----|-----|------|------|-----|
| 8678050 | 10.5 - 11 |    |     |     | 11   | 46.9 |     |
| 8673050 | 10.5      |    |     |     | 12   | 45   |     |
| 8678060 | 10.6 - 11 |    |     |     | 11   | 46.9 | 1.9 |
| 8673060 | 10.6      | 50 |     |     | 12   | 45   |     |
| 8678070 | 10.7 - 11 |    |     |     | 11   | 46.9 |     |
| 8673070 | 10.7      |    |     |     | 12   | 45   |     |
| 8678080 | 10.8 - 11 |    |     |     | 11   | 46.9 |     |
| 8673080 | 10.8      |    |     |     | 12   | 45   |     |
| 8678090 | 10.9 - 11 |    |     |     | 11   | 46.9 |     |
| 8673090 | 10.9      |    |     |     | 12   | 45   |     |
| 8678100 | 11 - 11   |    |     |     | 11   | 46.9 | 2   |
| 8673100 | 11        | 49 | 71  | 118 |      |      |     |
| 8673110 | 11.1      |    |     |     |      |      |     |
| 8673120 | 11.2      |    |     |     |      |      |     |
| 8673130 | 11.3      |    |     |     |      |      |     |
| 8673140 | 11.4      |    |     |     |      |      |     |
| 8673150 | 11.5      |    |     |     | 12   |      | 2.1 |
| 8673160 | 11.6      | 48 |     |     |      |      |     |
| 8673170 | 11.7      |    |     |     |      |      |     |
| 8673180 | 11.8      |    |     |     |      |      |     |
| 8673190 | 11.9      | 47 |     |     |      |      |     |
| 8673200 | 12        |    |     |     |      |      |     |
| 8678210 | 12.1 - 13 |    |     |     | 13   |      |     |
| 8673210 | 12.1      |    |     |     | 14   |      | 2.2 |
| 8678220 | 12.2 - 13 |    |     |     | 13   |      |     |
| 8673220 | 12.2      | 53 |     |     | 14   |      |     |
| 8678230 | 12.3 - 13 |    |     |     | 13   | 45   |     |
| 8673230 | 12.3      |    |     |     | 14   |      |     |
| 8678240 | 12.4 - 13 |    |     |     | 13   |      |     |
| 8673240 | 12.4      |    |     |     | 14   |      |     |
| 8678250 | 12.5 - 13 |    |     |     | 13   |      |     |
| 8673250 | 12.5      |    |     |     | 14   |      |     |
| 8678260 | 12.6 - 13 |    |     |     | 13   |      |     |
| 8673260 | 12.6      | 52 | 77  | 124 | 14   |      | 2.3 |
| 8678270 | 12.7 - 13 |    |     |     | 13   |      |     |
| 8673270 | 12.7      |    |     |     | 14   |      |     |
| 8678280 | 12.8 - 13 |    |     |     | 13   |      |     |
| 8673280 | 12.8      |    |     |     | 14   |      |     |
| 8678290 | 12.9 - 13 |    |     |     | 13   |      |     |
| 8673290 | 12.9      | 51 |     |     | 14   |      |     |
| 8678300 | 13 - 13   |    |     |     | 13   |      | 2.4 |
| 8673300 | 13        |    |     |     | 14   |      |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25~0.45%         | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| AD-4D         | ⊙                | ⊙                   | ⊙                 | ⊙           | ⊙              |                             |                 |             |             |                   |              | ⊙        | ⊙                      |                |         |                         |                 |                               |



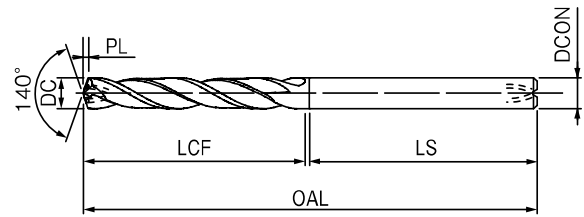
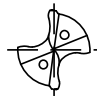


| EDP No.    | DC - DCON | LU | LCF | OAL | DCON | LS | PL  |
|------------|-----------|----|-----|-----|------|----|-----|
| 8673310    | 13.1      |    |     |     |      |    |     |
| 8673320    | 13.2      | 51 |     |     |      |    | 2.4 |
| 8673330    | 13.3      |    |     |     |      |    |     |
| 8673340    | 13.4      |    |     |     |      |    |     |
| 8673350    | 13.5      |    | 77  | 124 | 14   | 45 |     |
| 8673360    | 13.6      | 50 |     |     |      |    | 2.5 |
| 8673370    | 13.7      |    |     |     |      |    |     |
| 8673380    | 13.8      |    |     |     |      |    |     |
| 8673390    | 13.9      | 49 |     |     |      |    |     |
| 8673400    | 14        |    |     |     |      |    |     |
| 8678410    | 14.1 - 15 |    |     |     | 15   |    |     |
| 8673410    | 14.1      |    |     |     | 16   |    |     |
| 8678420    | 14.2 - 15 |    |     |     | 15   |    |     |
| 8673420    | 14.2      | 55 |     |     | 16   |    |     |
| 8678430    | 14.3 - 15 |    |     |     | 15   |    | 2.6 |
| 8673430    | 14.3      |    |     |     | 16   |    |     |
| 8678440    | 14.4 - 15 |    |     |     | 15   |    |     |
| 8673440    | 14.4      |    |     |     | 16   |    |     |
| 8678450    | 14.5 - 15 |    |     |     | 15   |    |     |
| 8673450    | 14.5      |    |     |     | 16   |    |     |
| 8678460    | 14.6 - 15 |    |     |     | 15   |    |     |
| 8673460    | 14.6      | 54 |     |     | 16   |    |     |
| 8678470    | 14.7 - 15 |    |     |     | 15   |    |     |
| 8673470    | 14.7      |    |     |     | 16   |    |     |
| 8678480    | 14.8 - 15 |    |     |     | 15   |    |     |
| 8673480    | 14.8      |    | 83  | 133 | 16   | 48 | 2.7 |
| 8678490    | 14.9 - 15 |    |     |     | 15   |    |     |
| 8673490    | 14.9      |    |     |     | 16   |    |     |
| 8678500    | 15 - 15   |    |     |     | 15   |    |     |
| 8673500    | 15        | 53 |     |     |      |    |     |
| 8673510    | 15.1      |    |     |     |      |    |     |
| 8673520    | 15.2      |    |     |     |      |    |     |
| 8673530    | 15.3      |    |     |     |      |    |     |
| 8673540    | 15.4      |    |     |     |      |    | 2.8 |
| 8673550    | 15.5      |    |     |     | 16   |    |     |
| 8673560    | 15.6      | 52 |     |     |      |    |     |
| 8673570    | 15.7      |    |     |     |      |    |     |
| 8673580    | 15.8      |    |     |     |      |    |     |
| 8673590    | 15.9      | 51 |     |     |      |    | 2.9 |
| 8673600    | 16        |    |     |     |      |    |     |
| 5560595240 | 16.1      | 61 | 93  | 143 | 18   |    |     |
| 5560595250 | 16.2      |    |     |     |      |    |     |

| EDP No.    | DC - DCON | LU | LCF | OAL | DCON | LS | PL  |
|------------|-----------|----|-----|-----|------|----|-----|
| 5560595260 | 16.3      | 61 |     |     |      |    |     |
| 5560595270 | 16.4      |    |     |     | 18   |    |     |
| 8678650    | 16.5 - 17 |    |     |     | 17   |    | 3   |
| 8673650    | 16.5      | 60 |     |     |      |    |     |
| 5560595280 | 16.6      |    |     |     | 18   |    |     |
| 5560595290 | 16.7      |    |     |     |      |    |     |
| 5560595300 | 16.8      |    |     |     |      |    |     |
| 5560595310 | 16.9      |    |     |     |      |    |     |
| 8678700    | 17 - 17   |    |     |     | 17   |    |     |
| 8673700    | 17        |    |     |     |      | 48 | 3.1 |
| 5560595320 | 17.1      | 59 | 93  | 143 |      |    |     |
| 5560595330 | 17.2      |    |     |     |      |    |     |
| 5560595340 | 17.3      |    |     |     |      |    |     |
| 5560595350 | 17.4      |    |     |     | 18   |    |     |
| 8673750    | 17.5      |    |     |     |      |    | 3.2 |
| 5560595360 | 17.6      |    |     |     |      |    |     |
| 5560595370 | 17.7      | 58 |     |     |      |    |     |
| 5560595380 | 17.8      |    |     |     |      |    |     |
| 5560595390 | 17.9      |    |     |     |      |    |     |
| 8673800    | 18        | 57 |     |     |      |    |     |
| 5560595400 | 18.1      |    |     |     |      |    | 3.3 |
| 5560595410 | 18.2      | 65 |     |     | 20   |    |     |
| 5560595420 | 18.3      |    |     |     |      |    |     |
| 5560595430 | 18.4      |    |     |     |      |    |     |
| 8678850    | 18.5 - 19 |    |     |     | 19   |    |     |
| 8673850    | 18.5      |    |     |     |      |    |     |
| 5560595440 | 18.6      | 64 |     |     | 20   |    | 3.4 |
| 5560595450 | 18.7      |    |     |     |      |    |     |
| 5560595460 | 18.8      |    |     |     |      |    |     |
| 5560595470 | 18.9      |    |     |     |      |    |     |
| 8678900    | 19 - 19   |    |     |     | 19   | 50 |     |
| 8673900    | 19        |    |     |     |      |    |     |
| 5560595480 | 19.1      | 63 | 101 | 153 |      |    | 3.5 |
| 5560595490 | 19.2      |    |     |     |      |    |     |
| 5560595500 | 19.3      |    |     |     |      |    |     |
| 5560595510 | 19.4      |    |     |     | 20   |    |     |
| 8673950    | 19.5      |    |     |     |      |    |     |
| 5560595520 | 19.6      |    |     |     |      |    |     |
| 5560595530 | 19.7      | 62 |     |     |      |    | 3.6 |
| 5560595540 | 19.8      |    |     |     |      |    |     |
| 5560595550 | 19.9      |    |     |     |      |    |     |
| 8674000    | 20        | 61 |     |     |      |    |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| AD-4D         | ⊙                | ⊙                   | ⊙                 | ⊙           | ⊙              |                             |                 |             |             |                   | ⊙            | ⊙        |                        |                |         |                         |                 |                               |





**SPEED  
FEED**  
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**CARBIDE**

**EgiAs**

**h8**

**30°**

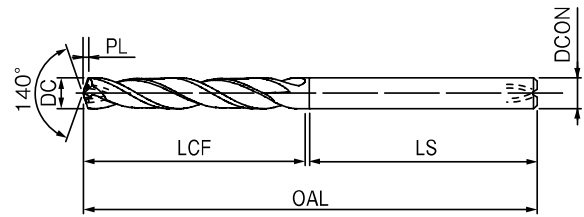
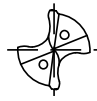
**SHRINK  
FIT**

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8690200 | 2 - 3     | 12  |     |      | 51.2 |     |
| 8690210 | 2.1 - 3   | 13  |     |      | 50.3 |     |
| 8690220 | 2.2 - 3   | 14  |     |      | 49.5 | 0.4 |
| 8690230 | 2.3 - 3   |     |     |      | 49.7 |     |
| 8690240 | 2.4 - 3   | 15  |     |      | 48.9 |     |
| 8690250 | 2.5 - 3   |     |     |      | 49.1 |     |
| 8690260 | 2.6 - 3   | 16  |     |      | 48.3 |     |
| 8690265 | 2.65 - 3  |     |     |      |      |     |
| 8690270 | 2.7 - 3   | 17  |     |      | 47.4 | 0.5 |
| 8690280 | 2.8 - 3   |     |     |      | 47.6 |     |
| 8690290 | 2.9 - 3   | 18  |     |      | 46.8 |     |
| 8690300 | 3 - 3     |     |     |      | 47   |     |
| 8690310 | 3.1       | 19  |     |      | 52.3 |     |
| 8690315 | 3.15      |     |     |      | 52.4 |     |
| 8690320 | 3.2       | 20  |     |      | 51.5 | 0.6 |
| 8690330 | 3.3       |     |     |      | 51.7 |     |
| 8690340 | 3.4       | 21  |     |      | 50.9 |     |
| 8690350 | 3.5       |     |     |      | 51.1 |     |
| 8690360 | 3.6       | 22  |     |      | 50.3 |     |
| 8690370 | 3.7       |     |     |      | 49.4 |     |
| 8690375 | 3.75      | 23  |     |      | 49.5 |     |
| 8690380 | 3.8       |     |     |      | 49.6 |     |
| 8690390 | 3.9       | 24  |     |      | 48.8 | 0.7 |
| 8690400 | 4         |     |     |      | 49   |     |
| 8690410 | 4.1 - 5   | 25  |     |      | 52.3 |     |
| 8700410 | 4.1       |     |     |      | 50.5 |     |
| 8690420 | 4.2 - 5   |     |     |      | 51.5 |     |
| 8700420 | 4.2       | 26  |     |      | 49.6 |     |
| 8690430 | 4.3 - 5   |     |     |      | 51.7 |     |
| 8700430 | 4.3       |     |     |      | 49.8 |     |
| 8690440 | 4.4 - 5   |     |     |      | 50.9 |     |
| 8700440 | 4.4       | 27  |     |      | 49   | 0.8 |
| 8690450 | 4.5 - 5   |     |     |      | 51.1 |     |
| 8700450 | 4.5       |     |     |      | 49.2 |     |
| 8690460 | 4.6 - 5   | 28  |     |      | 50.3 |     |
| 8700460 | 4.6       |     |     |      | 48.4 |     |
| 8690470 | 4.7 - 5   |     |     |      | 49.4 |     |
| 8700470 | 4.7       | 29  |     |      | 47.6 |     |
| 8690480 | 4.8 - 5   |     |     |      | 49.6 |     |
| 8700480 | 4.8       | 30  |     |      | 47.8 | 0.9 |
| 8690490 | 4.9 - 5   |     |     |      | 48.8 |     |
| 8700490 | 4.9       |     |     |      | 46.9 |     |
| 8690500 | 5 - 5     | 25  |     |      | 54   |     |
| 8700500 | 5         |     |     |      | 52.1 |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8690510 | 5.1       |     |     |      | 53.3 | 0.9 |
| 8690520 | 5.2       | 26  |     |      | 53.5 |     |
| 8690525 | 5.25      |     |     |      | 52.6 |     |
| 8690530 | 5.3       | 27  |     |      | 52.7 |     |
| 8690540 | 5.4       |     |     |      | 52.9 | 1   |
| 8690550 | 5.5       | 28  | 82  | 6    | 52.1 |     |
| 8690560 | 5.6       |     |     |      | 52.3 |     |
| 8690570 | 5.7       | 29  |     |      | 51.4 |     |
| 8690580 | 5.8       |     |     |      | 51.6 |     |
| 8690590 | 5.9       | 30  |     |      | 50.8 |     |
| 8690600 | 6         |     |     |      | 51   |     |
| 8690610 | 6.1 - 7   |     |     | 7    | 56   |     |
| 8700610 | 6.1       | 31  |     | 8    | 52.5 | 1.1 |
| 8690620 | 6.2 - 7   |     |     | 7    | 56   |     |
| 8700620 | 6.2       |     |     | 8    | 52.6 |     |
| 8690625 | 6.25 - 7  |     |     | 7    | 55   |     |
| 8690630 | 6.3 - 7   | 32  |     | 8    | 51.8 |     |
| 8700630 | 6.3       |     |     | 7    | 55   |     |
| 8690640 | 6.4 - 7   |     |     | 8    | 52   |     |
| 8700640 | 6.4       | 33  | 88  | 7    | 54   |     |
| 8690650 | 6.5 - 7   |     |     | 8    | 51.2 |     |
| 8700650 | 6.5       |     |     | 7    | 54   |     |
| 8690660 | 6.6 - 7   | 34  |     | 8    | 51.4 | 1.2 |
| 8700660 | 6.6       |     |     | 7    | 53   |     |
| 8690670 | 6.7 - 7   |     |     | 8    | 50.6 |     |
| 8700670 | 6.7       | 35  |     | 7    | 52   |     |
| 8690675 | 6.75 - 7  |     |     | 8    | 50.8 |     |
| 8690680 | 6.8 - 7   | 36  |     | 7    | 52   |     |
| 8700680 | 6.8       |     |     | 8    | 49.9 |     |
| 8690690 | 6.9 - 7   |     |     | 7    | 52   |     |
| 8700690 | 6.9       | 37  |     | 8    | 50.1 | 1.3 |
| 8690700 | 7 - 7     |     |     | 7    | 52   |     |
| 8700700 | 7         | 38  | 94  | 8    | 57   |     |
| 8690710 | 7.1       |     |     |      |      |     |
| 8690720 | 7.2       |     |     |      |      |     |
| 8690725 | 7.25      | 39  |     |      |      |     |
| 8690730 | 7.3       |     |     |      |      |     |
| 8690740 | 7.4       |     |     |      |      |     |
| 8690750 | 7.5       |     |     |      |      |     |
| 8690760 | 7.6       |     |     |      |      |     |
| 8690770 | 7.7       |     |     |      |      |     |
| 8690775 | 7.75      |     |     |      |      |     |
| 8690780 | 7.8       |     |     |      |      |     |
| 8690790 | 7.9       | 40  |     |      |      |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| <b>ADO-3D</b> | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       | ○                       | ○               | ○                             |





**SPEED  
FEED**  
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**CARBIDE**

**EgiAs**

**h8**

**30°**

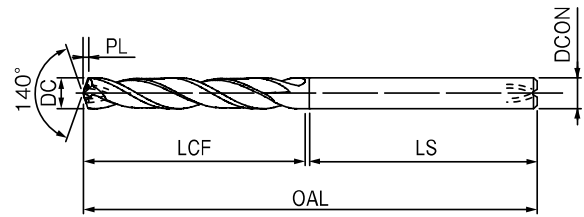
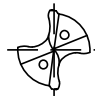
**SHRINK  
FIT**

| EDP No. | DC - DCON  | LCF | OAL | DCON | LS   | PL   |    |    |
|---------|------------|-----|-----|------|------|------|----|----|
| 8690800 | 8          | 40  | 94  | 8    | 53   | 1.5  |    |    |
| 8690810 | 8.1 - 9    | 41  | 101 | 9    | 59   |      |    |    |
| 8700810 | 8.1        |     |     | 10   | 55.5 |      |    |    |
| 8690820 | 8.2 - 9    |     |     | 9    | 59   |      |    |    |
| 8700820 | 8.2        |     |     | 10   | 55.6 |      |    |    |
| 8690825 | 8.25 - 9   | 42  |     | 9    | 58   |      |    |    |
| 8690830 | 8.3 - 9    |     |     | 9    | 58   |      |    |    |
| 8700830 | 8.3        |     |     | 10   | 54.8 |      |    |    |
| 8690840 | 8.4 - 9    |     |     | 9    | 58   |      |    |    |
| 8700840 | 8.4        | 10  |     | 55   |      |      |    |    |
| 8690850 | 8.5 - 9    | 43  |     | 9    | 57   |      |    |    |
| 8700850 | 8.5        |     |     | 10   | 54.2 |      |    |    |
| 8690860 | 8.6 - 9    |     |     | 9    | 57   |      |    |    |
| 8700860 | 8.6        |     |     | 10   | 54.4 |      |    |    |
| 8690870 | 8.7 - 9    | 44  |     | 9    | 56   |      |    |    |
| 8700870 | 8.7        |     |     | 10   | 53.6 |      |    |    |
| 8690875 | 8.75 - 9   |     |     | 9    | 56   |      |    |    |
| 8690880 | 8.8 - 9    |     |     | 10   | 53.8 |      |    |    |
| 8700880 | 8.8        | 45  |     | 9    | 55   |      |    |    |
| 8690890 | 8.9 - 9    |     |     | 10   | 52.9 |      |    |    |
| 8700890 | 8.9        |     |     | 9    | 55   |      |    |    |
| 8690900 | 9 - 9      |     |     | 53.1 |      |      |    |    |
| 8700900 | 9          | 46  |     | 106  | 10   | 59   |    |    |
| 8690910 | 9.1        |     |     |      |      | 1.7  |    |    |
| 8690920 | 9.2        |     |     |      |      |      | 47 | 58 |
| 8690925 | 9.25       |     |     |      |      |      |    |    |
| 8690930 | 9.3        |     |     |      |      |      |    |    |
| 8690940 | 9.4        |     |     |      |      |      |    |    |
| 8690950 | 9.5        | 48  |     |      | 57   |      |    |    |
| 8690960 | 9.6        |     |     |      |      |      |    |    |
| 8690970 | 9.7        |     |     |      |      |      |    |    |
| 8690975 | 9.75       |     |     |      |      |      |    |    |
| 8690980 | 9.8        | 49  |     | 56   |      |      |    |    |
| 8690990 | 9.9        |     |     |      |      |      |    |    |
| 8691000 | 10         |     |     |      |      |      |    |    |
| 8691010 | 10.1 - 11  |     |     |      | 50   | 55   |    |    |
| 8701010 | 10.1       | 1.8 |     |      |      |      |    |    |
| 8691020 | 10.2 - 11  |     |     | 51   |      |      | 11 | 61 |
| 8701020 | 10.2       |     |     |      |      |      |    |    |
| 8691025 | 10.25 - 11 |     |     |      |      |      |    |    |
| 8691030 | 10.3 - 11  |     |     |      |      |      |    |    |
| 8701030 | 10.3       |     |     | 52   | 12   | 57.5 |    |    |
| 8691040 | 10.4 - 11  |     |     |      |      |      |    |    |
| 8701040 | 10.4       |     |     |      |      |      |    |    |
| 8691040 | 10.4       |     |     |      |      |      |    |    |

| EDP No. | DC - DCON  | LCF | OAL | DCON | LS   | PL   |     |
|---------|------------|-----|-----|------|------|------|-----|
| 8691050 | 10.5 - 11  | 53  | 113 | 11   | 59   | 1.9  |     |
| 8701050 | 10.5       |     |     | 12   | 56.2 |      |     |
| 8691060 | 10.6 - 11  |     |     | 11   | 59   |      |     |
| 8701060 | 10.6       |     |     | 12   | 56.4 |      |     |
| 8691070 | 10.7 - 11  | 54  |     | 11   | 58   | 2    |     |
| 8701070 | 10.7       |     |     | 12   | 55.6 |      |     |
| 8691075 | 10.75 - 11 |     |     | 11   | 58   |      |     |
| 8691080 | 10.8 - 11  |     |     | 11   | 58   |      |     |
| 8701080 | 10.8       | 55  |     | 12   | 55.8 | 2.1  |     |
| 8691090 | 10.9 - 11  |     |     | 11   | 57   |      |     |
| 8701090 | 10.9       |     |     | 12   | 54.9 |      |     |
| 8691100 | 11 - 11    |     |     | 11   | 57   |      |     |
| 8701100 | 11         | 56  |     | 120  | 12   | 55.1 | 2.2 |
| 8691110 | 11.1       |     |     |      | 63   |      |     |
| 8691120 | 11.2       |     |     |      | 57   | 62   |     |
| 8691130 | 11.3       |     |     |      |      | 58   |     |
| 8691140 | 11.4       | 61  |     |      |      |      |     |
| 8691150 | 11.5       | 60  |     |      |      |      |     |
| 8691160 | 11.6       | 60  |     |      |      |      |     |
| 8691170 | 11.7       | 59  |     | 59   | 2.3  |      |     |
| 8691180 | 11.8       |     |     | 59   |      |      |     |
| 8691190 | 11.9       |     |     | 59   |      |      |     |
| 8691200 | 12         |     |     | 59   |      |      |     |
| 8691210 | 12.1 - 13  | 61  |     | 128  | 13   | 66   | 2.4 |
| 8701210 | 12.1       |     |     |      | 14   | 62.5 |     |
| 8691220 | 12.2 - 13  |     |     |      | 13   | 66   |     |
| 8701220 | 12.2       |     |     |      | 14   | 62.6 |     |
| 8691230 | 12.3 - 13  | 62  |     |      | 13   | 65   | 2.5 |
| 8701230 | 12.3       |     |     |      | 14   | 61.8 |     |
| 8691240 | 12.4 - 13  |     |     |      | 13   | 65   |     |
| 8701240 | 12.4       |     |     |      | 14   | 62   |     |
| 8691250 | 12.5 - 13  | 63  |     |      | 13   | 64   | 2.6 |
| 8701250 | 12.5       |     |     |      | 14   | 61.2 |     |
| 8691260 | 12.6 - 13  |     |     |      | 13   | 64   |     |
| 8701260 | 12.6       |     |     |      | 14   | 61.4 |     |
| 8691270 | 12.7 - 13  | 64  |     |      | 13   | 63   | 2.7 |
| 8701270 | 12.7       |     |     |      | 14   | 60.6 |     |
| 8691275 | 12.75 - 13 |     |     |      | 13   | 63   |     |
| 8691280 | 12.8 - 13  |     |     |      | 14   | 60.8 |     |
| 8701280 | 12.8       | 65  |     |      | 13   | 62   | 2.8 |
| 8691290 | 12.9 - 13  |     |     |      | 14   | 59.9 |     |
| 8701290 | 12.9       |     |     |      | 13   | 62   |     |
| 8691300 | 13 - 13    |     |     |      | 14   | 60.1 |     |
| 8701300 | 13         |     |     |      |      |      |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-3D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       | ○                       | ○               | ○                             |





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**CARBIDE**

**EgiAs**

**h8**

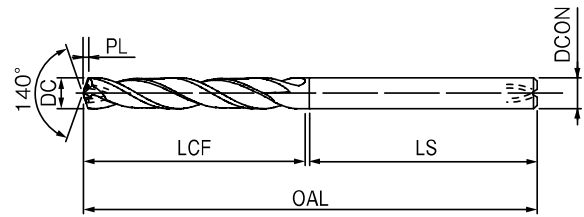
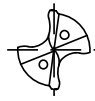
**30°**

**SHRINK  
FIT**

| EDP No.    | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|------------|-----------|-----|-----|------|------|-----|
| 8691310    | 13.1      |     |     |      |      |     |
| 8691320    | 13.2      | 66  |     |      | 67   | 2.4 |
| 8691330    | 13.3      | 67  |     |      | 66   |     |
| 8691340    | 13.4      |     |     |      |      |     |
| 8691350    | 13.5      | 68  | 134 | 14   | 65   |     |
| 8691360    | 13.6      |     |     |      |      |     |
| 8691370    | 13.7      | 69  |     |      | 64   | 2.5 |
| 8691380    | 13.8      |     |     |      |      |     |
| 8691390    | 13.9      | 70  |     |      | 63   |     |
| 8690400    | 14        |     |     |      |      |     |
| 8691410    | 14.1 - 15 |     |     | 15   | 68   |     |
| 8701410    | 14.1      |     |     | 16   | 64.5 |     |
| 8691420    | 14.2 - 15 | 71  |     | 15   | 68   |     |
| 8701420    | 14.2      |     |     | 16   | 64.6 |     |
| 8691430    | 14.3 - 15 |     |     | 15   | 67   | 2.6 |
| 8701430    | 14.3      | 72  |     | 16   | 63.8 |     |
| 8691440    | 14.4 - 15 |     |     | 15   | 67   |     |
| 8701440    | 14.4      |     |     | 16   | 64   |     |
| 8691450    | 14.5 - 15 |     |     | 15   | 66   |     |
| 8701450    | 14.5      | 73  | 140 | 16   | 63.2 |     |
| 8691460    | 14.6 - 15 |     |     | 15   | 66   |     |
| 8701460    | 14.6      |     |     | 16   | 63.4 |     |
| 8691470    | 14.7 - 15 |     |     | 15   | 65   |     |
| 8701470    | 14.7      | 74  |     | 16   | 62.6 |     |
| 8691480    | 14.8 - 15 |     |     | 15   | 65   |     |
| 8701480    | 14.8      |     |     | 16   | 62.8 | 2.7 |
| 8691490    | 14.9 - 15 |     |     | 15   | 64   |     |
| 8701490    | 14.9      | 75  |     | 16   | 61.9 |     |
| 8691500    | 15 - 15   |     |     | 15   | 64   |     |
| 8701500    | 15        |     |     |      | 62.1 |     |
| 8691510    | 15.1      | 76  |     |      | 68   |     |
| 8691520    | 15.2      |     |     |      |      |     |
| 8691530    | 15.3      | 77  |     |      | 67   | 2.8 |
| 8691540    | 15.4      |     |     |      |      |     |
| 8691550    | 15.5      | 78  | 145 | 16   | 66   |     |
| 8691560    | 15.6      |     |     |      |      |     |
| 8691570    | 15.7      | 79  |     |      | 65   |     |
| 8691580    | 15.8      |     |     |      |      |     |
| 8691590    | 15.9      | 80  |     |      | 64   | 2.9 |
| 8691600    | 16        |     |     |      |      |     |
| 5560595560 | 16.1      |     |     |      | 64.5 |     |
| 5560595570 | 16.2      | 81  | 150 | 18   | 64.7 |     |

| EDP No.    | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|------------|-----------|-----|-----|------|------|-----|
| 5560595580 | 16.3      |     |     |      |      |     |
| 5560595590 | 16.4      | 82  |     | 18   | 63.8 |     |
| 8691650    | 16.5 - 17 |     |     | 17   | 66   | 3   |
| 8701650    | 16.5      | 83  |     |      | 63.2 |     |
| 5560595600 | 16.6      |     | 150 |      | 63.4 |     |
| 5560595610 | 16.7      |     |     | 18   | 62.6 |     |
| 5560595620 | 16.8      | 84  |     |      | 62.8 |     |
| 5560595630 | 16.9      |     |     |      | 61.9 |     |
| 8691700    | 17 - 17   | 85  |     | 17   | 64   | 3.1 |
| 8701700    | 17        |     |     |      | 62.1 |     |
| 5560595640 | 17.1      |     |     |      | 68   |     |
| 5560595650 | 17.2      | 86  |     |      |      |     |
| 5560595660 | 17.3      |     |     |      | 67   |     |
| 5560595670 | 17.4      | 87  |     |      |      |     |
| 8691750    | 17.5      |     |     |      | 66   | 3.2 |
| 5560595680 | 17.6      | 88  | 155 | 18   | 65   |     |
| 5560595690 | 17.7      |     |     |      |      |     |
| 5560595700 | 17.8      | 89  |     |      | 64   |     |
| 5560595710 | 17.9      |     |     |      |      |     |
| 8691800    | 18        | 90  |     |      | 64.5 | 3.3 |
| 5560595720 | 18.1      |     |     |      | 64.6 |     |
| 5560595730 | 18.2      | 91  |     | 20   | 63.8 |     |
| 5560595740 | 18.3      |     |     |      | 64   |     |
| 5560595750 | 18.4      | 92  |     |      | 66   |     |
| 8691850    | 18.5 - 19 |     |     | 19   | 63.2 | 3.4 |
| 8701850    | 18.5      | 93  | 160 |      | 63.4 |     |
| 5560595760 | 18.6      |     |     |      | 62.6 |     |
| 5560595770 | 18.7      |     |     | 20   | 62.8 |     |
| 5560595780 | 18.8      | 94  |     |      | 61.9 |     |
| 5560595790 | 18.9      |     |     |      | 64   |     |
| 8691900    | 19 - 19   | 95  |     | 19   | 62.1 | 3.5 |
| 8701900    | 19        |     |     |      | 68   |     |
| 5560595800 | 19.1      | 96  |     |      | 67   |     |
| 5560595810 | 19.2      |     |     |      |      |     |
| 5560595820 | 19.3      | 97  |     |      | 66   |     |
| 5560595830 | 19.4      |     |     |      |      |     |
| 8691950    | 19.5      | 98  | 165 | 20   | 65   | 3.6 |
| 5560595840 | 19.6      |     |     |      |      |     |
| 5560595850 | 19.7      | 99  |     |      | 64   |     |
| 5560595860 | 19.8      |     |     |      |      |     |
| 5560595870 | 19.9      |     |     |      |      |     |
| 8692000    | 20        | 100 |     |      |      |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-3D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       | ○                       | ○               | ○                             |



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**CARBIDE**

**EgiAs**

**h8**

**30°**

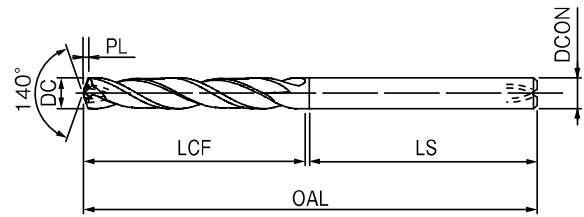
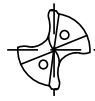
**SHRINK  
FIT**

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8692200 | 2 - 3     | 18  | 70  | 3    | 49.2 | 0.4 |
| 8692210 | 2.1 - 3   | 19  |     |      | 48.3 |     |
| 8692220 | 2.2 - 3   | 20  |     |      | 47.5 |     |
| 8692230 | 2.3 - 3   | 21  |     |      | 46.7 |     |
| 8692240 | 2.4 - 3   | 22  | 78  | 3    | 45.9 | 0.5 |
| 8692250 | 2.5 - 3   | 23  |     |      | 45.1 |     |
| 8692260 | 2.6 - 3   | 24  |     |      | 52.3 |     |
| 8692265 | 2.65 - 3  | 24  |     |      | 51.4 |     |
| 8692270 | 2.7 - 3   | 25  | 86  | 4    | 51.6 | 0.6 |
| 8692276 | 2.76 - 3  | 26  |     |      | 50.6 |     |
| 8692278 | 2.78 - 3  | 27  |     |      | 49.8 |     |
| 8692280 | 2.8 - 3   | 28  |     |      | 50   |     |
| 8692290 | 2.9 - 3   | 29  | 86  | 4    | 55.3 | 0.7 |
| 8692300 | 3 - 3     | 30  |     |      | 54.4 |     |
| 8692310 | 3.1       | 31  |     |      | 54.5 |     |
| 8692315 | 3.15      | 32  |     |      | 53.7 |     |
| 8692320 | 3.2       | 33  | 95  | 5    | 52.9 | 0.8 |
| 8692330 | 3.3       | 34  |     |      | 52.1 |     |
| 8692340 | 3.4       | 35  |     |      | 51.3 |     |
| 8692350 | 3.5       | 36  |     |      | 51.4 |     |
| 8692360 | 3.6       | 37  | 95  | 5    | 50.4 | 0.9 |
| 8692366 | 3.66      | 38  |     |      | 50.5 |     |
| 8692368 | 3.68      | 39  |     |      | 49.6 |     |
| 8692370 | 3.7       | 40  |     |      | 48.8 |     |
| 8692375 | 3.75      | 41  | 95  | 5    | 49   | 0.9 |
| 8692380 | 3.8       | 42  |     |      | 55.3 |     |
| 8692390 | 3.9       | 43  |     |      | 53.5 |     |
| 8692400 | 4         | 44  |     |      | 54.5 |     |
| 8692410 | 4.1 - 5   | 45  | 95  | 5    | 52.6 | 0.9 |
| 8702410 | 4.1       | 46  |     |      | 53.7 |     |
| 8692420 | 4.2 - 5   | 47  |     |      | 51.8 |     |
| 8702420 | 4.2       | 48  |     |      | 52.9 |     |
| 8692430 | 4.3 - 5   | 49  | 95  | 5    | 51   | 0.9 |
| 8702430 | 4.3       | 50  |     |      | 52.1 |     |
| 8692440 | 4.4 - 5   | 51  |     |      | 50.2 |     |
| 8702440 | 4.4       | 52  |     |      | 51.3 |     |
| 8692450 | 4.5 - 5   | 53  | 95  | 5    | 49.4 | 0.9 |
| 8702450 | 4.5       | 54  |     |      | 51.3 |     |
| 8692460 | 4.6 - 5   | 55  |     |      | 51.3 |     |
| 8702460 | 4.6       | 56  |     |      | 51.3 |     |
| 8692462 | 4.62 - 5  | 57  | 95  | 5    | 50.4 | 0.9 |
| 8692464 | 4.64 - 5  | 58  |     |      | 48.6 |     |
| 8692470 | 4.7 - 5   | 59  |     |      | 49.6 |     |
| 8702470 | 4.7       | 60  |     |      | 47.8 |     |
| 8692480 | 4.8 - 5   | 61  | 95  | 5    | 48.8 | 0.9 |
| 8702480 | 4.8       | 62  |     |      | 46.9 |     |
| 8692490 | 4.9 - 5   | 63  |     |      |      |     |
| 8702490 | 4.9       | 64  |     |      |      |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8692500 | 5 - 5     | 45  | 95  | 5    | 49   | 0.9 |
| 8702500 | 5         | 46  |     |      | 47.1 |     |
| 8692510 | 5.1       | 47  |     |      | 56.3 |     |
| 8692520 | 5.2       | 48  |     |      | 55.5 |     |
| 8692525 | 5.25      | 49  | 100 | 6    | 54.7 | 1   |
| 8692530 | 5.3       | 50  |     |      | 53.9 |     |
| 8692540 | 5.4       | 51  |     |      | 54.1 |     |
| 8692550 | 5.5       | 52  |     |      | 53.1 |     |
| 8692552 | 5.52      | 53  | 100 | 6    | 53.3 | 1.1 |
| 8692554 | 5.54      | 54  |     |      | 52.4 |     |
| 8692560 | 5.6       | 55  |     |      | 51.6 |     |
| 8692570 | 5.7       | 56  |     |      | 50.8 |     |
| 8692580 | 5.8       | 57  | 109 | 7    | 51   | 1.2 |
| 8692590 | 5.9       | 58  |     |      | 59   |     |
| 8692600 | 6         | 59  |     |      | 55.5 |     |
| 8692610 | 6.1 - 7   | 60  |     |      | 58   |     |
| 8702610 | 6.1       | 61  | 109 | 7    | 54.6 | 1.3 |
| 8692620 | 6.2 - 7   | 62  |     |      | 58   |     |
| 8702620 | 6.2       | 63  |     |      | 57   |     |
| 8692625 | 6.25 - 7  | 64  |     |      | 53.8 |     |
| 8692630 | 6.3 - 7   | 65  | 109 | 7    | 56   | 1.4 |
| 8702630 | 6.3       | 66  |     |      | 53   |     |
| 8692640 | 6.4 - 7   | 67  |     |      | 56   |     |
| 8702640 | 6.4       | 68  |     |      | 53.2 |     |
| 8692650 | 6.5 - 7   | 69  | 118 | 8    | 55   | 1.4 |
| 8702650 | 6.5       | 70  |     |      | 52.4 |     |
| 8692660 | 6.6 - 7   | 71  |     |      | 54   |     |
| 8702660 | 6.6       | 72  |     |      | 51.6 |     |
| 8692670 | 6.7 - 7   | 73  | 118 | 8    | 54   | 1.4 |
| 8702670 | 6.7       | 74  |     |      | 53   |     |
| 8692675 | 6.75 - 7  | 75  |     |      | 50.8 |     |
| 8692680 | 6.8 - 7   | 76  |     |      | 52   |     |
| 8692690 | 6.9 - 7   | 77  | 118 | 8    | 49.9 | 1.4 |
| 8702690 | 6.9       | 78  |     |      | 52   |     |
| 8692700 | 7 - 7     | 79  |     |      | 50.1 |     |
| 8702700 | 7         | 80  |     |      | 60   |     |
| 8692710 | 7.1       | 81  | 118 | 8    | 59   | 1.4 |
| 8692720 | 7.2       | 82  |     |      | 58   |     |
| 8692725 | 7.25      | 83  |     |      | 57   |     |
| 8692730 | 7.3       | 84  |     |      | 56   |     |
| 8692736 | 7.36      | 85  | 118 | 8    | 55   | 1.4 |
| 8692738 | 7.38      | 86  |     |      | 54   |     |
| 8692740 | 7.4       | 87  |     |      | 53   |     |
| 8692750 | 7.5       | 88  |     |      | 52   |     |
| 8692752 | 7.52      | 89  | 118 | 8    | 51   | 1.4 |
| 8692754 | 7.54      | 90  |     |      | 50   |     |
| 8692760 | 7.6       | 91  |     |      | 49   |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-5D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       | ○                       | ○               | ○                             |





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FEED**  
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**CARBIDE**

**EgiAs**

**h8**

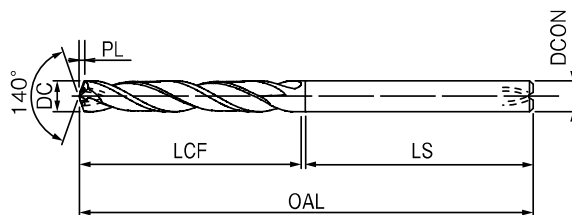
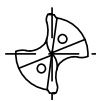
**30°**

**SHRINK  
FIT**

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8692770 | 7.7       |     |     |      |      |     |
| 8692775 | 7.75      | 62  |     |      | 55   |     |
| 8692780 | 7.8       | 63  | 118 | 8    | 54   | 1.4 |
| 8692790 | 7.9       | 64  |     |      | 53   |     |
| 8692800 | 8         |     |     |      |      |     |
| 8692810 | 8.1 - 9   | 65  |     | 9    | 62   |     |
| 8702810 | 8.1       |     |     | 10   | 58.5 |     |
| 8692820 | 8.2 - 9   |     |     | 9    | 61   |     |
| 8702820 | 8.2       | 66  |     | 10   | 57.6 |     |
| 8692825 | 8.25 - 9  |     |     | 9    | 61   | 1.5 |
| 8692830 | 8.3 - 9   | 67  |     | 10   | 56.8 |     |
| 8692840 | 8.4 - 9   |     |     | 9    | 59   |     |
| 8702840 | 8.4       | 68  |     | 10   | 56   |     |
| 8692850 | 8.5 - 9   |     |     | 9    | 59   |     |
| 8702850 | 8.5       |     | 128 | 10   | 56.2 |     |
| 8692860 | 8.6 - 9   | 69  |     | 9    | 58   |     |
| 8702860 | 8.6       |     |     | 10   | 55.4 |     |
| 8692870 | 8.7 - 9   |     |     | 9    | 57   |     |
| 8702870 | 8.7       | 70  |     | 10   | 54.6 |     |
| 8692875 | 8.75 - 9  |     |     | 9    | 57   | 1.6 |
| 8692880 | 8.8 - 9   | 71  |     | 10   | 53.8 |     |
| 8692890 | 8.9 - 9   |     |     | 9    | 55   |     |
| 8702890 | 8.9       | 72  |     | 10   | 52.9 |     |
| 8692900 | 9 - 9     |     |     | 9    | 55   |     |
| 8702900 | 9         |     |     |      | 53.1 |     |
| 8692910 | 9.1       | 73  |     |      | 62   |     |
| 8692920 | 9.2       |     |     |      |      |     |
| 8692924 | 9.24      | 74  |     |      | 61   |     |
| 8692925 | 9.25      |     |     |      |      |     |
| 8692926 | 9.26      |     |     |      |      |     |
| 8692930 | 9.3       | 75  |     |      | 60   |     |
| 8692936 | 9.36      |     |     |      |      | 1.7 |
| 8692938 | 9.38      |     |     |      |      |     |
| 8692940 | 9.4       | 76  | 136 | 10   | 59   |     |
| 8692950 | 9.5       |     |     |      |      |     |
| 8692952 | 9.52      |     |     |      |      |     |
| 8692954 | 9.54      | 77  |     |      | 58   |     |
| 8692960 | 9.6       |     |     |      |      |     |
| 8692970 | 9.7       | 78  |     |      | 57   |     |
| 8692975 | 9.75      |     |     |      |      |     |
| 8692980 | 9.8       | 79  |     |      | 56   |     |
| 8692990 | 9.9       | 80  |     |      | 55   | 1.8 |
| 8693000 | 10        |     |     |      |      |     |
| 8693010 | 10.1 - 11 | 81  |     | 11   | 64   |     |
| 8703010 | 10.1      |     | 146 | 12   | 60.5 |     |
| 8693020 | 10.2 - 11 | 82  |     | 11   | 63   | 1.9 |

| EDP No. | DC - DCON  | LCF | OAL | DCON | LS   | PL  |
|---------|------------|-----|-----|------|------|-----|
| 8703020 | 10.2       | 82  |     | 12   | 59.6 |     |
| 8693025 | 10.25 - 11 |     |     | 11   | 63   |     |
| 8693030 | 10.3 - 11  | 83  |     |      | 62   |     |
| 8703030 | 10.3       |     |     | 12   | 58.8 |     |
| 8693040 | 10.4 - 11  |     |     | 11   | 61   | 1.9 |
| 8703040 | 10.4       | 84  |     | 12   | 58   |     |
| 8693050 | 10.5 - 11  |     |     | 11   | 61   |     |
| 8703050 | 10.5       |     | 146 | 12   | 58.2 |     |
| 8693060 | 10.6 - 11  | 85  |     | 11   | 60   |     |
| 8703060 | 10.6       |     |     | 12   | 57.4 |     |
| 8693070 | 10.7 - 11  | 86  |     | 11   | 59   |     |
| 8703070 | 10.7       |     |     | 12   | 56.6 |     |
| 8693075 | 10.75 - 11 |     |     | 11   | 59   |     |
| 8693080 | 10.8 - 11  | 87  |     |      | 58   |     |
| 8703080 | 10.8       |     |     | 12   | 55.8 |     |
| 8693090 | 10.9 - 11  |     |     | 11   | 57   |     |
| 8703090 | 10.9       | 88  |     | 12   | 54.9 | 2   |
| 8693100 | 11 - 11    |     |     | 11   | 57   |     |
| 8703100 | 11         |     |     |      | 55.1 |     |
| 8693110 | 11.1       | 89  |     |      | 66   |     |
| 8693120 | 11.2       |     |     |      |      |     |
| 8693122 | 11.22      | 90  |     |      | 65   |     |
| 8693124 | 11.24      |     |     |      |      |     |
| 8693130 | 11.3       | 91  |     |      | 64   |     |
| 8693136 | 11.36      |     |     |      |      |     |
| 8693138 | 11.38      |     |     |      |      |     |
| 8693140 | 11.4       | 92  | 156 | 12   | 63   | 2.1 |
| 8693150 | 11.5       |     |     |      |      |     |
| 8693160 | 11.6       | 93  |     |      | 62   |     |
| 8693170 | 11.7       | 94  |     |      | 61   |     |
| 8693180 | 11.8       | 95  |     |      | 60   |     |
| 8693190 | 11.9       | 96  |     |      | 59   |     |
| 8693200 | 12         |     |     |      |      |     |
| 8693210 | 12.1 - 13  | 97  |     | 13   | 69   | 2.2 |
| 8703210 | 12.1       |     |     | 14   | 65.5 |     |
| 8693220 | 12.2 - 13  | 98  |     | 13   | 68   |     |
| 8703220 | 12.2       |     |     | 14   | 64.6 |     |
| 8693230 | 12.3 - 13  | 99  |     | 13   | 67   |     |
| 8703230 | 12.3       |     |     | 14   | 63.8 |     |
| 8693240 | 12.4 - 13  |     | 167 | 13   | 66   |     |
| 8703240 | 12.4       | 100 |     | 14   | 63   |     |
| 8693250 | 12.5 - 13  |     |     | 13   | 66   |     |
| 8703250 | 12.5       |     |     | 14   | 63.2 | 2.3 |
| 8693260 | 12.6 - 13  | 101 |     | 13   | 65   |     |
| 8703260 | 12.6       |     |     | 14   | 62.4 |     |
| 8693270 | 12.7 - 13  | 102 |     | 13   | 64   |     |
| 8703270 | 12.7       |     |     | 14   | 61.6 |     |
| 8693275 | 12.75 - 13 | 103 |     | 13   | 63   |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-5D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       |                         | ○               |                               |



**SPEED  
FEED**  
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**CARBIDE**

**EgiAs**

**h8**

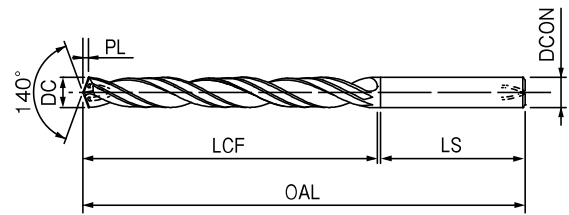
**30°**

**SHRINK  
FIT**

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8693280 | 12.8 - 13 | 103 | 167 | 13   | 63   | 2.3 |
| 8703280 | 12.8      |     |     | 14   | 60.8 |     |
| 8693290 | 12.9 - 13 | 104 | 176 | 13   | 62   | 2.4 |
| 8703290 | 12.9      |     |     | 14   | 59.9 |     |
| 8693300 | 13 - 13   | 105 | 185 | 13   | 62   | 2.5 |
| 8703300 | 13        |     |     | 14   | 60.1 |     |
| 8693310 | 13.1      | 106 | 193 | 14   | 70   | 2.6 |
| 8693320 | 13.2      | 107 |     | 15   | 69   |     |
| 8693325 | 13.25     | 108 | 201 | 16   | 68   | 2.7 |
| 8693330 | 13.3      | 109 |     | 17   | 67   |     |
| 8693340 | 13.4      | 110 | 209 | 18   | 66   | 2.8 |
| 8693350 | 13.5      | 111 |     | 19   | 65   |     |
| 8693360 | 13.6      | 112 | 217 | 20   | 64   | 2.9 |
| 8693370 | 13.7      | 113 |     | 21   | 63   |     |
| 8693380 | 13.8      | 114 | 225 | 22   | 62.1 | 3.0 |
| 8693390 | 13.9      | 115 |     | 23   | 61.9 |     |
| 8693400 | 14        | 116 | 233 | 24   | 61   | 3.1 |
| 8693410 | 14.1 - 15 | 117 |     | 25   | 60   |     |
| 8703410 | 14.1      | 118 | 241 | 26   | 59   | 3.2 |
| 8693420 | 14.2 - 15 | 119 |     | 27   | 58   |     |
| 8703420 | 14.2      | 120 | 249 | 28   | 57   | 3.3 |
| 8693430 | 14.3 - 15 | 121 |     | 29   | 56   |     |
| 8703430 | 14.3      | 122 | 257 | 30   | 55   | 3.4 |
| 8693440 | 14.4 - 15 | 123 |     | 31   | 54   |     |
| 8703440 | 14.4      | 124 | 265 | 32   | 53   | 3.5 |
| 8693450 | 14.5 - 15 | 125 |     | 33   | 52   |     |
| 8703450 | 14.5      | 126 | 273 | 34   | 51   | 3.6 |
| 8693460 | 14.6 - 15 | 127 |     | 35   | 50   |     |
| 8703460 | 14.6      | 128 | 281 | 36   | 49   | 3.7 |
| 8693470 | 14.7 - 15 | 129 |     | 37   | 48   |     |
| 8703470 | 14.7      | 130 | 289 | 38   | 47   | 3.8 |
| 8693480 | 14.8 - 15 | 131 |     | 39   | 46   |     |
| 8703480 | 14.8      | 132 | 297 | 40   | 45   | 3.9 |
| 8693490 | 14.9 - 15 | 133 |     | 41   | 44   |     |
| 8703490 | 14.9      | 134 | 305 | 42   | 43   | 4.0 |
| 8693500 | 15 - 15   | 135 |     | 43   | 42   |     |
| 8703500 | 15        | 136 | 313 | 44   | 41   | 4.1 |
| 8693510 | 15.1      | 137 |     | 45   | 40   |     |
| 8693520 | 15.2      | 138 | 321 | 46   | 39   | 4.2 |
| 8693525 | 15.25     | 139 |     | 47   | 38   |     |
| 8693530 | 15.3      | 140 | 329 | 48   | 37   | 4.3 |
| 8693540 | 15.4      | 141 |     | 49   | 36   |     |
| 8693550 | 15.5      | 142 | 337 | 50   | 35   | 4.4 |
| 8693560 | 15.6      | 143 |     | 51   | 34   |     |
| 8693570 | 15.7      | 144 | 345 | 52   | 33   | 4.5 |
| 8693580 | 15.8      | 145 |     | 53   | 32   |     |

| EDP No.    | DC - DCON | LCF | OAL | DCON | LS  | PL  |
|------------|-----------|-----|-----|------|-----|-----|
| 8693590    | 15.9      | 128 | 18  | 64   | 2.9 | 3   |
| 8693600    | 16        | 129 |     | 65   | 2.8 |     |
| 5560595880 | 16.1      | 130 | 19  | 66   | 2.7 | 3.1 |
| 5560595890 | 16.2      | 131 |     | 67   | 2.6 |     |
| 5560595900 | 16.3      | 132 | 20  | 68   | 2.5 | 3.2 |
| 5560595910 | 16.4      | 133 |     | 69   | 2.4 |     |
| 8693650    | 16.5 - 17 | 134 | 21  | 70   | 2.3 | 3.3 |
| 8703650    | 16.5      | 135 |     | 71   | 2.2 |     |
| 5560595920 | 16.6      | 136 | 22  | 72   | 2.1 | 3.4 |
| 5560595930 | 16.7      | 137 |     | 73   | 2.0 |     |
| 5560595940 | 16.8      | 138 | 23  | 74   | 1.9 | 3.5 |
| 5560595950 | 16.9      | 139 |     | 75   | 1.8 |     |
| 8693700    | 17 - 17   | 140 | 24  | 76   | 1.7 | 3.6 |
| 8703700    | 17        | 141 |     | 77   | 1.6 |     |
| 5560595960 | 17.1      | 142 | 25  | 78   | 1.5 | 3.7 |
| 5560595970 | 17.2      | 143 |     | 79   | 1.4 |     |
| 5560595980 | 17.3      | 144 | 26  | 80   | 1.3 | 3.8 |
| 5560595990 | 17.4      | 145 |     | 81   | 1.2 |     |
| 8693750    | 17.5      | 146 | 27  | 82   | 1.1 | 3.9 |
| 5560596000 | 17.6      | 147 |     | 83   | 1.0 |     |
| 5560596010 | 17.7      | 148 | 28  | 84   | 0.9 | 4.0 |
| 5560596020 | 17.8      | 149 |     | 85   | 0.8 |     |
| 5560596030 | 17.9      | 150 | 29  | 86   | 0.7 | 4.1 |
| 8693800    | 18        | 151 |     | 87   | 0.6 |     |
| 5560596040 | 18.1      | 152 | 30  | 88   | 0.5 | 4.2 |
| 5560596050 | 18.2      | 153 |     | 89   | 0.4 |     |
| 5560596060 | 18.3      | 154 | 31  | 90   | 0.3 | 4.3 |
| 5560596070 | 18.4      | 155 |     | 91   | 0.2 |     |
| 8693850    | 18.5 - 19 | 156 | 32  | 92   | 0.1 | 4.4 |
| 8703850    | 18.5      | 157 |     | 93   | 0.0 |     |
| 5560596080 | 18.6      | 158 | 33  | 94   | 0.0 | 4.5 |
| 5560596090 | 18.7      | 159 |     | 95   | 0.0 |     |
| 5560596100 | 18.8      | 160 | 34  | 96   | 0.0 | 4.6 |
| 5560596110 | 18.9      | 161 |     | 97   | 0.0 |     |
| 8693900    | 19 - 19   | 162 | 35  | 98   | 0.0 | 4.7 |
| 8703900    | 19        | 163 |     | 99   | 0.0 |     |
| 5560596120 | 19.1      | 164 | 36  | 100  | 0.0 | 4.8 |
| 5560596130 | 19.2      | 165 |     | 101  | 0.0 |     |
| 5560596140 | 19.3      | 166 | 37  | 102  | 0.0 | 4.9 |
| 5560596150 | 19.4      | 167 |     | 103  | 0.0 |     |
| 8693950    | 19.5      | 168 | 38  | 104  | 0.0 | 5.0 |
| 5560596160 | 19.6      | 169 |     | 105  | 0.0 |     |
| 5560596170 | 19.7      | 170 | 39  | 106  | 0.0 | 5.1 |
| 5560596180 | 19.8      | 171 |     | 107  | 0.0 |     |
| 5560596190 | 19.9      | 172 | 40  | 108  | 0.0 | 5.2 |
| 8694000    | 20        | 173 |     | 109  | 0.0 |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-5D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       | ○                       | ○               | ○                             |



**SPEED  
FEED**  
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**CARBIDE**

**EgiAs**

**h8**

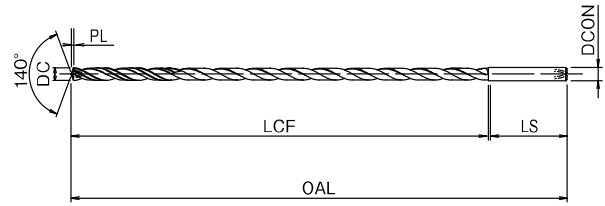
**30°**

**SHRINK  
FIT**

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8694200 | 2 - 3     | 22  | 75  | 3    | 50.1 | 0.4 |
| 8694210 | 2.1 - 3   | 24  |     |      |      |     |
| 8694220 | 2.2 - 3   | 25  |     |      |      |     |
| 8694230 | 2.3 - 3   | 26  |     |      |      |     |
| 8694240 | 2.4 - 3   | 27  | 80  | 3    | 45.1 | 0.5 |
| 8694250 | 2.5 - 3   | 28  |     |      |      |     |
| 8694260 | 2.6 - 3   | 29  |     |      |      |     |
| 8694270 | 2.7 - 3   | 30  |     |      |      |     |
| 8694280 | 2.8 - 3   | 31  | 95  | 4    | 47.6 | 0.6 |
| 8694290 | 2.9 - 3   | 32  |     |      |      |     |
| 8694300 | 3         | 33  |     |      |      |     |
| 8694310 | 3.1       | 34  |     |      |      |     |
| 8694320 | 3.2       | 35  | 105 | 5    | 57.3 | 0.7 |
| 8694330 | 3.3       | 36  |     |      |      |     |
| 8694340 | 3.4       | 37  |     |      |      |     |
| 8694350 | 3.5       | 39  |     |      |      |     |
| 8694360 | 3.6       | 40  | 115 | 6    | 53.3 | 0.8 |
| 8694370 | 3.7       | 41  |     |      |      |     |
| 8694380 | 3.8       | 42  |     |      |      |     |
| 8694390 | 3.9       | 43  |     |      |      |     |
| 8694400 | 4         | 44  | 125 | 7    | 50   | 0.9 |
| 8694410 | 4.1 - 5   | 45  |     |      |      |     |
| 8694420 | 4.2 - 5   | 46  |     |      |      |     |
| 8694430 | 4.3 - 5   | 47  |     |      |      |     |
| 8694440 | 4.4 - 5   | 48  | 135 | 8    | 54.9 | 1.0 |
| 8694450 | 4.5 - 5   | 50  |     |      |      |     |
| 8694460 | 4.6 - 5   | 51  |     |      |      |     |
| 8694470 | 4.7 - 5   | 52  |     |      |      |     |
| 8694480 | 4.8 - 5   | 53  | 145 | 9    | 51.4 | 1.1 |
| 8694490 | 4.9 - 5   | 54  |     |      |      |     |
| 8694500 | 5 - 5     | 55  |     |      |      |     |
| 8694510 | 5.1       | 56  |     |      |      |     |
| 8694520 | 5.2       | 57  | 155 | 10   | 55.5 | 1.2 |
| 8694530 | 5.3       | 58  |     |      |      |     |
| 8694540 | 5.4       | 59  |     |      |      |     |
| 8694550 | 5.5       | 61  |     |      |      |     |
| 8694560 | 5.6       | 62  | 165 | 11   | 51.3 | 1.3 |
| 8694570 | 5.7       | 63  |     |      |      |     |
| 8694580 | 5.8       | 64  |     |      |      |     |
| 8694590 | 5.9       | 65  |     |      |      |     |
| 8694600 | 6         | 66  | 175 | 12   | 48   | 1.4 |
| 8694610 | 6.1 - 7   | 67  |     |      |      |     |
| 8694620 | 6.2 - 7   | 68  |     |      |      |     |
| 8694630 | 6.3 - 7   | 69  |     |      |      |     |
| 8694640 | 6.4 - 7   | 70  | 185 | 13   | 51.8 | 1.5 |
| 8694650 | 6.5 - 7   | 72  |     |      |      |     |
| 8694660 | 6.6 - 7   | 73  |     |      |      |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8704660 | 6.6       | 73  | 125 | 8    | 48.4 | 1.2 |
| 8694670 | 6.7 - 7   | 74  |     |      |      |     |
| 8704670 | 6.7       | 75  |     |      |      |     |
| 8694680 | 6.8 - 7   | 75  |     |      |      |     |
| 8704680 | 6.8       | 76  | 135 | 8    | 46.8 | 1.3 |
| 8694690 | 6.9 - 7   | 76  |     |      |      |     |
| 8704690 | 6.9       | 77  |     |      |      |     |
| 8694700 | 7 - 7     | 77  |     |      |      |     |
| 8704700 | 7         | 78  | 140 | 8    | 45.1 | 1.4 |
| 8704710 | 7.1       | 78  |     |      |      |     |
| 8704720 | 7.2       | 79  |     |      |      |     |
| 8704730 | 7.3       | 80  |     |      |      |     |
| 8704740 | 7.4       | 81  | 150 | 9    | 56.5 | 1.5 |
| 8694750 | 7.5       | 83  |     |      |      |     |
| 8704760 | 7.6       | 84  |     |      |      |     |
| 8704770 | 7.7       | 85  |     |      |      |     |
| 8704780 | 7.8       | 86  | 160 | 9    | 51   | 1.6 |
| 8704790 | 7.9       | 87  |     |      |      |     |
| 8694800 | 8         | 88  |     |      |      |     |
| 8694810 | 8.1 - 9   | 89  |     |      |      |     |
| 8704810 | 8.1       | 90  | 170 | 10   | 55.6 | 1.7 |
| 8694820 | 8.2 - 9   | 90  |     |      |      |     |
| 8704820 | 8.2       | 91  |     |      |      |     |
| 8694830 | 8.3 - 9   | 91  |     |      |      |     |
| 8704830 | 8.3       | 92  | 180 | 10   | 54.8 | 1.8 |
| 8694840 | 8.4 - 9   | 92  |     |      |      |     |
| 8704840 | 8.4       | 93  |     |      |      |     |
| 8694850 | 8.5 - 9   | 94  |     |      |      |     |
| 8704850 | 8.5       | 95  | 190 | 10   | 52.2 | 1.9 |
| 8694860 | 8.6 - 9   | 95  |     |      |      |     |
| 8704860 | 8.6       | 96  |     |      |      |     |
| 8694870 | 8.7 - 9   | 96  |     |      |      |     |
| 8704870 | 8.7       | 97  | 200 | 10   | 50.6 | 2.0 |
| 8694880 | 8.8 - 9   | 97  |     |      |      |     |
| 8704880 | 8.8       | 98  |     |      |      |     |
| 8694890 | 8.9 - 9   | 98  |     |      |      |     |
| 8704890 | 8.9       | 99  | 210 | 10   | 48.9 | 2.1 |
| 8694900 | 9 - 9     | 99  |     |      |      |     |
| 8704900 | 9         | 100 |     |      |      |     |
| 8704910 | 9.1       | 101 |     |      |      |     |
| 8704920 | 9.2       | 102 | 220 | 11   | 59   | 2.2 |
| 8704930 | 9.3       | 103 |     |      |      |     |
| 8704940 | 9.4       | 104 |     |      |      |     |
| 8704950 | 9.5       | 105 |     |      |      |     |
| 8704960 | 9.6       | 106 | 230 | 11   | 53   | 2.3 |
| 8704970 | 9.7       | 107 |     |      |      |     |
| 8704980 | 9.8       | 108 |     |      |      |     |
| 8704990 | 9.9       | 109 |     |      |      |     |
| 8695000 | 10        | 110 | 240 | 11   | 49   | 2.4 |
| 8695010 | 10.1 - 11 | 111 |     |      |      |     |
| 8705010 | 10.1      | 112 |     |      |      |     |
| 8695020 | 10.2 - 11 | 112 |     |      |      |     |
| 8705020 | 10.2      | 113 | 250 | 11   | 68   | 2.5 |
| 8695030 | 10.3 - 11 | 113 |     |      |      |     |
| 8705030 | 10.3      | 114 |     |      |      |     |
| 8695040 | 10.4 - 11 | 114 |     |      |      |     |
| 8705040 | 10.4      | 115 | 260 | 11   | 64   | 2.6 |
| 8695050 | 10.5 - 11 | 115 |     |      |      |     |
| 8705050 | 10.5      | 116 |     |      |      |     |
| 8695060 | 10.6 - 11 | 117 |     |      |      |     |
| 8705060 | 10.6      | 118 | 270 | 11   | 61.4 | 2.7 |
| 8695070 | 10.7 - 11 | 118 |     |      |      |     |

| EDP No. | DC - DCON | LCF | OAL  | DCON | LS   | PL  |
|---------|-----------|-----|------|------|------|-----|
| 8705070 | 10.7      | 118 | 194  | 12   | 60.6 | 2   |
| 8695080 | 10.8 - 11 | 119 |      | 11   | 62   |     |
| 8705080 | 10.8      | 120 |      | 12   | 59.8 |     |
| 8695090 | 10.9 - 11 | 120 |      | 11   | 61   |     |
| 8705090 | 10.9      | 121 |      | 12   | 58.9 |     |
| 8695100 | 11 - 11   | 121 |      | 11   | 60   | 2.1 |
| 8705100 | 11        | 122 |      | 58.1 |      |     |
| 8705110 | 11.1      | 122 |      | 71   |      |     |
| 8705120 | 11.2      | 123 |      | 70   |      |     |
| 8705130 | 11.3      | 124 |      | 69   |      |     |
| 8705140 | 11.4      | 125 |      | 68   |      |     |
| 8705150 | 11.5      | 127 |      | 66   |      |     |
| 8705160 | 11.6      | 128 |      | 65   |      |     |
| 8705170 | 11.7      | 129 |      | 64   |      |     |
| 8705180 | 11.8      | 130 |      | 63   |      |     |
| 8705190 | 11.9      | 131 |      | 62   |      |     |
| 8695200 | 12        | 132 |      | 61   |      |     |
| 8705210 | 12.1      | 133 |      | 14   | 68.5 | 2.2 |
| 8705220 | 12.2      | 134 |      |      | 67.6 |     |
| 8705230 | 12.3      | 135 | 66.8 |      |      |     |
| 8705240 | 12.4      | 136 | 66   |      |      |     |
| 8695250 | 12.5 - 13 | 138 | 13   |      | 67   |     |
| 8705250 | 12.5      |     | 64.2 |      |      |     |
| 8705260 | 12.6      | 139 | 14   |      | 63.4 | 2.3 |
| 8705270 | 12.7      | 140 |      |      | 62.6 |     |
| 8705280 | 12.8      | 141 |      |      | 61.8 |     |
| 8705290 | 12.9      | 142 |      |      | 60.9 |     |
| 8695300 | 13 - 13   | 143 |      | 13   | 62   |     |
| 8705300 | 13        |     | 60.1 |      |      |     |
| 8705310 | 13.1      | 144 | 218  | 73   | 2.4  |     |
| 8705320 | 13.2      | 145 |      | 72   |      |     |
| 8705330 | 13.3      | 146 |      | 71   |      |     |
| 8705340 | 13.4      | 147 |      | 70   |      |     |
| 8705350 | 13.5      | 149 |      | 14   | 68   |     |
| 8705360 | 13.6      | 150 |      |      | 67   |     |
| 8705370 | 13.7      | 151 |      |      | 66   |     |
| 8705380 | 13.8      | 152 |      |      | 65   |     |
| 8705390 | 13.9      | 153 |      |      | 64   |     |
| 8705400 | 14        | 154 |      | 63   |      |     |
| 8705410 | 14.1      | 155 | 230  | 70.5 | 2.6  |     |
| 8705420 | 14.2      | 156 |      | 69.6 |      |     |
| 8705430 | 14.3      | 157 |      | 68.8 |      |     |
| 8705440 | 14.4      | 158 |      | 68   |      |     |
| 8705450 | 14.5      | 160 |      | 66.2 |      |     |
| 8705460 | 14.6      | 161 |      | 16   | 65.4 | 2.7 |
| 8705470 | 14.7      | 162 |      |      | 64.6 |     |
| 8705480 | 14.8      | 163 |      |      | 63.8 |     |
| 8705490 | 14.9      | 164 |      |      | 62.9 |     |
| 8705500 | 15        | 165 |      |      | 62.1 |     |
| 8705510 | 15.1      | 166 | 241  | 74   | 2.8  |     |
| 8705520 | 15.2      | 167 |      | 73   |      |     |
| 8705530 | 15.3      | 168 |      | 72   |      |     |
| 8705540 | 15.4      | 169 |      | 71   |      |     |
| 8705550 | 15.5      | 171 |      | 69   |      |     |
| 8705560 | 15.6      | 172 |      | 68   |      |     |
| 8705570 | 15.7      | 173 |      | 67   |      |     |
| 8705580 | 15.8      | 174 |      | 66   |      |     |
| 8705590 | 15.9      | 175 |      | 65   |      |     |
| 8705600 | 16        | 176 |      | 64   |      |     |
|         |           |     |      |      |      |     |
|         |           |     |      |      |      |     |



**SPEED  
FEED**  
P.154

**CARBIDE**

**EgiAs**

**e8**

**30°**

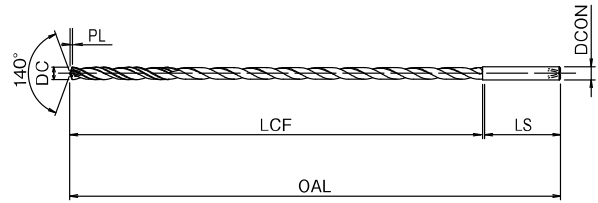
**SHRINK  
FIT**

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8696200 | 2 - 3     | 26  |     |      |      |     |
| 8696210 | 2.1 - 3   |     |     |      |      |     |
| 8696220 | 2.2 - 3   |     |     |      |      | 0.4 |
| 8696230 | 2.3 - 3   | 33  | 75  |      |      |     |
| 8696240 | 2.4 - 3   |     |     | 3    | 40   |     |
| 8696250 | 2.5 - 3   |     |     |      |      |     |
| 8696260 | 2.6 - 3   |     |     |      |      | 0.5 |
| 8696270 | 2.7 - 3   | 40  | 90  |      |      |     |
| 8696280 | 2.8 - 3   |     |     |      |      |     |
| 8696290 | 2.9 - 3   |     |     |      |      |     |
| 8696300 | 3 - 3     |     |     |      |      |     |
| 8696310 | 3.1       |     |     |      | 50   |     |
| 8696320 | 3.2       | 45  |     |      |      | 0.6 |
| 8696330 | 3.3       |     |     |      |      |     |
| 8696340 | 3.4       |     |     |      |      |     |
| 8696350 | 3.5       |     | 100 | 4    |      |     |
| 8696360 | 3.6       |     |     |      | 48   |     |
| 8696370 | 3.7       | 50  |     |      |      |     |
| 8696380 | 3.8       |     |     |      |      | 0.7 |
| 8696390 | 3.9       |     |     |      | 50   |     |
| 8696400 | 4         |     |     |      | 58   |     |
| 8696410 | 4.1 - 5   |     |     | 5    | 48.3 |     |
| 8710410 | 4.1       |     |     | 6    |      |     |
| 8696420 | 4.2 - 5   | 55  |     | 5    | 58   |     |
| 8710420 | 4.2       |     |     | 6    | 48.4 |     |
| 8696430 | 4.3 - 5   |     |     | 5    | 53   |     |
| 8710430 | 4.3       |     |     | 6    | 48.4 |     |
| 8696440 | 4.4 - 5   |     |     | 5    | 53   | 0.8 |
| 8710440 | 4.4       |     |     | 6    | 48.5 |     |
| 8696450 | 4.5 - 5   | 60  |     | 5    | 53   |     |
| 8710450 | 4.5       |     | 115 | 6    | 48.6 |     |
| 8696460 | 4.6 - 5   |     |     | 5    | 53   |     |
| 8710460 | 4.6       |     |     | 6    | 48.7 |     |
| 8696470 | 4.7 - 5   |     |     | 5    | 48   |     |
| 8710470 | 4.7       |     |     | 6    | 46.8 |     |
| 8696480 | 4.8 - 5   |     |     | 5    | 48   |     |
| 8710480 | 4.8       |     |     | 6    | 46.9 |     |
| 8696490 | 4.9 - 5   | 65  |     | 5    | 48   | 0.9 |
| 8710490 | 4.9       |     |     | 6    | 47   |     |
| 8696500 | 5 - 5     |     |     | 5    | 50   |     |
| 8710500 | 5         |     |     |      | 47   |     |
| 8710510 | 5.1       |     |     |      |      |     |
| 8710520 | 5.2       | 70  |     |      | 50   |     |
| 8710530 | 5.3       |     |     |      |      | 1   |
| 8710540 | 5.4       |     |     | 6    |      |     |
| 8710550 | 5.5       |     | 128 |      |      |     |
| 8710560 | 5.6       |     |     |      | 48   |     |
| 8710570 | 5.7       | 78  |     |      |      |     |
| 8710580 | 5.8       |     |     |      |      | 1.1 |
| 8710590 | 5.9       |     |     |      |      |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8696600 | 6         | 78  | 128 |      | 50   |     |
| 8696610 | 6.1 - 7   |     |     | 7    | 51   | 1.1 |
| 8710610 | 6.1       |     |     | 8    | 48.2 |     |
| 8696620 | 6.2 - 7   |     |     | 7    | 51   |     |
| 8710620 | 6.2       |     |     | 8    | 48.3 |     |
| 8696630 | 6.3 - 7   |     |     | 7    | 51   |     |
| 8710630 | 6.3       |     |     | 8    | 48.4 |     |
| 8696640 | 6.4 - 7   | 87  |     | 7    | 51   |     |
| 8710640 | 6.4       |     |     | 8    | 48.5 |     |
| 8696650 | 6.5 - 7   |     |     | 7    | 51   |     |
| 8710650 | 6.5       |     |     | 8    | 48.6 |     |
| 8696660 | 6.6 - 7   |     | 140 | 7    | 51   | 1.2 |
| 8710660 | 6.6       |     |     | 8    | 48.7 |     |
| 8696670 | 6.7 - 7   |     |     | 7    | 51   |     |
| 8710670 | 6.7       |     |     | 8    | 48.7 |     |
| 8696680 | 6.8 - 7   |     |     | 7    | 48   |     |
| 8710680 | 6.8       |     |     | 8    | 46.8 |     |
| 8696690 | 6.9 - 7   | 90  |     | 7    | 48   |     |
| 8710690 | 6.9       |     |     | 8    | 46.9 |     |
| 8696700 | 7 - 7     |     |     | 7    | 50   |     |
| 8710700 | 7         |     |     |      | 47   | 1.3 |
| 8710710 | 7.1       |     |     |      |      |     |
| 8710720 | 7.2       |     |     |      | 50   |     |
| 8710730 | 7.3       | 100 |     |      |      |     |
| 8710740 | 7.4       |     |     | 8    |      |     |
| 8710750 | 7.5       |     | 155 |      | 53   |     |
| 8710760 | 7.6       |     |     |      |      | 1.4 |
| 8710770 | 7.7       |     |     |      | 48   |     |
| 8710780 | 7.8       | 105 |     |      |      |     |
| 8710790 | 7.9       |     |     |      |      |     |
| 8696800 | 8         |     |     |      | 50   |     |
| 8696810 | 8.1 - 9   |     |     | 9    | 53   |     |
| 8710810 | 8.1       |     |     | 10   | 48.2 |     |
| 8696820 | 8.2 - 9   |     |     | 9    | 53   |     |
| 8710820 | 8.2       |     |     | 10   | 48.3 |     |
| 8696830 | 8.3 - 9   | 110 |     | 9    | 53   | 1.5 |
| 8710830 | 8.3       |     |     | 10   | 48.4 |     |
| 8696840 | 8.4 - 9   |     |     | 9    | 53   |     |
| 8710840 | 8.4       |     |     | 10   | 48.4 |     |
| 8696850 | 8.5 - 9   |     |     | 9    | 53   |     |
| 8710850 | 8.5       |     | 165 | 10   | 48.5 |     |
| 8710860 | 8.6 - 9   |     |     | 9    | 48   |     |
| 8710860 | 8.6       |     |     | 10   | 46.6 |     |
| 8710870 | 8.7 - 9   |     |     | 9    | 48   |     |
| 8710870 | 8.7       |     |     | 10   | 46.7 |     |
| 8710880 | 8.8 - 9   | 115 |     | 9    | 48   | 1.6 |
| 8710880 | 8.8       |     |     | 10   | 46.8 |     |
| 8710890 | 8.9 - 9   |     |     | 9    | 48   |     |
| 8710890 | 8.9       |     |     | 10   | 46.9 |     |
| 8696900 | 9 - 9     |     |     | 9    | 50   |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8710900 | 9         | 115 | 165 |      | 47   | 1.6 |
| 8710910 | 9.1       |     |     |      |      |     |
| 8710920 | 9.2       |     |     |      | 60   |     |
| 8710930 | 9.3       | 125 |     |      |      | 1.7 |
| 8710940 | 9.4       |     |     | 10   | 63   |     |
| 8696950 | 9.5       |     | 190 |      |      |     |
| 8710960 | 9.6       |     |     |      | 58   | 1.8 |
| 8710970 | 9.7       |     |     |      |      |     |
| 8710980 | 9.8       | 130 |     |      |      |     |
| 8710990 | 9.9       |     |     |      |      |     |
| 8697000 | 10        |     |     |      | 60   |     |
| 8697010 | 10.1 - 11 |     |     | 11   | 63   | 1.8 |
| 8711010 | 10.1      |     |     | 12   | 58.2 |     |
| 8697020 | 10.2 - 11 |     |     | 11   | 63   |     |
| 8711020 | 10.2      |     |     | 12   | 58.3 |     |
| 8697030 | 10.3 - 11 |     |     | 11   | 63   |     |
| 8711030 | 10.3      |     |     | 12   | 58.4 |     |
| 8697040 | 10.4 - 11 | 140 |     | 11   | 63   | 1.9 |
| 8711040 | 10.4      |     |     | 12   | 58.4 |     |
| 8697050 | 10.5 - 11 |     | 205 | 11   | 63   |     |
| 8711050 | 10.5      |     |     | 12   | 58.5 |     |
| 8697060 | 10.6 - 11 |     |     | 11   | 63   |     |
| 8711060 | 10.6      |     |     | 12   | 58.6 |     |
| 8697070 | 10.7 - 11 |     |     | 11   | 63   |     |
| 8711070 | 10.7      |     |     | 12   | 58.7 |     |
| 8697080 | 10.8 - 11 |     |     | 11   | 58   | 2   |
| 8711080 | 10.8      |     |     | 12   | 56.8 |     |
| 8697090 | 10.9 - 11 | 145 |     | 11   | 58   |     |
| 8711090 | 10.9      |     |     | 12   | 56.9 |     |
| 8697100 | 11 - 11   |     |     | 11   | 58   |     |
| 8711100 | 11        |     |     |      | 57   |     |
| 8711110 | 11.1      |     |     |      |      |     |
| 8711120 | 11.2      |     |     |      |      |     |
| 8711130 | 11.3      |     |     |      |      |     |
| 8711140 | 11.4      |     |     |      |      |     |
| 8711150 | 11.5      |     |     |      |      |     |
| 8711160 | 11.6      | 155 | 215 | 12   | 58   | 2.1 |
| 8711170 | 11.7      |     |     |      |      |     |
| 8711180 | 11.8      |     |     |      |      |     |
| 8711190 | 11.9      |     |     |      |      | 2.2 |
| 8697200 | 12        |     |     |      |      |     |
| 8711250 | 12.5      |     |     | 14   | 56.3 | 2.3 |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel* | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|----------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL       | AC                      |                 | AZ91D                         |
| ADO-10D       | ○                | ○                   | ○                 | ○           | ○              |                             |                 |             |             | ○ *               |              | ○        | ○                      |                |          |                         |                 |                               |



**SPEED  
FEED**  
P.154

**CARBIDE**

**EgiAs**

**e8**

**30°**

**SHRINK  
FIT**

| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8698300 | 3 - 3     | 55  | 105 | 3    | 50 | 0.5 |
| 8698310 | 3.1       | 60  |     |      | 63 |     |
| 8698320 | 3.2       |     |     |      |    | 0.6 |
| 8698330 | 3.3       |     |     |      |    |     |
| 8698340 | 3.4       |     |     |      |    |     |
| 8698350 | 3.5       | 65  | 125 | 4    | 58 |     |
| 8698360 | 3.6       |     |     |      |    |     |
| 8698370 | 3.7       |     |     |      |    |     |
| 8698380 | 3.8       |     |     |      | 48 | 0.7 |
| 8698390 | 3.9       |     |     |      | 50 |     |
| 8698400 | 4         |     |     |      |    |     |
| 8698410 | 4.1 - 5   | 75  |     | 5    | 63 |     |
| 8712410 | 4.1       |     |     | 6    | 45 |     |
| 8698420 | 4.2 - 5   |     |     | 5    | 63 |     |
| 8712420 | 4.2       |     |     | 6    | 45 |     |
| 8698430 | 4.3 - 5   |     |     | 5    | 53 |     |
| 8712430 | 4.3       |     |     | 6    | 45 |     |
| 8698440 | 4.4 - 5   |     |     | 5    | 53 | 0.8 |
| 8712440 | 4.4       |     |     | 6    | 45 |     |
| 8698450 | 4.5 - 5   | 85  |     | 5    | 53 |     |
| 8712450 | 4.5       |     | 140 | 6    | 45 |     |
| 8698460 | 4.6 - 5   |     |     | 5    | 53 |     |
| 8712460 | 4.6       |     |     | 6    | 45 |     |
| 8698470 | 4.7 - 5   |     |     | 5    | 53 |     |
| 8712470 | 4.7       |     |     | 6    | 45 |     |
| 8698480 | 4.8 - 5   |     |     | 5    | 48 | 0.9 |
| 8712480 | 4.8       |     |     | 6    | 45 |     |
| 8698490 | 4.9 - 5   | 90  |     | 5    | 48 |     |
| 8712490 | 4.9       |     |     | 6    | 45 |     |
| 8698500 | 5 - 5     |     |     | 5    | 50 |     |
| 8712500 | 5         |     |     |      | 45 |     |
| 8712510 | 5.1       | 95  |     |      | 63 |     |
| 8712520 | 5.2       |     |     |      |    |     |
| 8712530 | 5.3       |     |     |      |    |     |
| 8712540 | 5.4       |     |     |      |    |     |
| 8698550 | 5.5       |     | 160 | 6    |    | 1   |
| 8712560 | 5.6       |     |     |      | 48 |     |
| 8712570 | 5.7       | 110 |     |      |    |     |
| 8712580 | 5.8       |     |     |      |    |     |
| 8712590 | 5.9       |     |     |      |    |     |
| 8698600 | 6         |     |     |      | 50 | 1.1 |
| 8698610 | 6.1 - 7   |     |     | 7    | 53 |     |
| 8712610 | 6.1       | 120 | 175 | 8    | 45 |     |
| 8698620 | 6.2 - 7   |     |     | 7    | 53 |     |

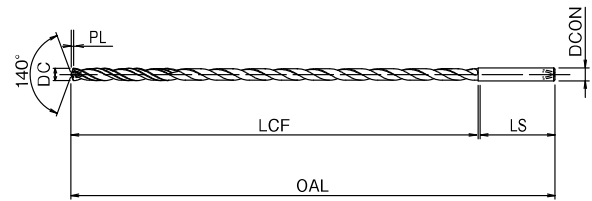
| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8712620 | 6.2       |     |     | 8    | 45 |     |
| 8698630 | 6.3 - 7   |     |     | 7    | 53 | 1.1 |
| 8712630 | 6.3       |     |     | 8    | 45 |     |
| 8698640 | 6.4 - 7   |     |     | 7    | 53 |     |
| 8712640 | 6.4       |     |     | 8    | 45 |     |
| 8698650 | 6.5 - 7   | 120 |     | 7    | 53 |     |
| 8712650 | 6.5       |     |     | 8    | 45 |     |
| 8698660 | 6.6 - 7   |     |     | 7    | 53 | 1.2 |
| 8712660 | 6.6       |     | 175 | 8    | 45 |     |
| 8698670 | 6.7 - 7   |     |     | 7    | 53 |     |
| 8712670 | 6.7       |     |     | 8    | 45 |     |
| 8698680 | 6.8 - 7   |     |     | 7    | 48 |     |
| 8712680 | 6.8       |     |     | 8    | 45 |     |
| 8698690 | 6.9 - 7   | 125 |     | 7    | 48 |     |
| 8712690 | 6.9       |     |     | 8    | 45 |     |
| 8698700 | 7 - 7     |     |     | 7    | 48 |     |
| 8712700 | 7         |     |     |      | 45 | 1.3 |
| 8712710 | 7.1       |     |     |      |    |     |
| 8712720 | 7.2       |     |     |      |    |     |
| 8712730 | 7.3       | 135 |     |      | 58 |     |
| 8712740 | 7.4       |     |     |      |    |     |
| 8698750 | 7.5       |     | 195 | 8    |    |     |
| 8712760 | 7.6       |     |     |      |    | 1.4 |
| 8712770 | 7.7       |     |     |      |    |     |
| 8712780 | 7.8       | 145 |     |      | 48 |     |
| 8712790 | 7.9       |     |     |      |    |     |
| 8698800 | 8         |     |     |      | 50 |     |
| 8698810 | 8.1 - 9   |     |     | 9    | 53 |     |
| 8712810 | 8.1       |     |     | 10   | 45 |     |
| 8698820 | 8.2 - 9   |     |     | 9    | 53 | 1.5 |
| 8712820 | 8.2       |     |     | 10   | 45 |     |
| 8698830 | 8.3 - 9   | 155 |     | 9    | 53 |     |
| 8712830 | 8.3       |     |     | 10   | 45 |     |
| 8698840 | 8.4 - 9   |     |     | 9    | 53 |     |
| 8712840 | 8.4       |     |     | 10   | 45 |     |
| 8698850 | 8.5 - 9   |     | 210 | 9    | 53 |     |
| 8712850 | 8.5       |     |     | 10   | 45 |     |
| 8698860 | 8.6 - 9   |     |     | 9    | 48 |     |
| 8712860 | 8.6       |     |     | 10   | 45 |     |
| 8698870 | 8.7 - 9   |     |     | 9    | 48 | 1.6 |
| 8712870 | 8.7       | 160 |     | 10   | 45 |     |
| 8698880 | 8.8 - 9   |     |     | 9    | 48 |     |
| 8712880 | 8.8       |     |     | 10   | 45 |     |
| 8698890 | 8.9 - 9   |     |     | 9    | 48 |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8712890 | 8.9       |     |     | 10   | 45   |     |
| 8698900 | 9 - 9     | 160 | 210 | 9    | 48   | 1.6 |
| 8712900 | 9         |     |     |      | 45   |     |
| 8712910 | 9.1       |     |     |      |      |     |
| 8712920 | 9.2       |     |     |      |      |     |
| 8712930 | 9.3       | 170 |     |      | 68   | 1.7 |
| 8712940 | 9.4       |     |     |      |      |     |
| 8698950 | 9.5       |     | 240 | 10   |      |     |
| 8712960 | 9.6       |     |     |      |      |     |
| 8712970 | 9.7       |     |     |      | 58   |     |
| 8712980 | 9.8       | 180 |     |      |      | 1.8 |
| 8712990 | 9.9       |     |     |      | 60   |     |
| 8699000 | 10        |     |     |      |      |     |
| 8699010 | 10.1 - 11 |     |     | 11   | 68   |     |
| 8713010 | 10.1      |     |     | 12   | 45   |     |
| 8699020 | 10.2 - 11 |     |     | 11   | 68   |     |
| 8713020 | 10.2      |     |     | 12   | 45   |     |
| 8699030 | 10.3 - 11 |     |     | 11   | 68   |     |
| 8713030 | 10.3      | 190 |     | 12   | 45   | 1.9 |
| 8699040 | 10.4 - 11 |     |     | 11   | 68   |     |
| 8713040 | 10.4      |     |     | 12   | 45   |     |
| 8699050 | 10.5 - 11 |     |     | 11   | 68   |     |
| 8713050 | 10.5      |     |     | 12   | 45   |     |
| 8699060 | 10.6 - 11 |     |     | 11   | 68   |     |
| 8713060 | 10.6      |     |     | 12   | 45   |     |
| 8699070 | 10.7 - 11 |     |     | 11   | 58   |     |
| 8713070 | 10.7      |     |     | 12   | 45   |     |
| 8699080 | 10.8 - 11 |     |     | 11   | 58   |     |
| 8713080 | 10.8      | 200 |     | 12   | 45   |     |
| 8699090 | 10.9 - 11 |     |     | 11   | 58   |     |
| 8713090 | 10.9      |     |     | 12   | 45   | 2   |
| 8699100 | 11 - 11   |     |     | 11   | 58   |     |
| 8713100 | 11        |     |     |      | 45   |     |
| 8713110 | 11.1      |     |     |      |      |     |
| 8713120 | 11.2      |     |     |      |      |     |
| 8713130 | 11.3      |     |     |      |      |     |
| 8713140 | 11.4      |     |     |      |      |     |
| 8713150 | 11.5      | 210 |     | 12   | 68   | 2.1 |
| 8713160 | 11.6      |     |     |      |      |     |
| 8713170 | 11.7      |     |     |      |      |     |
| 8713180 | 11.8      |     |     |      |      |     |
| 8713190 | 11.9      | 215 |     |      | 63   | 2.2 |
| 8699200 | 12        |     |     |      |      |     |
| 8713250 | 12.5      | 225 | 290 | 14   | 61.3 | 2.3 |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel* | CFRP | Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|----------|------|--------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25 - 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL       | AC   |                    | AZ91D           |                               |
| ADO-15D       | ○                | ○                   | ○                 | ○           | ○              |                             |                 |             |             | ○ *               |              | ○        | ○                      |                |          |      |                    |                 |                               |






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| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8706300 | 3 - 3     | 70  | 120 | 3    | 48 | 0.5 |
| 8706310 | 3.1       |     |     |      |    |     |
| 8706320 | 3.2       | 80  |     |      | 58 |     |
| 8706330 | 3.3       |     |     |      |    | 0.6 |
| 8706340 | 3.4       |     |     |      |    |     |
| 8706350 | 3.5       | 85  | 140 | 4    | 53 |     |
| 8706360 | 3.6       |     |     |      |    |     |
| 8706370 | 3.7       |     |     |      |    |     |
| 8706380 | 3.8       |     |     |      | 48 |     |
| 8706390 | 3.9       | 90  |     |      |    | 0.7 |
| 8706400 | 4         |     |     |      | 50 |     |
| 8706410 | 4.1 - 5   |     |     | 5    | 63 |     |
| 8714410 | 4.1       |     |     | 6    | 45 |     |
| 8706420 | 4.2 - 5   | 100 |     | 5    | 63 |     |
| 8714420 | 4.2       |     |     | 6    | 45 |     |
| 8706430 | 4.3 - 5   |     |     | 5    | 53 |     |
| 8714430 | 4.3       |     |     | 6    | 45 |     |
| 8706440 | 4.4 - 5   |     |     | 5    | 53 |     |
| 8714440 | 4.4       |     |     | 6    | 45 | 0.8 |
| 8706450 | 4.5 - 5   |     |     | 5    | 53 |     |
| 8714450 | 4.5       | 110 |     | 6    | 45 |     |
| 8706460 | 4.6 - 5   |     |     | 5    | 53 |     |
| 8714460 | 4.6       |     |     | 6    | 45 |     |
| 8706470 | 4.7 - 5   |     |     | 5    | 53 |     |
| 8714470 | 4.7       |     |     | 6    | 45 |     |
| 8706480 | 4.8 - 5   |     |     | 5    | 48 |     |
| 8714480 | 4.8       |     |     | 6    | 45 |     |
| 8706490 | 4.9 - 5   | 115 |     | 5    | 48 | 0.9 |
| 8714490 | 4.9       |     |     | 6    | 45 |     |
| 8706500 | 5 - 5     |     |     | 5    | 50 |     |
| 8714500 | 5         |     |     |      | 45 |     |
| 8714510 | 5.1       |     |     |      |    |     |
| 8714520 | 5.2       | 120 |     |      | 68 |     |
| 8714530 | 5.3       |     |     |      |    |     |
| 8714540 | 5.4       |     |     |      |    |     |
| 8706550 | 5.5       |     |     | 6    |    | 1   |
| 8714560 | 5.6       |     |     |      | 48 |     |
| 8714570 | 5.7       | 140 |     |      |    |     |
| 8714580 | 5.8       |     |     |      |    |     |
| 8714590 | 5.9       |     |     |      |    |     |
| 8706600 | 6         |     |     |      | 50 |     |
| 8706610 | 6.1 - 7   |     |     | 7    | 53 | 1.1 |
| 8714610 | 6.1       | 155 | 210 | 8    | 45 |     |
| 8706620 | 6.2 - 7   |     |     | 7    | 53 |     |

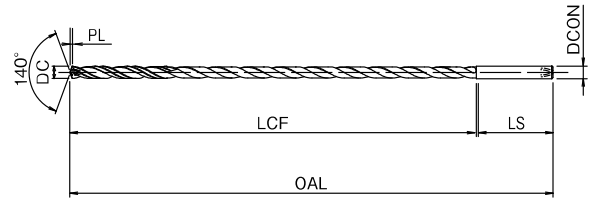
| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8714620 | 6.2       |     |     | 8    | 45 |     |
| 8706630 | 6.3 - 7   |     |     | 7    | 53 | 1.1 |
| 8714630 | 6.3       |     |     | 8    | 45 |     |
| 8706640 | 6.4 - 7   |     |     | 7    | 53 |     |
| 8714640 | 6.4       |     |     | 8    | 45 |     |
| 8706650 | 6.5 - 7   | 155 |     | 7    | 53 |     |
| 8714650 | 6.5       |     |     | 8    | 45 |     |
| 8706660 | 6.6 - 7   |     |     | 7    | 53 |     |
| 8714660 | 6.6       |     |     | 8    | 45 | 1.2 |
| 8706670 | 6.7 - 7   |     |     | 7    | 53 |     |
| 8714670 | 6.7       | 210 |     | 8    | 45 |     |
| 8706680 | 6.8 - 7   |     |     | 7    | 48 |     |
| 8714680 | 6.8       |     |     | 8    | 45 |     |
| 8706690 | 6.9 - 7   |     |     | 7    | 48 |     |
| 8714690 | 6.9       | 160 |     | 8    | 45 |     |
| 8706700 | 7 - 7     |     |     | 7    | 48 |     |
| 8714700 | 7         |     |     |      | 45 | 1.3 |
| 8714710 | 7.1       |     |     |      |    |     |
| 8714720 | 7.2       |     |     |      |    |     |
| 8714730 | 7.3       | 170 |     |      | 58 |     |
| 8714740 | 7.4       |     |     |      |    |     |
| 8706750 | 7.5       |     |     | 8    |    |     |
| 8714760 | 7.6       | 230 |     |      |    |     |
| 8714770 | 7.7       |     |     |      |    | 1.4 |
| 8714780 | 7.8       | 180 |     |      | 48 |     |
| 8714790 | 7.9       |     |     |      |    |     |
| 8706800 | 8         |     |     |      | 50 |     |
| 8706810 | 8.1 - 9   |     |     | 9    | 63 |     |
| 8714810 | 8.1       |     |     | 10   | 45 |     |
| 8706820 | 8.2 - 9   |     |     | 9    | 63 |     |
| 8714820 | 8.2       |     |     | 10   | 45 | 1.5 |
| 8706830 | 8.3 - 9   |     |     | 9    | 63 |     |
| 8714830 | 8.3       | 195 |     | 10   | 45 |     |
| 8706840 | 8.4 - 9   |     |     | 9    | 63 |     |
| 8714840 | 8.4       |     |     | 10   | 45 |     |
| 8706850 | 8.5 - 9   |     |     | 9    | 63 |     |
| 8714850 | 8.5       | 260 |     | 10   | 45 |     |
| 8706860 | 8.6 - 9   |     |     | 9    | 48 |     |
| 8714860 | 8.6       |     |     | 10   | 45 |     |
| 8706870 | 8.7 - 9   |     |     | 9    | 48 |     |
| 8714870 | 8.7       | 210 |     | 10   | 45 | 1.6 |
| 8706880 | 8.8 - 9   |     |     | 9    | 48 |     |
| 8714880 | 8.8       |     |     | 10   | 45 |     |
| 8706890 | 8.9 - 9   |     |     | 9    | 48 |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8714890 | 8.9       |     |     | 10   | 45   |     |
| 8706900 | 9 - 9     | 210 | 260 | 9    | 48   | 1.6 |
| 8714900 | 9         |     |     |      | 45   |     |
| 8714910 | 9.1       |     |     |      |      |     |
| 8714920 | 9.2       |     |     |      |      |     |
| 8714930 | 9.3       | 220 |     |      | 68   | 1.7 |
| 8714940 | 9.4       |     |     |      |      |     |
| 8706950 | 9.5       |     |     | 10   |      |     |
| 8714960 | 9.6       |     |     |      |      |     |
| 8714970 | 9.7       |     |     |      |      |     |
| 8714980 | 9.8       | 230 |     |      | 58   |     |
| 8714990 | 9.9       |     |     |      |      | 1.8 |
| 8707000 | 10        |     |     |      |      |     |
| 8707010 | 10.1 - 11 |     |     | 11   |      |     |
| 8715010 | 10.1      |     |     | 12   | 45   |     |
| 8707020 | 10.2 - 11 |     |     | 11   | 58   |     |
| 8715020 | 10.2      |     |     | 12   | 45   |     |
| 8707030 | 10.3 - 11 |     |     | 11   | 58   |     |
| 8715030 | 10.3      |     |     | 12   | 45   |     |
| 8707040 | 10.4 - 11 |     |     | 11   | 58   |     |
| 8715040 | 10.4      |     |     | 12   | 45   | 1.9 |
| 8707050 | 10.5 - 11 |     |     | 11   | 58   |     |
| 8715050 | 10.5      |     |     | 12   | 45   |     |
| 8707060 | 10.6 - 11 | 250 | 310 | 11   | 58   |     |
| 8715060 | 10.6      |     |     | 12   | 45   |     |
| 8707070 | 10.7 - 11 |     |     | 11   | 58   |     |
| 8715070 | 10.7      |     |     | 12   | 45   |     |
| 8707080 | 10.8 - 11 |     |     | 11   | 58   |     |
| 8715080 | 10.8      |     |     | 12   | 45   |     |
| 8707090 | 10.9 - 11 |     |     | 11   | 58   |     |
| 8715090 | 10.9      |     |     | 12   | 45   | 2   |
| 8707100 | 11 - 11   |     |     | 11   | 58   |     |
| 8715100 | 11        |     |     |      | 45   |     |
| 8715110 | 11.1      |     |     |      |      |     |
| 8715120 | 11.2      |     |     |      |      |     |
| 8715130 | 11.3      |     |     |      |      |     |
| 8715140 | 11.4      |     |     |      |      |     |
| 8715150 | 11.5      |     |     |      |      |     |
| 8715160 | 11.6      | 270 | 330 | 12   | 58   | 2.1 |
| 8715170 | 11.7      |     |     |      |      |     |
| 8715180 | 11.8      |     |     |      |      |     |
| 8715190 | 11.9      |     |     |      |      | 2.2 |
| 8707200 | 12        |     |     |      |      |     |
| 8715250 | 12.5      | 280 |     | 14   | 46.3 | 2.3 |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel® | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|----------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL       | AC                      |                 | AZ91D                         |
| ADO-20D       | ○                | ○                   | ○                 | ○           | ○              |                             |                 |             |             | ○                 | ○            |          |                        |                |          |                         |                 |                               |







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**CARBIDE**

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**SHRINK  
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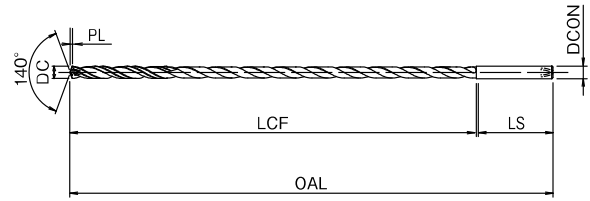
| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8726300 | 3 - 3     | 85  | 135 | 3    | 48 | 0.5 |
| 8724310 | 3.1       | 95  |     |      | 68 | 0.6 |
| 8724320 | 3.2       |     |     |      |    |     |
| 8724330 | 3.3       |     |     |      |    |     |
| 8724340 | 3.4       |     |     |      |    |     |
| 8724350 | 3.5       | 105 | 165 | 4    | 58 |     |
| 8724360 | 3.6       |     |     |      |    |     |
| 8724370 | 3.7       |     |     |      |    |     |
| 8724380 | 3.8       |     |     |      |    |     |
| 8724390 | 3.9       | 115 |     |      | 48 | 0.7 |
| 8724400 | 4         |     |     |      |    |     |
| 8726410 | 4.1 - 5   |     |     | 5    | 68 |     |
| 8724410 | 4.1       |     |     | 6    | 45 |     |
| 8726420 | 4.2 - 5   | 120 |     | 5    | 68 |     |
| 8724420 | 4.2       |     |     | 6    | 45 |     |
| 8726430 | 4.3 - 5   |     |     | 5    | 53 |     |
| 8724430 | 4.3       |     |     | 6    | 45 |     |
| 8726440 | 4.4 - 5   |     |     | 5    | 53 |     |
| 8724440 | 4.4       |     |     | 6    | 45 | 0.8 |
| 8726450 | 4.5 - 5   |     |     | 5    | 53 |     |
| 8724450 | 4.5       | 135 | 190 | 6    | 45 |     |
| 8726460 | 4.6 - 5   |     |     | 5    | 53 |     |
| 8724460 | 4.6       |     |     | 6    | 45 |     |
| 8726470 | 4.7 - 5   |     |     | 5    | 53 |     |
| 8724470 | 4.7       |     |     | 6    | 45 |     |
| 8726480 | 4.8 - 5   |     |     | 5    | 48 |     |
| 8724480 | 4.8       |     |     | 6    | 45 |     |
| 8726490 | 4.9 - 5   | 140 |     | 5    | 48 | 0.9 |
| 8724490 | 4.9       |     |     | 6    | 45 |     |
| 8726500 | 5 - 5     |     |     | 5    | 48 |     |
| 8724500 | 5         |     |     |      | 45 |     |
| 8724510 | 5.1       | 150 |     |      | 68 |     |
| 8724520 | 5.2       |     |     |      |    |     |
| 8724530 | 5.3       |     |     |      |    |     |
| 8724540 | 5.4       |     |     |      |    |     |
| 8724550 | 5.5       |     |     | 6    |    | 1   |
| 8724560 | 5.6       |     |     |      |    |     |
| 8724570 | 5.7       | 170 | 220 | 48   |    |     |
| 8724580 | 5.8       |     |     |      |    |     |
| 8724590 | 5.9       |     |     |      |    |     |
| 8724600 | 6         |     |     |      |    | 1.1 |
| 8726610 | 6.1 - 7   | 190 | 250 | 7    | 58 |     |
| 8724610 | 6.1       |     |     | 8    | 45 |     |
| 8726620 | 6.2 - 7   |     |     | 7    | 58 |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8724620 | 6.2       |     |     | 8    | 45 | 1.1 |
| 8726630 | 6.3 - 7   |     |     | 7    | 58 |     |
| 8724630 | 6.3       |     |     | 8    | 45 |     |
| 8726640 | 6.4 - 7   |     |     | 7    | 58 |     |
| 8724640 | 6.4       |     |     | 8    | 45 |     |
| 8726650 | 6.5 - 7   | 190 |     | 7    | 58 |     |
| 8724650 | 6.5       |     |     | 8    | 45 |     |
| 8726660 | 6.6 - 7   |     |     | 7    | 58 | 1.2 |
| 8724660 | 6.6       | 250 |     | 8    | 45 |     |
| 8726670 | 6.7 - 7   |     |     | 7    | 53 |     |
| 8724670 | 6.7       |     |     | 8    | 45 |     |
| 8726680 | 6.8 - 7   |     |     | 7    | 48 |     |
| 8724680 | 6.8       |     |     | 8    | 45 |     |
| 8726690 | 6.9 - 7   | 200 |     | 7    | 48 |     |
| 8724690 | 6.9       |     |     | 8    | 45 |     |
| 8726700 | 7 - 7     |     |     | 7    | 48 |     |
| 8724700 | 7         |     |     |      | 45 | 1.3 |
| 8724710 | 7.1       |     |     |      |    |     |
| 8724720 | 7.2       |     |     |      |    |     |
| 8724730 | 7.3       | 210 |     | 63   |    |     |
| 8724740 | 7.4       |     |     |      |    |     |
| 8724750 | 7.5       |     |     | 8    |    |     |
| 8724760 | 7.6       | 275 |     |      |    |     |
| 8724770 | 7.7       |     |     |      |    | 1.4 |
| 8724780 | 7.8       | 225 |     | 48   |    |     |
| 8724790 | 7.9       |     |     |      |    |     |
| 8724800 | 8         |     |     |      |    |     |
| 8726810 | 8.1 - 9   |     |     | 9    | 63 | 1.5 |
| 8724810 | 8.1       |     |     | 10   | 45 |     |
| 8726820 | 8.2 - 9   |     |     | 9    | 63 |     |
| 8724820 | 8.2       |     |     | 10   | 45 |     |
| 8726830 | 8.3 - 9   | 240 |     | 9    | 63 |     |
| 8724830 | 8.3       |     |     | 10   | 45 |     |
| 8726840 | 8.4 - 9   |     |     | 9    | 63 |     |
| 8724840 | 8.4       |     |     | 10   | 45 |     |
| 8726850 | 8.5 - 9   |     |     | 9    | 63 |     |
| 8724850 | 8.5       | 305 |     | 10   | 45 |     |
| 8726860 | 8.6 - 9   |     |     | 9    | 48 |     |
| 8724860 | 8.6       |     |     | 10   | 45 |     |
| 8726870 | 8.7 - 9   |     |     | 9    | 48 | 1.6 |
| 8724870 | 8.7       | 255 |     | 10   | 45 |     |
| 8726880 | 8.8 - 9   |     |     | 9    | 48 |     |
| 8724880 | 8.8       |     |     | 10   | 45 |     |
| 8726890 | 8.9 - 9   |     |     | 9    | 48 |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8724890 | 8.9       |     |     | 10   | 45 |     |
| 8726900 | 9 - 9     | 255 | 305 | 9    | 48 | 1.6 |
| 8724900 | 9         |     |     |      | 45 |     |
| 8724910 | 9.1       |     |     |      |    |     |
| 8724920 | 9.2       |     |     |      |    |     |
| 8724930 | 9.3       | 270 |     | 68   |    | 1.7 |
| 8724940 | 9.4       |     |     |      |    |     |
| 8624950 | 9.5       |     |     | 10   |    |     |
| 8724960 | 9.6       | 340 |     |      |    |     |
| 8724970 | 9.7       |     |     |      |    |     |
| 8724980 | 9.8       | 280 |     | 58   |    | 1.8 |
| 8724990 | 9.9       |     |     |      |    |     |
| 8725000 | 10        |     |     |      |    |     |
| 8727010 | 10.1 - 11 |     |     | 11   |    |     |
| 2725010 | 10.1      |     |     | 12   | 45 |     |
| 8727020 | 10.2 - 11 |     |     | 11   | 58 |     |
| 8725020 | 10.2      |     |     | 12   | 45 |     |
| 8727030 | 10.3 - 11 |     |     | 11   | 58 |     |
| 8725030 | 10.3      |     |     | 12   | 45 |     |
| 8727040 | 10.4 - 11 |     |     | 11   | 58 | 1.9 |
| 8725040 | 10.4      |     |     | 12   | 45 |     |
| 8727050 | 10.5 - 11 |     |     | 11   | 58 |     |
| 8725050 | 10.5      | 310 | 370 | 12   | 45 |     |
| 8727060 | 10.6 - 11 |     |     | 11   | 58 |     |
| 8725060 | 10.6      |     |     | 12   | 45 |     |
| 8727070 | 10.7 - 11 |     |     | 11   | 58 |     |
| 8725070 | 10.7      |     |     | 12   | 45 |     |
| 8727080 | 10.8 - 11 |     |     | 11   | 58 |     |
| 8725080 | 10.8      |     |     | 12   | 45 |     |
| 8727090 | 10.9 - 11 |     |     | 11   | 58 |     |
| 8725090 | 10.9      |     |     | 12   | 45 | 2   |
| 8727100 | 11 - 11   |     |     | 11   | 58 |     |
| 8725100 | 11        |     |     | 12   | 45 |     |
| 8725110 | 11.1      |     |     |      | 45 |     |
| 8725120 | 11.2      |     |     |      |    |     |
| 8725130 | 11.3      |     |     |      |    |     |
| 8725140 | 11.4      | 340 | 400 | 12   | 58 | 2.1 |
| 8725150 | 11.5      |     |     |      |    |     |
| 8725160 | 11.6      |     |     |      |    |     |
| 8725170 | 11.7      |     |     |      |    |     |
| 8725180 | 11.8      |     |     |      |    |     |
| 8725190 | 11.9      |     |     |      |    | 2.2 |
| 8725200 | 12        |     |     |      |    |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel® | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|----------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL       | AC                      |                 | AZ91D                         |
| ADO-25D       | ○                | ○                   | ○                 | ○           | ○              |                             |                 |             |             | ○                 | ○            |          |                        |                |          |                         |                 |                               |



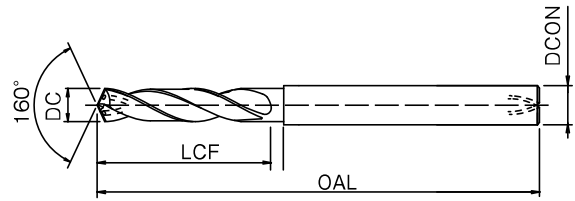


| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8708300 | 3 - 3     | 100 | 150 | 3    | 50 | 0.5 |
| 8708310 | 3.1       | 102 |     |      |    |     |
| 8708320 | 3.2       | 105 |     |      | 63 |     |
| 8708330 | 3.3       | 109 |     |      |    | 0.6 |
| 8708340 | 3.4       | 112 |     |      |    |     |
| 8708350 | 3.5       |     | 185 | 4    | 58 |     |
| 8708360 | 3.6       | 116 |     |      |    |     |
| 8708370 | 3.7       |     |     |      |    |     |
| 8708380 | 3.8       |     |     |      | 48 |     |
| 8708390 | 3.9       | 132 |     |      |    | 0.7 |
| 8708400 | 4         |     |     |      | 50 |     |
| 8708410 | 4.1 - 5   |     |     | 5    | 63 |     |
| 8716410 | 4.1       |     | 140 | 6    | 45 |     |
| 8708420 | 4.2 - 5   |     |     | 5    | 63 |     |
| 8716420 | 4.2       |     |     | 6    | 45 |     |
| 8708430 | 4.3 - 5   |     |     | 5    | 53 |     |
| 8716430 | 4.3       |     |     | 6    | 45 |     |
| 8708440 | 4.4 - 5   |     |     | 5    | 53 | 0.8 |
| 8716440 | 4.4       |     |     | 6    | 45 |     |
| 8708450 | 4.5 - 5   |     | 150 | 5    | 53 |     |
| 8716450 | 4.5       |     |     | 6    | 45 |     |
| 8708460 | 4.6 - 5   |     |     | 5    | 53 |     |
| 8716460 | 4.6       |     | 215 | 6    | 45 |     |
| 8708470 | 4.7 - 5   |     |     | 5    | 53 |     |
| 8716470 | 4.7       |     |     | 6    | 45 |     |
| 8708480 | 4.8 - 5   |     |     | 5    | 48 |     |
| 8716480 | 4.8       |     |     | 6    | 45 |     |
| 8708490 | 4.9 - 5   |     | 165 | 5    | 48 | 0.9 |
| 8716490 | 4.9       |     |     | 6    | 45 |     |
| 8708500 | 5 - 5     |     |     | 5    | 50 |     |
| 8716500 | 5         |     |     |      | 45 |     |
| 8716510 | 5.1       |     |     |      |    |     |
| 8716520 | 5.2       | 180 |     |      | 63 |     |
| 8716530 | 5.3       |     |     |      |    |     |
| 8716540 | 5.4       |     |     |      |    |     |
| 8708550 | 5.5       |     | 250 | 6    |    | 1   |
| 8716560 | 5.6       |     |     |      | 48 |     |
| 8716570 | 5.7       | 200 |     |      |    |     |
| 8716580 | 5.8       |     |     |      |    |     |
| 8716590 | 5.9       |     |     |      |    |     |
| 8708600 | 6         |     |     |      | 50 |     |
| 8708610 | 6.1 - 7   |     |     | 7    | 63 |     |
| 8716610 | 6.1       |     |     | 8    | 45 | 1.1 |
| 8708620 | 6.2 - 7   |     |     | 7    | 63 |     |
| 8716620 | 6.2       |     |     | 8    | 45 |     |
| 8708630 | 6.3 - 7   |     | 215 | 7    | 63 |     |
| 8716630 | 6.3       |     | 280 | 8    | 45 |     |
| 8708640 | 6.4 - 7   |     |     | 7    | 63 |     |
| 8716640 | 6.4       |     |     | 8    | 45 |     |
| 8708650 | 6.5 - 7   |     |     | 7    | 63 | 1.2 |
| 8716650 | 6.5       |     |     | 8    | 45 |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS | PL  |
|---------|-----------|-----|-----|------|----|-----|
| 8708660 | 6.6 - 7   |     |     | 7    | 63 |     |
| 8716660 | 6.6       | 215 |     | 8    | 45 |     |
| 8708670 | 6.7 - 7   |     |     | 7    | 63 | 1.2 |
| 8716670 | 6.7       |     | 280 | 8    | 45 |     |
| 8708680 | 6.8 - 7   |     |     | 7    | 48 |     |
| 8716680 | 6.8       |     |     | 8    | 45 |     |
| 8708690 | 6.9 - 7   |     | 230 | 7    | 48 |     |
| 8716690 | 6.9       |     |     | 8    | 45 |     |
| 8708700 | 7 - 7     |     |     | 7    | 48 |     |
| 8716700 | 7         |     |     |      | 45 | 1.3 |
| 8716710 | 7.1       |     |     |      |    |     |
| 8716720 | 7.2       |     |     |      |    |     |
| 8716730 | 7.3       | 250 |     |      | 63 |     |
| 8716740 | 7.4       |     | 315 | 8    |    |     |
| 8716750 | 7.5       |     |     |      |    |     |
| 8716760 | 7.6       |     |     |      |    |     |
| 8716770 | 7.7       |     |     |      | 48 | 1.4 |
| 8716780 | 7.8       | 265 |     |      |    |     |
| 8716790 | 7.9       |     |     |      |    |     |
| 8708800 | 8         |     |     |      | 50 |     |
| 8708810 | 8.1 - 9   |     |     | 9    | 68 |     |
| 8716810 | 8.1       |     |     | 10   | 45 |     |
| 8708820 | 8.2 - 9   |     |     | 9    | 68 |     |
| 8716820 | 8.2       |     |     | 10   | 45 |     |
| 8708830 | 8.3 - 9   |     | 280 | 9    | 68 | 1.5 |
| 8716830 | 8.3       |     |     | 10   | 45 |     |
| 8708840 | 8.4 - 9   |     |     | 9    | 68 |     |
| 8716840 | 8.4       |     |     | 10   | 45 |     |
| 8708850 | 8.5 - 9   |     |     | 9    | 68 |     |
| 8716850 | 8.5       |     | 350 | 10   | 45 |     |
| 8708860 | 8.6 - 9   |     |     | 9    | 48 |     |
| 8716860 | 8.6       |     |     | 10   | 45 |     |
| 8708870 | 8.7 - 9   |     |     | 9    | 48 |     |
| 8716870 | 8.7       |     |     | 10   | 45 |     |
| 8708880 | 8.8 - 9   |     | 300 | 9    | 48 | 1.6 |
| 8716880 | 8.8       |     |     | 10   | 45 |     |
| 8708890 | 8.9 - 9   |     |     | 9    | 48 |     |
| 8716890 | 8.9       |     |     | 10   | 45 |     |
| 8708900 | 9 - 9     |     |     | 9    | 48 |     |
| 8716900 | 9         |     |     |      | 45 |     |
| 8716910 | 9.1       |     |     |      |    |     |
| 8716920 | 9.2       |     |     |      |    |     |
| 8716930 | 9.3       | 315 |     |      | 73 | 1.7 |
| 8716940 | 9.4       |     |     |      |    |     |
| 8716950 | 9.5       |     | 390 | 10   |    |     |
| 8716960 | 9.6       |     |     |      |    |     |
| 8716970 | 9.7       |     |     |      |    |     |
| 8716980 | 9.8       | 330 |     |      | 58 | 1.8 |
| 8716990 | 9.9       |     |     |      |    |     |
| 8709000 | 10        |     |     |      |    |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC   |                 | AZ91D                         |
| ADO-30D       | ⊙                | ⊙                   | ⊙                 | ⊙           | ⊙              |                             |                 |             |             | ⊙ *               |              | ⊙        | ⊙                      |                |         |      |                 |                               |





**SPEED  
FEED**  
P155

**CARBIDE**

**EgiAs**

**h8**

**30°**

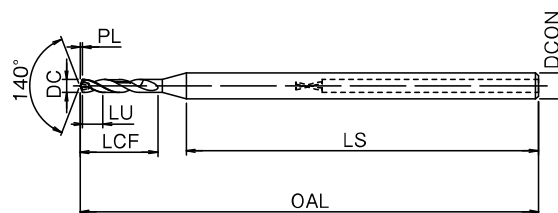
**SHRINK  
FIT**

| EDP No. | DC - DCON       | LCF | OAL | DCON |
|---------|-----------------|-----|-----|------|
| 8688903 | <b>3.03 - 3</b> | 15  | 65  | 3    |
| 8688923 | <b>3.53</b>     | 18  | 70  | 4    |
| 8688904 | <b>4.03</b>     | 20  |     |      |
| 8688924 | <b>4.53 - 5</b> | 23  | 75  | 5    |
| 8888905 | <b>5.03 - 5</b> | 25  |     |      |
| 8688925 | <b>5.53</b>     | 28  | 80  | 6    |
| 8688906 | <b>6.03</b>     | 30  |     |      |
| 8688926 | <b>6.53 - 7</b> | 33  | 85  | 7    |

| EDP No. | DC - DCON         | LCF | OAL | DCON |
|---------|-------------------|-----|-----|------|
| 8688907 | <b>7.03 - 7</b>   | 35  | 85  | 7    |
| 8688908 | <b>8.03</b>       | 40  | 90  | 8    |
| 8688928 | <b>8.53 - 9</b>   | 43  | 95  | 9    |
| 8688909 | <b>9.03 - 9</b>   | 45  |     |      |
| 8688910 | <b>10.03</b>      | 50  | 100 | 10   |
| 8688911 | <b>11.03 - 11</b> | 55  | 115 | 11   |
| 8688912 | <b>12.03</b>      | 60  | 120 | 12   |

| Work Material  | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|----------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation   | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| <b>ADO-PLT</b> | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       | ○                       | ○               | ○                             |

### ADO-MICRO 2D

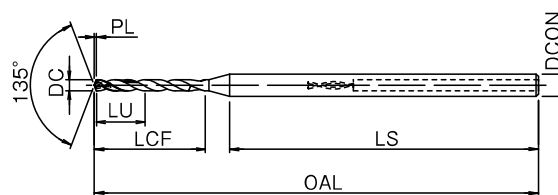


| EDP No. | DC   | LU  | LCF | OAL | DCON | LS   | PL  |
|---------|------|-----|-----|-----|------|------|-----|
| 8732001 | 0.7  | 1.4 | 4.2 | 47  | 3    | 38.5 | 0.1 |
| 8732002 | 0.75 | 1.5 | 4.5 | 47  | 3    | 38.3 | 0.1 |
| 8732003 | 0.8  | 1.6 | 4.8 | 50  | 3    | 41.1 | 0.1 |
| 8732004 | 0.85 | 1.7 | 5.1 | 50  | 3    | 40.9 | 0.2 |
| 8732005 | 0.9  | 1.8 | 5.4 | 50  | 3    | 40.7 | 0.2 |
| 8732006 | 0.95 | 1.9 | 5.7 | 50  | 3    | 40.5 | 0.2 |
| 8732007 | 1    | 2   | 6   | 53  | 3    | 42.8 | 0.2 |
| 8732008 | 1.1  | 2.2 | 6.6 | 53  | 3    | 42.4 | 0.2 |
| 8732009 | 1.2  | 2.4 | 7.2 | 53  | 3    | 41.9 | 0.2 |

Unit:mm

| EDP No. | DC  | LU  | LCF  | OAL | DCON | LS   | PL  |
|---------|-----|-----|------|-----|------|------|-----|
| 8732010 | 1.3 | 2.6 | 7.8  | 53  | 3    | 41.5 | 0.2 |
| 8732011 | 1.4 | 2.8 | 8.4  | 53  | 3    | 41.1 | 0.3 |
| 8732012 | 1.5 | 3   | 9    | 53  | 3    | 40.7 | 0.3 |
| 8732013 | 1.6 | 3.2 | 9.6  | 53  | 3    | 40.3 | 0.3 |
| 8732014 | 1.7 | 3.4 | 10.2 | 53  | 3    | 39.9 | 0.3 |
| 8732015 | 1.8 | 3.6 | 10.8 | 53  | 3    | 39.5 | 0.3 |
| 8732016 | 1.9 | 3.8 | 11.4 | 53  | 3    | 39   | 0.3 |
| 8732017 | 2   | 4   | 12   | 58  | 3    | 43.6 | 0.4 |

### ADO-MICRO 5D



| EDP No. | DC   | LU  | LCF | OAL | DCON | LS   | PL  |
|---------|------|-----|-----|-----|------|------|-----|
| 8732018 | 0.7  | 3.5 | 7   | 47  | 3    | 35.7 | 0.1 |
| 8732019 | 0.75 | 3.8 | 7.5 | 47  | 3    | 35.3 | 0.2 |
| 8732020 | 0.8  | 4   | 8   | 50  | 3    | 37.9 | 0.2 |
| 8732021 | 0.85 | 4.3 | 8.5 | 50  | 3    | 37.5 | 0.2 |
| 8732022 | 0.9  | 4.5 | 9   | 50  | 3    | 37.1 | 0.2 |
| 8732023 | 0.95 | 4.8 | 9.5 | 50  | 3    | 36.7 | 0.2 |
| 8732024 | 1    | 5   | 10  | 55  | 3    | 40.8 | 0.2 |
| 8732025 | 1.1  | 5.5 | 11  | 55  | 3    | 40   | 0.2 |
| 8732026 | 1.2  | 6   | 12  | 60  | 3    | 44.1 | 0.2 |

Unit:mm

| EDP No. | DC  | LU  | LCF | OAL | DCON | LS   | PL  |
|---------|-----|-----|-----|-----|------|------|-----|
| 8732027 | 1.3 | 6.5 | 13  | 60  | 3    | 43.3 | 0.3 |
| 8732028 | 1.4 | 7   | 14  | 60  | 3    | 42.5 | 0.3 |
| 8732029 | 1.5 | 7.5 | 15  | 60  | 3    | 41.7 | 0.3 |
| 8732030 | 1.6 | 8   | 16  | 60  | 3    | 40.9 | 0.3 |
| 8732031 | 1.7 | 8.5 | 17  | 60  | 3    | 40.1 | 0.4 |
| 8732032 | 1.8 | 9   | 18  | 65  | 3    | 44.3 | 0.4 |
| 8732033 | 1.9 | 9.5 | 19  | 65  | 3    | 43.4 | 0.4 |
| 8732034 | 2   | 10  | 20  | 65  | 3    | 42.6 | 0.4 |

### ADO-MICRO 12D

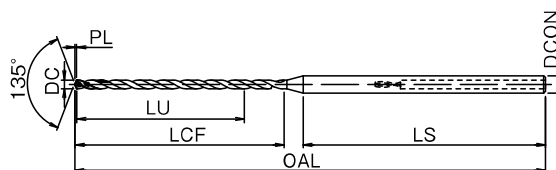
| EDP No. | DC  | LU   | LCF  | OAL | DCON | LS   | PL  |
|---------|-----|------|------|-----|------|------|-----|
| 8732035 | 1   | 12   | 17   | 60  | 3    | 38.8 | 0.2 |
| 8732036 | 1.1 | 13.2 | 18.7 | 65  | 3    | 42.3 | 0.2 |
| 8732037 | 1.2 | 14.4 | 20.4 | 65  | 3    | 40.7 | 0.2 |
| 8732038 | 1.3 | 15.6 | 22.1 | 65  | 3    | 39.2 | 0.3 |
| 8732039 | 1.4 | 16.8 | 23.8 | 70  | 3    | 42.7 | 0.3 |
| 8732040 | 1.5 | 18   | 25.5 | 70  | 3    | 41.2 | 0.3 |

Unit:mm

| EDP No. | DC  | LU   | LCF  | OAL | DCON | LS   | PL  |
|---------|-----|------|------|-----|------|------|-----|
| 8732041 | 1.6 | 19.2 | 27.2 | 70  | 3    | 39.7 | 0.3 |
| 8732042 | 1.7 | 20.4 | 28.9 | 73  | 3    | 41.2 | 0.4 |
| 8732043 | 1.8 | 21.6 | 30.6 | 73  | 3    | 39.7 | 0.4 |
| 8732044 | 1.9 | 22.8 | 32.3 | 73  | 3    | 38.1 | 0.4 |
| 8732045 | 2   | 24   | 34   | 77  | 3    | 40.6 | 0.4 |

· ADO-MICRO 2D is the recommended pilot hole drill.

### ADO-MICRO 20D



|         |        |              |     |               |                        |
|---------|--------|--------------|-----|---------------|------------------------|
| CARBIDE | IchAda | 0~<br>-0.009 | 30° | SHRINK<br>FIT | SPEED<br>FEED<br>P.156 |
|---------|--------|--------------|-----|---------------|------------------------|

| EDP No. | DC  | LU | LCF  | OAL | DCON | LS   | PL  |
|---------|-----|----|------|-----|------|------|-----|
| 8732046 | 1   | 20 | 24   | 68  | 3    | 39.8 | 0.2 |
| 8732047 | 1.1 | 22 | 26.4 | 75  | 3    | 44.6 | 0.2 |
| 8732048 | 1.2 | 24 | 28.8 | 75  | 3    | 42.3 | 0.2 |
| 8732049 | 1.3 | 26 | 31.2 | 75  | 3    | 40.1 | 0.3 |
| 8732050 | 1.4 | 28 | 33.6 | 81  | 3    | 43.9 | 0.3 |
| 8732051 | 1.5 | 30 | 36   | 81  | 3    | 41.7 | 0.3 |

Unit:mm

| EDP No. | DC  | LU | LCF  | OAL | DCON | LS   | PL  |
|---------|-----|----|------|-----|------|------|-----|
| 8732052 | 1.6 | 32 | 38.4 | 81  | 3    | 39.5 | 0.3 |
| 8732053 | 1.7 | 34 | 40.8 | 88  | 3    | 44.3 | 0.4 |
| 8732054 | 1.8 | 36 | 43.2 | 88  | 3    | 42.1 | 0.4 |
| 8732055 | 1.9 | 38 | 45.6 | 88  | 3    | 39.8 | 0.4 |
| 8732056 | 2   | 40 | 48   | 95  | 3    | 44.6 | 0.4 |

### ADO-MICRO 30D

| EDP No. | DC  | LU | LCF  | OAL | DCON | LS   | PL  |
|---------|-----|----|------|-----|------|------|-----|
| 8732057 | 1   | 30 | 34   | 77  | 3    | 38.8 | 0.2 |
| 8732058 | 1.1 | 33 | 37.4 | 86  | 3    | 44.6 | 0.2 |
| 8732059 | 1.2 | 36 | 40.8 | 86  | 3    | 41.3 | 0.2 |
| 8732060 | 1.3 | 39 | 44.2 | 86  | 3    | 38.1 | 0.3 |
| 8732061 | 1.4 | 42 | 47.6 | 95  | 3    | 43.9 | 0.3 |
| 8732062 | 1.5 | 45 | 51   | 95  | 3    | 40.7 | 0.3 |

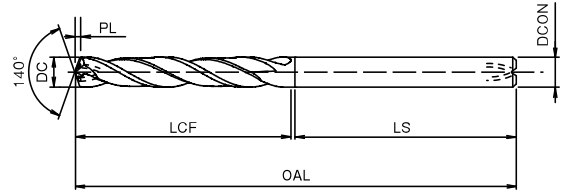
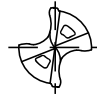
Unit:mm

| EDP No. | DC  | LU | LCF  | OAL | DCON | LS   | PL  |
|---------|-----|----|------|-----|------|------|-----|
| 8732063 | 1.6 | 48 | 54.4 | 101 | 3    | 43.5 | 0.3 |
| 8732064 | 1.7 | 51 | 57.8 | 101 | 3    | 40.3 | 0.4 |
| 8732065 | 1.8 | 54 | 61.2 | 107 | 3    | 43.1 | 0.4 |
| 8732066 | 1.9 | 57 | 64.6 | 107 | 3    | 39.8 | 0.4 |
| 8732067 | 2   | 60 | 68   | 112 | 3    | 41.6 | 0.4 |

· ADO-MICRO 2D is the recommended pilot hole drill.

| Work Material   | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|-----------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation    | C ~ 0.25%        | 0.25 ~ 0.45%        | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-MICRO 2D/5D | ○                | ○                   | ○                 | ○           | ○              | ○                           |                 |             |             | ○                 | ○            | ○        | ○                      | ○              | ○       | ○                       |                 |                               |





**SPEED  
FEED**  
P.157

**CARBIDE**

**WXL**

**h8**

**30°**

**SHRINK  
FIT**

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8665200 | 2 - 3     | 12  |     |      | 51.1 |     |
| 8665210 | 2.1 - 3   | 13  |     |      | 51.3 |     |
| 8665220 | 2.2 - 3   |     |     |      | 49.5 | 0.4 |
| 8665230 | 2.3 - 3   | 14  |     |      | 49.7 |     |
| 8665240 | 2.4 - 3   |     |     |      | 48.9 |     |
| 8665250 | 2.5 - 3   | 15  |     |      | 49.1 |     |
| 8665260 | 2.6 - 3   | 16  | 66  | 3    | 48.3 |     |
| 8665270 | 2.7 - 3   |     |     |      | 47.4 |     |
| 8665280 | 2.8 - 3   | 17  |     |      | 47.6 | 0.5 |
| 8665283 | 2.83 - 3  |     |     |      | 47.7 |     |
| 8665287 | 2.87 - 3  |     |     |      | 46.8 |     |
| 8665290 | 2.9 - 3   | 18  |     |      |      |     |
| 8665300 | 3 - 3     |     |     |      | 47   |     |
| 8665310 | 3.1       | 19  |     |      | 52.3 |     |
| 8665315 | 3.15      |     |     |      | 52.4 |     |
| 8665320 | 3.2       |     |     |      | 51.5 | 0.6 |
| 8665326 | 3.26(#30) | 20  |     |      | 51.6 |     |
| 8665330 | 3.3       |     |     |      | 51.7 |     |
| 8665340 | 3.4       | 21  |     |      | 50.9 |     |
| 8665350 | 3.5       | 22  | 74  | 4    | 51.1 |     |
| 8665360 | 3.6       |     |     |      | 50.3 |     |
| 8665370 | 3.7       |     |     |      | 49.4 |     |
| 8665373 | 3.73      | 23  |     |      | 49.5 | 0.7 |
| 8665375 | 3.75      |     |     |      | 49.6 |     |
| 8665380 | 3.8       |     |     |      | 48.8 |     |
| 8665390 | 3.9       | 24  |     |      | 49   |     |
| 8665400 | 4         |     |     |      | 52.3 |     |
| 8665410 | 4.1 - 5   | 25  |     | 5    | 50.5 |     |
| 8680410 | 4.1       |     |     | 6    | 51.5 |     |
| 8665420 | 4.2 - 5   |     |     | 5    | 49.6 |     |
| 8680420 | 4.2       | 26  |     | 6    | 51.7 |     |
| 8665430 | 4.3 - 5   |     |     | 5    | 49.8 |     |
| 8680430 | 4.3       |     |     | 6    | 50.9 |     |
| 8665440 | 4.4 - 5   |     |     | 5    | 49   | 0.8 |
| 8680440 | 4.4       | 27  |     | 6    | 49.1 |     |
| 8665450 | 4.5 - 5   |     |     | 5    | 51.1 |     |
| 8680450 | 4.5       |     |     | 6    | 49.2 |     |
| 8665460 | 4.6 - 5   |     |     | 5    | 50.3 |     |
| 8680460 | 4.6       | 28  | 80  | 6    | 48.4 |     |
| 8665465 | 4.65      |     |     | 6    | 48.5 |     |
| 8665470 | 4.7 - 5   |     |     | 5    | 49.4 |     |
| 8680470 | 4.7       |     |     | 6    | 47.6 |     |
| 8665480 | 4.8 - 5   | 29  |     | 5    | 49.6 |     |
| 8680480 | 4.8       |     |     | 6    | 47.8 | 0.9 |
| 8665485 | 4.85(#11) |     |     | 6    | 47.9 |     |
| 8665490 | 4.9 - 5   |     |     | 5    | 48.8 |     |
| 8680490 | 4.9       | 30  |     | 6    | 46.9 |     |
| 8665500 | 5 - 5     | 25  |     | 5    | 54   |     |
| 8680500 | 5         |     |     | 6    | 52.1 |     |
| 8665510 | 5.1       | 26  |     |      | 53.3 |     |
| 8665520 | 5.2       |     |     |      | 53.5 |     |
| 8665525 | 5.25      |     |     |      | 52.6 |     |
| 8665530 | 5.3       | 27  | 82  | 6    | 52.7 | 1   |
| 8665540 | 5.4       |     |     |      | 52.9 |     |
| 8665550 | 5.5       | 28  |     |      | 52.1 |     |

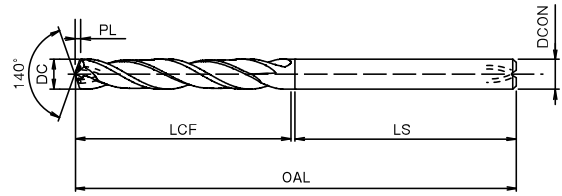
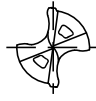
| EDP No. | DC - DCON        | LCF | OAL | DCON | LS   | PL   |
|---------|------------------|-----|-----|------|------|------|
| 8680555 | 5.55             | 28  |     |      | 52.2 |      |
| 8665560 | 5.6              |     |     |      | 52.3 | 1    |
| 8665570 | 5.7              | 29  | 82  | 6    | 51.4 |      |
| 8665580 | 5.8              |     |     |      | 51.6 |      |
| 8665590 | 5.9              | 30  |     |      | 50.8 |      |
| 8665600 | 6                |     |     |      | 51   |      |
| 8665610 | 6.1 - 7          |     |     | 7    | 56   |      |
| 8680610 | 6.1              | 31  |     | 8    | 52.5 | 1.1  |
| 8665620 | 6.2 - 7          |     |     | 7    | 56   |      |
| 8680620 | 6.2              |     |     | 8    | 52.6 |      |
| 8665625 | 6.25 - 7         |     |     | 7    | 55   |      |
| 8665630 | 6.3 - 7          |     |     |      |      |      |
| 8680630 | 6.3              | 32  |     | 8    | 51.8 |      |
| 8665635 | 6.35(1/8) - 6.35 |     |     | 6.35 | 55   |      |
| 8665640 | 6.4 - 7          |     |     | 7    |      |      |
| 8680640 | 6.4              |     |     | 8    | 52   |      |
| 8665650 | 6.5 - 7          |     |     | 7    | 54   |      |
| 8680650 | 6.5              | 33  | 88  | 8    | 51.2 | 1.2  |
| 8665660 | 6.6 - 7          |     |     | 7    | 54   |      |
| 8680660 | 6.6              |     |     | 8    | 51.4 |      |
| 8665670 | 6.7 - 7          |     |     | 7    | 53   |      |
| 8680670 | 6.7              | 34  |     | 8    | 50.6 |      |
| 8665675 | 6.75 - 7         |     |     | 7    | 53   |      |
| 8665680 | 6.8 - 7          |     |     | 8    | 50.8 |      |
| 8680680 | 6.8              |     |     | 7    | 52   |      |
| 8665690 | 6.9 - 7          |     |     | 8    | 49.9 |      |
| 8680690 | 6.9              | 35  |     | 7    | 52   |      |
| 8665700 | 7 - 7            |     |     |      | 50.1 | 1.3  |
| 8680700 | 7                |     |     |      |      |      |
| 8665710 | 7.1              | 36  |     |      | 57   |      |
| 8665720 | 7.2              |     |     |      |      |      |
| 8665725 | 7.25             | 37  |     |      | 56   |      |
| 8665730 | 7.3              |     |     |      |      |      |
| 8665740 | 7.4              | 38  | 94  | 8    | 55   | 1.4  |
| 8680745 | 7.45             |     |     |      |      |      |
| 8665750 | 7.5              |     |     |      |      |      |
| 8680755 | 7.55             | 39  |     |      | 54   |      |
| 8665760 | 7.6              |     |     |      |      |      |
| 8665770 | 7.7              | 40  |     |      | 53   |      |
| 8665775 | 7.75             |     |     |      |      |      |
| 8665780 | 7.8              | 41  |     |      | 9    | 59   |
| 8665790 | 7.9              |     |     |      | 10   | 55.5 |
| 8665800 | 8                |     |     |      | 9    | 59   |
| 8665810 | 8.1 - 9          |     |     |      | 10   | 55.6 |
| 8680810 | 8.1              | 42  | 101 |      | 9    | 58   |
| 8665820 | 8.2 - 9          |     |     |      | 10   | 55   |
| 8665825 | 8.25 - 9         |     |     |      | 9    | 57   |
| 8665830 | 8.3 - 9          |     |     |      | 10   | 54.2 |
| 8680830 | 8.3              | 43  |     |      | 9    | 57   |
| 8665840 | 8.4 - 9          |     |     |      | 10   | 54.4 |
| 8680840 | 8.4              |     |     |      |      |      |
| 8665850 | 8.5 - 9          |     |     |      |      |      |
| 8680850 | 8.5              |     |     |      |      |      |
| 8665860 | 8.6 - 9          |     |     |      |      |      |
| 8680860 | 8.6              |     |     |      |      |      |

| EDP No. | DC - DCON  | LCF | OAL | DCON | LS   | PL   |
|---------|------------|-----|-----|------|------|------|
| 8665870 | 8.7 - 9    |     |     | 9    | 56   |      |
| 8680870 | 8.7        | 44  |     | 10   | 53.6 |      |
| 8665875 | 8.75 - 9   |     |     | 9    | 56.8 | 1.6  |
| 8665880 | 8.8 - 9    |     |     | 10   | 53.8 |      |
| 8680880 | 8.8        |     |     | 9    | 55   |      |
| 8665890 | 8.9 - 9    | 45  | 101 | 10   | 52.9 |      |
| 8680890 | 8.9        |     |     | 9    | 55   |      |
| 8665900 | 9 - 9      |     |     | 9    | 55   |      |
| 8680900 | 9          | 46  |     |      | 53.1 |      |
| 8665910 | 9.1        |     |     |      | 59   |      |
| 8665920 | 9.2        | 47  |     |      | 58   | 1.7  |
| 8665925 | 9.25       |     |     |      |      |      |
| 8665930 | 9.3        | 48  | 106 | 10   | 57   |      |
| 8665940 | 9.4        |     |     |      |      |      |
| 8665950 | 9.5        | 49  |     |      | 56   | 1.8  |
| 8680955 | 9.55       |     |     |      |      |      |
| 8665960 | 9.6        | 50  |     |      | 55   |      |
| 8665970 | 9.7        |     |     |      |      |      |
| 8665975 | 9.75       | 51  |     |      | 11   | 61   |
| 8665980 | 9.8        |     |     |      | 12   | 57.5 |
| 8665990 | 9.9        |     |     |      | 11   | 61   |
| 8666000 | 10         |     |     |      | 12   | 57.6 |
| 8666010 | 10.1 - 11  | 52  |     |      | 11   | 60   |
| 8681010 | 10.1       |     |     |      | 12   | 56.8 |
| 8666020 | 10.2 - 11  | 53  | 113 |      | 11   | 60   |
| 8681020 | 10.2       |     |     |      | 12   | 57   |
| 8666025 | 10.25 - 11 |     |     |      | 12   | 56.2 |
| 8666030 | 10.3 - 11  | 54  |     |      | 11   | 59   |
| 8681030 | 10.3       |     |     |      | 12   | 56.4 |
| 8666040 | 10.4 - 11  | 55  |     |      | 11   | 58   |
| 8681040 | 10.4       |     |     |      | 12   | 55.6 |
| 8666050 | 10.5 - 11  | 56  |     |      | 11   | 58   |
| 8681050 | 10.5       |     |     |      | 12   | 55.8 |
| 8666060 | 10.6 - 11  | 57  |     |      | 11   | 57   |
| 8681060 | 10.6       |     |     |      | 12   | 54.9 |
| 8666070 | 10.7 - 11  | 58  |     |      | 11   | 57   |
| 8681070 | 10.7       |     |     |      | 12   | 55.1 |
| 8666075 | 10.75 - 11 | 59  |     |      | 63   |      |
| 8666080 | 10.8 - 11  | 60  |     |      | 62   |      |
| 8681080 | 10.8       |     |     |      | 61   | 2.1  |
| 8666090 | 10.9 - 11  | 61  | 120 |      | 59   |      |
| 8681090 | 10.9       |     |     |      | 60   |      |
| 8666100 | 11 - 11    | 62  |     |      | 59   | 2.2  |
| 8681100 | 11         |     |     |      | 13   | 66   |
| 8666110 | 11.1       |     |     |      | 14   | 62.5 |
| 8666120 | 11.2       |     |     |      |      |      |
| 8666130 | 11.3       |     |     |      |      |      |
| 8666140 | 11.4       |     |     |      |      |      |
| 8666150 | 11.5       |     |     |      |      |      |
| 8666160 | 11.6       |     |     |      |      |      |
| 8666170 | 11.7       |     |     |      |      |      |
| 8666180 | 11.8       |     |     |      |      |      |
| 8666190 | 11.9       |     |     |      |      |      |
| 8666200 | 12         |     |     |      |      |      |
| 8666210 | 12.1 - 13  | 61  | 128 | 13   | 66   |      |
| 8681210 | 12.1       |     |     |      | 14   | 62.5 |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-SUS-3D    | ○                | ○                   | ○                 | ○           |                |                             |                 |             |             | ○                 |              | ○        | ○                      | ○              | ○       |                         | ○               |                               |



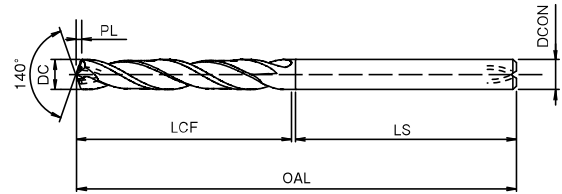




| EDP No. | DC - DCON  | LCF | OAL | DCON | LS   | PL  |
|---------|------------|-----|-----|------|------|-----|
| 8666220 | 12.2 - 13  | 61  |     | 13   | 66   | 2.2 |
| 8681220 | 12.2       |     |     | 14   | 62.6 |     |
| 8666230 | 12.3 - 13  |     |     | 13   | 65   |     |
| 8681230 | 12.3       | 62  |     | 14   | 61.8 |     |
| 8666240 | 12.4 - 13  |     |     | 13   | 65   |     |
| 8681240 | 12.4       |     |     | 14   | 62   |     |
| 8666250 | 12.5 - 13  |     |     | 13   | 64   |     |
| 8681250 | 12.5       | 63  |     | 14   | 61.2 |     |
| 8666260 | 12.6 - 13  |     |     | 13   | 64   |     |
| 8681260 | 12.6       |     | 128 | 14   | 61.4 | 2.3 |
| 8666270 | 12.7 - 13  |     |     | 13   | 63   |     |
| 8681270 | 12.7       |     |     | 14   | 60.6 |     |
| 8666275 | 12.75 - 13 | 64  |     | 13   | 63   |     |
| 8666280 | 12.8 - 13  |     |     | 14   | 60.8 |     |
| 8681280 | 12.8       |     |     | 13   | 62   |     |
| 8666290 | 12.9 - 13  |     |     | 14   | 59.9 |     |
| 8681290 | 12.9       | 65  |     | 13   | 62   |     |
| 8666300 | 13 - 13    |     |     |      | 60.1 |     |
| 8681300 | 13         |     |     |      | 67   | 2.4 |
| 8666310 | 13.1       | 66  |     |      | 66   |     |
| 8666320 | 13.2       |     |     |      |      |     |
| 8666330 | 13.3       | 67  |     |      |      |     |
| 8666340 | 13.4       |     |     |      |      |     |
| 8666343 | 13.43      |     |     |      |      |     |
| 8666350 | 13.5       | 68  | 134 | 14   | 65   | 2.5 |
| 8666355 | 13.55      |     |     |      |      |     |
| 8666360 | 13.6       |     |     |      |      |     |
| 8666370 | 13.7       | 69  |     |      | 64   |     |
| 8666380 | 13.8       |     |     |      |      |     |
| 8666390 | 13.9       | 70  |     |      | 63   |     |
| 8666400 | 14         |     |     |      |      |     |
| 8666410 | 14.1 - 15  |     |     | 15   | 68   | 2.6 |
| 8681410 | 14.1       | 71  |     | 16   | 64.5 |     |
| 8666420 | 14.2 - 15  |     |     | 15   | 68   |     |
| 8681420 | 14.2       |     |     | 16   | 64.6 |     |
| 8666430 | 14.3 - 15  |     |     | 15   | 67   |     |
| 8681430 | 14.3       | 72  |     | 16   | 63.8 |     |
| 8666440 | 14.4 - 15  |     |     | 15   | 67   |     |
| 8681440 | 14.4       |     |     | 16   | 64   |     |
| 8666450 | 14.5 - 15  |     |     | 15   | 66   |     |
| 8681450 | 14.5       | 73  | 140 | 16   | 63.2 | 2.7 |
| 8666460 | 14.6 - 15  |     |     | 15   | 66   |     |
| 8681460 | 14.6       |     |     | 16   | 63.4 |     |
| 8666470 | 14.7 - 15  |     |     | 15   | 65   |     |
| 8681470 | 14.7       | 74  |     | 16   | 62.6 |     |
| 8666480 | 14.8 - 15  |     |     | 15   | 65   |     |
| 8681480 | 14.8       |     |     | 16   | 62.8 |     |
| 8666490 | 14.9 - 15  |     |     | 15   | 64   |     |
| 8681490 | 14.9       | 75  |     | 16   | 61.9 |     |
| 8666500 | 15 - 15    |     |     | 15   | 64   |     |
| 8681500 | 15         |     |     |      | 62.1 |     |
| 8666510 | 15.1       | 76  |     |      | 68   | 2.8 |
| 8666520 | 15.2       |     |     |      |      |     |
| 8666530 | 15.3       | 77  | 145 | 16   | 67   |     |
| 8666540 | 15.4       |     |     |      |      |     |
| 8666550 | 15.5       | 78  |     |      | 66   |     |

| EDP No.    | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|------------|-----------|-----|-----|------|------|-----|
| 8681555    | 15.55     | 78  |     |      | 66   | 2.8 |
| 8666560    | 15.6      |     |     |      |      |     |
| 8666570    | 15.7      | 79  | 145 | 16   | 65   |     |
| 8666580    | 15.8      |     |     |      |      |     |
| 8666590    | 15.9      | 80  |     |      | 64   | 2.9 |
| 8666600    | 16        |     |     |      |      |     |
| 5560842550 | 16.1      | 81  |     |      | 64.5 |     |
| 5560842560 | 16.2      |     |     | 18   | 64.6 |     |
| 5560842570 | 16.3      | 82  |     |      | 63.8 |     |
| 5560842580 | 16.4      |     |     |      | 64   |     |
| 8666650    | 16.5 - 17 |     |     | 17   | 66   | 3   |
| 8681650    | 16.5      | 83  | 150 |      | 63.2 |     |
| 5560842590 | 16.6      |     |     |      | 63.4 |     |
| 8681670    | 16.7      | 84  |     | 18   | 62.6 |     |
| 5560842600 | 16.8      |     |     |      | 62.8 |     |
| 5560842610 | 16.9      |     |     |      | 61.9 |     |
| 8666700    | 17 - 17   | 85  |     | 17   | 64   | 3.1 |
| 8681700    | 17        |     |     |      | 62.1 |     |
| 5560842620 | 17.1      | 86  |     |      | 68   |     |
| 5560842630 | 17.2      |     |     |      |      |     |
| 8681730    | 17.3      | 87  |     |      | 67   |     |
| 5560842640 | 17.4      |     |     |      |      |     |
| 8666750    | 17.5      | 88  | 155 | 18   | 66   | 3.2 |
| 8681755    | 17.55     |     |     |      |      |     |
| 5560842650 | 17.6      |     |     |      |      |     |
| 5560842660 | 17.7      | 89  |     |      | 65   |     |
| 5560842670 | 17.8      |     |     |      |      |     |
| 5560842680 | 17.9      | 90  |     |      | 64   |     |
| 8666800    | 18        |     |     |      |      |     |
| 5560842690 | 18.1      | 91  |     |      | 64.5 | 3.3 |
| 5560842700 | 18.2      |     |     |      | 64.6 |     |
| 5560842710 | 18.3      | 92  |     |      | 63.8 |     |
| 5560842720 | 18.4      |     |     |      | 64   |     |
| 8666850    | 18.5 - 19 |     |     | 20   | 66   | 3.4 |
| 8681850    | 18.5      | 93  | 160 |      | 63.2 |     |
| 5560842730 | 18.6      |     |     |      | 63.4 |     |
| 8681870    | 18.7      | 94  |     |      | 62.6 |     |
| 5560842740 | 18.8      |     |     |      | 62.8 |     |
| 5560842750 | 18.9      |     |     |      | 61.9 |     |
| 8666900    | 19 - 19   | 95  |     | 19   | 64   |     |
| 8681900    | 19        |     |     |      | 62.1 |     |
| 5560842760 | 19.1      | 96  |     |      | 68   | 3.5 |
| 5560842770 | 19.2      |     |     |      |      |     |
| 8681930    | 19.3      | 97  |     |      | 67   |     |
| 5560842780 | 19.4      |     |     |      |      |     |
| 8666950    | 19.5      | 98  | 165 | 20   | 66   |     |
| 8681955    | 19.55     |     |     |      |      |     |
| 5560842790 | 19.6      |     |     |      |      |     |
| 5560842800 | 19.7      | 99  |     |      | 65   | 3.6 |
| 5560842810 | 19.8      |     |     |      |      |     |
| 5560842820 | 19.9      | 100 |     |      | 64   |     |
| 8667000    | 20        |     |     |      |      |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-SUS-3D    | ○                | ○                   | ○                 | ○           |                |                             |                 |             |             | ○                 |              | ○        | ○                      | ○              | ○       |                         | ○               |                               |



SPEED  
FEED  
P.157

CARBIDE

WXL

h8

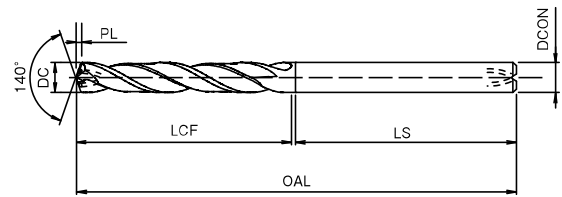
30°

SHRINK  
FIT

| EDP No. | DC - DCON | LCF | OAL | DCON | LS  | PL |
|---------|-----------|-----|-----|------|-----|----|
| 8667200 | 2 - 3     | 18  | 70  | 49.1 | 0.4 |    |
| 8667210 | 2.1 - 3   | 19  |     |      |     |    |
| 8667220 | 2.2 - 3   | 20  |     |      |     |    |
| 8667230 | 2.3 - 3   | 21  |     |      |     |    |
| 8667240 | 2.4 - 3   | 22  | 78  | 51.4 | 0.5 |    |
| 8667250 | 2.5 - 3   | 23  |     |      |     |    |
| 8667260 | 2.6 - 3   | 24  |     |      |     |    |
| 8667270 | 2.7 - 3   | 25  |     |      |     |    |
| 8667276 | 2.76 - 3  |     | 86  | 51.6 | 0.6 |    |
| 8667278 | 2.78 - 3  |     |     |      |     |    |
| 8667280 | 2.8 - 3   |     |     |      |     |    |
| 8667283 | 2.83 - 3  |     |     |      |     |    |
| 8667287 | 2.87 - 3  |     | 95  | 51.3 | 0.7 |    |
| 8667290 | 2.9 - 3   |     |     |      |     |    |
| 8667300 | 3 - 3     |     |     |      |     |    |
| 8667310 | 3.1       |     |     |      |     |    |
| 8667315 | 3.15      |     | 100 | 51.4 | 0.8 |    |
| 8667320 | 3.2       |     |     |      |     |    |
| 8667326 | 3.26(#30) |     |     |      |     |    |
| 8667330 | 3.3       |     |     |      |     |    |
| 8667340 | 3.4       |     | 109 | 51.3 | 0.9 |    |
| 8667350 | 3.5       |     |     |      |     |    |
| 8667360 | 3.6       |     |     |      |     |    |
| 8667366 | 3.66      |     |     |      |     |    |
| 8667368 | 3.68      |     | 118 | 51.4 | 1.0 |    |
| 8667370 | 3.7       |     |     |      |     |    |
| 8667373 | 3.73      |     |     |      |     |    |
| 8667375 | 3.75      |     |     |      |     |    |
| 8667380 | 3.8       |     | 128 | 51.3 | 1.1 |    |
| 8667390 | 3.9       |     |     |      |     |    |
| 8667400 | 4         |     |     |      |     |    |
| 8667410 | 4.1 - 5   |     |     |      |     |    |
| 8682410 | 4.1       |     | 136 | 51.4 | 1.2 |    |
| 8682420 | 4.2 - 5   |     |     |      |     |    |
| 8682430 | 4.3 - 5   |     |     |      |     |    |
| 8682440 | 4.4 - 5   |     |     |      |     |    |
| 8682445 | 4.45      |     | 146 | 51.3 | 1.3 |    |
| 8682450 | 4.5 - 5   |     |     |      |     |    |
| 8682460 | 4.6 - 5   |     |     |      |     |    |
| 8682470 | 4.7 - 5   |     |     |      |     |    |
| 8682480 | 4.8 - 5   |     | 156 | 51.4 | 1.4 |    |
| 8682485 | 4.85(#11) |     |     |      |     |    |
| 8682490 | 4.9 - 5   |     |     |      |     |    |
| 8682500 | 5 - 5     |     |     |      |     |    |
| 8667510 | 5.1       |     | 166 | 51.3 | 1.5 |    |
| 8667520 | 5.2       |     |     |      |     |    |
| 8667525 | 5.25      |     |     |      |     |    |
| 8667530 | 5.3       |     |     |      |     |    |

| EDP No. | DC - DCON        | LCF | OAL | DCON | LS  | PL |
|---------|------------------|-----|-----|------|-----|----|
| 8667540 | 5.4              |     | 176 | 51.4 | 1.6 |    |
| 8667550 | 5.5              |     |     |      |     |    |
| 8667552 | 5.52             |     |     |      |     |    |
| 8667554 | 5.54             |     |     |      |     |    |
| 8667560 | 5.6              |     | 186 | 51.3 | 1.7 |    |
| 8667570 | 5.7              |     |     |      |     |    |
| 8667580 | 5.8              |     |     |      |     |    |
| 8667590 | 5.9              |     |     |      |     |    |
| 8667600 | 6                |     | 196 | 51.4 | 1.8 |    |
| 8667610 | 6.1 - 7          |     |     |      |     |    |
| 8682610 | 6.1              |     |     |      |     |    |
| 8667620 | 6.2 - 7          |     |     |      |     |    |
| 8682620 | 6.2              |     | 206 | 51.3 | 1.9 |    |
| 8667625 | 6.25 - 7         |     |     |      |     |    |
| 8667630 | 6.3 - 7          |     |     |      |     |    |
| 8682630 | 6.3              |     |     |      |     |    |
| 8667635 | 6.35(1/8) - 6.35 |     | 216 | 51.4 | 2.0 |    |
| 8667640 | 6.4 - 7          |     |     |      |     |    |
| 8682640 | 6.4              |     |     |      |     |    |
| 8667650 | 6.5 - 7          |     |     |      |     |    |
| 8682650 | 6.5              |     | 226 | 51.3 | 2.1 |    |
| 8667660 | 6.6 - 7          |     |     |      |     |    |
| 8682660 | 6.6              |     |     |      |     |    |
| 8667670 | 6.7 - 7          |     |     |      |     |    |
| 8682670 | 6.7              |     | 236 | 51.4 | 2.2 |    |
| 8667675 | 6.75 - 7         |     |     |      |     |    |
| 8667680 | 6.8 - 7          |     |     |      |     |    |
| 8682680 | 6.8              |     |     |      |     |    |
| 8667690 | 6.9 - 7          |     | 246 | 51.3 | 2.3 |    |
| 8682690 | 6.9              |     |     |      |     |    |
| 8667700 | 7 - 7            |     |     |      |     |    |
| 8682700 | 7                |     |     |      |     |    |
| 8667710 | 7.1              |     | 256 | 51.4 | 2.4 |    |
| 8667720 | 7.2              |     |     |      |     |    |
| 8667725 | 7.25             |     |     |      |     |    |
| 8667730 | 7.3              |     |     |      |     |    |
| 8667736 | 7.36             |     | 266 | 51.3 | 2.5 |    |
| 8667738 | 7.38             |     |     |      |     |    |
| 8667740 | 7.4              |     |     |      |     |    |
| 8682745 | 7.45             |     |     |      |     |    |
| 8667750 | 7.5              |     | 276 | 51.4 | 2.6 |    |
| 8667752 | 7.52             |     |     |      |     |    |
| 8667754 | 7.54             |     |     |      |     |    |
| 8667760 | 7.6              |     |     |      |     |    |
| 8667770 | 7.7              |     | 286 | 51.3 | 2.7 |    |
| 8667775 | 7.75             |     |     |      |     |    |
| 8667780 | 7.8              |     |     |      |     |    |
| 8667790 | 7.9              |     |     |      |     |    |
| 8667800 | 8                |     | 296 | 51.4 | 2.8 |    |
| 8667810 | 8.1 - 9          |     |     |      |     |    |
| 8682810 | 8.1              |     |     |      |     |    |
| 8667820 | 8.2 - 9          |     |     |      |     |    |
| 8682820 | 8.2              |     | 306 | 51.3 | 2.9 |    |
| 8667825 | 8.25 - 9         |     |     |      |     |    |
| 8667830 | 8.3 - 9          |     |     |      |     |    |
| 8682830 | 8.3              |     |     |      |     |    |
| 8667840 | 8.4 - 9          |     | 316 | 51.4 | 3.0 |    |
| 8682840 | 8.4              |     |     |      |     |    |
| 8667850 | 8.5 - 9          |     |     |      |     |    |
| 8682850 | 8.5              |     |     |      |     |    |

| EDP No. | DC - DCON  | LCF | OAL  | DCON | LS   | PL   |     |
|---------|------------|-----|------|------|------|------|-----|
| 8667860 | 8.6 - 9    | 69  | 128  | 9    | 58   | 1.6  |     |
| 8682860 | 8.6        |     |      | 10   | 55.4 |      |     |
| 8667870 | 8.7 - 9    |     |      | 9    | 57   |      |     |
| 8682870 | 8.7        | 70  |      | 10   | 54.6 |      |     |
| 8667875 | 8.75 - 9   | 71  |      | 9    | 57   |      |     |
| 8667880 | 8.8 - 9    |     |      | 9    | 56   |      |     |
| 8682880 | 8.8        |     |      | 10   | 53.8 |      |     |
| 8667890 | 8.9 - 9    | 72  |      | 9    | 55   |      |     |
| 8682890 | 8.9        |     |      | 10   | 52.9 |      |     |
| 8667900 | 9 - 9      |     |      | 9    | 55   |      |     |
| 8682900 | 9          | 136 |      | 10   | 53.1 |      | 1.7 |
| 8667910 | 9.1        |     |      |      | 62   |      |     |
| 8667920 | 9.2        |     | 74   |      | 61   |      |     |
| 8667924 | 9.24       |     |      |      | 75   | 60   |     |
| 8667925 | 9.25       |     |      |      |      |      |     |
| 8667926 | 9.26       |     |      |      |      |      |     |
| 8667930 | 9.3        |     | 76   |      | 59   |      |     |
| 8667936 | 9.36       |     |      |      |      |      |     |
| 8667938 | 9.38       |     |      |      |      |      |     |
| 8667940 | 9.4        |     | 77   |      | 58   |      |     |
| 8667950 | 9.5        |     |      |      |      |      |     |
| 8667952 | 9.52       |     |      |      |      |      |     |
| 8667954 | 9.54       | 78  | 57   |      |      |      |     |
| 8667960 | 9.6        |     |      |      |      |      |     |
| 8667970 | 9.7        |     |      |      |      |      |     |
| 8667975 | 9.75       | 79  | 56   |      |      |      |     |
| 8667980 | 9.8        |     |      |      |      |      |     |
| 8667990 | 9.9        |     |      |      |      |      |     |
| 8668000 | 10         | 80  | 55   | 1.8  |      |      |     |
| 8668010 | 10.1 - 11  | 81  | 11   |      | 64   |      |     |
| 8683010 | 10.1       |     | 12   |      | 60.5 |      |     |
| 8668020 | 10.2 - 11  |     | 11   |      | 63   |      |     |
| 8683020 | 10.2       | 82  | 12   |      | 59.6 |      |     |
| 8668025 | 10.25 - 11 |     | 63   |      |      |      |     |
| 8668030 | 10.3 - 11  |     | 11   |      | 62   |      |     |
| 8683030 | 10.3       | 83  | 12   |      | 58.8 |      |     |
| 8668040 | 10.4 - 11  |     | 11   |      | 61   |      |     |
| 8683040 | 10.4       |     | 84   |      | 12   | 58   |     |
| 8668050 | 10.5 - 11  | 11  |      |      | 61   |      |     |
| 8683050 | 10.5       | 85  |      |      | 12   | 58.2 |     |
| 8668060 | 10.6 - 11  |     | 11   | 60   |      |      |     |
| 8683060 | 10.6       |     | 12   | 57.4 |      |      |     |
| 8668070 | 10.7 - 11  | 86  | 11   | 59   |      |      |     |
| 8683070 | 10.7       |     | 12   | 56.6 |      |      |     |
| 8668075 | 10.75 - 11 |     | 11   | 59   |      |      |     |
| 8683080 | 10.8 - 11  | 87  | 11   | 58   |      |      |     |
| 8683080 | 10.8       |     | 12   | 55.8 |      |      |     |
| 8668090 | 10.9 - 11  |     | 11   | 57   |      |      |     |
| 8683090 | 10.9       | 88  | 12   | 54.9 |      |      |     |
| 8668100 | 11 - 11    |     | 11   | 57   |      |      |     |
| 8683100 | 11         |     | 55.1 | 2    |      |      |     |
| 8668110 | 11.1       | 156 | 12   |      | 66   |      |     |
| 8668120 | 11.2       |     |      |      | 65   |      |     |
| 8668122 | 11.22      |     |      |      | 90   | 64   |     |
| 8668124 | 11.24      |     |      |      |      |      |     |
| 8668130 | 11.3       |     |      |      |      |      |     |
| 8668136 | 11.36      |     |      |      | 91   | 63   |     |
| 8668138 | 11.38      |     |      |      |      |      |     |
| 8668140 | 11.4       |     |      |      |      |      |     |
| 8668140 | 11.5       |     |      |      | 92   |      |     |



**SPEED  
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**CARBIDE**

**WXL**

**h8**

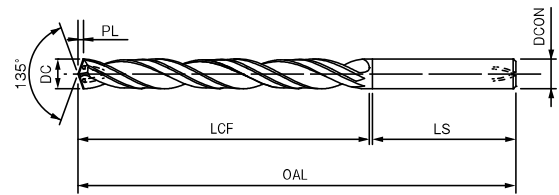
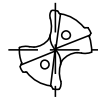
**30°**

**SHRINK  
FIT**

| EDP No. | DC - DCON  | LCF | OAL | DCON    | LS  | PL |
|---------|------------|-----|-----|---------|-----|----|
| 8668160 | 11.6       | 93  | 156 | 62      | 2.1 |    |
| 8668170 | 11.7       | 94  |     | 61      |     |    |
| 8668180 | 11.8       | 95  |     | 60      |     |    |
| 8668190 | 11.9       | 96  | 97  | 59      | 2.2 |    |
| 8668200 | 12         |     |     |         |     |    |
| 8668210 | 12.1 - 13  |     |     | 13 69   |     |    |
| 8683210 | 12.1       |     | 98  | 14 65.5 | 2.3 |    |
| 8668220 | 12.2 - 13  |     |     | 13 68   |     |    |
| 8683220 | 12.2       |     |     | 14 64.6 |     |    |
| 8668230 | 12.3 - 13  | 99  | 100 | 13 67   | 2.4 |    |
| 8683230 | 12.3       |     |     | 14 63.8 |     |    |
| 8668240 | 12.4 - 13  |     |     | 13 66   |     |    |
| 8683240 | 12.4       |     | 101 | 14 63   | 2.5 |    |
| 8668250 | 12.5 - 13  |     |     | 13 66   |     |    |
| 8683250 | 12.5       |     |     | 14 63.2 |     |    |
| 8668260 | 12.6 - 13  | 102 | 103 | 13 65   | 2.6 |    |
| 8683260 | 12.6       |     |     | 14 62.4 |     |    |
| 8668270 | 12.7 - 13  |     |     | 13 64   |     |    |
| 8683270 | 12.7       |     | 104 | 14 61.6 | 2.7 |    |
| 8668275 | 12.75 - 13 |     |     | 13 64   |     |    |
| 8668280 | 12.8 - 13  |     |     | 14 63   |     |    |
| 8683280 | 12.8       |     | 105 | 14 60.8 | 2.8 |    |
| 8668290 | 12.9 - 13  |     |     | 13 62   |     |    |
| 8683290 | 12.9       |     |     | 14 59.9 |     |    |
| 8668300 | 13 - 13    | 106 | 107 | 13 62   | 2.9 |    |
| 8683300 | 13         |     |     | 60.1    |     |    |
| 8668310 | 13.1       |     |     | 70      |     |    |
| 8668320 | 13.2       | 108 | 109 | 69      | 3.0 |    |
| 8668325 | 13.25      |     |     | 68      |     |    |
| 8668330 | 13.3       |     |     | 67      |     |    |
| 8668340 | 13.4       |     | 110 | 14      | 3.1 |    |
| 8668343 | 13.43      |     |     | 66      |     |    |
| 8668350 | 13.5       |     |     | 65      |     |    |
| 8668355 | 13.55      | 111 | 112 | 64      | 3.2 |    |
| 8668360 | 13.6       |     |     | 63      |     |    |
| 8668370 | 13.7       |     |     | 62      |     |    |
| 8668380 | 13.8       |     | 113 | 61      | 3.3 |    |
| 8668390 | 13.9       |     |     | 60      |     |    |
| 8668400 | 14         |     |     | 59      |     |    |
| 8668410 | 14.1 - 15  | 114 | 115 | 15 71   | 3.4 |    |
| 8683410 | 14.1       |     |     | 16 67.5 |     |    |
| 8668420 | 14.2 - 15  |     |     | 15 70   |     |    |
| 8683420 | 14.2       |     | 116 | 16 66.6 | 3.5 |    |
| 8668430 | 14.3 - 15  |     |     | 15 69   |     |    |
| 8683430 | 14.3       |     |     | 16 65.8 |     |    |
| 8668440 | 14.4 - 15  | 117 | 118 | 15 68   | 3.6 |    |
| 8683440 | 14.4       |     |     | 16 65   |     |    |
| 8668450 | 14.5 - 15  |     |     | 15 68   |     |    |
| 8683450 | 14.5       |     | 119 | 16 65.2 | 3.7 |    |
| 8668460 | 14.6 - 15  |     |     | 15 67   |     |    |
| 8683460 | 14.6       |     |     | 16 64.4 |     |    |
| 8668470 | 14.7 - 15  | 120 | 120 | 15 66   | 3.8 |    |
| 8683470 | 14.7       |     |     | 16 63.6 |     |    |
| 8668480 | 14.8 - 15  |     |     | 15 65   |     |    |
| 8683480 | 14.8       |     | 121 | 16 62.8 | 3.9 |    |
| 8668490 | 14.9 - 15  |     |     | 15 64   |     |    |
| 8683490 | 14.9       |     |     | 16 61.9 |     |    |
| 8668500 | 15 - 15    |     | 122 | 15 64   | 4.0 |    |
| 8683500 | 15         |     |     | 16 62.1 |     |    |

| EDP No.    | DC - DCON | LCF | OAL | DCON | LS  | PL |
|------------|-----------|-----|-----|------|-----|----|
| 8668510    | 15.1      | 121 | 193 | 71   | 2.7 |    |
| 8668520    | 15.2      | 122 |     | 70   |     |    |
| 8668525    | 15.25     | 123 |     | 69   |     |    |
| 8668530    | 15.3      | 124 | 124 | 68   | 2.8 |    |
| 8668540    | 15.4      |     |     | 67   |     |    |
| 8668550    | 15.5      |     |     | 66   |     |    |
| 8668555    | 15.55     | 125 | 125 | 65   | 2.9 |    |
| 8668560    | 15.6      |     |     | 64   |     |    |
| 8668570    | 15.7      | 126 |     | 63   |     |    |
| 8668580    | 15.8      | 127 | 127 | 62   | 3.0 |    |
| 8668590    | 15.9      |     |     | 61   |     |    |
| 8668600    | 16        | 128 |     | 60   |     |    |
| 5560842830 | 16.1      | 113 | 113 | 66.5 | 3.1 |    |
| 5560842840 | 16.2      | 114 |     | 65.6 |     |    |
| 5560842850 | 16.3      | 115 |     | 64.8 |     |    |
| 5560842860 | 16.4      | 116 | 116 | 65   | 3.2 |    |
| 8668650    | 16.5 - 17 |     |     | 64.2 |     |    |
| 8683650    | 16.5      |     |     | 63.4 |     |    |
| 5560842870 | 16.6      | 117 | 117 | 62.8 | 3.3 |    |
| 8683670    | 16.7      |     |     | 61.9 |     |    |
| 5560842880 | 16.8      | 118 |     | 61   |     |    |
| 5560842890 | 16.9      | 119 | 119 | 60.1 | 3.4 |    |
| 8668700    | 17 - 17   |     |     | 62.1 |     |    |
| 8683700    | 17        |     |     | 70   |     |    |
| 5560842900 | 17.1      | 120 | 120 | 69   | 3.5 |    |
| 5560842910 | 17.2      | 121 |     | 68   |     |    |
| 8683730    | 17.3      | 122 |     | 67   |     |    |
| 5560842920 | 17.4      | 123 | 123 | 66   | 3.6 |    |
| 8668750    | 17.5      |     |     | 65   |     |    |
| 8683755    | 17.55     | 124 |     | 64   |     |    |
| 5560842930 | 17.6      | 125 | 125 | 63.6 | 3.7 |    |
| 5560842940 | 17.7      | 126 |     | 62.8 |     |    |
| 5560842950 | 17.8      | 127 |     | 61.9 |     |    |
| 5560842960 | 17.9      | 128 | 128 | 61   | 3.8 |    |
| 8668800    | 18        |     |     | 60.1 |     |    |
| 5560842970 | 18.1      | 129 |     | 62.1 |     |    |
| 5560842980 | 18.2      | 130 | 130 | 70   | 3.9 |    |
| 5560842990 | 18.3      | 131 |     | 69   |     |    |
| 5560843000 | 18.4      | 132 |     | 68   |     |    |
| 8668850    | 18.5 - 19 | 133 | 133 | 67   | 4.0 |    |
| 8683850    | 18.5      |     |     | 64.2 |     |    |
| 5560843010 | 18.6      | 134 |     | 63.4 |     |    |
| 8683870    | 18.7      | 135 | 135 | 62.8 | 4.1 |    |
| 5560843020 | 18.8      |     |     | 61.9 |     |    |
| 5560843030 | 18.9      | 136 |     | 61   |     |    |
| 8668900    | 19 - 19   | 137 | 137 | 60.1 | 4.2 |    |
| 8683900    | 19        |     |     | 70   |     |    |
| 5560843040 | 19.1      | 138 |     | 69   |     |    |
| 5560843050 | 19.2      | 139 | 139 | 68   | 4.3 |    |
| 8683930    | 19.3      |     |     | 67   |     |    |
| 5560843060 | 19.4      | 140 |     | 66   |     |    |
| 8668950    | 19.5      |     | 205 | 65   | 4.4 |    |
| 8683955    | 19.55     |     |     | 64   |     |    |
| 5560843070 | 19.6      | 141 |     | 63.6 |     |    |
| 5560843080 | 19.7      | 142 | 142 | 62.8 | 4.5 |    |
| 5560843090 | 19.8      | 143 |     | 61.9 |     |    |
| 5560843100 | 19.9      | 144 |     | 61   |     |    |
| 8669000    | 20        |     |     | 60.1 | 4.6 |    |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-SUS-5D    | ○                | ○                   | ○                 | ○           |                |                             |                 |             |             | ○                 |              | ○        | ○                      | ○              | ○       |                         | ○               |                               |


**SPEED  
FEED**  
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**CARBIDE**
**WXL**
**h8**
**30°**
**SHRINK  
FIT**

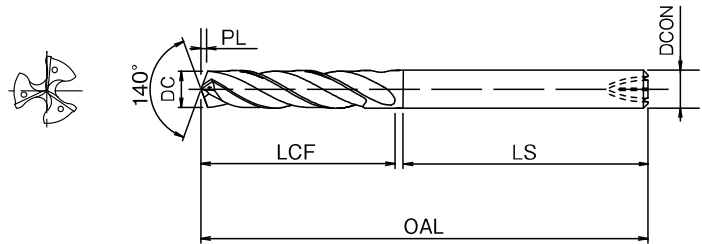
| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8686200 | 2 - 3     | 22  | 75  | 3    | 50.1 | 0.4 |
| 8686210 | 2.1 - 3   | 24  |     |      | 48.3 |     |
| 8686220 | 2.2 - 3   | 25  |     |      | 47.5 |     |
| 8686230 | 2.3 - 3   | 26  |     |      | 46.7 |     |
| 8686240 | 2.4 - 3   | 27  | 80  | 3    | 45.9 | 0.5 |
| 8686250 | 2.5 - 3   | 28  |     |      | 45.1 |     |
| 8686260 | 2.6 - 3   | 29  |     |      | 49.3 |     |
| 8686270 | 2.7 - 3   | 30  |     |      | 48.4 |     |
| 8686280 | 2.8 - 3   | 31  | 95  | 4    | 47.6 | 0.6 |
| 8686290 | 2.9 - 3   | 32  |     |      | 46.8 |     |
| 8686300 | 3 - 3     | 33  |     |      | 46   |     |
| 8684310 | 3.1       | 34  |     |      | 58.3 |     |
| 8684320 | 3.2       | 35  | 95  | 4    | 57.5 | 0.7 |
| 8684330 | 3.3       | 36  |     |      | 56.7 |     |
| 8684340 | 3.4       | 37  |     |      | 55.9 |     |
| 8684350 | 3.5       | 39  |     |      | 54.1 |     |
| 8684360 | 3.6       | 40  | 105 | 5    | 53.3 | 0.8 |
| 8684370 | 3.7       | 41  |     |      | 52.4 |     |
| 8684380 | 3.8       | 42  |     |      | 51.6 |     |
| 8684390 | 3.9       | 43  |     |      | 50.8 |     |
| 8684400 | 4         | 44  | 105 | 5    | 50   | 0.9 |
| 8686410 | 4.1 - 5   | 45  |     |      | 57.3 |     |
| 8684410 | 4.1       | 46  |     |      | 55.5 |     |
| 8686420 | 4.2 - 5   | 46  |     |      | 56.5 |     |
| 8684420 | 4.2       | 47  | 105 | 5    | 54.6 | 1.0 |
| 8686430 | 4.3 - 5   | 47  |     |      | 55.7 |     |
| 8684430 | 4.3       | 48  |     |      | 53.8 |     |
| 8686440 | 4.4 - 5   | 48  |     |      | 54.9 |     |
| 8684440 | 4.4       | 49  | 105 | 5    | 53   | 1.1 |
| 8686450 | 4.5 - 5   | 50  |     |      | 53.1 |     |
| 8684450 | 4.5       | 51  |     |      | 51.2 |     |
| 8686460 | 4.6 - 5   | 51  |     |      | 52.3 |     |
| 8684460 | 4.6       | 52  | 105 | 5    | 50.4 | 1.2 |
| 8686470 | 4.7 - 5   | 52  |     |      | 51.4 |     |
| 8684470 | 4.7       | 53  |     |      | 49.6 |     |
| 8686480 | 4.8 - 5   | 53  |     |      | 50.6 |     |
| 8684480 | 4.8       | 54  | 105 | 5    | 48.8 | 1.3 |
| 8686490 | 4.9 - 5   | 54  |     |      | 49.8 |     |
| 8684490 | 4.9       | 55  |     |      | 47.9 |     |
| 8686500 | 5 - 5     | 55  |     |      | 49   |     |
| 8684500 | 5         | 56  | 115 | 6    | 47.1 | 1.4 |
| 8686510 | 5.1       | 56  |     |      | 56.3 |     |
| 8684520 | 5.2       | 57  |     |      | 55.5 |     |
| 8686530 | 5.3       | 58  |     |      | 54.7 |     |
| 8684540 | 5.4       | 59  | 115 | 6    | 53.9 | 1.5 |
| 8686550 | 5.5       | 61  |     |      | 52.1 |     |
| 8684560 | 5.6       | 62  |     |      | 51.3 |     |
| 8686570 | 5.7       | 63  |     |      | 50.4 |     |
| 8684580 | 5.8       | 64  | 115 | 6    | 49.6 | 1.6 |
| 8684590 | 5.9       | 65  |     |      | 48.8 |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8684600 | 6         | 66  | 115 | 6    | 48   | 1.2 |
| 8686610 | 6.1 - 7   | 67  | 125 | 7    | 57   | 1.3 |
| 8684610 | 6.1       | 68  |     |      | 53.5 |     |
| 8686620 | 6.2 - 7   | 68  |     |      | 56   |     |
| 8684620 | 6.2       | 69  |     |      | 52.6 |     |
| 8686630 | 6.3 - 7   | 69  | 125 | 7    | 55   | 1.4 |
| 8684630 | 6.3       | 70  |     |      | 51.8 |     |
| 8686640 | 6.4 - 7   | 70  |     |      | 54   |     |
| 8684640 | 6.4       | 71  |     |      | 51   |     |
| 8686650 | 6.5 - 7   | 72  | 125 | 7    | 52   | 1.5 |
| 8684650 | 6.5       | 73  |     |      | 49.2 |     |
| 8686660 | 6.6 - 7   | 73  |     |      | 51   |     |
| 8684660 | 6.6       | 74  |     |      | 48.4 |     |
| 8686670 | 6.7 - 7   | 74  | 140 | 8    | 50   | 1.6 |
| 8684670 | 6.7       | 75  |     |      | 47.6 |     |
| 8686680 | 6.8 - 7   | 75  |     |      | 49   |     |
| 8684680 | 6.8       | 76  |     |      | 46.8 |     |
| 8686690 | 6.9 - 7   | 76  | 140 | 8    | 48   | 1.7 |
| 8684690 | 6.9       | 77  |     |      | 45.9 |     |
| 8686700 | 7 - 7     | 77  |     |      | 47   |     |
| 8684700 | 7         | 78  |     |      | 45.1 |     |
| 8686710 | 7.1 - 7   | 78  | 140 | 8    | 61   | 1.8 |
| 8684710 | 7.1       | 79  |     |      | 60   |     |
| 8686720 | 7.2 - 7   | 79  |     |      | 59   |     |
| 8684720 | 7.2       | 80  |     |      | 58   |     |
| 8686730 | 7.3 - 7   | 80  | 140 | 8    | 56   | 1.9 |
| 8684730 | 7.3       | 81  |     |      | 55   |     |
| 8686740 | 7.4 - 7   | 81  |     |      | 54   |     |
| 8684740 | 7.4       | 82  |     |      | 53   |     |
| 8686750 | 7.5 - 7   | 82  | 140 | 8    | 52   | 2.0 |
| 8684750 | 7.5       | 83  |     |      | 51   |     |
| 8686760 | 7.6 - 7   | 83  |     |      | 50   |     |
| 8684760 | 7.6       | 84  |     |      | 49   |     |
| 8686770 | 7.7 - 7   | 84  | 140 | 8    | 48   | 2.1 |
| 8684770 | 7.7       | 85  |     |      | 47   |     |
| 8686780 | 7.8 - 7   | 85  |     |      | 46   |     |
| 8684780 | 7.8       | 86  |     |      | 45   |     |
| 8686790 | 7.9 - 7   | 86  | 140 | 8    | 44   | 2.2 |
| 8684790 | 7.9       | 87  |     |      | 43   |     |
| 8686800 | 8 - 7     | 87  |     |      | 42   |     |
| 8684800 | 8         | 88  |     |      | 41   |     |
| 8686810 | 8.1 - 9   | 88  | 150 | 9    | 60   | 2.3 |
| 8684810 | 8.1       | 89  |     |      | 56.5 |     |
| 8686820 | 8.2 - 9   | 89  |     |      | 59   |     |
| 8684820 | 8.2       | 90  |     |      | 55.6 |     |
| 8686830 | 8.3 - 9   | 90  | 150 | 9    | 58   | 2.4 |
| 8684830 | 8.3       | 91  |     |      | 54.8 |     |
| 8686840 | 8.4 - 9   | 91  |     |      | 57   |     |
| 8684840 | 8.4       | 92  |     |      | 54   |     |
| 8686850 | 8.5 - 9   | 92  | 150 | 9    | 55   | 2.5 |
| 8684850 | 8.5       | 93  |     |      | 52.2 |     |
| 8686860 | 8.6 - 9   | 93  |     |      | 54   |     |
| 8684860 | 8.6       | 94  |     |      | 51.4 |     |
| 8686870 | 8.7 - 9   | 94  | 150 | 9    | 53   | 2.6 |
| 8684870 | 8.7       | 95  |     |      | 50.6 |     |
| 8686880 | 8.8 - 9   | 95  |     |      | 52   |     |
| 8684880 | 8.8       | 96  |     |      | 49.8 |     |
| 8686890 | 8.9 - 9   | 96  | 150 | 9    | 51   | 2.7 |
| 8684890 | 8.9       | 97  |     |      | 48.9 |     |
| 8686900 | 9 - 9     | 97  |     |      | 50   |     |
| 8684900 | 9         | 98  |     |      | 48   |     |

| EDP No. | DC - DCON | LCF | OAL | DCON | LS   | PL  |
|---------|-----------|-----|-----|------|------|-----|
| 8684900 | 9         | 99  | 150 | 9    | 48.1 | 1.9 |
| 8684910 | 9.1       | 100 | 160 | 10   | 59   | 2.0 |
| 8684920 | 9.2       | 101 |     |      | 58   |     |
| 8684930 | 9.3       | 102 |     |      | 57   |     |
| 8684940 | 9.4       | 103 |     |      | 56   |     |
| 8684950 | 9.5       | 105 | 160 | 10   | 54   | 2.1 |
| 8684960 | 9.6       | 106 |     |      | 53   |     |
| 8684970 | 9.7       | 107 |     |      | 52   |     |
| 8684980 | 9.8       | 108 |     |      | 51   |     |
| 8684990 | 9.9       | 109 | 160 | 10   | 50   | 2.2 |
| 8685000 | 10        | 110 |     |      | 49   |     |
| 8687010 | 10.1 - 11 | 111 |     |      | 70   |     |
| 8685010 | 10.1      | 112 |     |      | 66.5 |     |
| 8687020 | 10.2 - 11 | 112 | 182 | 11   | 69   | 2.3 |
| 8685020 | 10.2      | 113 |     |      | 65.6 |     |
| 8687030 | 10.3 - 11 | 113 |     |      | 68   |     |
| 8685030 | 10.3      | 114 |     |      | 64.8 |     |
| 8687040 | 10.4 - 11 | 114 | 182 | 11   | 67   | 2.4 |
| 8685040 | 10.4      | 115 |     |      | 64   |     |
| 8687050 | 10.5 - 11 | 116 |     |      | 65   |     |
| 8685050 | 10.5      | 117 |     |      | 62.2 |     |
| 8687060 | 10.6 - 11 | 117 | 182 | 11   | 64   | 2.5 |
| 8685060 | 10.6      | 118 |     |      | 61.4 |     |
| 8687070 | 10.7 - 11 | 118 |     |      | 63   |     |
| 8685070 | 10.7      | 119 |     |      | 60.6 |     |
| 8687080 | 10.8 - 11 | 119 | 182 | 11   | 62   | 2.6 |
| 8685080 | 10.8      | 120 |     |      | 59.8 |     |
| 8687090 | 10.9 - 11 | 120 |     |      | 61   |     |
| 8685090 | 10.9      | 121 |     |      | 58.9 |     |
| 8687100 | 11 - 11   | 121 | 182 | 11   | 60   | 2.7 |
| 8685100 | 11        | 122 |     |      | 58.1 |     |
| 8687110 | 11.1      | 123 |     |      | 71   |     |
| 8685110 | 11.1      | 124 |     |      | 70   |     |
| 8687120 | 11.2      | 125 | 194 | 12   | 69   | 2.8 |
| 8685120 | 11.2      | 126 |     |      | 68   |     |
| 8687130 | 11.3      | 127 |     |      | 66   |     |
| 8685130 | 11.3      | 128 |     |      | 65   |     |
| 8687140 | 11.4      | 129 | 194 | 12   | 64   | 2.9 |
| 8685140 | 11.4      | 130 |     |      | 63   |     |
| 8687150 | 11.5      | 131 |     |      | 62   |     |
| 8685150 | 11.5      | 132 |     |      | 61   |     |
| 8687160 | 11.6      | 133 | 194 | 12   | 60   | 3.0 |
| 8685160 | 11.6      | 134 |     |      | 59   |     |
| 8687170 | 11.7      | 135 |     |      | 58   |     |
| 8685170 | 11.7      | 136 |     |      | 57   |     |
| 8687180 | 11.8      | 137 | 194 | 12   | 56   | 3.1 |
| 8685180 | 11.8      | 138 |     |      | 55   |     |
| 8687190 | 11.9      | 139 |     |      | 54   |     |
| 8685190 | 11.9      | 140 |     |      | 53   |     |
| 8687200 | 12        | 141 | 194 | 12   | 52   | 3.2 |
| 8685200 | 12        | 142 |     |      | 51   |     |
| 8687210 |           | 143 |     |      | 50   |     |
| 8685210 |           | 144 |     |      | 49   |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C-0.25%          | C0.25-0.45%         | C0.45%-           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-SUS-8D    | ○                | ○                   | ○                 | ○           |                |                             |                 |             |             | ○                 |              | ○        | ○                      | ○              | ○       |                         | ○               |                               |





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FEED**  
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**CARBIDE**

**EgiAs**

**h8**

**30°**

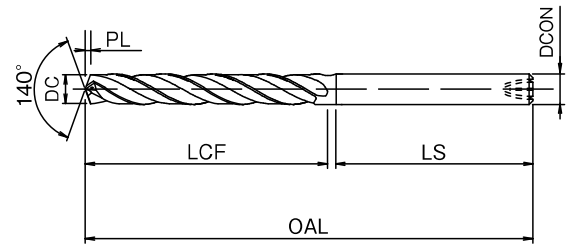
**SHRINK  
FIT**

| EDP No. | DC   | LCF | OAL | DCON | LS   | PL  |
|---------|------|-----|-----|------|------|-----|
| 8720300 | 3    | 18  | 66  | 3    | 47   | 0.5 |
| 8720330 | 3.3  | 20  |     |      | 51.7 | 0.6 |
| 8720350 | 3.5  | 21  | 74  | 4    | 51.1 |     |
| 8720366 | 3.66 | 22  |     |      | 50.4 | 0.7 |
| 8720400 | 4    | 24  |     |      | 49   |     |
| 8720420 | 4.2  | 26  |     |      | 49.6 | 0.8 |
| 8720450 | 4.5  | 27  | 80  |      | 49.2 |     |
| 8720460 | 4.6  | 28  |     |      | 48.4 |     |
| 8720500 | 5    | 25  |     |      | 52.1 | 0.9 |
| 8720510 | 5.1  | 26  |     |      | 53.3 |     |
| 8720520 | 5.2  | 26  |     |      | 53.5 |     |
| 8720530 | 5.3  | 27  |     | 6    | 52.7 | 1   |
| 8720540 | 5.4  | 27  |     |      | 52.9 |     |
| 8720550 | 5.5  | 28  | 82  |      | 52.1 |     |
| 8720560 | 5.6  | 28  |     |      | 52.3 |     |
| 8720570 | 5.7  | 29  |     |      | 51.4 |     |
| 8720580 | 5.8  | 29  |     |      | 51.6 |     |
| 8720590 | 5.9  | 30  |     |      | 50.8 | 1.1 |
| 8720600 | 6    | 30  |     |      | 51   |     |
| 8720610 | 6.1  | 31  |     |      | 52.5 |     |
| 8720620 | 6.2  | 31  |     |      | 52.6 |     |
| 8720630 | 6.3  | 32  |     |      | 51.8 |     |
| 8720640 | 6.4  | 32  |     |      | 52   |     |
| 8720650 | 6.5  | 33  | 88  |      | 51.2 | 1.2 |
| 8720660 | 6.6  | 33  |     |      | 51.4 |     |
| 8720670 | 6.7  | 34  |     |      | 50.6 |     |
| 8720680 | 6.8  | 34  |     |      | 50.8 |     |
| 8720690 | 6.9  | 35  |     |      | 49.9 |     |
| 8720700 | 7    | 35  |     |      | 50.1 |     |
| 8720710 | 7.1  | 36  |     | 8    | 57   | 1.3 |
| 8720720 | 7.2  | 36  |     |      | 56   |     |
| 8720730 | 7.3  | 37  |     |      | 55   |     |
| 8720738 | 7.38 | 37  |     |      | 54   | 1.4 |
| 8720740 | 7.4  | 38  | 94  |      | 53   |     |
| 8720750 | 7.5  | 38  |     |      | 55   |     |
| 8720760 | 7.6  | 39  |     |      | 54   |     |
| 8720770 | 7.7  | 40  |     |      | 53   |     |
| 8720780 | 7.8  | 41  |     |      | 55.5 | 1.5 |
| 8720790 | 7.9  | 41  |     |      | 55.6 |     |
| 8720800 | 8    | 42  |     |      | 54.8 |     |
| 8720810 | 8.1  | 42  |     |      | 55   |     |
| 8720820 | 8.2  | 43  | 101 |      | 54.2 |     |
| 8720830 | 8.3  | 43  |     |      | 54.4 |     |
| 8720840 | 8.4  | 44  |     |      | 53.6 |     |
| 8720850 | 8.5  | 44  |     | 10   | 53.8 | 1.6 |
| 8720860 | 8.6  | 45  |     |      | 52.9 |     |
| 8720870 | 8.7  | 45  |     |      | 53.1 |     |
| 8720880 | 8.8  | 46  |     |      | 59   |     |
| 8720890 | 8.9  | 46  |     |      | 58   | 1.7 |
| 8720900 | 9    | 47  | 106 |      |      |     |
| 8720910 | 9.1  |     |     |      |      |     |
| 8720920 | 9.2  |     |     |      |      |     |
| 8720925 | 9.25 |     |     |      |      |     |
| 8720930 | 9.3  |     |     |      |      |     |
| 8720938 | 9.38 |     |     |      |      |     |

| EDP No. | DC    | LCF | OAL | DCON | LS   | PL  |
|---------|-------|-----|-----|------|------|-----|
| 8720940 | 9.4   | 47  |     |      | 58   | 1.7 |
| 8720950 | 9.5   | 48  |     |      | 57   |     |
| 8720960 | 9.6   | 49  | 106 | 10   | 56   |     |
| 8720970 | 9.7   | 50  |     |      | 55   | 1.8 |
| 8720980 | 9.8   | 51  |     |      | 57.5 |     |
| 8720990 | 9.9   | 52  |     |      | 57.6 |     |
| 8721000 | 10    | 53  |     |      | 56.8 |     |
| 8721010 | 10.1  | 54  |     |      | 57   | 1.9 |
| 8721020 | 10.2  | 55  |     |      | 56.2 |     |
| 8721030 | 10.3  | 56  |     |      | 56.4 |     |
| 8721040 | 10.4  | 57  | 113 |      | 55.6 |     |
| 8721050 | 10.5  | 58  |     |      | 55.8 |     |
| 8721060 | 10.6  | 59  |     |      | 54.9 |     |
| 8721070 | 10.7  | 60  |     |      | 55.1 | 2   |
| 8721080 | 10.8  | 61  |     |      | 63   |     |
| 8721090 | 10.9  | 62  |     |      | 62   |     |
| 8721100 | 11    | 63  |     |      | 61   | 2.1 |
| 8721110 | 11.1  | 64  |     |      | 60   |     |
| 8721120 | 11.2  | 65  | 120 |      | 59   | 2.2 |
| 8721125 | 11.25 | 66  |     |      | 61.2 | 2.3 |
| 8721130 | 11.3  | 67  |     |      | 60.1 |     |
| 8721138 | 11.38 | 68  |     |      | 66   | 2.4 |
| 8721140 | 11.4  | 69  |     |      | 65   |     |
| 8721150 | 11.5  | 70  |     |      | 64.5 | 2.5 |
| 8721160 | 11.6  | 71  |     |      | 64.6 |     |
| 8721170 | 11.7  | 72  |     |      | 63.8 | 2.6 |
| 8721180 | 11.8  | 73  |     |      | 63.2 |     |
| 8721190 | 11.9  | 74  |     |      | 62.1 | 2.7 |
| 8721200 | 12    | 75  |     |      | 68   |     |
| 8721250 | 12.5  | 76  | 128 |      | 67   | 2.8 |
| 8721300 | 13    | 77  |     |      | 66   |     |
| 8721325 | 13.25 | 78  |     |      | 64   | 2.9 |
| 8721330 | 13.3  | 79  |     |      | 63.2 | 3   |
| 8721338 | 13.38 | 80  |     |      | 62.1 |     |
| 8721350 | 13.5  | 81  |     |      | 67   | 3.1 |
| 8721400 | 14    | 82  |     |      | 66   | 3.2 |
| 8721410 | 14.1  | 83  |     |      | 64   | 3.3 |
| 8721420 | 14.2  | 84  |     |      | 63.2 | 3.4 |
| 8721430 | 14.3  | 85  |     |      | 67   |     |
| 8721450 | 14.5  | 86  |     |      | 66   | 3.5 |
| 8721500 | 15    | 87  |     |      | 66   |     |
| 8721520 | 15.2  | 88  |     |      | 64   | 3.6 |
| 8721530 | 15.3  | 89  |     |      | 66   |     |
| 8721550 | 15.5  | 90  |     |      | 66   |     |
| 8721600 | 16    | 91  |     |      | 64   |     |
| 8721650 | 16.5  | 92  |     |      | 66   |     |
| 8721700 | 17    | 93  |     |      | 66   |     |
| 8721725 | 17.25 | 94  |     |      | 64   |     |
| 8721750 | 17.5  | 95  |     |      | 66   |     |
| 8721800 | 18    | 96  |     |      | 66   |     |
| 8721850 | 18.5  | 97  |     |      | 64   |     |
| 8721900 | 19    | 98  |     |      | 66   |     |
| 8721925 | 19.25 | 99  |     |      | 64   |     |
| 8721950 | 19.5  | 100 |     |      | 64   |     |
| 8722000 | 20    | 100 |     |      | 64   |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADO-TRS-3D    | ○                | ○                   | ○                 | ○           |                |                             |                 |             |             | ○                 |              | ○        | ○                      | ○              | ○       |                         | ○               |                               |





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FEED**  
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**CARBIDE**

**EgiAs**

**h8**

**30°**

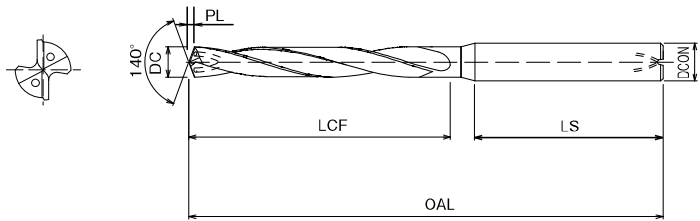
**SHRINK  
FIT**

| EDP No. | DC   | LCF | OAL | DCON | LS   | PL  |
|---------|------|-----|-----|------|------|-----|
| 8722300 | 3    | 27  | 78  | 3    | 50   | 0.5 |
| 8722330 | 3.3  | 30  |     |      | 53.7 | 0.6 |
| 8722350 | 3.5  | 32  | 86  | 4    | 52.1 |     |
| 8722366 | 3.66 | 33  |     |      | 51.4 | 0.7 |
| 8722400 | 4    | 36  |     |      | 49   |     |
| 8722420 | 4.2  | 38  |     |      | 52.6 |     |
| 8722450 | 4.5  | 41  | 95  |      | 50.2 | 0.8 |
| 8722460 | 4.6  | 42  |     |      | 49.4 |     |
| 8722500 | 5    | 45  |     |      | 47.1 |     |
| 8722510 | 5.1  | 41  |     |      | 56.3 | 0.9 |
| 8722520 | 5.2  | 42  |     |      | 55.5 |     |
| 8722530 | 5.3  | 43  |     |      | 54.7 |     |
| 8722540 | 5.4  |     |     | 6    | 53.9 |     |
| 8722550 | 5.5  | 44  |     |      | 54.1 | 1   |
| 8722560 | 5.6  | 45  | 100 |      | 53.3 |     |
| 8722570 | 5.7  | 46  |     |      | 52.4 |     |
| 8722580 | 5.8  | 47  |     |      | 51.6 |     |
| 8722590 | 5.9  |     |     |      | 50.8 |     |
| 8722600 | 6    | 48  |     |      | 51   | 1.1 |
| 8722610 | 6.1  | 49  |     |      | 55.5 |     |
| 8722620 | 6.2  | 50  |     |      | 54.6 |     |
| 8722630 | 6.3  | 51  |     |      | 53.8 |     |
| 8722640 | 6.4  |     |     |      | 53   |     |
| 8722650 | 6.5  | 52  |     |      | 53.2 |     |
| 8722660 | 6.6  | 53  | 109 |      | 52.4 | 1.2 |
| 8722670 | 6.7  | 54  |     |      | 51.6 |     |
| 8722680 | 6.8  | 55  |     |      | 50.8 |     |
| 8722690 | 6.9  |     |     |      | 49.9 |     |
| 8722700 | 7    | 56  |     |      | 50.1 |     |
| 8722710 | 7.1  | 57  |     | 8    | 60   |     |
| 8722720 | 7.2  | 58  |     |      | 59   | 1.3 |
| 8722730 | 7.3  | 59  |     |      | 58   |     |
| 8722738 | 7.38 |     |     |      |      |     |
| 8722740 | 7.4  | 60  |     |      | 57   |     |
| 8722750 | 7.5  |     | 118 |      |      |     |
| 8722760 | 7.6  | 61  |     |      | 56   |     |
| 8722770 | 7.7  | 62  |     |      | 55   | 1.4 |
| 8722780 | 7.8  | 63  |     |      | 54   |     |
| 8722790 | 7.9  | 64  |     |      | 53   |     |
| 8722800 | 8    |     |     |      |      |     |
| 8722810 | 8.1  | 65  |     |      | 58.5 |     |
| 8722820 | 8.2  | 66  |     |      | 57.6 | 1.5 |
| 8722830 | 8.3  | 67  |     |      | 56.8 |     |
| 8722840 | 8.4  |     |     |      | 56   |     |
| 8722850 | 8.5  | 68  |     |      | 56.2 |     |
| 8722860 | 8.6  | 69  |     |      | 55.4 |     |
| 8722870 | 8.7  | 70  |     |      | 54.6 |     |
| 8722880 | 8.8  | 71  |     | 10   | 53.8 | 1.6 |
| 8722890 | 8.9  | 72  |     |      | 52.9 |     |
| 8722900 | 9    |     |     |      | 53.1 |     |
| 8722910 | 9.1  | 73  |     |      | 62   |     |
| 8722920 | 9.2  |     |     |      |      |     |
| 8722925 | 9.25 | 74  |     |      | 61   | 1.7 |
| 8722930 | 9.3  | 75  | 136 |      | 60   |     |
| 8722938 | 9.38 | 76  |     |      | 59   |     |

| EDP No. | DC    | LCF | OAL | DCON | LS   | PL  |
|---------|-------|-----|-----|------|------|-----|
| 8722940 | 9.4   | 76  |     |      | 59   | 1.7 |
| 8722950 | 9.5   |     |     |      | 58   |     |
| 8722960 | 9.6   | 77  | 136 | 10   | 57   |     |
| 8722970 | 9.7   | 78  |     |      | 56   | 1.8 |
| 8722980 | 9.8   | 79  |     |      | 55   |     |
| 8722990 | 9.9   | 80  |     |      |      |     |
| 8723000 | 10    |     |     |      | 60.5 | 1.9 |
| 8723010 | 10.1  | 81  |     |      | 59.6 |     |
| 8723020 | 10.2  | 82  |     |      | 58.8 |     |
| 8723030 | 10.3  | 83  |     |      | 58   |     |
| 8723040 | 10.4  | 84  |     |      | 58.2 |     |
| 8723050 | 10.5  |     | 146 |      | 57.4 |     |
| 8723060 | 10.6  | 85  |     |      | 56.6 |     |
| 8723070 | 10.7  | 86  |     |      | 55.8 |     |
| 8723080 | 10.8  | 87  |     |      | 54.9 |     |
| 8723090 | 10.9  | 88  |     |      | 55.1 | 2   |
| 8723100 | 11    |     |     |      | 66   |     |
| 8723110 | 11.1  | 89  |     | 12   | 65   |     |
| 8723120 | 11.2  | 90  |     |      | 64   |     |
| 8723125 | 11.25 |     |     |      |      |     |
| 8723130 | 11.3  | 91  |     |      | 63   | 2.1 |
| 8723138 | 11.38 |     |     |      | 62   |     |
| 8723140 | 11.4  | 92  | 156 |      | 61   |     |
| 8723150 | 11.5  |     |     |      | 60   |     |
| 8723160 | 11.6  | 93  |     |      | 59   | 2.2 |
| 8723170 | 11.7  | 94  |     |      | 63.2 | 2.3 |
| 8723180 | 11.8  | 95  |     |      | 60.1 |     |
| 8723190 | 11.9  |     |     |      | 69   | 2.4 |
| 8723200 | 12    | 96  |     |      | 68   |     |
| 8723250 | 12.5  | 100 | 167 |      | 67   |     |
| 8723300 | 13    | 104 |     | 14   | 63   | 2.5 |
| 8723325 | 13.25 | 106 |     |      | 67.5 |     |
| 8723330 | 13.3  | 107 |     |      | 66.6 | 2.6 |
| 8723338 | 13.38 | 108 | 176 |      | 65.8 |     |
| 8723350 | 13.5  |     |     |      | 65.2 |     |
| 8723400 | 14    | 112 |     |      | 62.1 | 2.7 |
| 8723410 | 14.1  | 113 |     |      | 70   |     |
| 8723420 | 14.2  | 114 |     |      | 69   | 2.8 |
| 8723430 | 14.3  | 115 | 185 |      | 68   |     |
| 8723450 | 14.5  | 116 |     |      | 64   | 2.9 |
| 8723500 | 15    | 120 |     | 16   | 65.2 | 3   |
| 8723520 | 15.2  | 122 |     |      | 62.1 | 3.1 |
| 8723530 | 15.3  | 123 |     |      | 70   |     |
| 8723550 | 15.5  | 124 | 193 |      | 68   | 3.2 |
| 8723600 | 16    | 128 |     |      | 64   |     |
| 8723650 | 16.5  | 132 |     | 201  | 65.2 | 3.3 |
| 8723700 | 17    | 136 |     |      | 62.1 | 3.4 |
| 8723725 | 17.25 | 138 |     | 18   | 64   |     |
| 8723750 | 17.5  | 140 |     |      | 68   | 3.5 |
| 8723800 | 18    | 144 |     |      | 65.2 |     |
| 8723850 | 18.5  | 148 |     |      | 62.1 |     |
| 8723900 | 19    | 152 | 217 |      | 70   | 3.6 |
| 8723925 | 19.25 | 154 |     | 20   | 68   |     |
| 8723950 | 19.5  | 156 | 225 |      | 64   |     |
| 8724000 | 20    | 160 |     |      |      |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel® | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|----------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL       | AC                      |                 | AZ91D                         |
| ADO-TRS-5D    | ○                | ○                   | ○                 | ○           |                |                             |                 |             |             | ○                 |              | ○        | ○                      | ○              | ○        |                         | ○               |                               |





**SPEED  
FEED**  
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**CARBIDE**

**WXS**

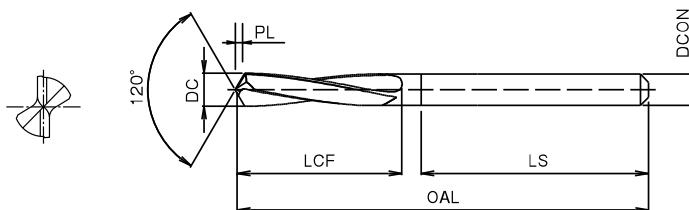
**h8**

**12°-20°**

**SHRINK  
FIT**

| EDP No. | DC    | LCF | OAL | DCON | LS   | PL  |
|---------|-------|-----|-----|------|------|-----|
| 3316330 | 3.3   |     |     |      | 39   |     |
| 3316340 | 3.4   | 32  |     |      | 39.1 | 0.6 |
| 3316349 | 3.49  |     |     |      | 39.3 |     |
| 3316350 | 3.5   |     | 78  |      | 37.5 |     |
| 3316360 | 3.6   | 34  |     |      | 37.7 |     |
| 3316370 | 3.7   |     |     |      | 35.9 | 0.7 |
| 3316380 | 3.8   |     |     |      | 36.1 |     |
| 3316390 | 3.9   | 36  |     |      | 36.3 |     |
| 3316400 | 4     |     |     |      | 44.5 |     |
| 3316410 | 4.1   |     |     |      | 44.6 |     |
| 3316415 | 4.15  | 38  |     |      | 41.8 | 0.8 |
| 3316420 | 4.2   |     |     |      | 42   |     |
| 3316430 | 4.3   | 41  |     |      | 42.2 |     |
| 3316440 | 4.4   |     | 88  |      | 40.4 |     |
| 3316450 | 4.5   | 43  |     |      | 40.6 |     |
| 3316460 | 4.6   |     |     | 6    | 38.8 | 0.9 |
| 3316470 | 4.7   |     |     |      | 38.9 |     |
| 3316480 | 4.8   | 45  |     |      | 39.1 |     |
| 3316490 | 4.9   |     |     |      | 46.3 |     |
| 3316500 | 5     | 42  |     |      | 46.5 |     |
| 3316510 | 5.1   |     |     |      | 44.7 |     |
| 3316520 | 5.2   |     |     |      | 44.9 |     |
| 3316530 | 5.3   | 44  |     |      | 45.1 | 1   |
| 3316540 | 5.4   |     |     |      | 43.2 |     |
| 3316550 | 5.5   |     | 92  |      | 43.3 |     |
| 3316556 | 5.56  | 46  |     |      | 43.4 |     |
| 3316560 | 5.6   |     |     |      | 42   | 1.1 |
| 3316570 | 5.7   | 48  |     |      |      |     |
| 3316580 | 5.8   |     |     |      | 45.2 | 1.2 |
| 3316590 | 5.9   |     |     |      | 41.8 |     |
| 3316600 | 6     | 52  |     |      | 42.1 | 1.3 |
| 3316650 | 6.5   | 56  | 102 |      | 56   | 1.4 |
| 3316680 | 6.8   | 60  |     | 8    | 52   | 1.5 |
| 3316700 | 7     | 64  |     |      | 58   | 1.6 |
| 3316750 | 7.5   | 68  | 118 |      | 54   | 1.7 |
| 3316780 | 7.8   | 70  |     |      | 58   | 1.8 |
| 3316800 | 8     | 72  |     | 10   | 60   | 1.9 |
| 3316850 | 8.5   | 76  |     |      | 56   | 2   |
| 3316858 | 8.58  | 80  |     |      | 62   | 2.1 |
| 3316870 | 8.7   |     | 128 |      | 60   | 2.2 |
| 3316880 | 8.8   |     |     |      |      |     |
| 3316900 | 9     |     |     |      |      |     |
| 3316950 | 9.5   |     |     |      |      |     |
| 3316980 | 9.8   |     |     |      |      |     |
| 3316997 | 9.97  |     |     |      |      |     |
| 3317000 | 10    |     |     |      |      |     |
| 3317030 | 10.3  |     |     |      |      |     |
| 3317050 | 10.5  |     |     |      |      |     |
| 3317080 | 10.8  |     |     |      |      |     |
| 3317100 | 11    |     |     |      |      |     |
| 3317150 | 11.5  |     |     |      |      |     |
| 3317156 | 11.56 |     |     |      |      |     |
| 3317180 | 11.8  |     |     |      |      |     |
| 3317200 | 12    |     |     |      |      |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel® | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|----------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL       | AC                      |                 | AZ91D                         |
| WHO55-5D      |                  |                     |                   |             |                |                             |                 |             |             |                   |              |          |                        |                |          |                         |                 |                               |



**SPEED  
FEED**  
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**CARBIDE**

**WXS**

**h8**

**12°**

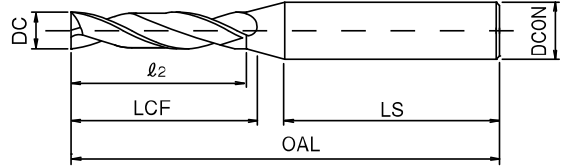
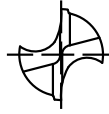
**SHRINK  
FIT**

| EDP No. | DC  | LCF | OAL | DCON | LS   | PL  |
|---------|-----|-----|-----|------|------|-----|
| 3318200 | 2   |     |     |      | 27.1 |     |
| 3318210 | 2.1 | 12  | 42  |      | 27.3 | 0.6 |
| 3318220 | 2.2 |     |     |      | 27.5 |     |
| 3318230 | 2.3 | 13  | 43  |      | 27.7 |     |
| 3318240 | 2.4 |     |     |      | 27.9 | 0.7 |
| 3318250 | 2.5 | 14  | 44  | 3    | 28.1 |     |
| 3318260 | 2.6 |     |     |      | 28.3 |     |
| 3318270 | 2.7 |     |     |      | 28.4 | 0.8 |
| 3318280 | 2.8 | 16  | 46  |      | 28.6 |     |
| 3318290 | 2.9 |     |     |      | 28.8 |     |
| 3318300 | 3   |     |     |      | 29   |     |
| 3318310 | 3.1 |     |     |      | 27.3 | 0.9 |
| 3318320 | 3.2 | 18  | 48  |      | 27.5 |     |
| 3318330 | 3.3 |     |     |      | 27.7 |     |
| 3318340 | 3.4 |     |     |      | 27.9 | 1   |
| 3318350 | 3.5 | 20  | 50  | 4    | 28.1 |     |
| 3318360 | 3.6 |     |     |      | 28.3 |     |
| 3318370 | 3.7 |     |     |      | 28.4 |     |
| 3318380 | 3.8 |     |     |      | 28.6 | 1.1 |
| 3318390 | 3.9 | 22  | 52  |      | 28.8 |     |
| 3318400 | 4   |     |     |      | 29   |     |
| 3318410 | 4.1 | 25  |     |      | 39.3 | 1.2 |
| 3318420 | 4.2 |     |     |      | 39.5 |     |
| 3318430 | 4.3 |     |     |      | 36.7 |     |
| 3318440 | 4.4 |     |     |      | 36.9 |     |
| 3318450 | 4.5 | 28  | 68  | 5    | 37.1 | 1.3 |
| 3318460 | 4.6 |     |     |      | 37.3 |     |
| 3318470 | 4.7 |     |     |      | 37.4 |     |
| 3318480 | 4.8 |     |     |      | 33.6 | 1.4 |
| 3318490 | 4.9 |     |     |      | 33.8 |     |
| 3318500 | 5   |     |     |      | 34   |     |
| 3318510 | 5.1 | 32  |     |      | 38.3 |     |
| 3318520 | 5.2 |     |     |      | 38.5 | 1.5 |
| 3318530 | 5.3 |     |     |      | 38.7 |     |
| 3318540 | 5.4 |     |     |      | 35.9 |     |
| 3318550 | 5.5 |     |     |      | 36.1 | 1.6 |
| 3318560 | 5.6 |     | 74  | 6    | 36.3 |     |
| 3318570 | 5.7 | 35  |     |      | 36.4 |     |
| 3318580 | 5.8 |     |     |      | 36.6 |     |
| 3318590 | 5.9 |     |     |      | 36.8 | 1.7 |
| 3318600 | 6   |     |     |      | 37   |     |
| 3318610 | 6.1 |     |     |      |      |     |
| 3318620 | 6.2 |     |     |      |      | 1.8 |
| 3318630 | 6.3 |     |     |      |      |     |
| 3318640 | 6.4 | 40  |     |      | 41   |     |
| 3318650 | 6.5 |     |     |      |      |     |
| 3318660 | 6.6 |     | 83  | 7    |      | 1.9 |
| 3318670 | 6.7 |     |     |      |      |     |
| 3318680 | 6.8 |     |     |      |      |     |
| 3318690 | 6.9 | 45  |     |      | 36   | 2   |
| 3318700 | 7   |     |     |      |      |     |

| EDP No. | DC   | LCF | OAL | DCON | LS | PL  |
|---------|------|-----|-----|------|----|-----|
| 3318710 | 7.1  |     |     |      |    | 2   |
| 3318720 | 7.2  |     |     |      |    |     |
| 3318730 | 7.3  | 45  |     |      | 47 | 2.1 |
| 3318740 | 7.4  |     |     |      |    |     |
| 3318750 | 7.5  |     | 94  | 8    |    | 2.2 |
| 3318760 | 7.6  |     |     |      |    |     |
| 3318770 | 7.7  |     |     |      | 42 |     |
| 3318780 | 7.8  |     |     |      |    | 2.3 |
| 3318790 | 7.9  |     |     |      |    |     |
| 3318800 | 8    | 50  |     |      |    |     |
| 3318810 | 8.1  |     |     |      |    |     |
| 3318820 | 8.2  |     |     |      |    | 2.4 |
| 3318830 | 8.3  |     |     |      | 49 |     |
| 3318840 | 8.4  |     |     |      |    |     |
| 3318850 | 8.5  |     | 101 | 9    |    | 2.5 |
| 3318860 | 8.6  |     |     |      |    |     |
| 3318870 | 8.7  |     |     |      | 42 |     |
| 3318880 | 8.8  |     |     |      |    | 2.6 |
| 3318890 | 8.9  |     |     |      |    |     |
| 3318900 | 9    | 57  |     |      |    |     |
| 3318910 | 9.1  |     |     |      |    | 2.7 |
| 3318920 | 9.2  |     |     |      | 47 |     |
| 3318930 | 9.3  |     |     |      |    |     |
| 3318940 | 9.4  |     |     |      |    | 2.8 |
| 3318950 | 9.5  |     | 106 | 10   |    |     |
| 3318960 | 9.6  |     |     |      |    |     |
| 3318970 | 9.7  |     |     |      | 41 | 2.9 |
| 3318980 | 9.8  |     |     |      |    |     |
| 3318990 | 9.9  |     |     |      |    | 3   |
| 3319000 | 10   | 63  |     |      |    |     |
| 3319010 | 10.1 |     |     |      |    |     |
| 3319020 | 10.2 |     |     |      |    | 3.1 |
| 3319030 | 10.3 |     |     |      | 48 |     |
| 3319040 | 10.4 |     |     |      |    |     |
| 3319050 | 10.5 |     | 113 | 11   |    |     |
| 3319060 | 10.6 |     |     |      |    |     |
| 3319070 | 10.7 |     |     |      |    | 3.2 |
| 3319080 | 10.8 |     |     |      | 40 |     |
| 3319090 | 10.9 |     |     |      |    |     |
| 3319100 | 11   |     |     |      |    | 3.3 |
| 3319110 | 11.1 |     |     |      |    |     |
| 3319120 | 11.2 | 71  |     |      |    |     |
| 3319130 | 11.3 |     |     |      |    |     |
| 3319140 | 11.4 |     |     |      |    | 3.4 |
| 3319150 | 11.5 |     | 120 | 12   | 47 |     |
| 3319160 | 11.6 |     |     |      |    |     |
| 3319170 | 11.7 |     |     |      |    |     |
| 3319180 | 11.8 |     |     |      |    | 3.5 |
| 3319190 | 11.9 | 76  |     |      | 42 |     |
| 3319200 | 12   |     |     |      |    |     |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel® | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|----------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C-0.25%          | 0.25-0.45%          | C0.45%-           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL       | AC                      |                 | AZ91D                         |
| WH70-DRL      |                  |                     |                   |             |                |                             |                 | ⊙           | ⊙           |                   |              |          |                        |                |          |                         |                 |                               |

Type 1



**SPEED  
FEED**  
P.160

**CARBIDE**

**EgiAs**

**IchAda**

**h8**

**20°**

**SHRINK  
FIT**

2 ≤ DC DC < 2

| EDP No. | DC   | LCF | OAL | DCON | LS   | PL  | TYPE |
|---------|------|-----|-----|------|------|-----|------|
| 3330020 | 0.2  | 0.6 |     |      | 34.1 | 0.7 |      |
| 3330025 | 0.25 | 0.8 |     |      | 34   | 0.9 |      |
| 3330030 | 0.3  | 0.9 |     |      |      | 1   |      |
| 3330035 | 0.35 | 1.1 |     |      | 33.9 | 1.2 |      |
| 3330040 | 0.4  | 1.2 |     |      |      | 1.3 |      |
| 3330045 | 0.45 | 1.4 |     |      | 33.7 | 1.5 |      |
| 3330050 | 0.5  | 1.7 |     |      | 33.4 | 1.9 |      |
| 3330055 | 0.55 | 1.9 |     |      | 33.3 | 2.1 |      |
| 3330060 | 0.6  | 2.0 |     |      | 33.2 | 2.2 |      |
| 3330065 | 0.65 | 2.2 |     |      | 33.2 | 2.4 |      |
| 3330070 | 0.7  |     |     |      | 33.1 | 2.6 |      |
| 3330071 | 0.71 | 2.4 | 40  |      | 33.2 | 2.7 |      |
| 3330072 | 0.72 |     |     |      | 33.1 | 2.7 |      |
| 3330074 | 0.74 | 2.5 |     |      | 33   | 2.8 |      |
| 3330075 | 0.75 | 2.6 |     |      | 33   | 2.9 |      |
| 3330080 | 0.8  | 2.7 |     |      |      | 3   |      |
| 3330081 | 0.81 | 2.8 |     |      | 32.9 | 3.1 |      |
| 3330085 | 0.85 | 2.9 |     |      |      | 3.2 |      |
| 3330089 | 0.89 | 3.0 |     |      |      |     |      |
| 3330090 | 0.9  |     |     |      | 32.8 | 3.3 |      |
| 3330091 | 0.91 | 3.1 |     |      |      | 3.4 |      |
| 3330092 | 0.92 |     |     |      | 37   | 4.3 |      |
| 3330095 | 0.95 | 3.2 |     |      | 36.7 | 4.7 |      |
| 3330100 | 1    | 4.0 |     |      | 36.8 |     |      |
| 3330109 | 1.09 |     |     |      | 36.5 | 5.1 |      |
| 3330110 | 1.1  | 4.4 |     |      | 36.4 | 5.3 |      |
| 3330111 | 1.11 |     |     |      | 36.4 | 5.4 |      |
| 3330112 | 1.12 | 4.5 |     |      | 36.3 | 5.5 |      |
| 3330120 | 1.2  | 4.8 |     |      | 36.2 | 5.7 |      |
| 3330125 | 1.25 | 5.0 |     |      | 36.1 | 5.9 |      |
| 3330126 | 1.26 |     |     |      | 36   | 6.1 |      |
| 3330127 | 1.27 | 5.1 |     |      | 35.9 | 6.2 |      |
| 3330128 | 1.28 |     |     |      | 35.9 | 6.3 |      |
| 3330129 | 1.29 | 5.2 |     |      | 35.7 | 6.7 |      |
| 3330130 | 1.3  |     |     |      | 35.5 | 7.1 |      |
| 3330135 | 1.35 | 5.4 |     |      | 35.4 | 7.3 |      |
| 3330140 | 1.4  | 5.6 |     |      | 35.3 | 7.5 |      |
| 3330144 | 1.44 |     |     |      | 35.2 | 7.6 |      |
| 3330145 | 1.45 | 5.8 | 45  |      |      |     |      |
| 3330146 | 1.46 |     |     |      |      |     |      |
| 3330147 | 1.47 | 5.9 |     |      |      |     |      |
| 3330148 | 1.48 |     |     |      |      |     |      |
| 3330150 | 1.5  | 6.0 |     |      |      |     |      |
| 3330153 | 1.53 | 6.1 |     |      |      |     |      |
| 3330154 | 1.54 |     |     |      |      |     |      |
| 3330155 | 1.55 | 6.2 |     |      |      |     |      |
| 3330156 | 1.56 |     |     |      |      |     |      |
| 3330157 | 1.57 | 6.3 |     |      |      |     |      |
| 3330158 | 1.58 |     |     |      |      |     |      |
| 3330160 | 1.6  | 6.4 |     |      |      |     |      |
| 3330170 | 1.7  | 6.8 |     |      |      |     |      |
| 3330175 | 1.75 | 7.0 |     |      |      |     |      |
| 3330180 | 1.8  | 7.2 |     |      |      |     |      |
| 3330182 | 1.82 |     |     |      |      |     |      |
| 3330183 | 1.83 | 7.3 |     |      |      |     |      |

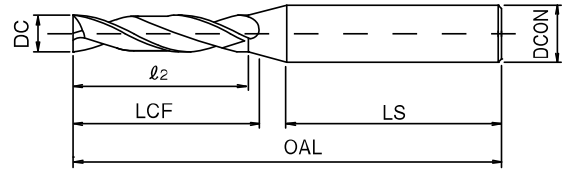
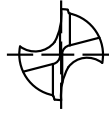
| EDP No.    | DC   | LCF | OAL | DCON | LS   | PL  | TYPE |
|------------|------|-----|-----|------|------|-----|------|
| 3330184    | 1.84 |     |     |      | 35.1 |     |      |
| 3330185    | 1.85 | 7.4 | 45  | 3    | 35.2 | 7.7 |      |
| 3330186    | 1.86 |     |     |      |      |     |      |
| 3330190    | 1.9  | 7.6 |     |      | 35.1 | 7.9 |      |
| 3330195    | 1.95 | 7.8 |     |      | 34.9 | 8.1 |      |
| 3330200    | 2    |     |     |      |      |     |      |
| 5560586450 | 2.01 |     |     |      | 10.3 |     |      |
| 5560586460 | 2.02 |     |     |      |      |     |      |
| 5560586470 | 2.03 |     |     |      | 10.4 |     |      |
| 5560586480 | 2.04 |     |     |      |      |     |      |
| 5560586490 | 2.05 | 10  |     |      |      |     |      |
| 5560586500 | 2.06 |     |     |      |      |     |      |
| 5560586510 | 2.07 |     |     |      | 10.5 |     |      |
| 5560586520 | 2.08 |     |     |      |      |     |      |
| 5560586530 | 2.09 |     |     |      | 10.6 |     |      |
| 3330210    | 2.1  |     |     |      |      |     |      |
| 5560586540 | 2.11 |     |     |      | 10.7 |     |      |
| 5560586550 | 2.12 |     |     |      |      |     |      |
| 5560586560 | 2.13 |     |     |      | 10.8 |     |      |
| 5560586570 | 2.14 |     |     |      |      |     |      |
| 5560586580 | 2.15 |     |     |      | 10.9 |     |      |
| 5560586590 | 2.16 |     |     |      |      |     |      |
| 5560586600 | 2.17 |     |     |      | 11   |     |      |
| 5560586610 | 2.18 |     |     |      |      |     |      |
| 5560586620 | 2.19 |     |     |      | 10.7 |     |      |
| 3330220    | 2.2  |     |     |      |      |     |      |
| 5560586630 | 2.21 |     |     |      | 10.8 |     |      |
| 5560586640 | 2.22 |     |     |      |      |     |      |
| 5560586650 | 2.23 |     |     |      | 10.9 |     |      |
| 5560586660 | 2.24 |     |     |      |      |     |      |
| 5560586670 | 2.25 |     |     |      | 11   |     |      |
| 5560586680 | 2.26 |     |     |      |      |     |      |
| 5560586690 | 2.27 |     |     |      | 11.1 |     |      |
| 5560586700 | 2.28 |     |     |      |      |     |      |
| 5560586710 | 2.29 |     |     |      | 11.2 |     |      |
| 3330230    | 2.3  |     |     |      |      |     |      |
| 5560586720 | 2.31 |     |     |      |      |     |      |
| 3330232    | 2.32 |     |     |      |      |     |      |
| 5560586730 | 2.33 |     |     |      |      |     |      |
| 5560586740 | 2.34 |     |     |      |      |     |      |
| 5560586750 | 2.35 |     |     |      |      |     |      |
| 5560586760 | 2.36 |     |     |      |      |     |      |
| 5560586770 | 2.37 |     |     |      |      |     |      |
| 5560586780 | 2.38 |     |     |      |      |     |      |
| 5560586790 | 2.39 |     |     |      |      |     |      |
| 3330240    | 2.4  |     |     |      |      |     |      |
| 5560586800 | 2.41 |     |     |      |      |     |      |
| 3330242    | 2.42 |     |     |      |      |     |      |
| 5560586810 | 2.43 |     |     |      |      |     |      |
| 5560586820 | 2.44 |     |     |      |      |     |      |
| 5560586830 | 2.45 |     |     |      |      |     |      |
| 5560586840 | 2.46 |     |     |      |      |     |      |
| 5560586850 | 2.47 |     |     |      |      |     |      |
| 5560586860 | 2.48 |     |     |      |      |     |      |
| 5560586870 | 2.49 |     |     |      |      |     |      |

| EDP No.    | DC   | LCF | OAL | DCON | LS   | PL | TYPE |
|------------|------|-----|-----|------|------|----|------|
| 3330250    | 2.5  |     |     |      |      |    |      |
| 5560586880 | 2.51 | 12  |     |      | 11.2 |    |      |
| 5560586890 | 2.52 |     |     |      |      |    |      |
| 5560586900 | 2.53 |     |     |      |      |    |      |
| 3330254    | 2.54 |     |     |      | 11.3 |    |      |
| 5560586910 | 2.55 |     |     |      |      |    |      |
| 5560586920 | 2.56 |     |     |      |      |    |      |
| 5560586930 | 2.57 |     |     |      | 11.4 |    |      |
| 3330258    | 2.58 |     |     |      |      |    |      |
| 5560586940 | 2.59 |     |     |      |      |    |      |
| 3330260    | 2.6  |     |     |      |      |    |      |
| 5560586950 | 2.61 |     |     |      | 11.5 |    |      |
| 5560586960 | 2.62 |     |     |      |      |    |      |
| 5560586970 | 2.63 | 13  |     |      |      |    |      |
| 5560586980 | 2.64 |     |     |      |      |    |      |
| 5560586990 | 2.65 |     |     |      | 11.6 |    |      |
| 5560587000 | 2.66 |     |     |      |      |    |      |
| 5560587010 | 2.67 |     |     |      | 11.7 |    |      |
| 5560587020 | 2.68 |     |     |      |      |    |      |
| 5560587030 | 2.69 |     |     |      |      |    |      |
| 3330270    | 2.7  |     | 50  | 4    | 36   |    |      |
| 5560587040 | 2.71 |     |     |      |      |    |      |
| 5560587050 | 2.72 |     |     |      | 11.8 |    |      |
| 5560587060 | 2.73 |     |     |      |      |    |      |
| 5560587070 | 2.74 |     |     |      | 11.9 |    |      |
| 5560587080 | 2.75 |     |     |      |      |    |      |
| 3330276    | 2.76 |     |     |      |      |    |      |
| 5560587090 | 2.77 |     |     |      | 11.7 |    |      |
| 3330278    | 2.78 |     |     |      |      |    |      |
| 5560587100 | 2.79 |     |     |      | 11.8 |    |      |
| 3330280    | 2.8  |     |     |      |      |    |      |
| 5560587110 | 2.81 | 14  |     |      |      |    |      |
| 5560587120 | 2.82 |     |     |      | 11.9 |    |      |
| 5560587130 | 2.83 |     |     |      |      |    |      |
| 5560587140 | 2.84 |     |     |      |      |    |      |
| 5560587150 | 2.85 |     |     |      |      |    |      |
| 5560587160 | 2.86 |     |     |      |      |    |      |
| 5560587170 | 2.87 |     |     |      | 11.2 |    |      |
| 5560587180 | 2.88 |     |     |      |      |    |      |
| 5560587190 | 2.89 |     |     |      | 11.3 |    |      |
| 3330290    | 2.9  |     |     |      |      |    |      |
| 5560587200 | 2.91 |     |     |      |      |    |      |
| 5560587210 | 2.92 |     |     |      | 11.4 |    |      |
| 5560587220 | 2.93 |     |     |      |      |    |      |
| 5560587230 | 2.94 |     |     |      | 11.5 |    |      |
| 5560587240 | 2.95 |     |     |      |      |    |      |
| 5560587250 | 2.96 |     |     |      |      |    |      |
| 5560587260 | 2.97 | 15  | 55  | 6    | 38   |    |      |
| 5560587270 | 2.98 |     |     |      |      |    |      |
| 5560587280 | 2.99 |     |     |      |      |    |      |
| 3330300    | 3    |     |     |      |      |    |      |
| 5560587290 | 3.01 |     |     |      | 11.4 |    |      |
| 5560587300 | 3.02 |     |     |      |      |    |      |
| 3330303    | 3.03 |     |     |      |      |    |      |
| 5560587310 | 3.04 |     |     |      | 11.5 |    |      |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADF-2D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       | ○                       | ○               | ○                             |



Type 1


**SPEED  
FEED**  
P.160

**CARBIDE**
**EgiAs**
**IchAda**
**h8**
**20°**
**SHRINK  
FIT**
 $2 \leq DC$     $DC < 2$ 

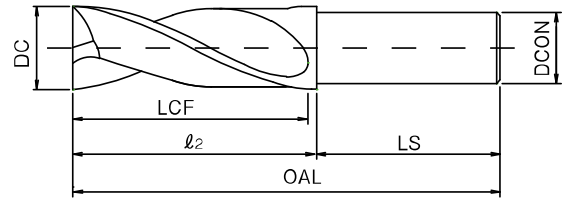
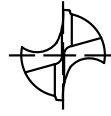
| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2   | TYPE |
|------------|------|-----|-----|------|----|------|------|
| 5560587320 | 3.05 | 15  |     |      |    | 11.5 |      |
| 5560587330 | 3.06 |     |     |      |    |      |      |
| 5560587340 | 3.07 |     |     |      |    |      |      |
| 5560587350 | 3.08 |     |     |      |    |      |      |
| 5560587360 | 3.09 |     |     |      |    |      |      |
| 3330310    | 3.1  |     |     |      |    | 11.6 |      |
| 5560587370 | 3.11 |     |     |      |    |      |      |
| 5560587380 | 3.12 |     |     |      |    |      |      |
| 5560587390 | 3.13 |     |     |      |    |      |      |
| 5560587400 | 3.14 |     |     |      |    |      |      |
| 3330315    | 3.15 |     |     |      |    | 11.7 |      |
| 5560587410 | 3.16 |     |     |      |    |      |      |
| 5560587420 | 3.17 |     |     |      |    |      |      |
| 5560587430 | 3.18 |     |     |      |    |      |      |
| 5560587440 | 3.19 |     |     |      |    |      |      |
| 3330320    | 3.2  | 16  |     |      |    | 11.8 |      |
| 5560587450 | 3.21 |     |     |      |    |      |      |
| 5560587460 | 3.22 |     |     |      |    |      |      |
| 5560587470 | 3.23 |     |     |      |    |      |      |
| 5560587480 | 3.24 |     |     |      |    |      |      |
| 5560587490 | 3.25 |     |     |      |    | 11.9 |      |
| 5560587500 | 3.26 |     |     |      |    |      |      |
| 5560587510 | 3.27 |     |     |      |    |      |      |
| 5560587520 | 3.28 |     |     |      |    |      |      |
| 5560587530 | 3.29 |     |     |      |    |      |      |
| 3330330    | 3.3  |     |     |      |    | 12   | 1    |
| 5560587540 | 3.31 |     |     |      |    |      |      |
| 5560587550 | 3.32 |     |     |      |    |      |      |
| 5560587560 | 3.33 |     |     |      |    |      |      |
| 5560587570 | 3.34 |     |     |      |    |      |      |
| 5560587580 | 3.35 | 16  |     |      |    | 12.1 |      |
| 5560587590 | 3.36 |     |     |      |    |      |      |
| 5560587600 | 3.37 |     |     |      |    |      |      |
| 5560587610 | 3.38 |     |     |      |    |      |      |
| 5560587620 | 3.39 |     |     |      |    | 12.2 |      |
| 3330340    | 3.4  |     |     |      |    |      |      |
| 5560587630 | 3.41 |     |     |      |    |      |      |
| 5560587640 | 3.42 |     |     |      |    |      |      |
| 5560587650 | 3.43 |     |     |      |    | 12.3 |      |
| 5560587660 | 3.44 |     |     |      |    |      |      |
| 5560587670 | 3.45 |     |     |      |    |      |      |
| 5560587680 | 3.46 |     |     |      |    |      |      |
| 5560587690 | 3.47 |     |     |      |    |      |      |
| 5560587700 | 3.48 |     |     |      |    | 12.4 |      |
| 5560587710 | 3.49 |     |     |      |    |      |      |
| 3330350    | 3.5  |     |     |      |    |      |      |
| 5560587720 | 3.51 |     |     |      |    |      |      |
| 5560587730 | 3.52 |     |     |      |    |      |      |
| 3330353    | 3.53 | 16  |     |      |    | 12.5 |      |
| 5560587740 | 3.54 |     |     |      |    |      |      |
| 5560587750 | 3.55 |     |     |      |    |      |      |
| 5560587760 | 3.56 |     |     |      |    |      |      |
| 5560587770 | 3.57 |     |     |      |    |      |      |
| 5560587780 | 3.58 | 21  |     |      |    |      |      |
| 5560587790 | 3.59 |     |     |      |    |      |      |

| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2   | TYPE |  |  |
|------------|------|-----|-----|------|----|------|------|--|--|
| 3330360    | 3.6  | 16  | 55  |      |    | 12.5 |      |  |  |
| 5560587800 | 3.61 |     |     |      |    |      |      |  |  |
| 5560587810 | 3.62 |     |     |      |    |      |      |  |  |
| 5560587820 | 3.63 |     |     |      |    |      |      |  |  |
| 5560587830 | 3.64 |     |     |      |    | 12.6 |      |  |  |
| 5560587840 | 3.65 |     |     |      |    |      |      |  |  |
| 3330366    | 3.66 |     |     |      |    |      |      |  |  |
| 5560587850 | 3.67 |     |     |      |    |      |      |  |  |
| 3330368    | 3.68 |     |     |      |    | 12.7 |      |  |  |
| 5560587860 | 3.69 |     |     |      |    |      |      |  |  |
| 3330370    | 3.7  |     |     |      |    |      |      |  |  |
| 5560587870 | 3.71 |     |     |      |    | 17.7 |      |  |  |
| 5560587880 | 3.72 |     |     |      |    |      |      |  |  |
| 5560587890 | 3.73 |     |     |      |    |      |      |  |  |
| 5560587900 | 3.74 |     |     |      |    |      |      |  |  |
| 5560587910 | 3.75 | 19  | 60  |      |    | 17.8 |      |  |  |
| 5560587920 | 3.76 |     |     |      |    |      |      |  |  |
| 5560587930 | 3.77 |     |     |      |    |      |      |  |  |
| 5560587940 | 3.78 |     |     |      |    | 17.9 |      |  |  |
| 5560587950 | 3.79 |     |     |      |    |      |      |  |  |
| 3330380    | 3.8  |     |     |      |    |      |      |  |  |
| 5560587960 | 3.81 |     |     |      |    | 18   |      |  |  |
| 5560587970 | 3.82 |     |     |      |    |      |      |  |  |
| 5560587980 | 3.83 |     |     |      |    |      |      |  |  |
| 5560587990 | 3.84 |     |     |      |    |      |      |  |  |
| 5560588000 | 3.85 |     |     |      |    | 18.1 |      |  |  |
| 5560588010 | 3.86 |     |     |      |    |      |      |  |  |
| 5560588020 | 3.87 |     |     |      |    |      |      |  |  |
| 5560588030 | 3.88 |     |     |      |    | 18.2 |      |  |  |
| 5560588040 | 3.89 |     |     |      |    |      |      |  |  |
| 3330390    | 3.9  |     |     |      |    |      |      |  |  |
| 5560588050 | 3.91 |     |     |      |    | 18.3 |      |  |  |
| 5560588060 | 3.92 |     |     |      |    |      |      |  |  |
| 5560588070 | 3.93 |     |     |      |    |      |      |  |  |
| 5560588080 | 3.94 |     |     |      |    | 12.4 |      |  |  |
| 5560588090 | 3.95 |     |     |      |    |      |      |  |  |
| 5560588100 | 3.96 |     |     |      |    |      |      |  |  |
| 5560588110 | 3.97 |     |     |      |    | 12.5 |      |  |  |
| 5560588120 | 3.98 |     |     |      |    |      |      |  |  |
| 5560588130 | 3.99 |     |     |      |    |      |      |  |  |
| 3330400    | 4    | 21  |     |      |    |      |      |  |  |
| 5560588140 | 4.01 |     |     |      |    |      |      |  |  |
| 5560588150 | 4.02 |     |     |      |    |      |      |  |  |
| 3330403    | 4.03 |     |     |      |    |      |      |  |  |
| 5560588160 | 4.04 |     |     |      |    |      |      |  |  |
| 5560588170 | 4.05 |     |     |      |    |      |      |  |  |
| 5560588180 | 4.06 |     |     |      |    |      |      |  |  |
| 5560588190 | 4.07 |     |     |      |    |      |      |  |  |
| 5560588200 | 4.08 |     |     |      |    |      |      |  |  |
| 5560588210 | 4.09 |     |     |      |    |      |      |  |  |
| 3330410    | 4.1  |     |     |      |    |      |      |  |  |
| 5560588220 | 4.11 |     |     |      |    |      |      |  |  |
| 5560588230 | 4.12 |     |     |      |    |      |      |  |  |
| 5560588240 | 4.13 |     |     |      |    |      |      |  |  |
| 5560588250 | 4.14 |     |     |      |    |      |      |  |  |

| EDP No.    | DC   | LCF  | OAL | DCON | LS | #2   | TYPE |
|------------|------|------|-----|------|----|------|------|
| 5560588260 | 4.15 | 21   | 60  | 6    | 38 | 18.5 | 1    |
| 5560588270 | 4.16 |      |     |      |    |      |      |
| 5560588280 | 4.17 |      |     |      |    |      |      |
| 5560588290 | 4.18 |      |     |      |    | 18.6 |      |
| 5560588300 | 4.19 |      |     |      |    |      |      |
| 3330420    | 4.2  |      |     |      |    |      |      |
| 5560588310 | 4.21 |      |     |      |    |      |      |
| 5560588320 | 4.22 |      |     |      |    |      |      |
| 5560588330 | 4.23 |      |     |      |    | 18.7 |      |
| 5560588340 | 4.24 |      |     |      |    |      |      |
| 5560588350 | 4.25 |      |     |      |    |      |      |
| 5560588360 | 4.26 |      |     |      |    |      |      |
| 5560588370 | 4.27 |      |     |      |    |      |      |
| 5560588380 | 4.28 |      |     |      |    | 18.8 |      |
| 5560588390 | 4.29 |      |     |      |    |      |      |
| 3330430    | 4.3  |      |     |      |    |      |      |
| 5560588400 | 4.31 |      |     |      |    |      |      |
| 5560588410 | 4.32 |      |     |      |    | 18.9 |      |
| 5560588420 | 4.33 |      |     |      |    |      |      |
| 5560588430 | 4.34 |      |     |      |    |      |      |
| 5560588440 | 4.35 |      |     |      |    |      |      |
| 5560588450 | 4.36 |      |     |      |    |      |      |
| 5560588460 | 4.37 |      |     |      |    | 19   |      |
| 5560588470 | 4.38 |      |     |      |    |      |      |
| 5560588480 | 4.39 |      |     |      |    |      |      |
| 3330440    | 4.4  |      |     |      |    |      |      |
| 5560588490 | 4.41 |      |     |      |    |      |      |
| 5560588500 | 4.42 |      |     |      |    | 19.1 |      |
| 5560588510 | 4.43 |      |     |      |    |      |      |
| 5560588520 | 4.44 |      |     |      |    |      |      |
| 5560588530 | 4.45 |      |     |      |    |      |      |
| 5560588540 | 4.46 | 19.2 |     |      |    |      |      |
| 5560588550 | 4.47 |      |     |      |    |      |      |
| 5560588560 | 4.48 |      |     |      |    |      |      |
| 5560588570 | 4.49 |      |     |      |    |      |      |
| 3330450    | 4.5  | 19.3 |     |      |    |      |      |
| 5560588580 | 4.51 |      |     |      |    |      |      |
| 5560588590 | 4.52 |      |     |      |    |      |      |
| 3330453    | 4.53 | 19.4 |     |      |    |      |      |
| 5560588600 | 4.54 |      |     |      |    |      |      |
| 5560588610 | 4.55 |      |     |      |    |      |      |
| 5560588620 | 4.56 |      |     |      |    |      |      |
| 5560588630 | 4.57 | 19.5 |     |      |    |      |      |
| 5560588640 | 4.58 |      |     |      |    |      |      |
| 5560588650 | 4.59 |      |     |      |    |      |      |
| 3330460    | 4.6  |      |     |      |    |      |      |
| 5560588660 | 4.61 | 19.6 |     |      |    |      |      |
| 3330462    | 4.62 |      |     |      |    |      |      |
| 5560588670 | 4.63 |      |     |      |    |      |      |
| 3330464    | 4.64 |      |     |      |    |      |      |
| 5560588680 | 4.65 |      |     |      |    |      |      |
| 5560588690 | 4.66 |      |     |      |    |      |      |
| 5560588700 | 4.67 |      |     |      |    |      |      |
| 5560588710 | 4.68 |      |     |      |    |      |      |
| 5560588720 | 4.69 |      |     |      |    |      |      |



Type 2



**SPEED FEED**  
P.160

**CARBIDE**

**EgiAs**

**IchAda**

**h8**

**20°**

**SHRINK FIT**

2≤DC DC<2

| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2   | TYPE |
|------------|------|-----|-----|------|----|------|------|
| 3330470    | 4.7  | 21  | 60  |      |    | 19.6 |      |
| 5560588730 | 4.71 |     |     |      |    |      |      |
| 5560588740 | 4.72 |     |     |      |    | 24.6 |      |
| 5560588750 | 4.73 |     |     |      |    |      |      |
| 5560588760 | 4.74 |     |     |      |    |      |      |
| 5560588770 | 4.75 |     |     |      |    |      |      |
| 5560588780 | 4.76 |     |     |      |    |      |      |
| 5560588790 | 4.77 |     |     |      |    | 24.7 |      |
| 5560588800 | 4.78 |     |     |      |    |      |      |
| 5560588810 | 4.79 |     |     |      |    |      |      |
| 3330480    | 4.8  |     |     |      |    |      |      |
| 5560588820 | 4.81 |     |     |      |    |      |      |
| 5560588830 | 4.82 |     |     |      |    | 24.8 |      |
| 5560588840 | 4.83 |     |     |      |    |      |      |
| 5560588850 | 4.84 |     |     |      |    |      |      |
| 5560588860 | 4.85 |     |     |      |    |      |      |
| 5560588870 | 4.86 |     |     |      |    |      |      |
| 5560588880 | 4.87 |     |     |      |    | 24.9 |      |
| 5560588890 | 4.88 |     |     |      |    |      |      |
| 5560588900 | 4.89 |     |     |      |    |      |      |
| 3330490    | 4.9  |     |     |      |    |      |      |
| 5560588910 | 4.91 |     |     |      |    |      |      |
| 5560588920 | 4.92 |     |     |      |    |      |      |
| 5560588930 | 4.93 |     |     |      |    | 25   |      |
| 5560588940 | 4.94 |     |     |      |    |      |      |
| 5560588950 | 4.95 |     |     |      |    |      |      |
| 5560588960 | 4.96 |     |     |      |    |      |      |
| 5560588970 | 4.97 | 24  | 65  | 6    | 38 | 25.1 | 1    |
| 5560588980 | 4.98 |     |     |      |    |      |      |
| 5560588990 | 4.99 |     |     |      |    |      |      |
| 3330500    | 5    |     |     |      |    |      |      |
| 5560589000 | 5.01 |     |     |      |    |      |      |
| 5560589010 | 5.02 |     |     |      |    |      |      |
| 3330503    | 5.03 |     |     |      |    | 25.2 |      |
| 5560589020 | 5.04 |     |     |      |    |      |      |
| 5560589030 | 5.05 |     |     |      |    |      |      |
| 5560589040 | 5.06 |     |     |      |    |      |      |
| 5560589050 | 5.07 |     |     |      |    |      |      |
| 5560589060 | 5.08 |     |     |      |    |      |      |
| 5560589070 | 5.09 |     |     |      |    | 25.3 |      |
| 3330510    | 5.1  |     |     |      |    |      |      |
| 5560589080 | 5.11 |     |     |      |    |      |      |
| 5560589090 | 5.12 |     |     |      |    |      |      |
| 5560589100 | 5.13 |     |     |      |    |      |      |
| 5560589110 | 5.14 |     |     |      |    | 25.4 |      |
| 5560589120 | 5.15 |     |     |      |    |      |      |
| 5560589130 | 5.16 |     |     |      |    |      |      |
| 5560589140 | 5.17 |     |     |      |    |      |      |
| 5560589150 | 5.18 |     |     |      |    |      |      |
| 5560589160 | 5.19 |     |     |      |    | 25.5 |      |
| 3330520    | 5.2  |     |     |      |    |      |      |
| 5560589170 | 5.21 |     |     |      |    |      |      |
| 5560589180 | 5.22 |     |     |      |    |      |      |
| 5560589190 | 5.23 |     |     |      |    |      |      |
| 5560589200 | 5.24 |     |     |      |    | 25.6 |      |

| EDP No.    | DC   | LCF | OAL | DCON | LS   | ℓ2 | TYPE |
|------------|------|-----|-----|------|------|----|------|
| 5560589210 | 5.25 |     |     |      |      |    |      |
| 5560589220 | 5.26 |     |     |      |      |    |      |
| 5560589230 | 5.27 | 24  |     |      | 25.6 |    |      |
| 5560589240 | 5.28 |     |     |      |      |    |      |
| 5560589250 | 5.29 |     |     |      |      |    |      |
| 3330530    | 5.3  |     |     |      | 25.7 |    |      |
| 5560589260 | 5.31 |     |     |      |      |    |      |
| 5560589270 | 5.32 |     |     |      |      |    |      |
| 5560589280 | 5.33 |     |     |      |      |    |      |
| 5560589290 | 5.34 |     |     |      |      |    |      |
| 5560589300 | 5.35 |     |     |      |      |    |      |
| 5560589310 | 5.36 |     |     |      | 25.8 |    |      |
| 5560589320 | 5.37 |     |     |      |      |    |      |
| 5560589330 | 5.38 |     |     |      |      |    |      |
| 5560589340 | 5.39 |     |     |      |      |    |      |
| 3330540    | 5.4  |     |     |      |      |    |      |
| 5560589350 | 5.41 |     |     |      | 25.9 |    |      |
| 5560589360 | 5.42 |     |     |      |      |    |      |
| 5560589370 | 5.43 |     |     |      |      |    |      |
| 5560589380 | 5.44 |     |     |      |      |    |      |
| 5560589390 | 5.45 |     |     |      |      |    |      |
| 5560589400 | 5.46 |     |     |      | 26   |    |      |
| 5560589410 | 5.47 |     |     |      |      |    |      |
| 5560589420 | 5.48 |     |     |      |      |    |      |
| 5560589430 | 5.49 |     |     |      |      |    |      |
| 3330550    | 5.5  |     |     |      |      |    |      |
| 5560589440 | 5.51 |     |     |      |      |    |      |
| 3330552    | 5.52 | 65  | 6   | 38   | 26.1 | 1  |      |
| 5560589450 | 5.53 |     |     |      |      |    |      |
| 3330554    | 5.54 |     |     |      |      |    |      |
| 5560589460 | 5.55 | 27  |     |      |      |    |      |
| 5560589470 | 5.56 |     |     |      |      |    |      |
| 5560589480 | 5.57 |     |     |      | 26.2 |    |      |
| 5560589490 | 5.58 |     |     |      |      |    |      |
| 5560589500 | 5.59 |     |     |      |      |    |      |
| 3330560    | 5.6  |     |     |      |      |    |      |
| 5560589510 | 5.61 |     |     |      |      |    |      |
| 5560589520 | 5.62 |     |     |      |      |    |      |
| 5560589530 | 5.63 |     |     |      | 26.3 |    |      |
| 5560589540 | 5.64 |     |     |      |      |    |      |
| 5560589550 | 5.65 |     |     |      |      |    |      |
| 5560589560 | 5.66 |     |     |      |      |    |      |
| 5560589570 | 5.67 |     |     |      |      |    |      |
| 5560589580 | 5.68 |     |     |      | 26.4 |    |      |
| 5560589590 | 5.69 |     |     |      |      |    |      |
| 3330570    | 5.7  |     |     |      |      |    |      |
| 5560589600 | 5.71 |     |     |      |      |    |      |
| 5560589610 | 5.72 |     |     |      |      |    |      |
| 5560589620 | 5.73 |     |     |      | 26.5 |    |      |
| 5560589630 | 5.74 |     |     |      |      |    |      |
| 5560589640 | 5.75 |     |     |      |      |    |      |
| 5560589650 | 5.76 |     |     |      |      |    |      |
| 5560589660 | 5.77 |     |     |      | 26.6 |    |      |
| 5560589670 | 5.78 |     |     |      |      |    |      |
| 5560589680 | 5.79 |     |     |      |      |    |      |

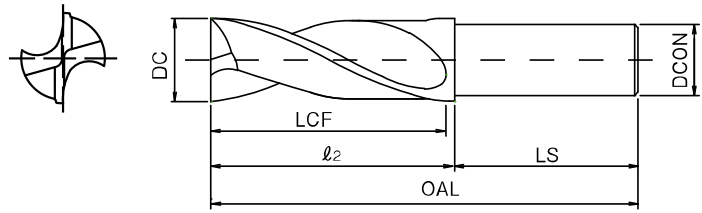
| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2   | TYPE |
|------------|------|-----|-----|------|----|------|------|
| 3330580    | 5.8  |     |     |      |    |      |      |
| 5560589690 | 5.81 |     |     |      |    | 26.6 |      |
| 5560589700 | 5.82 |     |     |      |    |      |      |
| 5560589710 | 5.83 |     |     |      |    |      |      |
| 5560589720 | 5.84 |     |     |      |    | 26.7 |      |
| 5560589730 | 5.85 |     |     |      |    |      |      |
| 5560589740 | 5.86 |     |     |      |    |      |      |
| 5560589750 | 5.87 |     |     |      |    |      |      |
| 5560589760 | 5.88 |     |     |      |    |      |      |
| 5560589770 | 5.89 |     |     |      |    | 26.8 | 1    |
| 3330590    | 5.9  | 27  | 65  |      |    |      |      |
| 5560589780 | 5.91 |     |     |      |    |      |      |
| 5560589790 | 5.92 |     |     |      |    |      |      |
| 5560589800 | 5.93 |     |     |      |    |      |      |
| 5560589810 | 5.94 |     |     |      |    | 26.9 |      |
| 5560589820 | 5.95 |     |     |      |    |      |      |
| 5560589830 | 5.96 |     |     |      |    |      |      |
| 5560589840 | 5.97 |     |     |      |    |      |      |
| 5560589850 | 5.98 |     |     |      |    |      |      |
| 5560589860 | 5.99 |     |     |      | 27 |      |      |
| 3330600    | 6    |     |     |      |    |      |      |
| 5560589870 | 6.01 |     |     |      |    |      |      |
| 5560589880 | 6.02 |     |     |      |    |      |      |
| 3330603    | 6.03 |     |     |      |    |      |      |
| 5560589890 | 6.04 |     |     |      |    |      |      |
| 5560589900 | 6.05 |     |     |      |    |      |      |
| 5560589910 | 6.06 |     |     |      |    |      |      |
| 5560589920 | 6.07 |     |     | 6    | 38 |      |      |
| 5560589930 | 6.08 |     |     |      |    |      |      |
| 5560589940 | 6.09 |     |     |      |    |      |      |
| 3330610    | 6.1  |     |     |      |    |      |      |
| 5560589950 | 6.11 |     |     |      |    |      |      |
| 5560589960 | 6.12 |     |     |      |    |      |      |
| 5560589970 | 6.13 |     |     |      |    |      |      |
| 5560589980 | 6.14 |     |     |      |    |      |      |
| 5560589990 | 6.15 |     |     |      |    |      |      |
| 5560590000 | 6.16 |     |     |      |    |      |      |
| 5560590010 | 6.17 | 30  | 70  |      |    |      |      |
| 5560590020 | 6.18 |     |     |      | 32 | 2    |      |
| 5560590030 | 6.19 |     |     |      |    |      |      |
| 3330620    | 6.2  |     |     |      |    |      |      |
| 5560590040 | 6.21 |     |     |      |    |      |      |
| 5560590050 | 6.22 |     |     |      |    |      |      |
| 5560590060 | 6.23 |     |     |      |    |      |      |
| 5560590070 | 6.24 |     |     |      |    |      |      |
| 5560590080 | 6.25 |     |     |      |    |      |      |
| 5560590090 | 6.26 |     |     |      |    |      |      |
| 5560590100 | 6.27 |     |     |      |    |      |      |
| 5560590110 | 6.28 |     |     |      |    |      |      |
| 5560590120 | 6.29 |     |     |      |    |      |      |
| 3330630    | 6.3  |     |     |      |    |      |      |
| 5560590130 | 6.31 |     |     |      |    |      |      |
| 5560590140 | 6.32 |     |     |      |    |      |      |
| 5560590150 | 6.33 |     |     |      |    |      |      |
| 5560590160 | 6.34 |     |     |      |    |      |      |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel* | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|----------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL       | AC                      |                 | AZ91D                         |
| ADF-2D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○        |                         |                 |                               |





Type 2



**SPEED FEED**  
P.160

**CARBIDE**

**EgiAs**

**IchAda**

**h8**

**20°**

**SHRINK FIT**

2≤DC DC<2

| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|------------|------|-----|-----|------|----|----|------|
| 5560590170 | 6.35 |     |     |      |    |    |      |
| 5560590180 | 6.36 |     |     |      |    |    |      |
| 5560590190 | 6.37 |     |     |      |    |    |      |
| 5560590200 | 6.38 |     |     |      |    |    |      |
| 5560590210 | 6.39 |     |     |      |    |    |      |
| 3330640    | 6.4  |     |     |      |    |    |      |
| 5560590220 | 6.41 |     |     |      |    |    |      |
| 5560590230 | 6.42 |     |     |      |    |    |      |
| 5560590240 | 6.43 |     |     |      |    |    |      |
| 5560590250 | 6.44 |     |     |      |    |    |      |
| 5560590260 | 6.45 |     |     |      |    |    |      |
| 5560590270 | 6.46 |     |     |      |    |    |      |
| 5560590280 | 6.47 |     |     |      |    |    |      |
| 5560590290 | 6.48 |     |     |      |    |    |      |
| 5560590300 | 6.49 |     |     |      |    |    |      |
| 3330650    | 6.5  |     |     |      |    |    |      |
| 5560590310 | 6.51 |     |     |      |    |    |      |
| 5560590320 | 6.52 |     |     |      |    |    |      |
| 3330653    | 6.53 |     |     |      |    |    |      |
| 5560590330 | 6.54 |     |     |      |    |    |      |
| 5560590340 | 6.55 |     |     |      |    |    |      |
| 5560590350 | 6.56 |     |     |      |    |    |      |
| 5560590360 | 6.57 |     |     |      |    |    |      |
| 5560590370 | 6.58 |     |     |      |    |    |      |
| 5560590380 | 6.59 |     |     |      |    |    |      |
| 3330660    | 6.6  |     |     |      |    |    |      |
| 5560590390 | 6.61 | 30  | 70  | 6    | 38 | 32 | 2    |
| 5560590400 | 6.62 |     |     |      |    |    |      |
| 5560590410 | 6.63 |     |     |      |    |    |      |
| 5560590420 | 6.64 |     |     |      |    |    |      |
| 5560590430 | 6.65 |     |     |      |    |    |      |
| 5560590440 | 6.66 |     |     |      |    |    |      |
| 5560590450 | 6.67 |     |     |      |    |    |      |
| 5560590460 | 6.68 |     |     |      |    |    |      |
| 5560590470 | 6.69 |     |     |      |    |    |      |
| 3330670    | 6.7  |     |     |      |    |    |      |
| 5560590480 | 6.71 |     |     |      |    |    |      |
| 5560590490 | 6.72 |     |     |      |    |    |      |
| 5560590500 | 6.73 |     |     |      |    |    |      |
| 5560590510 | 6.74 |     |     |      |    |    |      |
| 5560590520 | 6.75 |     |     |      |    |    |      |
| 5560590530 | 6.76 |     |     |      |    |    |      |
| 5560590540 | 6.77 |     |     |      |    |    |      |
| 5560590550 | 6.78 |     |     |      |    |    |      |
| 5560590560 | 6.79 |     |     |      |    |    |      |
| 3330680    | 6.8  |     |     |      |    |    |      |
| 5560590570 | 6.81 |     |     |      |    |    |      |
| 5560590580 | 6.82 |     |     |      |    |    |      |
| 5560590590 | 6.83 |     |     |      |    |    |      |
| 5560590600 | 6.84 |     |     |      |    |    |      |
| 5560590610 | 6.85 |     |     |      |    |    |      |
| 5560590620 | 6.86 |     |     |      |    |    |      |
| 5560590630 | 6.87 |     |     |      |    |    |      |
| 5560590640 | 6.88 |     |     |      |    |    |      |
| 5560590650 | 6.89 |     |     |      |    |    |      |

| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|------------|------|-----|-----|------|----|----|------|
| 3330690    | 6.9  |     |     |      |    |    |      |
| 5560590660 | 6.91 |     |     |      |    |    |      |
| 5560590670 | 6.92 |     |     |      |    |    |      |
| 5560590680 | 6.93 |     |     |      |    |    |      |
| 5560590690 | 6.94 |     |     |      |    |    |      |
| 5560590700 | 6.95 | 30  | 70  | 38   | 32 |    |      |
| 5560590710 | 6.96 |     |     |      |    |    |      |
| 5560590720 | 6.97 |     |     |      |    |    |      |
| 5560590730 | 6.98 |     |     |      |    |    |      |
| 5560590740 | 6.99 |     |     |      |    |    |      |
| 3330700    | 7    |     |     |      |    |    |      |
| 5560590750 | 7.01 |     |     |      |    |    |      |
| 5560590760 | 7.02 |     |     |      |    |    |      |
| 3330700    | 7.03 |     |     |      |    |    |      |
| 5560590770 | 7.04 |     |     |      |    |    |      |
| 5560590780 | 7.05 |     |     |      |    |    |      |
| 5560590790 | 7.06 |     |     |      |    |    |      |
| 5560590800 | 7.07 |     |     |      |    |    |      |
| 5560590810 | 7.08 |     |     |      |    |    |      |
| 5560590820 | 7.09 |     |     |      |    |    |      |
| 3330710    | 7.1  |     |     |      |    |    |      |
| 5560590830 | 7.11 |     |     |      |    |    |      |
| 5560590840 | 7.12 |     |     |      |    |    |      |
| 5560590850 | 7.13 |     |     |      |    |    |      |
| 5560590860 | 7.14 |     |     |      |    |    |      |
| 5560590870 | 7.15 |     |     |      |    |    |      |
| 5560590880 | 7.16 |     |     |      |    |    |      |
| 5560590890 | 7.17 |     |     | 6    |    |    | 2    |
| 5560590900 | 7.18 |     |     |      |    |    |      |
| 5560590910 | 7.19 |     |     |      |    |    |      |
| 3330720    | 7.2  |     |     |      |    |    |      |
| 5560590920 | 7.21 |     |     |      |    |    |      |
| 5560590930 | 7.22 | 34  | 75  | 39   | 36 |    |      |
| 5560590940 | 7.23 |     |     |      |    |    |      |
| 5560590950 | 7.24 |     |     |      |    |    |      |
| 5560590960 | 7.25 |     |     |      |    |    |      |
| 5560590970 | 7.26 |     |     |      |    |    |      |
| 5560590980 | 7.27 |     |     |      |    |    |      |
| 5560590990 | 7.28 |     |     |      |    |    |      |
| 5560591000 | 7.29 |     |     |      |    |    |      |
| 3330730    | 7.3  |     |     |      |    |    |      |
| 5560591010 | 7.31 |     |     |      |    |    |      |
| 5560591020 | 7.32 |     |     |      |    |    |      |
| 5560591030 | 7.33 |     |     |      |    |    |      |
| 5560591040 | 7.34 |     |     |      |    |    |      |
| 5560591050 | 7.35 |     |     |      |    |    |      |
| 5560591060 | 7.36 |     |     |      |    |    |      |
| 5560591070 | 7.37 |     |     |      |    |    |      |
| 5560591080 | 7.38 |     |     |      |    |    |      |
| 5560591090 | 7.39 |     |     |      |    |    |      |
| 3330740    | 7.4  |     |     |      |    |    |      |
| 5560591100 | 7.41 |     |     |      |    |    |      |
| 5560591110 | 7.42 |     |     |      |    |    |      |
| 5560591120 | 7.43 |     |     |      |    |    |      |
| 5560591130 | 7.44 |     |     |      |    |    |      |

| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|------------|------|-----|-----|------|----|----|------|
| 5560591140 | 7.45 |     |     |      |    |    |      |
| 5560591150 | 7.46 |     |     |      |    |    |      |
| 5560591160 | 7.47 |     |     |      |    |    |      |
| 5560591170 | 7.48 |     |     |      |    |    |      |
| 5560591180 | 7.49 |     |     |      |    |    |      |
| 3330750    | 7.5  |     |     |      |    |    |      |
| 5560591190 | 7.51 |     |     |      |    |    |      |
| 5560591200 | 7.52 |     |     |      |    |    |      |
| 5560591210 | 7.53 |     |     |      |    |    |      |
| 5560591220 | 7.54 |     |     |      |    |    |      |
| 5560591230 | 7.55 |     |     |      |    |    |      |
| 5560591240 | 7.56 |     |     |      |    |    |      |
| 5560591250 | 7.57 |     |     |      |    |    |      |
| 5560591260 | 7.58 |     |     |      |    |    |      |
| 5560591270 | 7.59 |     |     |      |    |    |      |
| 3330760    | 7.6  |     |     |      |    |    |      |
| 5560591280 | 7.61 |     |     |      |    |    |      |
| 5560591290 | 7.62 |     |     |      |    |    |      |
| 5560591300 | 7.63 |     |     |      |    |    |      |
| 5560591310 | 7.64 |     |     |      |    |    |      |
| 5560591320 | 7.65 |     |     |      |    |    |      |
| 5560591330 | 7.66 |     |     |      |    |    |      |
| 5560591340 | 7.67 |     |     |      |    |    |      |
| 5560591350 | 7.68 |     |     |      |    |    |      |
| 5560591360 | 7.69 |     |     |      |    |    |      |
| 3330770    | 7.7  |     |     |      |    |    |      |
| 5560591370 | 7.71 | 34  | 75  | 6    | 39 | 36 | 2    |
| 5560591380 | 7.72 |     |     |      |    |    |      |
| 5560591390 | 7.73 |     |     |      |    |    |      |
| 5560591400 | 7.74 |     |     |      |    |    |      |
| 5560591410 | 7.75 |     |     |      |    |    |      |
| 5560591420 | 7.76 |     |     |      |    |    |      |
| 5560591430 | 7.77 |     |     |      |    |    |      |
| 5560591440 | 7.78 |     |     |      |    |    |      |
| 5560591450 | 7.79 |     |     |      |    |    |      |
| 3330780    | 7.8  |     |     |      |    |    |      |
| 5560591460 | 7.81 |     |     |      |    |    |      |
| 5560591470 | 7.82 |     |     |      |    |    |      |
| 5560591480 | 7.83 |     |     |      |    |    |      |
| 5560591490 | 7.84 |     |     |      |    |    |      |
| 5560591500 | 7.85 |     |     |      |    |    |      |
| 5560591510 | 7.86 |     |     |      |    |    |      |
| 5560591520 | 7.87 |     |     |      |    |    |      |
| 5560591530 | 7.88 |     |     |      |    |    |      |
| 5560591540 | 7.89 |     |     |      |    |    |      |
| 3330790    | 7.9  |     |     |      |    |    |      |
| 5560591550 | 7.91 |     |     |      |    |    |      |
| 5560591560 | 7.92 |     |     |      |    |    |      |
| 5560591570 | 7.93 |     |     |      |    |    |      |
| 5560591580 | 7.94 |     |     |      |    |    |      |
| 5560591590 | 7.95 |     |     |      |    |    |      |
| 5560591600 | 7.96 |     |     |      |    |    |      |
| 5560591610 | 7.97 |     |     |      |    |    |      |
| 5560591620 | 7.98 |     |     |      |    |    |      |
| 5560591630 | 7.99 |     |     |      |    |    |      |

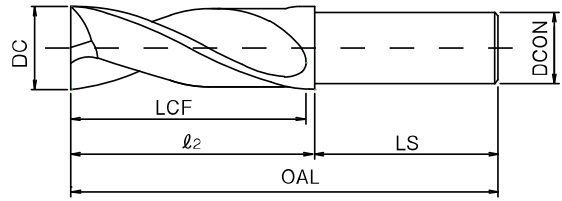
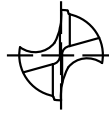
| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADF-2D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       |                         |                 |                               |







Type 2



**SPEED  
FEED**  
P.160

**CARBIDE**

**EgiAs**

**IchAda**

**h8**

**20°**

**SHRINK  
FIT**

2≤DC DC<2

| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|------------|------|-----|-----|------|----|----|------|
| 3330800    | 8    | 34  | 75  |      | 39 | 36 |      |
| 5560591640 | 8.01 |     |     |      |    |    |      |
| 5560591650 | 8.02 |     |     |      |    |    |      |
| 3330803    | 8.03 |     |     |      |    |    |      |
| 5560591660 | 8.04 |     |     |      |    |    |      |
| 5560591670 | 8.05 |     |     |      |    |    |      |
| 5560591680 | 8.06 |     |     |      |    |    |      |
| 5560591690 | 8.07 |     |     |      |    |    |      |
| 5560591700 | 8.08 |     |     |      |    |    |      |
| 5560591710 | 8.09 |     |     |      |    |    |      |
| 3330810    | 8.1  |     |     |      |    |    |      |
| 5560591720 | 8.11 |     |     |      |    |    |      |
| 5560591730 | 8.12 |     |     |      |    |    |      |
| 5560591740 | 8.13 |     |     |      |    |    |      |
| 5560591750 | 8.14 |     |     |      |    |    |      |
| 5560591760 | 8.15 |     |     |      |    |    |      |
| 5560591770 | 8.16 |     |     |      |    |    |      |
| 5560591780 | 8.17 |     |     |      |    |    |      |
| 5560591790 | 8.18 |     |     |      |    |    |      |
| 5560591800 | 8.19 |     |     |      |    |    |      |
| 3330820    | 8.2  |     |     |      |    |    |      |
| 5560591810 | 8.21 |     |     |      |    |    |      |
| 5560591820 | 8.22 |     |     |      |    |    |      |
| 5560591830 | 8.23 |     |     |      |    |    |      |
| 5560591840 | 8.24 |     |     |      |    |    |      |
| 5560591850 | 8.25 |     |     |      |    |    |      |
| 5560591860 | 8.26 | 38  | 80  | 8    | 40 | 40 | 2    |
| 5560591870 | 8.27 |     |     |      |    |    |      |
| 5560591880 | 8.28 |     |     |      |    |    |      |
| 5560591890 | 8.29 |     |     |      |    |    |      |
| 3330830    | 8.3  |     |     |      |    |    |      |
| 5560591900 | 8.31 |     |     |      |    |    |      |
| 5560591910 | 8.32 |     |     |      |    |    |      |
| 5560591920 | 8.33 |     |     |      |    |    |      |
| 5560591930 | 8.34 |     |     |      |    |    |      |
| 5560591940 | 8.35 |     |     |      |    |    |      |
| 5560591950 | 8.36 |     |     |      |    |    |      |
| 5560591960 | 8.37 |     |     |      |    |    |      |
| 5560591970 | 8.38 |     |     |      |    |    |      |
| 5560591980 | 8.39 |     |     |      |    |    |      |
| 3330840    | 8.4  |     |     |      |    |    |      |
| 5560591990 | 8.41 |     |     |      |    |    |      |
| 5560592000 | 8.42 |     |     |      |    |    |      |
| 5560592010 | 8.43 |     |     |      |    |    |      |
| 5560592020 | 8.44 |     |     |      |    |    |      |
| 5560592030 | 8.45 |     |     |      |    |    |      |
| 5560592040 | 8.46 |     |     |      |    |    |      |
| 5560592050 | 8.47 |     |     |      |    |    |      |
| 5560592060 | 8.48 |     |     |      |    |    |      |
| 5560592070 | 8.49 |     |     |      |    |    |      |
| 3330850    | 8.5  |     |     |      |    |    |      |
| 5560592080 | 8.51 |     |     |      |    |    |      |
| 5560592090 | 8.52 |     |     |      |    |    |      |
| 3330853    | 8.53 |     |     |      |    |    |      |
| 5560592100 | 8.54 |     |     |      |    |    |      |

| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|------------|------|-----|-----|------|----|----|------|
| 5560592110 | 8.55 |     |     |      |    |    |      |
| 5560592120 | 8.56 |     |     |      |    |    |      |
| 5560592130 | 8.57 |     |     |      |    |    |      |
| 5560592140 | 8.58 |     |     |      |    |    |      |
| 5560592150 | 8.59 |     |     |      |    |    |      |
| 3330860    | 8.6  |     |     |      |    |    |      |
| 5560592160 | 8.61 |     |     |      |    |    |      |
| 5560592170 | 8.62 |     |     |      |    |    |      |
| 5560592180 | 8.63 |     |     |      |    |    |      |
| 5560592190 | 8.64 |     |     |      |    |    |      |
| 5560592200 | 8.65 |     |     |      |    |    |      |
| 5560592210 | 8.66 |     |     |      |    |    |      |
| 5560592220 | 8.67 |     |     |      |    |    |      |
| 5560592230 | 8.68 |     |     |      |    |    |      |
| 5560592240 | 8.69 |     |     |      |    |    |      |
| 3330870    | 8.7  |     |     |      |    |    |      |
| 5560592250 | 8.71 |     |     |      |    |    |      |
| 5560592260 | 8.72 |     |     |      |    |    |      |
| 5560592270 | 8.73 |     |     |      |    |    |      |
| 5560592280 | 8.74 |     |     |      |    |    |      |
| 5560592290 | 8.75 |     |     |      |    |    |      |
| 5560592300 | 8.76 |     |     |      |    |    |      |
| 5560592310 | 8.77 | 38  | 80  |      | 40 | 40 |      |
| 5560592320 | 8.78 |     |     |      |    |    |      |
| 5560592330 | 8.79 |     |     |      |    |    |      |
| 3330880    | 8.8  |     |     |      |    |    |      |
| 5560592340 | 8.81 |     |     |      |    |    |      |
| 5560592350 | 8.82 |     |     | 8    |    |    | 2    |
| 5560592360 | 8.83 |     |     |      |    |    |      |
| 5560592370 | 8.84 |     |     |      |    |    |      |
| 5560592380 | 8.85 |     |     |      |    |    |      |
| 5560592390 | 8.86 |     |     |      |    |    |      |
| 5560592400 | 8.87 |     |     |      |    |    |      |
| 5560592410 | 8.88 |     |     |      |    |    |      |
| 5560592420 | 8.89 |     |     |      |    |    |      |
| 3330890    | 8.9  |     |     |      |    |    |      |
| 5560592430 | 8.91 |     |     |      |    |    |      |
| 5560592440 | 8.92 |     |     |      |    |    |      |
| 5560592450 | 8.93 |     |     |      |    |    |      |
| 5560592460 | 8.94 |     |     |      |    |    |      |
| 5560592470 | 8.95 |     |     |      |    |    |      |
| 5560592480 | 8.96 |     |     |      |    |    |      |
| 5560592490 | 8.97 |     |     |      |    |    |      |
| 5560592500 | 8.98 |     |     |      |    |    |      |
| 5560592510 | 8.99 |     |     |      |    |    |      |
| 3330900    | 9    |     |     |      |    |    |      |
| 5560592520 | 9.01 |     |     |      |    |    |      |
| 5560592530 | 9.02 |     |     |      |    |    |      |
| 3330903    | 9.03 |     |     |      |    |    |      |
| 5560592540 | 9.04 |     |     |      |    |    |      |
| 5560592550 | 9.05 | 42  | 85  |      | 41 | 44 |      |
| 5560592560 | 9.06 |     |     |      |    |    |      |
| 5560592570 | 9.07 |     |     |      |    |    |      |
| 5560592580 | 9.08 |     |     |      |    |    |      |
| 5560592590 | 9.09 |     |     |      |    |    |      |

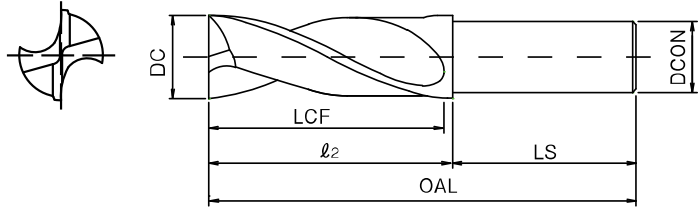
| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|------------|------|-----|-----|------|----|----|------|
| 3330910    | 9.1  |     |     |      |    |    |      |
| 5560592600 | 9.11 |     |     |      |    |    |      |
| 5560592610 | 9.12 |     |     |      |    |    |      |
| 5560592620 | 9.13 |     |     |      |    |    |      |
| 5560592630 | 9.14 |     |     |      |    |    |      |
| 5560592640 | 9.15 |     |     |      |    |    |      |
| 5560592650 | 9.16 |     |     |      |    |    |      |
| 5560592660 | 9.17 |     |     |      |    |    |      |
| 5560592670 | 9.18 |     |     |      |    |    |      |
| 5560592680 | 9.19 |     |     |      |    |    |      |
| 3330920    | 9.2  |     |     |      |    |    |      |
| 5560592690 | 9.21 |     |     |      |    |    |      |
| 5560592700 | 9.22 |     |     |      |    |    |      |
| 5560592710 | 9.23 |     |     |      |    |    |      |
| 5560592720 | 9.24 |     |     |      |    |    |      |
| 5560592730 | 9.25 |     |     |      |    |    |      |
| 5560592740 | 9.26 |     |     |      |    |    |      |
| 5560592750 | 9.27 |     |     |      |    |    |      |
| 5560592760 | 9.28 |     |     |      |    |    |      |
| 5560592770 | 9.29 |     |     |      |    |    |      |
| 3330930    | 9.3  |     |     |      |    |    |      |
| 5560592780 | 9.31 |     |     |      |    |    |      |
| 5560592790 | 9.32 |     |     |      |    |    |      |
| 5560592800 | 9.33 |     |     |      |    |    |      |
| 5560592810 | 9.34 |     |     |      |    |    |      |
| 5560592820 | 9.35 |     |     |      |    |    |      |
| 5560592830 | 9.36 | 42  | 85  | 8    | 41 | 44 | 2    |
| 5560592840 | 9.37 |     |     |      |    |    |      |
| 5560592850 | 9.38 |     |     |      |    |    |      |
| 5560592860 | 9.39 |     |     |      |    |    |      |
| 3330940    | 9.4  |     |     |      |    |    |      |
| 5560592870 | 9.41 |     |     |      |    |    |      |
| 5560592880 | 9.42 |     |     |      |    |    |      |
| 5560592890 | 9.43 |     |     |      |    |    |      |
| 5560592900 | 9.44 |     |     |      |    |    |      |
| 5560592910 | 9.45 |     |     |      |    |    |      |
| 5560592920 | 9.46 |     |     |      |    |    |      |
| 5560592930 | 9.47 |     |     |      |    |    |      |
| 5560592940 | 9.48 |     |     |      |    |    |      |
| 5560592950 | 9.49 |     |     |      |    |    |      |
| 3330950    | 9.5  |     |     |      |    |    |      |
| 5560592960 | 9.51 |     |     |      |    |    |      |
| 5560592970 | 9.52 |     |     |      |    |    |      |
| 5560592980 | 9.53 |     |     |      |    |    |      |
| 5560592990 | 9.54 |     |     |      |    |    |      |
| 5560593000 | 9.55 |     |     |      |    |    |      |
| 5560593010 | 9.56 |     |     |      |    |    |      |
| 5560593020 | 9.57 |     |     |      |    |    |      |
| 5560593030 | 9.58 |     |     |      |    |    |      |
| 5560593040 | 9.59 |     |     |      |    |    |      |
| 3330960    | 9.6  |     |     |      |    |    |      |
| 5560593050 | 9.61 |     |     |      |    |    |      |
| 5560593060 | 9.62 |     |     |      |    |    |      |
| 5560593070 | 9.63 |     |     |      |    |    |      |
| 5560593080 | 9.64 |     |     |      |    |    |      |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADF-2D        | ○                | ○                   | ○                 | ○           | ○              | ○                           | ○               | ○           | ○           | ○                 | ○            | ○        | ○                      | ○              | ○       |                         |                 |                               |





Type 2



**SPEED  
FEED**  
P.160

**CARBIDE**

**EgiAs**

**IchAda**

**h8**

**20°**

**SHRINK  
FIT**

2≤DC DC<2

| EDP No.    | DC    | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|------------|-------|-----|-----|------|----|----|------|
| 5560593090 | 9.65  |     |     |      |    |    |      |
| 5560593100 | 9.66  |     |     |      |    |    |      |
| 5560593110 | 9.67  |     |     |      |    |    |      |
| 5560593120 | 9.68  |     |     |      |    |    |      |
| 5560593130 | 9.69  |     |     |      |    |    |      |
| 3330970    | 9.7   |     |     |      |    |    |      |
| 5560593140 | 9.71  |     |     |      |    |    |      |
| 5560593150 | 9.72  |     |     |      |    |    |      |
| 5560593160 | 9.73  |     |     |      |    |    |      |
| 5560593170 | 9.74  |     |     |      |    |    |      |
| 5560593180 | 9.75  |     |     |      |    |    |      |
| 5560593190 | 9.76  |     |     |      |    |    |      |
| 5560593200 | 9.77  |     |     |      |    |    |      |
| 5560593210 | 9.78  |     |     |      |    |    |      |
| 5560593220 | 9.79  |     |     |      |    |    |      |
| 3330980    | 9.8   |     |     |      |    |    |      |
| 5560593230 | 9.81  |     |     |      |    |    |      |
| 5560593240 | 9.82  | 42  | 85  | 8    | 41 | 44 |      |
| 5560593250 | 9.83  |     |     |      |    |    |      |
| 5560593260 | 9.84  |     |     |      |    |    |      |
| 5560593270 | 9.85  |     |     |      |    |    |      |
| 5560593280 | 9.86  |     |     |      |    |    |      |
| 5560593290 | 9.87  |     |     |      |    |    |      |
| 5560593300 | 9.88  |     |     |      |    |    |      |
| 5560593310 | 9.89  |     |     |      |    |    |      |
| 3330990    | 9.9   |     |     |      |    |    |      |
| 5560593320 | 9.91  |     |     |      |    |    |      |
| 5560593330 | 9.92  |     |     |      |    |    | 2    |
| 5560593340 | 9.93  |     |     |      |    |    |      |
| 5560593350 | 9.94  |     |     |      |    |    |      |
| 5560593360 | 9.95  |     |     |      |    |    |      |
| 5560593370 | 9.96  |     |     |      |    |    |      |
| 5560593380 | 9.97  |     |     |      |    |    |      |
| 5560593390 | 9.98  |     |     |      |    |    |      |
| 5560593400 | 9.99  |     |     |      |    |    |      |
| 3331000    | 10    |     |     |      |    |    |      |
| 3331003    | 10.03 |     |     |      |    |    |      |
| 3331010    | 10.1  |     |     |      |    |    |      |
| 3331020    | 10.2  |     |     |      |    |    |      |
| 3331030    | 10.3  |     |     |      |    |    |      |
| 3331040    | 10.4  |     |     |      |    |    |      |
| 3331050    | 10.5  | 46  | 90  | 10   | 42 | 48 |      |
| 3331060    | 10.6  |     |     |      |    |    |      |
| 3331070    | 10.7  |     |     |      |    |    |      |
| 3331080    | 10.8  |     |     |      |    |    |      |
| 3331090    | 10.9  |     |     |      |    |    |      |
| 3331100    | 11    |     |     |      |    |    |      |

| EDP No. | DC    | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|---------|-------|-----|-----|------|----|----|------|
| 3331103 | 11.03 |     |     |      |    |    |      |
| 3331110 | 11.1  |     |     |      |    |    |      |
| 3331120 | 11.2  |     |     |      |    |    |      |
| 3331130 | 11.3  |     |     |      |    |    |      |
| 3331140 | 11.4  |     |     |      |    |    |      |
| 3331150 | 11.5  | 50  | 95  | 10   | 43 | 52 |      |
| 3331160 | 11.6  |     |     |      |    |    |      |
| 3331170 | 11.7  |     |     |      |    |    |      |
| 3331180 | 11.8  |     |     |      |    |    |      |
| 3331190 | 11.9  |     |     |      |    |    |      |
| 3331200 | 12    |     |     |      |    |    |      |
| 3331203 | 12.03 |     |     |      |    |    |      |
| 3331210 | 12.1  |     |     |      |    |    |      |
| 3331220 | 12.2  |     |     |      |    |    |      |
| 3331230 | 12.3  |     |     |      |    |    |      |
| 3331240 | 12.4  |     |     |      |    |    |      |
| 3331250 | 12.5  | 56  | 100 |      | 42 | 58 |      |
| 3331260 | 12.6  |     |     |      |    |    |      |
| 3331270 | 12.7  |     |     |      |    |    |      |
| 3331280 | 12.8  |     |     |      |    |    |      |
| 3331290 | 12.9  |     |     |      |    |    |      |
| 3331300 | 13    |     |     |      |    |    |      |
| 3331310 | 13.1  |     |     |      |    |    |      |
| 3331320 | 13.2  |     |     |      |    |    |      |
| 3331330 | 13.3  |     |     |      |    |    |      |
| 3331340 | 13.4  |     |     |      |    |    |      |
| 3331350 | 13.5  | 60  | 105 | 12   | 43 | 62 | 2    |
| 3331360 | 13.6  |     |     |      |    |    |      |
| 3331370 | 13.7  |     |     |      |    |    |      |
| 3331380 | 13.8  |     |     |      |    |    |      |
| 3331390 | 13.9  |     |     |      |    |    |      |
| 3331400 | 14    |     |     |      |    |    |      |
| 3331410 | 14.1  |     |     |      |    |    |      |
| 3331420 | 14.2  |     |     |      |    |    |      |
| 3331430 | 14.3  |     |     |      |    |    |      |
| 3331440 | 14.4  |     |     |      |    |    |      |
| 3331450 | 14.5  | 64  | 110 |      | 44 | 66 |      |
| 3331460 | 14.6  |     |     |      |    |    |      |
| 3331470 | 14.7  |     |     |      |    |    |      |
| 3331480 | 14.8  |     |     |      |    |    |      |
| 3331490 | 14.9  |     |     |      |    |    |      |
| 3331500 | 15    |     |     |      |    |    |      |
| 3331510 | 15.1  |     |     |      |    |    |      |
| 3331520 | 15.2  |     |     |      |    |    |      |
| 3331530 | 15.3  | 68  | 115 |      | 45 | 70 |      |
| 3331540 | 15.4  |     |     |      |    |    |      |
| 3331550 | 15.5  |     |     |      |    |    |      |

| EDP No.    | DC   | LCF | OAL | DCON | LS | ℓ2 | TYPE |
|------------|------|-----|-----|------|----|----|------|
| 3331560    | 15.6 |     |     |      |    |    |      |
| 3331570    | 15.7 | 68  | 115 | 12   | 45 | 70 |      |
| 3331580    | 15.8 |     |     |      |    |    |      |
| 3331590    | 15.9 |     |     |      |    |    |      |
| 3331600    | 16   |     |     |      |    |    |      |
| 5560593410 | 16.1 |     |     |      |    |    |      |
| 5560593420 | 16.2 |     |     |      |    |    |      |
| 5560593430 | 16.3 |     |     |      |    |    |      |
| 5560593440 | 16.4 |     |     |      |    |    |      |
| 3331650    | 16.5 | 74  | 125 |      | 49 | 76 |      |
| 5560593450 | 16.6 |     |     |      |    |    |      |
| 5560593460 | 16.7 |     |     |      |    |    |      |
| 5560593470 | 16.8 |     |     |      |    |    |      |
| 5560593480 | 16.9 |     |     |      |    |    |      |
| 3331700    | 17   |     |     |      |    |    |      |
| 5560593490 | 17.1 |     |     |      |    |    |      |
| 5560593500 | 17.2 |     |     |      |    |    |      |
| 5560593510 | 17.3 |     |     |      |    |    |      |
| 5560593520 | 17.4 |     |     |      |    |    |      |
| 3331750    | 17.5 | 78  | 130 |      | 50 | 80 |      |
| 5560593530 | 17.6 |     |     |      |    |    |      |
| 5560593540 | 17.7 |     |     |      |    |    |      |
| 5560593550 | 17.8 |     |     |      |    |    |      |
| 5560593560 | 17.9 |     |     |      |    |    |      |
| 3331800    | 18   |     |     | 16   |    |    |      |
| 5560593570 | 18.1 |     |     |      |    |    |      |
| 5560593580 | 18.2 |     |     |      |    |    | 2    |
| 5560593590 | 18.3 |     |     |      |    |    |      |
| 5560593600 | 18.4 |     |     |      |    |    |      |
| 3331850    | 18.5 | 84  | 135 |      | 49 | 86 |      |
| 5560593610 | 18.6 |     |     |      |    |    |      |
| 5560593620 | 18.7 |     |     |      |    |    |      |
| 5560593630 | 18.8 |     |     |      |    |    |      |
| 5560593640 | 18.9 |     |     |      |    |    |      |
| 3331900    | 19   |     |     |      |    |    |      |
| 5560593650 | 19.1 |     |     |      |    |    |      |
| 5560593660 | 19.2 |     |     |      |    |    |      |
| 5560593670 | 19.3 |     |     |      |    |    |      |
| 5560593680 | 19.4 |     |     |      |    |    |      |
| 3331950    | 19.5 | 88  | 140 |      | 50 | 90 |      |
| 5560593690 | 19.6 |     |     |      |    |    |      |
| 5560593700 | 19.7 |     |     |      |    |    |      |
| 5560593710 | 19.8 |     |     |      |    |    |      |
| 5560593720 | 19.9 |     |     |      |    |    |      |
| 3332000    | 20   |     |     | 20   |    |    |      |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel |             | Quenched and Tempered Steel |             |             | Stainless Steel | Tool Steel | Cast Iron | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel® | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-------------|-----------------------------|-------------|-------------|-----------------|------------|-----------|-------------------|--------------|----------|------------------------|----------------|----------|-------------------------|-----------------|-------------------------------|
|               | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC | 45 ~ 50 HRC                 | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS             | SKD SKS    | FC        | FCD               | Cu           | AL       | AC                     |                |          | AZ91D                   |                 |                               |
| Abbreviation  |                  |                     |                   |             |                |             |                             |             |             |                 |            |           |                   |              |          |                        |                |          |                         |                 |                               |
| ADF-2D        | ○                | ○                   | ○                 | ○           | ○              | ○           | ○                           | ○           | ○           |                 |            | ○         | ○                 |              | ○        | ○                      |                |          |                         |                 |                               |





**SPEED  
FEED**  
P161

**CARBIDE**

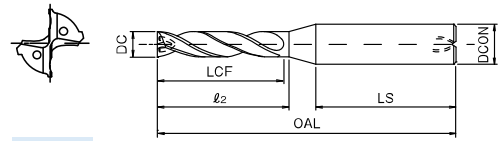
**EgiAs**

**h8**

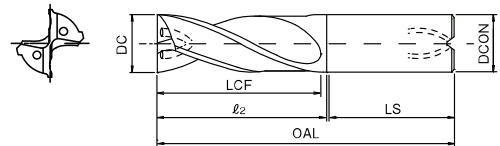
**20°**

**SHRINK  
FIT**

Type 1



Type 2

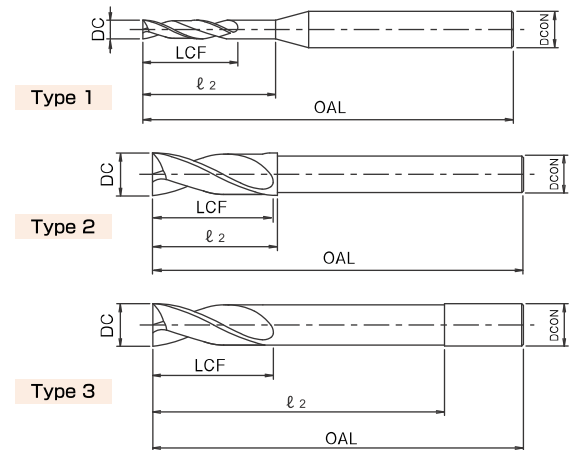


| EDP No. | DC   | LCF | OAL | DCON | LS   | L2 | TYPE |
|---------|------|-----|-----|------|------|----|------|
| 3334300 | 3    |     |     |      | 37.1 |    |      |
| 3334301 | 3.03 |     |     |      | 37.2 |    |      |
| 3334302 | 3.1  | 15  |     |      | 37.3 |    | 16   |
| 3334303 | 3.15 |     |     |      | 37.4 |    |      |
| 3334304 | 3.2  |     |     |      | 37.5 |    |      |
| 3334305 | 3.3  |     |     |      | 37.7 |    |      |
| 3334306 | 3.4  |     | 55  |      | 37.9 |    |      |
| 3334307 | 3.5  |     |     | 4    | 37.1 |    | 1    |
| 3334308 | 3.53 |     |     |      | 37.3 |    |      |
| 3334309 | 3.6  | 16  |     |      | 37.3 |    | 17   |
| 3334310 | 3.66 |     |     |      | 37.4 |    |      |
| 3334311 | 3.68 |     |     |      | 39.6 |    |      |
| 3334312 | 3.7  |     |     |      | 39.8 |    | 20   |
| 3334313 | 3.8  | 19  |     |      | 40   |    | 2    |
| 3334314 | 3.9  |     |     |      | 34.3 |    |      |
| 3334315 | 4    |     |     |      | 34.5 |    |      |
| 3334316 | 4.03 |     |     |      | 34.6 |    |      |
| 3334317 | 4.1  |     |     |      | 34.8 |    |      |
| 3334318 | 4.2  |     |     |      | 35   |    |      |
| 3334319 | 4.3  |     | 60  |      | 35.2 |    | 22   |
| 3334320 | 4.4  |     |     |      | 35.3 |    |      |
| 3334321 | 4.5  | 21  |     |      | 35.4 |    |      |
| 3334322 | 4.53 |     |     |      | 35.5 |    |      |
| 3334323 | 4.6  |     |     |      | 35.6 |    |      |
| 3334324 | 4.62 |     |     |      | 35.8 |    |      |
| 3334325 | 4.64 |     |     |      | 35.9 |    |      |
| 3334326 | 4.7  |     |     |      | 36.1 |    |      |
| 3334327 | 4.8  |     |     |      | 36.2 |    |      |
| 3334328 | 4.9  |     |     |      | 36.3 |    |      |
| 3334329 | 5    |     |     | 6    | 36.4 |    | 1    |
| 3334330 | 5.03 | 24  |     |      | 36.6 |    | 25   |
| 3334331 | 5.1  |     |     |      | 36.8 |    |      |
| 3334332 | 5.2  |     |     |      | 37   |    |      |
| 3334333 | 5.3  |     |     |      | 35.3 |    |      |
| 3334334 | 5.4  |     |     |      | 35.5 |    |      |
| 3334335 | 5.5  |     | 65  |      | 35.6 |    |      |
| 3334336 | 5.52 |     |     |      | 35.8 |    |      |
| 3334337 | 5.54 |     |     |      | 35.9 |    |      |
| 3334338 | 5.6  |     |     |      | 36.1 |    |      |
| 3334339 | 5.7  |     |     |      | 36.2 |    |      |
| 3334340 | 5.8  |     |     |      | 36.3 |    |      |
| 3334341 | 5.9  |     |     |      | 36.4 |    |      |
| 3334342 | 6    |     |     |      | 36.6 |    |      |
| 3334343 | 6.03 |     |     |      | 36.8 |    | 2    |
| 3334344 | 6.1  |     |     |      | 37   |    |      |
| 3334345 | 6.2  |     |     |      | 35.3 |    |      |
| 3334346 | 6.3  |     |     |      | 35.5 |    |      |
| 3334347 | 6.4  |     |     |      | 35.6 |    |      |
| 3334348 | 6.5  |     |     |      | 35.8 |    |      |
| 3334349 | 6.53 |     |     |      | 36   |    |      |
| 3334350 | 6.6  |     |     |      | 36.2 |    |      |
| 3334351 | 6.7  |     |     |      | 36.3 |    |      |
| 3334352 | 6.8  |     |     |      | 36.4 |    |      |
| 3334353 | 6.9  |     |     |      | 36.6 |    |      |
| 3334354 | 7    |     |     |      | 36.8 |    |      |
| 3334355 | 7.03 |     |     |      | 37.1 |    |      |
|         |      |     |     |      | 37.2 |    |      |

| EDP No. | DC    | LCF | OAL | DCON | LS   | L2 | TYPE |
|---------|-------|-----|-----|------|------|----|------|
| 3334356 | 7.1   |     |     |      | 38.3 |    |      |
| 3334357 | 7.2   |     |     |      | 38.5 |    |      |
| 3334358 | 7.3   |     |     |      | 38.7 |    |      |
| 3334359 | 7.4   |     |     |      | 38.9 |    |      |
| 3334360 | 7.5   | 34  | 75  | 8    | 39.1 | 35 | 1    |
| 3334361 | 7.6   |     |     |      | 39.3 |    |      |
| 3334362 | 7.7   |     |     |      | 39.4 |    |      |
| 3334363 | 7.8   |     |     |      | 39.6 |    |      |
| 3334364 | 7.9   |     |     |      | 39.8 |    |      |
| 3334365 | 8     |     |     |      | 40   |    | 2    |
| 3334366 | 8.03  |     |     |      | 37.3 |    |      |
| 3334367 | 8.1   |     |     |      | 37.5 |    |      |
| 3334368 | 8.2   |     |     |      | 37.6 |    |      |
| 3334369 | 8.3   |     |     |      | 37.8 |    |      |
| 3334370 | 8.4   |     |     |      | 38   |    |      |
| 3334371 | 8.5   |     |     |      | 38.2 |    |      |
| 3334372 | 8.53  | 38  | 80  |      | 38.3 | 39 |      |
| 3334373 | 8.6   |     |     |      | 38.4 |    |      |
| 3334374 | 8.7   |     |     |      | 38.6 |    |      |
| 3334375 | 8.8   |     |     |      | 38.8 |    |      |
| 3334376 | 8.9   |     |     |      | 38.9 |    | 1    |
| 3334377 | 9     |     |     | 10   | 39.1 |    |      |
| 3334378 | 9.03  |     |     |      | 39.2 |    |      |
| 3334379 | 9.1   |     |     |      | 40.3 |    |      |
| 3334380 | 9.2   |     |     |      | 40.5 |    |      |
| 3334381 | 9.3   |     |     |      | 40.7 |    |      |
| 3334382 | 9.4   |     |     |      | 40.9 |    |      |
| 3334383 | 9.5   | 42  | 85  |      | 41.1 | 43 |      |
| 3334384 | 9.6   |     |     |      | 41.3 |    |      |
| 3334385 | 9.7   |     |     |      | 41.4 |    |      |
| 3334386 | 9.8   |     |     |      | 41.6 |    |      |
| 3334387 | 9.9   |     |     |      | 41.8 |    |      |
| 3334388 | 10    |     |     |      | 42   |    | 2    |
| 3334389 | 10.03 |     |     |      | 39.3 |    |      |
| 3334390 | 10.1  |     |     |      | 39.5 |    |      |
| 3334391 | 10.2  |     |     |      | 39.8 |    |      |
| 3334392 | 10.3  |     |     |      | 40   |    |      |
| 3334393 | 10.4  |     |     |      | 40.2 |    |      |
| 3334394 | 10.5  |     |     |      | 40.4 |    | 47   |
| 3334395 | 10.6  | 46  | 90  |      | 40.8 |    |      |
| 3334396 | 10.7  |     |     |      | 40.9 |    |      |
| 3334397 | 10.8  |     |     |      | 41.1 |    | 1    |
| 3334398 | 10.9  |     |     |      | 41.2 |    |      |
| 3334399 | 11    |     |     |      | 42.3 |    |      |
| 3334400 | 11.03 |     |     |      | 42.5 |    |      |
| 3334401 | 11.1  |     |     |      | 42.7 |    |      |
| 3334402 | 11.2  |     |     |      | 42.9 |    |      |
| 3334403 | 11.3  |     |     |      | 43.1 |    |      |
| 3334404 | 11.4  |     |     |      | 43.3 |    |      |
| 3334405 | 11.5  |     |     |      | 43.4 |    |      |
| 3334406 | 11.6  |     |     |      | 43.6 |    |      |
| 3334407 | 11.7  |     |     |      | 43.8 |    |      |
| 3334408 | 11.8  |     |     |      | 44   |    | 2    |
| 3334409 | 11.9  |     |     |      | 44   |    |      |
| 3334410 | 12    |     |     |      | 39.3 | 57 | 1    |
| 3334411 | 12.03 | 56  | 100 | 14   | 39.3 | 57 | 1    |

| EDP No. | DC   | LCF | OAL | DCON | LS   | L2 | TYPE |
|---------|------|-----|-----|------|------|----|------|
| 3334412 | 12.1 |     |     |      | 39.5 |    |      |
| 3334413 | 12.2 |     |     |      | 39.6 |    |      |
| 3334414 | 12.3 |     |     |      | 39.8 |    |      |
| 3334415 | 12.4 |     |     |      | 40   |    |      |
| 3334416 | 12.5 | 56  | 100 |      | 40.2 | 57 |      |
| 3334417 | 12.6 |     |     |      | 40.4 |    |      |
| 3334418 | 12.7 |     |     |      | 40.6 |    |      |
| 3334419 | 12.8 |     |     |      | 40.8 |    |      |
| 3334420 | 12.9 |     |     |      | 40.9 |    |      |
| 3334421 | 13   |     |     |      | 41.1 |    | 1    |
| 3334422 | 13.1 |     |     | 14   | 41.2 |    |      |
| 3334423 | 13.2 |     |     |      | 42.5 |    |      |
| 3334424 | 13.3 |     |     |      | 42.7 |    |      |
| 3334425 | 13.4 |     |     |      | 42.9 |    |      |
| 3334426 | 13.5 | 60  | 105 |      | 43.1 | 61 |      |
| 3334427 | 13.6 |     |     |      | 43.3 |    |      |
| 3334428 | 13.7 |     |     |      | 43.4 |    |      |
| 3334429 | 13.8 |     |     |      | 43.8 |    |      |
| 3334430 | 13.9 |     |     |      | 44   |    | 2    |
| 3334431 | 14   |     |     |      | 41.5 |    |      |
| 3334432 | 14.1 |     |     |      | 41.6 |    |      |
| 3334433 | 14.2 |     |     |      | 41.8 |    |      |
| 3334434 | 14.3 |     |     |      | 42   |    |      |
| 3334435 | 14.4 |     |     |      | 42.2 |    |      |
| 3334436 | 14.5 | 64  | 110 |      | 42.4 | 65 |      |
| 3334437 | 14.6 |     |     |      | 42.6 |    |      |
| 3334438 | 14.7 |     |     |      | 42.8 |    |      |
| 3334439 | 14.8 |     |     |      | 42.9 |    |      |
| 3334440 | 14.9 |     |     |      | 43.1 |    | 1    |
| 3334441 | 15   |     |     | 16   | 43.3 |    |      |
| 3334442 | 15.1 |     |     |      | 44.3 |    |      |
| 3334443 | 15.2 |     |     |      | 44.5 |    |      |
| 3334444 | 15.3 |     |     |      | 44.7 |    |      |
| 3334445 | 15.4 |     |     |      | 44.9 |    |      |
| 3334446 | 15.5 | 68  | 115 |      | 45.1 | 69 |      |
| 3334447 | 15.6 |     |     |      | 45.3 |    |      |
| 3334448 | 15.7 |     |     |      | 45.4 |    |      |
| 3334449 | 15.8 |     |     |      | 45.6 |    |      |
| 3334450 | 15.9 |     |     |      | 45.8 |    |      |
| 3334451 | 16   |     |     |      | 46   |    | 2    |
| 3334452 | 16.5 | 74  | 125 |      | 47.2 | 75 | 1    |
| 3334453 | 17   |     |     |      | 48.1 |    |      |
| 3334454 | 17.5 | 78  | 130 | 18   | 50.1 | 79 | 2    |
| 3334455 | 18   |     |     |      | 51   |    |      |
| 3334456 | 18.5 | 84  | 135 | 20   | 47.2 | 85 | 1    |
| 3334457 | 19   |     |     |      | 48.1 |    |      |
| 3334458 | 19.5 | 88  | 140 |      | 50.1 | 89 | 2    |
| 3334459 | 20   |     |     |      | 51   |    |      |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      |                 | AZ91D                         |
| ADFO-3D       | ○                | ○                   | ○                 | ○           | ○              | ○                           |                 |             |             |                   | ○            | ○        |                        | ○              | ○       |                         |                 |                               |



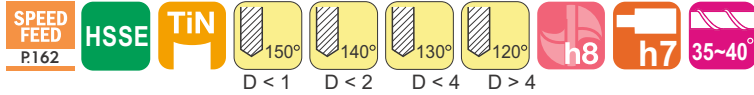
| EDP No. | DC  | LCF | OAL | DCON | £2 | TYPE |
|---------|-----|-----|-----|------|----|------|
| 3332300 | 3   | 15  | 100 | 6    | 30 | 1    |
| 3332310 | 3.1 |     |     |      | 31 |      |
| 3332320 | 3.2 |     |     |      | 32 |      |
| 3332330 | 3.3 |     |     |      | 33 |      |
| 3332340 | 3.4 | 16  |     |      | 34 |      |
| 3332350 | 3.5 |     |     |      | 35 |      |
| 3332360 | 3.6 |     |     |      | 36 |      |
| 3332370 | 3.7 |     |     |      | 37 |      |
| 3332380 | 3.8 | 19  |     |      | 38 |      |
| 3332390 | 3.9 |     |     |      | 39 |      |
| 3332400 | 4   |     |     |      | 40 |      |
| 3332410 | 4.1 |     |     |      | 41 |      |
| 3332420 | 4.2 | 21  | 42  |      |    |      |
| 3332430 | 4.3 |     | 43  |      |    |      |
| 3332440 | 4.4 |     | 44  |      |    |      |
| 3332450 | 4.5 |     | 45  |      |    |      |
| 3332460 | 4.6 | 24  | 46  |      |    |      |
| 3332470 | 4.7 |     | 47  |      |    |      |
| 3332480 | 4.8 |     | 48  |      |    |      |
| 3332490 | 4.9 |     | 49  |      |    |      |
| 3332500 | 5   | 27  | 50  |      |    |      |
| 3332510 | 5.1 |     | 51  |      |    |      |
| 3332520 | 5.2 |     | 52  |      |    |      |
| 3332530 | 5.3 |     | 53  |      |    |      |
| 3332540 | 5.4 | 110 | 54  |      |    |      |
| 3332550 | 5.5 |     | 55  |      |    |      |
| 3332560 | 5.6 |     | 56  |      |    |      |
| 3332570 | 5.7 |     | 57  |      |    |      |
| 3332580 | 5.8 |     | 58  |      |    |      |
| 3332590 | 5.9 |     | 59  |      |    |      |
| 3332600 | 6   |     |     |      | 29 | 2    |
| 3334060 |     |     |     |      | 60 | 3    |

| EDP No. | DC   | LCF | OAL | DCON | l2 | TYPE |     |
|---------|------|-----|-----|------|----|------|-----|
| 3332650 | 6.5  | 30  | 120 | 6    | 32 | 2    |     |
| 3332680 | 6.8  |     |     |      |    |      |     |
| 3332700 | 7    |     |     |      |    |      |     |
| 3332750 | 7.5  | 34  | 130 |      |    |      |     |
| 3332780 | 7.8  |     |     |      | 36 |      |     |
| 3332800 | 8    |     |     |      |    | 80   | 3   |
| 3334080 |      |     |     |      |    |      |     |
| 3332850 | 8.5  | 38  | 140 | 8    | 40 | 2    |     |
| 3332880 | 8.8  |     |     |      |    |      |     |
| 3332900 | 9    |     |     |      |    |      |     |
| 3332950 | 9.5  | 42  | 150 |      |    | 44   |     |
| 3332980 | 9.8  |     |     |      |    |      |     |
| 3333000 | 10   |     |     |      |    | 100  | 3   |
| 3334100 |      |     |     |      |    |      |     |
| 3333050 | 10.5 | 46  | 160 | 10   |    | 2    |     |
| 3333080 | 10.8 |     |     |      | 48 |      |     |
| 3333100 | 11   |     |     |      |    |      |     |
| 3333180 | 11.8 | 50  | 170 |      |    | 52   |     |
| 3333200 | 12   |     |     |      |    | 120  | 3   |
| 3334120 |      |     |     |      |    |      |     |
| 3333250 | 12.5 | 56  | 180 | 12   | 58 | 2    |     |
| 3333300 | 13   |     |     |      |    |      |     |
| 3333350 | 13.5 |     |     |      | 60 |      | 190 |
| 3333400 | 14   | 64  | 200 |      |    | 66   |     |
| 3333500 | 15   |     |     |      |    | 70   |     |
| 3333600 | 16   |     |     |      | 68 | 210  | 160 |
| 3334160 |      |     |     |      |    |      |     |
| 3333700 | 17   | 74  | 220 | 16   | 76 | 2    |     |
| 3333750 | 17.5 | 78  | 230 |      |    |      |     |
| 3333800 | 18   |     |     |      |    |      |     |
| 3334000 | 20   | 88  | 250 | 20   | 90 |      |     |
| 3334200 |      |     |     |      |    | 200  | 3   |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel | Stainless Steel | Tool Steel  | Cast Iron   | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | CFRP Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-----------------|-------------|-------------|-------------------|--------------|----------|------------------------|----------------|---------|-------------------------|-----------------|-------------------------------|
| Abbreviation  | C ~ 0.25%        | C0.25 ~ 0.45%       | C0.45% ~          | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC     | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS               | SKD SKS      | FC       | FCD                    | Cu             | AL      | AC                      | AZ91D           |                               |
| ADFLS-2D      | ○                | ○                   | ○                 | ○           | ○              | ○                           |                 |             |             |                   | ○            | ○        | ○                      | ○              |         |                         |                 |                               |



For General Purpose Applications



| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 61505   | 0.5  | 38  | 3   | 3    |
| 8595051 | 0.51 | 38  | 3   | 3    |
| 8595052 | 0.52 | 38  | 3   | 3    |
| 8595053 | 0.53 | 38  | 3   | 3    |
| 8595054 | 0.54 | 38  | 3.5 | 3    |
| 8595055 | 0.55 | 38  | 3.5 | 3    |
| 8595056 | 0.56 | 38  | 3.5 | 3    |
| 8595057 | 0.57 | 38  | 3.5 | 3    |
| 8595058 | 0.58 | 38  | 3.5 | 3    |
| 8595059 | 0.59 | 38  | 3.5 | 3    |
| 61506   | 0.6  | 38  | 3.5 | 3    |
| 8595061 | 0.61 | 38  | 4   | 3    |
| 8595062 | 0.62 | 38  | 4   | 3    |
| 8595063 | 0.63 | 38  | 4   | 3    |
| 8595064 | 0.64 | 38  | 4   | 3    |
| 8595065 | 0.65 | 38  | 4   | 3    |
| 8595066 | 0.66 | 38  | 4   | 3    |
| 8595067 | 0.67 | 38  | 4   | 3    |
| 8595068 | 0.68 | 38  | 4.5 | 3    |
| 8595069 | 0.69 | 38  | 4.5 | 3    |
| 61507   | 0.7  | 38  | 4.5 | 3    |
| 8595071 | 0.71 | 38  | 4.5 | 3    |
| 8595072 | 0.72 | 38  | 4.5 | 3    |
| 8595073 | 0.73 | 38  | 4.5 | 3    |
| 8595074 | 0.74 | 38  | 4.5 | 3    |
| 8595075 | 0.75 | 38  | 4.5 | 3    |
| 8595076 | 0.76 | 38  | 5   | 3    |
| 8595077 | 0.77 | 38  | 5   | 3    |
| 8595078 | 0.78 | 38  | 5   | 3    |
| 8595079 | 0.79 | 38  | 5   | 3    |
| 61508   | 0.8  | 38  | 5   | 3    |
| 8595081 | 0.81 | 38  | 5   | 3    |
| 8595082 | 0.82 | 38  | 5   | 3    |
| 8595083 | 0.83 | 38  | 5   | 3    |
| 8595084 | 0.84 | 38  | 5   | 3    |
| 8595085 | 0.85 | 38  | 5   | 3    |
| 8595086 | 0.86 | 38  | 5.5 | 3    |
| 8595087 | 0.87 | 38  | 5.5 | 3    |
| 8595088 | 0.88 | 38  | 5.5 | 3    |
| 8595089 | 0.89 | 38  | 5.5 | 3    |
| 61509   | 0.9  | 38  | 5.5 | 3    |
| 8595091 | 0.91 | 38  | 5.5 | 3    |
| 8595092 | 0.92 | 38  | 5.5 | 3    |
| 8595093 | 0.93 | 38  | 5.5 | 3    |
| 8595094 | 0.94 | 38  | 5.5 | 3    |
| 8595095 | 0.95 | 38  | 5.5 | 3    |
| 8595096 | 0.96 | 38  | 6   | 3    |
| 8595097 | 0.97 | 38  | 6   | 3    |
| 8595098 | 0.98 | 38  | 6   | 3    |
| 8595099 | 0.99 | 38  | 6   | 3    |
| 61510   | 1    | 38  | 6   | 3    |
| 8595101 | 1.01 | 38  | 6   | 3    |
| 8595102 | 1.02 | 38  | 6   | 3    |
| 8595103 | 1.03 | 38  | 6   | 3    |
| 8595104 | 1.04 | 38  | 6   | 3    |
| 8595105 | 1.05 | 38  | 6   | 3    |
| 8595106 | 1.06 | 38  | 6   | 3    |
| 8595107 | 1.07 | 39  | 7   | 3    |
| 8595108 | 1.08 | 39  | 7   | 3    |
| 8595109 | 1.09 | 39  | 7   | 3    |
| 61511   | 1.1  | 39  | 7   | 3    |
| 8595111 | 1.11 | 39  | 7   | 3    |
| 8595112 | 1.12 | 39  | 7   | 3    |
| 8595113 | 1.13 | 39  | 7   | 3    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8595114 | 1.14 | 39  | 7   | 3    |
| 8595115 | 1.15 | 39  | 7   | 3    |
| 8595116 | 1.16 | 39  | 7   | 3    |
| 8595117 | 1.17 | 39  | 7   | 3    |
| 8595118 | 1.18 | 39  | 7   | 3    |
| 8595119 | 1.19 | 40  | 8   | 3    |
| 61512   | 1.2  | 40  | 8   | 3    |
| 8595121 | 1.21 | 40  | 8   | 3    |
| 8595122 | 1.22 | 40  | 8   | 3    |
| 8595123 | 1.23 | 40  | 8   | 3    |
| 8595124 | 1.24 | 40  | 8   | 3    |
| 8595125 | 1.25 | 40  | 8   | 3    |
| 8595126 | 1.26 | 40  | 8   | 3    |
| 8595127 | 1.27 | 40  | 8   | 3    |
| 8595128 | 1.28 | 40  | 8   | 3    |
| 8595129 | 1.29 | 40  | 8   | 3    |
| 61513   | 1.3  | 40  | 8   | 3    |
| 8595131 | 1.31 | 40  | 8   | 3    |
| 8595132 | 1.32 | 40  | 8   | 3    |
| 8595133 | 1.33 | 41  | 9   | 3    |
| 8595134 | 1.34 | 41  | 9   | 3    |
| 8595135 | 1.35 | 41  | 9   | 3    |
| 8595136 | 1.36 | 41  | 9   | 3    |
| 8595137 | 1.37 | 41  | 9   | 3    |
| 8595138 | 1.38 | 41  | 9   | 3    |
| 8595139 | 1.39 | 41  | 9   | 3    |
| 61514   | 1.4  | 41  | 9   | 3    |
| 8595141 | 1.41 | 41  | 9   | 3    |
| 8595142 | 1.42 | 41  | 9   | 3    |
| 8595143 | 1.43 | 41  | 9   | 3    |
| 8595144 | 1.44 | 41  | 9   | 3    |
| 8595145 | 1.45 | 41  | 9   | 3    |
| 8595146 | 1.46 | 41  | 9   | 3    |
| 8595147 | 1.47 | 41  | 9   | 3    |
| 8595148 | 1.48 | 41  | 9   | 3    |
| 8595149 | 1.49 | 41  | 9   | 3    |
| 61515   | 1.5  | 41  | 9   | 3    |
| 8595151 | 1.51 | 42  | 10  | 3    |
| 8595152 | 1.52 | 42  | 10  | 3    |
| 8595153 | 1.53 | 42  | 10  | 3    |
| 8595154 | 1.54 | 42  | 10  | 3    |
| 8595155 | 1.55 | 42  | 10  | 3    |
| 8595156 | 1.56 | 42  | 10  | 3    |
| 8595157 | 1.57 | 42  | 10  | 3    |
| 8595158 | 1.58 | 42  | 10  | 3    |
| 8595159 | 1.59 | 42  | 10  | 3    |
| 61516   | 1.6  | 42  | 10  | 3    |
| 8595161 | 1.61 | 42  | 10  | 3    |
| 8595162 | 1.62 | 42  | 10  | 3    |
| 8595163 | 1.63 | 42  | 10  | 3    |
| 8595164 | 1.64 | 42  | 10  | 3    |
| 8595165 | 1.65 | 42  | 10  | 3    |
| 8595166 | 1.66 | 42  | 10  | 3    |
| 8595167 | 1.67 | 42  | 10  | 3    |
| 8595168 | 1.68 | 42  | 10  | 3    |
| 8595169 | 1.69 | 42  | 10  | 3    |
| 61517   | 1.7  | 42  | 10  | 3    |
| 8595171 | 1.71 | 43  | 11  | 3    |
| 8595172 | 1.72 | 43  | 11  | 3    |
| 8595173 | 1.73 | 43  | 11  | 3    |
| 8595174 | 1.74 | 43  | 11  | 3    |
| 8595175 | 1.75 | 43  | 11  | 3    |
| 8595176 | 1.76 | 43  | 11  | 3    |
| 8595177 | 1.77 | 43  | 11  | 3    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8595178 | 1.78 | 43  | 11  | 3    |
| 8595179 | 1.79 | 43  | 11  | 3    |
| 61518   | 1.8  | 43  | 11  | 3    |
| 8595181 | 1.81 | 43  | 11  | 3    |
| 8595182 | 1.82 | 43  | 11  | 3    |
| 8595183 | 1.83 | 43  | 11  | 3    |
| 8595184 | 1.84 | 43  | 11  | 3    |
| 8595185 | 1.85 | 43  | 11  | 3    |
| 8595186 | 1.86 | 43  | 11  | 3    |
| 8595187 | 1.87 | 43  | 11  | 3    |
| 8595188 | 1.88 | 43  | 11  | 3    |
| 8595189 | 1.89 | 43  | 11  | 3    |
| 61519   | 1.9  | 43  | 11  | 3    |
| 8595191 | 1.91 | 44  | 12  | 3    |
| 8595192 | 1.92 | 44  | 12  | 3    |
| 8595193 | 1.93 | 44  | 12  | 3    |
| 8595194 | 1.94 | 44  | 12  | 3    |
| 8595195 | 1.95 | 44  | 12  | 3    |
| 8595196 | 1.96 | 44  | 12  | 3    |
| 8595197 | 1.97 | 44  | 12  | 3    |
| 8595198 | 1.98 | 44  | 12  | 3    |
| 8595199 | 1.99 | 44  | 12  | 3    |
| 61520   | 2    | 44  | 12  | 3    |
| 8595201 | 2.01 | 44  | 12  | 3    |
| 8595202 | 2.02 | 44  | 12  | 3    |
| 8595203 | 2.03 | 44  | 12  | 3    |
| 8595204 | 2.04 | 44  | 12  | 3    |
| 8595205 | 2.05 | 44  | 12  | 3    |
| 8595206 | 2.06 | 44  | 12  | 3    |
| 8595207 | 2.07 | 44  | 12  | 3    |
| 8595208 | 2.08 | 44  | 12  | 3    |
| 8595209 | 2.09 | 44  | 12  | 3    |
| 61521   | 2.1  | 44  | 12  | 3    |
| 8595211 | 2.11 | 44  | 12  | 3    |
| 8595212 | 2.12 | 44  | 12  | 3    |
| 8595213 | 2.13 | 45  | 13  | 3    |
| 8595214 | 2.14 | 45  | 13  | 3    |
| 8595215 | 2.15 | 45  | 13  | 3    |
| 8595216 | 2.16 | 45  | 13  | 3    |
| 8595217 | 2.17 | 45  | 13  | 3    |
| 8595218 | 2.18 | 45  | 13  | 3    |
| 8595219 | 2.19 | 45  | 13  | 3    |
| 61522   | 2.2  | 45  | 13  | 3    |
| 8595221 | 2.21 | 45  | 13  | 3    |
| 8595222 | 2.22 | 45  | 13  | 3    |
| 8595223 | 2.23 | 45  | 13  | 3    |
| 8595224 | 2.24 | 45  | 13  | 3    |
| 8595225 | 2.25 | 45  | 13  | 3    |
| 8595226 | 2.26 | 45  | 13  | 3    |
| 8595227 | 2.27 | 45  | 13  | 3    |
| 8595228 | 2.28 | 45  | 13  | 3    |
| 8595229 | 2.29 | 45  | 13  | 3    |
| 61523   | 2.3  | 45  | 13  | 3    |
| 8595231 | 2.31 | 45  | 13  | 3    |
| 8595232 | 2.32 | 45  | 13  | 3    |
| 8595233 | 2.33 | 45  | 13  | 3    |
| 8595234 | 2.34 | 45  | 13  | 3    |
| 8595235 | 2.35 | 45  | 13  | 3    |
| 8595236 | 2.36 | 45  | 13  | 3    |
| 8595237 | 2.37 | 46  | 14  | 3    |
| 8595238 | 2.38 | 46  | 14  | 3    |
| 8595239 | 2.39 | 46  | 14  | 3    |
| 61524   | 2.4  | 46  | 14  | 3    |
| 8595241 | 2.41 | 46  | 14  | 3    |

For General Purpose Applications

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8595242 | 2.42 | 46  | 14  | 3    |
| 8595243 | 2.43 | 46  | 14  | 3    |
| 8595244 | 2.44 | 46  | 14  | 3    |
| 8595245 | 2.45 | 46  | 14  | 3    |
| 8595246 | 2.46 | 46  | 14  | 3    |
| 8595247 | 2.47 | 46  | 14  | 3    |
| 8595248 | 2.48 | 46  | 14  | 3    |
| 8595249 | 2.49 | 46  | 14  | 3    |
| 61525   | 2.5  | 46  | 14  | 3    |
| 8595251 | 2.51 | 46  | 14  | 3    |
| 8595252 | 2.52 | 46  | 14  | 3    |
| 8595253 | 2.53 | 46  | 14  | 3    |
| 8595254 | 2.54 | 46  | 14  | 3    |
| 8595255 | 2.55 | 46  | 14  | 3    |
| 8595256 | 2.56 | 46  | 14  | 3    |
| 8595257 | 2.57 | 46  | 14  | 3    |
| 8595258 | 2.58 | 46  | 14  | 3    |
| 8595259 | 2.59 | 46  | 14  | 3    |
| 61526   | 2.6  | 46  | 14  | 3    |
| 8595261 | 2.61 | 46  | 14  | 3    |
| 8595262 | 2.62 | 46  | 14  | 3    |
| 8595263 | 2.63 | 46  | 14  | 3    |
| 8595264 | 2.64 | 46  | 14  | 3    |
| 8595265 | 2.65 | 46  | 14  | 3    |
| 8595266 | 2.66 | 48  | 16  | 3    |
| 8595267 | 2.67 | 48  | 16  | 3    |
| 8595268 | 2.68 | 48  | 16  | 3    |
| 8595269 | 2.69 | 48  | 16  | 3    |
| 61527   | 2.7  | 48  | 16  | 3    |
| 8595271 | 2.71 | 48  | 16  | 3    |
| 8595272 | 2.72 | 48  | 16  | 3    |
| 8595273 | 2.73 | 48  | 16  | 3    |
| 8595274 | 2.74 | 48  | 16  | 3    |
| 8595275 | 2.75 | 48  | 16  | 3    |
| 8595276 | 2.76 | 48  | 16  | 3    |
| 8595277 | 2.77 | 48  | 16  | 3    |
| 8595278 | 2.78 | 48  | 16  | 3    |
| 8595279 | 2.79 | 48  | 16  | 3    |
| 61528   | 2.8  | 48  | 16  | 3    |
| 8595281 | 2.81 | 48  | 16  | 3    |
| 8595282 | 2.82 | 48  | 16  | 3    |
| 8595283 | 2.83 | 48  | 16  | 3    |
| 8595284 | 2.84 | 48  | 16  | 3    |
| 8595285 | 2.85 | 48  | 16  | 3    |
| 8595286 | 2.86 | 48  | 16  | 3    |
| 8595287 | 2.87 | 48  | 16  | 3    |
| 8595288 | 2.88 | 48  | 16  | 3    |
| 8595289 | 2.89 | 48  | 16  | 3    |
| 61529   | 2.9  | 48  | 16  | 3    |
| 8595291 | 2.91 | 48  | 16  | 3    |
| 8595292 | 2.92 | 48  | 16  | 3    |
| 8595293 | 2.93 | 48  | 16  | 3    |
| 8595294 | 2.94 | 48  | 16  | 3    |
| 8595295 | 2.95 | 48  | 16  | 3    |
| 8595296 | 2.96 | 48  | 16  | 3    |
| 8595297 | 2.97 | 48  | 16  | 3    |
| 8595298 | 2.98 | 48  | 16  | 3    |
| 8595299 | 2.99 | 48  | 16  | 3    |
| 61530   | 3.00 | 48  | 16  | 3    |
| 8595301 | 3.01 | 50  | 18  | 4    |
| 8595302 | 3.02 | 50  | 18  | 4    |
| 8595303 | 3.03 | 50  | 18  | 4    |
| 8595304 | 3.04 | 50  | 18  | 4    |
| 8595305 | 3.05 | 50  | 18  | 4    |
| 8595306 | 3.06 | 50  | 18  | 4    |
| 8595307 | 3.07 | 50  | 18  | 4    |
| 8595308 | 3.08 | 50  | 18  | 4    |
| 8595309 | 3.09 | 50  | 18  | 4    |
| 61531   | 3.10 | 50  | 18  | 4    |
| 8595311 | 3.11 | 50  | 18  | 4    |
| 8595312 | 3.12 | 50  | 18  | 4    |
| 8595313 | 3.13 | 50  | 18  | 4    |
| 8595314 | 3.14 | 50  | 18  | 4    |
| 8595315 | 3.15 | 50  | 18  | 4    |
| 8595316 | 3.16 | 50  | 18  | 4    |
| 8595317 | 3.17 | 50  | 18  | 4    |
| 8595318 | 3.18 | 50  | 18  | 4    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8595319 | 3.19 | 50  | 18  | 4    |
| 61532   | 3.20 | 50  | 18  | 4    |
| 8595321 | 3.21 | 50  | 18  | 4    |
| 8595322 | 3.22 | 50  | 18  | 4    |
| 8595323 | 3.23 | 50  | 18  | 4    |
| 8595324 | 3.24 | 50  | 18  | 4    |
| 8595324 | 3.24 | 50  | 18  | 4    |
| 8595325 | 3.25 | 50  | 18  | 4    |
| 8595326 | 3.26 | 50  | 18  | 4    |
| 8595327 | 3.27 | 50  | 18  | 4    |
| 8595328 | 3.28 | 50  | 18  | 4    |
| 8595329 | 3.29 | 50  | 18  | 4    |
| 61533   | 3.3  | 50  | 18  | 4    |
| 8595331 | 3.31 | 50  | 18  | 4    |
| 8595332 | 3.32 | 50  | 18  | 4    |
| 8595333 | 3.33 | 50  | 18  | 4    |
| 8595334 | 3.34 | 50  | 18  | 4    |
| 8595335 | 3.35 | 50  | 18  | 4    |
| 8595336 | 3.36 | 52  | 20  | 4    |
| 8595337 | 3.37 | 52  | 20  | 4    |
| 8595338 | 3.38 | 52  | 20  | 4    |
| 8595339 | 3.39 | 52  | 20  | 4    |
| 61534   | 3.40 | 52  | 20  | 4    |
| 8595341 | 3.41 | 52  | 20  | 4    |
| 8595342 | 3.42 | 52  | 20  | 4    |
| 8595343 | 3.43 | 52  | 20  | 4    |
| 8595344 | 3.44 | 52  | 20  | 4    |
| 8595345 | 3.45 | 52  | 20  | 4    |
| 8595346 | 3.46 | 52  | 20  | 4    |
| 8595347 | 3.47 | 52  | 20  | 4    |
| 8595348 | 3.48 | 52  | 20  | 4    |
| 8595349 | 3.49 | 52  | 20  | 4    |
| 61535   | 3.50 | 52  | 20  | 4    |
| 8595351 | 3.51 | 52  | 20  | 4    |
| 8595352 | 3.52 | 52  | 20  | 4    |
| 8595353 | 3.53 | 52  | 20  | 4    |
| 8595354 | 3.54 | 52  | 20  | 4    |
| 8595355 | 3.55 | 52  | 20  | 4    |
| 8595356 | 3.56 | 52  | 20  | 4    |
| 8595357 | 3.57 | 52  | 20  | 4    |
| 8595358 | 3.58 | 52  | 20  | 4    |
| 8595359 | 3.59 | 52  | 20  | 4    |
| 61536   | 3.6  | 52  | 20  | 4    |
| 8595361 | 3.61 | 52  | 20  | 4    |
| 8595362 | 3.62 | 52  | 20  | 4    |
| 8595363 | 3.63 | 52  | 20  | 4    |
| 8595364 | 3.64 | 52  | 20  | 4    |
| 8595365 | 3.65 | 52  | 20  | 4    |
| 8595366 | 3.66 | 52  | 20  | 4    |
| 8595367 | 3.67 | 52  | 20  | 4    |
| 8595368 | 3.68 | 52  | 20  | 4    |
| 8595369 | 3.69 | 52  | 20  | 4    |
| 61537   | 3.7  | 52  | 20  | 4    |
| 8595371 | 3.71 | 52  | 20  | 4    |
| 8595372 | 3.72 | 52  | 20  | 4    |
| 8595373 | 3.73 | 52  | 20  | 4    |
| 8595374 | 3.74 | 52  | 20  | 4    |
| 8595375 | 3.75 | 52  | 20  | 4    |
| 8595376 | 3.76 | 54  | 22  | 4    |
| 8595377 | 3.77 | 54  | 22  | 4    |
| 8595378 | 3.78 | 54  | 22  | 4    |
| 8595379 | 3.79 | 54  | 22  | 4    |
| 61538   | 3.8  | 54  | 22  | 4    |
| 8595381 | 3.81 | 54  | 22  | 4    |
| 8595382 | 3.82 | 54  | 22  | 4    |
| 8595383 | 3.83 | 54  | 22  | 4    |
| 8595384 | 3.84 | 54  | 22  | 4    |
| 8595385 | 3.85 | 54  | 22  | 4    |
| 8595386 | 3.86 | 54  | 22  | 4    |
| 8595387 | 3.87 | 54  | 22  | 4    |
| 8595388 | 3.88 | 54  | 22  | 4    |
| 8595389 | 3.89 | 54  | 22  | 4    |
| 61539   | 3.9  | 54  | 22  | 4    |
| 8595391 | 3.91 | 54  | 22  | 4    |
| 8595392 | 3.92 | 54  | 22  | 4    |
| 8595393 | 3.93 | 54  | 22  | 4    |
| 8595394 | 3.94 | 54  | 22  | 4    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8595395 | 3.95 | 54  | 22  | 4    |
| 8595396 | 3.96 | 54  | 22  | 4    |
| 8595397 | 3.97 | 54  | 22  | 4    |
| 8595398 | 3.98 | 54  | 22  | 4    |
| 8595399 | 3.99 | 54  | 22  | 4    |
| 61540   | 4    | 54  | 22  | 4    |
| 8595401 | 4.01 | 66  | 22  | 6    |
| 8595402 | 4.02 | 66  | 22  | 6    |
| 8595403 | 4.03 | 66  | 22  | 6    |
| 8595404 | 4.04 | 66  | 22  | 6    |
| 8595405 | 4.05 | 66  | 22  | 6    |
| 8595406 | 4.06 | 66  | 22  | 6    |
| 8595407 | 4.07 | 66  | 22  | 6    |
| 8595408 | 4.08 | 66  | 22  | 6    |
| 8595409 | 4.09 | 66  | 22  | 6    |
| 61541   | 4.1  | 66  | 22  | 6    |
| 8595411 | 4.11 | 66  | 22  | 6    |
| 8595412 | 4.12 | 66  | 22  | 6    |
| 8595413 | 4.13 | 66  | 22  | 6    |
| 8595414 | 4.14 | 66  | 22  | 6    |
| 8595415 | 4.15 | 66  | 22  | 6    |
| 8595416 | 4.16 | 66  | 22  | 6    |
| 8595417 | 4.17 | 66  | 22  | 6    |
| 8595418 | 4.18 | 66  | 22  | 6    |
| 8595419 | 4.19 | 66  | 22  | 6    |
| 61542   | 4.20 | 66  | 22  | 6    |
| 8595421 | 4.21 | 66  | 22  | 6    |
| 8595422 | 4.22 | 66  | 22  | 6    |
| 8595423 | 4.23 | 66  | 22  | 6    |
| 8595424 | 4.24 | 66  | 22  | 6    |
| 8595425 | 4.25 | 66  | 22  | 6    |
| 8595426 | 4.26 | 68  | 24  | 6    |
| 8595427 | 4.27 | 68  | 24  | 6    |
| 8595428 | 4.28 | 68  | 24  | 6    |
| 8595429 | 4.29 | 68  | 24  | 6    |
| 61543   | 4.3  | 68  | 24  | 6    |
| 8595431 | 4.31 | 68  | 24  | 6    |
| 8595432 | 4.32 | 68  | 24  | 6    |
| 8595433 | 4.33 | 68  | 24  | 6    |
| 8595434 | 4.34 | 68  | 24  | 6    |
| 8595435 | 4.35 | 68  | 24  | 6    |
| 8595436 | 4.36 | 68  | 24  | 6    |
| 8595437 | 4.37 | 68  | 24  | 6    |
| 8595438 | 4.38 | 68  | 24  | 6    |
| 8595439 | 4.39 | 68  | 24  | 6    |
| 61544   | 4.4  | 68  | 24  | 6    |
| 8595441 | 4.41 | 68  | 24  | 6    |
| 8595442 | 4.42 | 68  | 24  | 6    |
| 8595443 | 4.43 | 68  | 24  | 6    |
| 8595444 | 4.44 | 68  | 24  | 6    |
| 8595445 | 4.45 | 68  | 24  | 6    |
| 8595446 | 4.46 | 68  | 24  | 6    |
| 8595447 | 4.47 | 68  | 24  | 6    |
| 8595448 | 4.48 | 68  | 24  | 6    |
| 8595449 | 4.49 | 68  | 24  | 6    |
| 61545   | 4.5  | 68  | 24  | 6    |
| 8595451 | 4.51 | 68  | 24  | 6    |
| 8595452 | 4.52 | 68  | 24  | 6    |
| 8595453 | 4.53 | 68  | 24  | 6    |
| 8595454 | 4.54 | 68  | 24  | 6    |
| 8595455 | 4.55 | 68  | 24  | 6    |
| 8595456 | 4.56 | 68  | 24  | 6    |
| 8595457 | 4.57 | 68  | 24  | 6    |
| 8595458 | 4.58 | 68  | 24  | 6    |
| 8595459 | 4.59 | 68  | 24  | 6    |
| 61546   | 4.6  | 68  | 24  | 6    |
| 8595461 | 4.61 | 68  | 24  | 6    |
| 8595462 | 4.62 | 68  | 24  | 6    |
| 8595463 | 4.63 | 68  | 24  | 6    |
| 8595464 | 4.64 | 68  | 24  | 6    |
| 8595465 | 4.65 | 68  | 24  | 6    |
| 8595466 | 4.66 | 68  | 24  | 6    |
| 8595467 | 4.67 | 68  | 24  | 6    |
| 8595468 | 4.68 | 68  | 24  | 6    |
| 8595469 | 4.69 | 68  | 24  | 6    |
| 61547   | 4.7  | 68  | 24  | 6    |
| 8595471 | 4.71 | 68  | 24  | 6    |





### For General Purpose Applications

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8595472 | 4.72 | 68  | 24  | 6    |
| 8595473 | 4.73 | 68  | 24  | 6    |
| 8595474 | 4.74 | 68  | 24  | 6    |
| 8595475 | 4.75 | 68  | 24  | 6    |
| 8595476 | 4.76 | 70  | 26  | 6    |
| 8595477 | 4.77 | 70  | 26  | 6    |
| 8595478 | 4.78 | 70  | 26  | 6    |
| 8595479 | 4.79 | 70  | 26  | 6    |
| 61548   | 4.8  | 70  | 26  | 6    |
| 8595481 | 4.81 | 70  | 26  | 6    |
| 8595482 | 4.82 | 70  | 26  | 6    |
| 8595483 | 4.83 | 70  | 26  | 6    |
| 8595484 | 4.84 | 70  | 26  | 6    |
| 8595485 | 4.85 | 70  | 26  | 6    |
| 8595486 | 4.86 | 70  | 26  | 6    |
| 8595487 | 4.87 | 70  | 26  | 6    |
| 8595488 | 4.88 | 70  | 26  | 6    |
| 8595489 | 4.89 | 70  | 26  | 6    |
| 61549   | 4.9  | 70  | 26  | 6    |
| 8595491 | 4.91 | 70  | 26  | 6    |
| 8595492 | 4.92 | 70  | 26  | 6    |
| 8595493 | 4.93 | 70  | 26  | 6    |
| 8595494 | 4.94 | 70  | 26  | 6    |
| 8595495 | 4.95 | 70  | 26  | 6    |
| 8595496 | 4.96 | 70  | 26  | 6    |
| 8595497 | 4.97 | 70  | 26  | 6    |
| 8595498 | 4.98 | 70  | 26  | 6    |
| 8595499 | 4.99 | 70  | 26  | 6    |
| 61550   | 5.00 | 70  | 26  | 6    |
| 8595501 | 5.01 | 70  | 26  | 6    |
| 8595502 | 5.02 | 70  | 26  | 6    |
| 8595503 | 5.03 | 70  | 26  | 6    |
| 8595504 | 5.04 | 70  | 26  | 6    |
| 8595505 | 5.05 | 70  | 26  | 6    |
| 8595506 | 5.06 | 70  | 26  | 6    |
| 8595507 | 5.07 | 70  | 26  | 6    |
| 8595508 | 5.08 | 70  | 26  | 6    |
| 8595509 | 5.09 | 70  | 26  | 6    |
| 61551   | 5.1  | 70  | 26  | 6    |
| 8595511 | 5.11 | 70  | 26  | 6    |
| 8595512 | 5.12 | 70  | 26  | 6    |
| 8595513 | 5.13 | 70  | 26  | 6    |
| 8595514 | 5.14 | 70  | 26  | 6    |
| 8595515 | 5.15 | 70  | 26  | 6    |
| 8595516 | 5.16 | 70  | 26  | 6    |
| 8595517 | 5.17 | 70  | 26  | 6    |
| 8595518 | 5.18 | 70  | 26  | 6    |
| 8595519 | 5.19 | 70  | 26  | 6    |
| 61552   | 5.2  | 70  | 26  | 6    |
| 8595521 | 5.21 | 70  | 26  | 6    |
| 8595522 | 5.22 | 70  | 26  | 6    |
| 8595523 | 5.23 | 70  | 26  | 6    |
| 8595524 | 5.24 | 70  | 26  | 6    |
| 8595525 | 5.25 | 70  | 26  | 6    |
| 8595526 | 5.26 | 70  | 26  | 6    |
| 8595527 | 5.27 | 70  | 26  | 6    |
| 8595528 | 5.28 | 70  | 26  | 6    |
| 8595529 | 5.29 | 70  | 26  | 6    |
| 61553   | 5.3  | 70  | 26  | 6    |
| 8595531 | 5.31 | 72  | 28  | 6    |
| 8595532 | 5.32 | 72  | 28  | 6    |
| 8595533 | 5.33 | 72  | 28  | 6    |
| 8595534 | 5.34 | 72  | 28  | 6    |
| 8595535 | 5.35 | 72  | 28  | 6    |
| 8595536 | 5.36 | 72  | 28  | 8    |
| 8595537 | 5.37 | 72  | 28  | 8    |
| 8595538 | 5.38 | 72  | 28  | 8    |
| 8595539 | 5.39 | 72  | 28  | 8    |
| 61554   | 5.4  | 72  | 28  | 8    |
| 8595541 | 5.41 | 72  | 28  | 8    |
| 8595542 | 5.42 | 72  | 28  | 8    |
| 8595543 | 5.43 | 72  | 28  | 8    |
| 8595544 | 5.44 | 72  | 28  | 8    |
| 8595545 | 5.45 | 72  | 28  | 8    |
| 8595546 | 5.46 | 72  | 28  | 8    |
| 8595547 | 5.47 | 72  | 28  | 8    |
| 8595548 | 5.48 | 72  | 28  | 8    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8595549 | 5.49 | 72  | 28  | 8    |
| 61555   | 5.5  | 72  | 28  | 8    |
| 8595551 | 5.51 | 72  | 28  | 8    |
| 8595552 | 5.52 | 72  | 28  | 8    |
| 8595553 | 5.53 | 72  | 28  | 8    |
| 8595554 | 5.54 | 72  | 28  | 8    |
| 8595555 | 5.55 | 72  | 28  | 8    |
| 8595556 | 5.56 | 72  | 28  | 8    |
| 8595557 | 5.57 | 72  | 28  | 8    |
| 8595558 | 5.58 | 72  | 28  | 8    |
| 8595559 | 5.59 | 72  | 28  | 8    |
| 61556   | 5.6  | 72  | 28  | 8    |
| 8595561 | 5.61 | 72  | 28  | 8    |
| 8595562 | 5.62 | 72  | 28  | 8    |
| 8595563 | 5.63 | 72  | 28  | 8    |
| 8595564 | 5.64 | 72  | 28  | 8    |
| 8595565 | 5.65 | 72  | 28  | 8    |
| 8595566 | 5.66 | 72  | 28  | 8    |
| 8595567 | 5.67 | 72  | 28  | 8    |
| 8595568 | 5.68 | 72  | 28  | 8    |
| 8595569 | 5.69 | 72  | 28  | 8    |
| 61557   | 5.7  | 72  | 28  | 8    |
| 8595571 | 5.71 | 72  | 28  | 8    |
| 8595572 | 5.72 | 72  | 28  | 8    |
| 8595573 | 5.73 | 72  | 28  | 8    |
| 8595574 | 5.74 | 72  | 28  | 8    |
| 8595575 | 5.75 | 72  | 28  | 8    |
| 8595576 | 5.76 | 72  | 28  | 8    |
| 8595577 | 5.77 | 72  | 28  | 8    |
| 8595578 | 5.78 | 72  | 28  | 8    |
| 8595579 | 5.79 | 72  | 28  | 8    |
| 61558   | 5.8  | 72  | 28  | 8    |
| 8595581 | 5.81 | 72  | 28  | 8    |
| 8595582 | 5.82 | 72  | 28  | 8    |
| 8595583 | 5.83 | 72  | 28  | 8    |
| 8595584 | 5.84 | 72  | 28  | 8    |
| 8595585 | 5.85 | 72  | 28  | 8    |
| 8595586 | 5.86 | 72  | 28  | 8    |
| 8595587 | 5.87 | 72  | 28  | 8    |
| 8595588 | 5.88 | 72  | 28  | 8    |
| 8595589 | 5.89 | 72  | 28  | 8    |
| 61559   | 5.9  | 72  | 28  | 8    |
| 8595591 | 5.91 | 72  | 28  | 8    |
| 8595592 | 5.92 | 72  | 28  | 8    |
| 8595593 | 5.93 | 72  | 28  | 8    |
| 8595594 | 5.94 | 72  | 28  | 8    |
| 8595595 | 5.95 | 72  | 28  | 8    |
| 8595596 | 5.96 | 72  | 28  | 8    |
| 8595597 | 5.97 | 72  | 28  | 8    |
| 8595598 | 5.98 | 72  | 28  | 8    |
| 8595599 | 5.99 | 72  | 28  | 8    |
| 61560   | 6    | 72  | 28  | 8    |
| 8595605 | 6.05 | 75  | 31  | 8    |
| 61561   | 6.1  | 75  | 31  | 8    |
| 8595615 | 6.15 | 75  | 31  | 8    |
| 61562   | 6.2  | 75  | 31  | 8    |
| 8595625 | 6.25 | 75  | 31  | 8    |
| 61563   | 6.3  | 75  | 31  | 8    |
| 8595635 | 6.35 | 75  | 31  | 8    |
| 61564   | 6.4  | 75  | 31  | 8    |
| 8595645 | 6.45 | 75  | 31  | 8    |
| 61565   | 6.5  | 75  | 31  | 8    |
| 8595655 | 6.55 | 75  | 31  | 8    |
| 61566   | 6.6  | 75  | 31  | 8    |
| 8595665 | 6.65 | 75  | 31  | 8    |
| 61567   | 6.7  | 75  | 31  | 8    |
| 8595675 | 6.75 | 78  | 34  | 8    |
| 61568   | 6.8  | 78  | 34  | 8    |
| 8595685 | 6.85 | 78  | 34  | 8    |
| 61569   | 6.9  | 78  | 34  | 8    |
| 8595695 | 6.95 | 78  | 34  | 8    |
| 61570   | 7    | 78  | 34  | 8    |
| 8595705 | 7.05 | 78  | 34  | 8    |
| 61571   | 7.1  | 78  | 34  | 8    |
| 8595715 | 7.15 | 78  | 34  | 8    |
| 61572   | 7.2  | 78  | 34  | 8    |
| 8595725 | 7.25 | 78  | 34  | 8    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 61573   | 7.3  | 78  | 34  | 8    |
| 8595735 | 7.35 | 78  | 34  | 8    |
| 61574   | 7.4  | 78  | 34  | 8    |
| 8595745 | 7.45 | 78  | 34  | 8    |
| 61575   | 7.5  | 78  | 34  | 8    |
| 8595755 | 7.55 | 81  | 37  | 8    |
| 61576   | 7.6  | 81  | 37  | 8    |
| 8595765 | 7.65 | 81  | 37  | 8    |
| 61577   | 7.7  | 81  | 37  | 8    |
| 8595775 | 7.75 | 81  | 37  | 8    |
| 61578   | 7.8  | 81  | 37  | 8    |
| 8595785 | 7.85 | 81  | 37  | 8    |
| 61579   | 7.9  | 81  | 37  | 8    |
| 8595795 | 7.95 | 81  | 37  | 8    |
| 61580   | 8    | 81  | 37  | 8    |
| 8595805 | 8.05 | 87  | 37  | 10   |
| 61581   | 8.1  | 87  | 37  | 10   |
| 8595815 | 8.15 | 87  | 37  | 10   |
| 61582   | 8.2  | 87  | 37  | 10   |
| 8595825 | 8.25 | 87  | 37  | 10   |
| 61583   | 8.3  | 87  | 37  | 10   |
| 8595835 | 8.35 | 87  | 37  | 10   |
| 61584   | 8.4  | 87  | 37  | 10   |
| 8595845 | 8.45 | 87  | 37  | 10   |
| 61585   | 8.5  | 87  | 37  | 10   |
| 8595855 | 8.55 | 90  | 40  | 10   |
| 61586   | 8.6  | 90  | 40  | 10   |
| 8595865 | 8.65 | 90  | 40  | 10   |
| 61587   | 8.7  | 90  | 40  | 10   |
| 8595875 | 8.75 | 90  | 40  | 10   |
| 61588   | 8.8  | 90  | 40  | 10   |
| 8595885 | 8.85 | 90  | 40  | 10   |
| 61589   | 8.9  | 90  | 40  | 10   |
| 8595895 | 8.95 | 90  | 40  | 10   |
| 61690   | 9    | 90  | 40  | 10   |
| 8595905 | 9.05 | 90  | 40  | 10   |
| 61591   | 9.1  | 90  | 40  | 10   |
| 8595915 | 9.15 | 90  | 40  | 10   |
| 61592   | 9.2  | 90  | 40  | 10   |
| 8595925 | 9.25 | 90  | 40  | 10   |
| 61593   | 9.3  | 90  | 40  | 10   |
| 8595935 | 9.35 | 90  | 40  | 10   |
| 61594   | 9.4  | 90  | 40  | 10   |
| 8595945 | 9.45 | 90  | 40  | 10   |
| 61595   | 9.5  | 90  | 40  | 10   |
| 8595955 | 9.54 | 93  | 43  | 10   |
| 61596   | 9.6  | 93  | 43  | 10   |
| 8595965 | 9.65 | 93  | 43  | 10   |
| 61567   | 9.7  | 93  | 43  | 10   |
| 8595975 | 9.75 | 93  | 43  | 10   |
| 61598   | 9.8  | 93  | 43  | 10   |
| 8595985 | 9.85 | 93  | 43  | 10   |
| 61599   | 9.9  | 93  | 43  | 10   |
| 8595995 | 9.95 | 93  | 43  | 10   |
| 61600   | 10   | 93  | 43  | 10   |
| 61601   | 10.1 | 100 | 43  | 12   |
| 61602   | 10.2 | 100 | 43  | 12   |
| 61603   | 10.3 | 100 | 43  | 12   |
| 61604   | 10.4 | 100 | 43  | 12   |
| 61605   | 10.5 | 100 | 43  | 12   |
| 61606   | 10.6 | 100 | 43  | 12   |
| 61607   | 10.7 | 104 | 47  | 12   |
| 61608   | 10.8 | 104 | 47  | 12   |
| 61609   | 10.9 | 104 | 47  | 12   |
| 61610   | 11   | 104 | 47  | 12   |
| 61611   | 11.1 | 104 | 47  | 12   |
| 61612   | 11.2 | 104 | 47  | 12   |
| 61613   | 11.3 | 104 | 47  | 12   |
| 61614   | 11.4 | 104 | 47  | 12   |
| 61615   | 11.5 | 104 | 47  | 12   |
| 61616   | 11.6 | 104 | 47  | 12   |
| 61617   | 11.7 | 104 | 47  | 12   |
| 61618   | 11.8 | 104 | 47  | 12   |
| 61619   | 11.9 | 108 | 51  | 12   |
| 61620   | 12   | 108 | 51  | 12   |

# EX-SUS-GDR

High Performance HSS-EV3 Drills For SUS & General Applications

For General Purpose Applications



SPEED  
FEED  
P.162

HSSE

TiN

130°

120°

h8

h7

35~40°

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 62520   | 2    | 56  | 24  | 3    |
| 8597201 | 2.01 | 56  | 24  | 3    |
| 8597202 | 2.02 | 56  | 24  | 3    |
| 8597203 | 2.03 | 56  | 24  | 3    |
| 8597204 | 2.04 | 56  | 24  | 3    |
| 8597205 | 2.05 | 56  | 24  | 3    |
| 8597206 | 2.06 | 56  | 24  | 3    |
| 8597207 | 2.07 | 56  | 24  | 3    |
| 8597208 | 2.08 | 56  | 24  | 3    |
| 8597209 | 2.09 | 56  | 24  | 3    |
| 62521   | 2.1  | 56  | 24  | 3    |
| 8597211 | 2.11 | 56  | 24  | 3    |
| 8597212 | 2.12 | 56  | 24  | 3    |
| 8597213 | 2.13 | 59  | 27  | 3    |
| 8597214 | 2.14 | 59  | 27  | 3    |
| 8597215 | 2.15 | 59  | 27  | 3    |
| 8597216 | 2.16 | 59  | 27  | 3    |
| 8597217 | 2.17 | 59  | 27  | 3    |
| 8597218 | 2.18 | 59  | 27  | 3    |
| 8597219 | 2.19 | 59  | 27  | 3    |
| 62522   | 2.2  | 59  | 27  | 3    |
| 8597221 | 2.21 | 59  | 27  | 3    |
| 8597222 | 2.22 | 59  | 27  | 3    |
| 8597223 | 2.23 | 59  | 27  | 3    |
| 8597224 | 2.24 | 59  | 27  | 3    |
| 8597225 | 2.25 | 59  | 27  | 3    |
| 8597226 | 2.26 | 59  | 27  | 3    |
| 8597227 | 2.27 | 59  | 27  | 3    |
| 8597228 | 2.28 | 59  | 27  | 3    |
| 8597229 | 2.29 | 59  | 27  | 3    |
| 62523   | 2.3  | 59  | 27  | 3    |
| 8597231 | 2.31 | 59  | 27  | 3    |
| 8597232 | 2.32 | 59  | 27  | 3    |
| 8597233 | 2.33 | 59  | 27  | 3    |
| 8597234 | 2.34 | 59  | 27  | 3    |
| 8597235 | 2.35 | 59  | 27  | 3    |
| 8597236 | 2.36 | 59  | 27  | 3    |
| 8597237 | 2.37 | 62  | 30  | 3    |
| 8597238 | 2.38 | 62  | 30  | 3    |
| 8597239 | 2.39 | 62  | 30  | 3    |
| 62524   | 2.4  | 62  | 30  | 3    |
| 8597241 | 2.41 | 62  | 30  | 3    |
| 8597242 | 2.42 | 62  | 30  | 3    |
| 8597243 | 2.43 | 62  | 30  | 3    |
| 8597244 | 2.44 | 62  | 30  | 3    |
| 8597245 | 2.45 | 62  | 30  | 3    |
| 8597246 | 2.46 | 62  | 30  | 3    |
| 8597247 | 2.47 | 62  | 30  | 3    |
| 8597248 | 2.48 | 62  | 30  | 3    |
| 8597249 | 2.49 | 62  | 30  | 3    |
| 62525   | 2.5  | 62  | 30  | 3    |
| 8597251 | 2.51 | 62  | 30  | 3    |
| 8597252 | 2.52 | 62  | 30  | 3    |
| 8597253 | 2.53 | 62  | 30  | 3    |
| 8597254 | 2.54 | 62  | 30  | 3    |
| 8597255 | 2.55 | 62  | 30  | 3    |
| 8597256 | 2.56 | 62  | 30  | 3    |
| 8597257 | 2.57 | 62  | 30  | 3    |
| 8597258 | 2.58 | 62  | 30  | 3    |
| 8597259 | 2.59 | 62  | 30  | 3    |
| 62526   | 2.6  | 62  | 30  | 3    |
| 8597261 | 2.61 | 62  | 30  | 3    |
| 8597262 | 2.62 | 62  | 30  | 3    |
| 8597263 | 2.63 | 62  | 30  | 3    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8597264 | 2.64 | 62  | 30  | 3    |
| 8597265 | 2.65 | 62  | 30  | 3    |
| 8597266 | 2.66 | 65  | 33  | 3    |
| 8597267 | 2.67 | 65  | 33  | 3    |
| 8597268 | 2.68 | 65  | 33  | 3    |
| 8597269 | 2.69 | 65  | 33  | 3    |
| 62527   | 2.7  | 65  | 33  | 3    |
| 8597271 | 2.71 | 65  | 33  | 3    |
| 8597272 | 2.72 | 65  | 33  | 3    |
| 8597273 | 2.73 | 65  | 33  | 3    |
| 8597274 | 2.74 | 65  | 33  | 3    |
| 8597275 | 2.75 | 65  | 33  | 3    |
| 8597276 | 2.76 | 65  | 33  | 3    |
| 8597277 | 2.77 | 65  | 33  | 3    |
| 8597278 | 2.78 | 65  | 33  | 3    |
| 8597279 | 2.79 | 65  | 33  | 3    |
| 62528   | 2.8  | 65  | 33  | 3    |
| 8597281 | 2.81 | 65  | 33  | 3    |
| 8597282 | 2.82 | 65  | 33  | 3    |
| 8597283 | 2.83 | 65  | 33  | 3    |
| 8597284 | 2.84 | 65  | 33  | 3    |
| 8597285 | 2.85 | 65  | 33  | 3    |
| 8597286 | 2.86 | 65  | 33  | 3    |
| 8597287 | 2.87 | 65  | 33  | 3    |
| 8597288 | 2.88 | 65  | 33  | 3    |
| 8597289 | 2.89 | 65  | 33  | 3    |
| 62529   | 2.9  | 65  | 33  | 3    |
| 8597291 | 2.91 | 65  | 33  | 3    |
| 8597292 | 2.92 | 65  | 33  | 3    |
| 8597293 | 2.93 | 65  | 33  | 3    |
| 8597294 | 2.94 | 65  | 33  | 3    |
| 8597295 | 2.95 | 65  | 33  | 3    |
| 8597296 | 2.96 | 65  | 33  | 3    |
| 8597297 | 2.97 | 65  | 33  | 3    |
| 8597298 | 2.98 | 65  | 33  | 3    |
| 8597299 | 2.99 | 65  | 33  | 3    |
| 62530   | 3    | 65  | 33  | 3    |
| 8597301 | 3.01 | 68  | 36  | 4    |
| 8597302 | 3.02 | 68  | 36  | 4    |
| 8597303 | 3.03 | 68  | 36  | 4    |
| 8597304 | 3.04 | 68  | 36  | 4    |
| 8597305 | 3.05 | 68  | 36  | 4    |
| 8597306 | 3.06 | 68  | 36  | 4    |
| 8597307 | 3.07 | 68  | 36  | 4    |
| 8597308 | 3.08 | 68  | 36  | 4    |
| 8597309 | 3.09 | 68  | 36  | 4    |
| 62531   | 3.1  | 68  | 36  | 4    |
| 8597311 | 3.11 | 68  | 36  | 4    |
| 8597312 | 3.12 | 68  | 36  | 4    |
| 8597313 | 3.13 | 68  | 36  | 4    |
| 8597314 | 3.14 | 68  | 36  | 4    |
| 8597315 | 3.15 | 68  | 36  | 4    |
| 8597316 | 3.16 | 68  | 36  | 4    |
| 8597317 | 3.17 | 68  | 36  | 4    |
| 8597318 | 3.18 | 68  | 36  | 4    |
| 8597319 | 3.19 | 68  | 36  | 4    |
| 62532   | 3.2  | 68  | 36  | 4    |
| 8597321 | 3.21 | 68  | 36  | 4    |
| 8597322 | 3.22 | 68  | 36  | 4    |
| 8597323 | 3.23 | 68  | 36  | 4    |
| 8597324 | 3.24 | 68  | 36  | 4    |
| 8597325 | 3.25 | 68  | 36  | 4    |
| 8597326 | 3.26 | 68  | 36  | 4    |
| 8597327 | 3.27 | 68  | 36  | 4    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8597328 | 3.28 | 68  | 36  | 4    |
| 8597329 | 3.29 | 68  | 36  | 4    |
| 62533   | 3.3  | 68  | 36  | 4    |
| 8597331 | 3.31 | 68  | 36  | 4    |
| 8597332 | 3.32 | 68  | 36  | 4    |
| 8597333 | 3.33 | 68  | 36  | 4    |
| 8597334 | 3.34 | 68  | 36  | 4    |
| 8597335 | 3.35 | 68  | 36  | 4    |
| 8597336 | 3.36 | 71  | 39  | 4    |
| 8597337 | 3.37 | 71  | 39  | 4    |
| 8597338 | 3.38 | 71  | 39  | 4    |
| 8597339 | 3.39 | 71  | 39  | 4    |
| 62534   | 3.4  | 71  | 39  | 4    |
| 8597341 | 3.41 | 71  | 39  | 4    |
| 8597342 | 3.42 | 71  | 39  | 4    |
| 8597343 | 3.43 | 71  | 39  | 4    |
| 8597344 | 3.44 | 71  | 39  | 4    |
| 8597345 | 3.45 | 71  | 39  | 4    |
| 8597346 | 3.46 | 71  | 39  | 4    |
| 8597347 | 3.47 | 71  | 39  | 4    |
| 8597348 | 3.48 | 71  | 39  | 4    |
| 8597349 | 3.49 | 71  | 39  | 4    |
| 62535   | 3.5  | 71  | 39  | 4    |
| 8597351 | 3.51 | 71  | 39  | 4    |
| 8597352 | 3.52 | 71  | 39  | 4    |
| 8597353 | 3.53 | 71  | 39  | 4    |
| 8597354 | 3.54 | 71  | 39  | 4    |
| 8597355 | 3.55 | 71  | 39  | 4    |
| 8597356 | 3.56 | 71  | 39  | 4    |
| 8597357 | 3.57 | 71  | 39  | 4    |
| 8597358 | 3.58 | 71  | 39  | 4    |
| 8597359 | 3.59 | 71  | 39  | 4    |
| 62536   | 3.6  | 71  | 39  | 4    |
| 8597361 | 3.61 | 71  | 39  | 4    |
| 8597362 | 3.62 | 71  | 39  | 4    |
| 8597363 | 3.63 | 71  | 39  | 4    |
| 8597364 | 3.64 | 71  | 39  | 4    |
| 8597365 | 3.65 | 71  | 39  | 4    |
| 8597366 | 3.66 | 71  | 39  | 4    |
| 8597367 | 3.67 | 71  | 39  | 4    |
| 8597368 | 3.68 | 71  | 39  | 4    |
| 8597369 | 3.69 | 71  | 39  | 4    |
| 62537   | 3.7  | 71  | 39  | 4    |
| 8597371 | 3.71 | 71  | 39  | 4    |
| 8597372 | 3.72 | 71  | 39  | 4    |
| 8597373 | 3.73 | 71  | 39  | 4    |
| 8597374 | 3.74 | 71  | 39  | 4    |
| 8597375 | 3.75 | 71  | 39  | 4    |
| 8597376 | 3.76 | 75  | 43  | 4    |
| 8597377 | 3.77 | 75  | 43  | 4    |
| 8597378 | 3.78 | 75  | 43  | 4    |
| 8597379 | 3.79 | 75  | 43  | 4    |
| 62538   | 3.8  | 75  | 43  | 4    |
| 8597381 | 3.81 | 75  | 43  | 4    |
| 8597382 | 3.82 | 75  | 43  | 4    |
| 8597383 | 3.83 | 75  | 43  | 4    |
| 8597384 | 3.84 | 75  | 43  | 4    |
| 8597385 | 3.85 | 75  | 43  | 4    |
| 8597386 | 3.86 | 75  | 43  | 4    |
| 8597387 | 3.87 | 75  | 43  | 4    |
| 8597388 | 3.88 | 75  | 43  | 4    |
| 8597389 | 3.89 | 75  | 43  | 4    |
| 62539   | 3.9  | 75  | 43  | 4    |
| 8597391 | 3.91 | 75  | 43  | 4    |



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For General Purpose Applications

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8597392 | 3.92 | 75  | 43  | 4    |
| 8597393 | 3.93 | 75  | 43  | 4    |
| 8597394 | 3.94 | 75  | 43  | 4    |
| 8597395 | 3.95 | 75  | 43  | 4    |
| 8597396 | 3.96 | 75  | 43  | 4    |
| 8597397 | 3.97 | 75  | 43  | 4    |
| 8597398 | 3.98 | 75  | 43  | 4    |
| 8597399 | 3.99 | 75  | 43  | 4    |
| 62540   | 4    | 75  | 43  | 4    |
| 8597401 | 4.01 | 87  | 43  | 6    |
| 8597402 | 4.02 | 87  | 43  | 6    |
| 8597403 | 4.03 | 87  | 43  | 6    |
| 8597404 | 4.04 | 87  | 43  | 6    |
| 8597405 | 4.05 | 87  | 43  | 6    |
| 8597406 | 4.06 | 87  | 43  | 6    |
| 8597407 | 4.07 | 87  | 43  | 6    |
| 8597408 | 4.08 | 87  | 43  | 6    |
| 8597409 | 4.09 | 87  | 43  | 6    |
| 62541   | 4.1  | 87  | 43  | 6    |
| 8597411 | 4.11 | 87  | 43  | 6    |
| 8597412 | 4.12 | 87  | 43  | 6    |
| 8597413 | 4.13 | 87  | 43  | 6    |
| 8597414 | 4.14 | 87  | 43  | 6    |
| 8597415 | 4.15 | 87  | 43  | 6    |
| 8597416 | 4.16 | 87  | 43  | 6    |
| 8597417 | 4.17 | 87  | 43  | 6    |
| 8597418 | 4.18 | 87  | 43  | 6    |
| 8597419 | 4.19 | 87  | 43  | 6    |
| 62542   | 4.2  | 87  | 43  | 6    |
| 8597421 | 4.21 | 87  | 43  | 6    |
| 8597422 | 4.22 | 87  | 43  | 6    |
| 8597423 | 4.23 | 87  | 43  | 6    |
| 8597424 | 4.24 | 87  | 43  | 6    |
| 8597425 | 4.25 | 87  | 43  | 6    |
| 8597426 | 4.26 | 91  | 47  | 6    |
| 8597427 | 4.27 | 91  | 47  | 6    |
| 8597428 | 4.28 | 91  | 47  | 6    |
| 8597429 | 4.29 | 91  | 47  | 6    |
| 62543   | 4.3  | 91  | 47  | 6    |
| 8597431 | 4.31 | 91  | 47  | 6    |
| 8597432 | 4.32 | 91  | 47  | 6    |
| 8597433 | 4.33 | 91  | 47  | 6    |
| 8597434 | 4.34 | 91  | 47  | 6    |
| 8597435 | 4.35 | 91  | 47  | 6    |
| 8597436 | 4.36 | 91  | 47  | 6    |
| 8597437 | 4.37 | 91  | 47  | 6    |
| 8597438 | 4.38 | 91  | 47  | 6    |
| 8597439 | 4.39 | 91  | 47  | 6    |
| 62544   | 4.4  | 91  | 47  | 6    |
| 8597441 | 4.41 | 91  | 47  | 6    |
| 8597442 | 4.42 | 91  | 47  | 6    |
| 8597443 | 4.43 | 91  | 47  | 6    |
| 8597444 | 4.44 | 91  | 47  | 6    |
| 8597445 | 4.45 | 91  | 47  | 6    |
| 8597446 | 4.46 | 91  | 47  | 6    |
| 8597447 | 4.47 | 91  | 47  | 6    |
| 8597448 | 4.48 | 91  | 47  | 6    |
| 8597449 | 4.49 | 91  | 47  | 6    |
| 62545   | 4.5  | 91  | 47  | 6    |
| 8597451 | 4.51 | 91  | 47  | 6    |
| 8597452 | 4.52 | 91  | 47  | 6    |
| 8597453 | 4.53 | 91  | 47  | 6    |
| 8597454 | 4.54 | 91  | 47  | 6    |
| 8597455 | 4.55 | 91  | 47  | 6    |

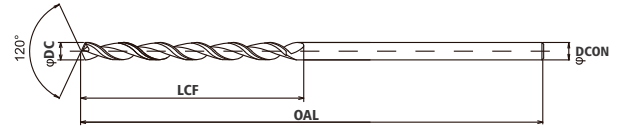
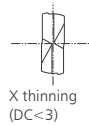
| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8597456 | 4.56 | 91  | 47  | 6    |
| 8597457 | 4.57 | 91  | 47  | 6    |
| 8597458 | 4.58 | 91  | 47  | 6    |
| 8597459 | 4.59 | 91  | 47  | 6    |
| 62546   | 4.6  | 91  | 47  | 6    |
| 8597461 | 4.61 | 91  | 47  | 6    |
| 8597462 | 4.62 | 91  | 47  | 6    |
| 8597463 | 4.63 | 91  | 47  | 6    |
| 8597464 | 4.64 | 91  | 47  | 6    |
| 8597465 | 4.65 | 91  | 47  | 6    |
| 8597466 | 4.66 | 91  | 47  | 6    |
| 8597467 | 4.67 | 91  | 47  | 6    |
| 8597468 | 4.68 | 91  | 47  | 6    |
| 8597469 | 4.69 | 91  | 47  | 6    |
| 62547   | 4.7  | 91  | 47  | 6    |
| 8597471 | 4.71 | 91  | 47  | 6    |
| 8597472 | 4.72 | 91  | 47  | 6    |
| 8597473 | 4.73 | 91  | 47  | 6    |
| 8597474 | 4.74 | 91  | 47  | 6    |
| 8597475 | 4.75 | 91  | 47  | 6    |
| 8597476 | 4.76 | 96  | 52  | 6    |
| 8597477 | 4.77 | 96  | 52  | 6    |
| 8597478 | 4.78 | 96  | 52  | 6    |
| 8597479 | 4.79 | 96  | 52  | 6    |
| 62548   | 4.8  | 96  | 52  | 6    |
| 8597481 | 4.81 | 96  | 52  | 6    |
| 8597482 | 4.82 | 96  | 52  | 6    |
| 8597483 | 4.83 | 96  | 52  | 6    |
| 8597484 | 4.84 | 96  | 52  | 6    |
| 8597485 | 4.85 | 96  | 52  | 6    |
| 8597486 | 4.86 | 96  | 52  | 6    |
| 8597487 | 4.87 | 96  | 52  | 6    |
| 8597488 | 4.88 | 96  | 52  | 6    |
| 8597489 | 4.89 | 96  | 52  | 6    |
| 62549   | 4.9  | 96  | 52  | 6    |
| 8597491 | 4.91 | 96  | 52  | 6    |
| 8597492 | 4.92 | 96  | 52  | 6    |
| 8597493 | 4.93 | 96  | 52  | 6    |
| 8597494 | 4.94 | 96  | 52  | 6    |
| 8597495 | 4.95 | 96  | 52  | 6    |
| 8597496 | 4.96 | 96  | 52  | 6    |
| 8597497 | 4.97 | 96  | 52  | 6    |
| 8597498 | 4.98 | 96  | 52  | 6    |
| 8597499 | 4.99 | 96  | 52  | 6    |
| 62550   | 5    | 96  | 52  | 6    |
| 8597501 | 5.01 | 96  | 52  | 6    |
| 8597502 | 5.02 | 96  | 52  | 6    |
| 8597503 | 5.03 | 96  | 52  | 6    |
| 8597504 | 5.04 | 96  | 52  | 6    |
| 8597505 | 5.05 | 96  | 52  | 6    |
| 8597506 | 5.06 | 96  | 52  | 6    |
| 8597507 | 5.07 | 96  | 52  | 6    |
| 8597508 | 5.08 | 96  | 52  | 6    |
| 8597509 | 5.09 | 96  | 52  | 6    |
| 62551   | 5.1  | 96  | 52  | 6    |
| 8597511 | 5.11 | 96  | 52  | 6    |
| 8597512 | 5.12 | 96  | 52  | 6    |
| 8597513 | 5.13 | 96  | 52  | 6    |
| 8597514 | 5.14 | 96  | 52  | 6    |
| 8597515 | 5.15 | 96  | 52  | 6    |
| 8597516 | 5.16 | 96  | 52  | 6    |
| 8597517 | 5.17 | 96  | 52  | 6    |
| 8597518 | 5.18 | 96  | 52  | 6    |
| 8597519 | 5.19 | 96  | 52  | 6    |

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 62552   | 5.2  | 96  | 52  | 6    |
| 8597521 | 5.21 | 96  | 52  | 6    |
| 8597522 | 5.22 | 96  | 52  | 6    |
| 8597523 | 5.23 | 96  | 52  | 6    |
| 8597524 | 5.24 | 96  | 52  | 6    |
| 8597525 | 5.25 | 96  | 52  | 6    |
| 8597526 | 5.26 | 96  | 52  | 6    |
| 8597527 | 5.27 | 96  | 52  | 6    |
| 8597528 | 5.28 | 96  | 52  | 6    |
| 8597529 | 5.29 | 96  | 52  | 6    |
| 62553   | 5.3  | 96  | 52  | 6    |
| 8597531 | 5.31 | 101 | 57  | 6    |
| 8597532 | 5.32 | 101 | 57  | 6    |
| 8597533 | 5.33 | 101 | 57  | 6    |
| 8597534 | 5.34 | 101 | 57  | 6    |
| 8597535 | 5.35 | 101 | 57  | 6    |
| 8597536 | 5.36 | 101 | 57  | 6    |
| 8597537 | 5.37 | 101 | 57  | 6    |
| 8597538 | 5.38 | 101 | 57  | 6    |
| 8597539 | 5.39 | 101 | 57  | 6    |
| 62554   | 5.4  | 101 | 57  | 6    |
| 8597541 | 5.41 | 101 | 57  | 6    |
| 8597542 | 5.42 | 101 | 57  | 6    |
| 8597543 | 5.43 | 101 | 57  | 6    |
| 8597544 | 5.44 | 101 | 57  | 6    |
| 8597545 | 5.45 | 101 | 57  | 6    |
| 8597546 | 5.46 | 101 | 57  | 6    |
| 8597547 | 5.47 | 101 | 57  | 6    |
| 8597548 | 5.48 | 101 | 57  | 6    |
| 8597549 | 5.49 | 101 | 57  | 6    |
| 62555   | 5.5  | 101 | 57  | 6    |
| 8597551 | 5.51 | 101 | 57  | 6    |
| 8597552 | 5.52 | 101 | 57  | 6    |
| 8597553 | 5.53 | 101 | 57  | 6    |
| 8597554 | 5.54 | 101 | 57  | 6    |
| 8597555 | 5.55 | 101 | 57  | 6    |
| 8597556 | 5.56 | 101 | 57  | 6    |
| 8597557 | 5.57 | 101 | 57  | 6    |
| 8597558 | 5.58 | 101 | 57  | 6    |
| 8597559 | 5.59 | 101 | 57  | 6    |
| 62556   | 5.6  | 101 | 57  | 6    |
| 8597561 | 5.61 | 101 | 57  | 6    |
| 8597562 | 5.62 | 101 | 57  | 6    |
| 8597563 | 5.63 | 101 | 57  | 6    |
| 8597564 | 5.64 | 101 | 57  | 6    |
| 8597565 | 5.65 | 101 | 57  | 6    |
| 8597566 | 5.66 | 101 | 57  | 6    |
| 8597567 | 5.67 | 101 | 57  | 6    |
| 8597568 | 5.68 | 101 | 57  | 6    |
| 8597569 | 5.69 | 101 | 57  | 6    |
| 62557   | 5.7  | 101 | 57  | 6    |
| 8597571 | 5.71 | 101 | 57  | 6    |
| 8597572 | 5.72 | 101 | 57  | 6    |
| 8597573 | 5.73 | 101 | 57  | 6    |
| 8597574 | 5.74 | 101 | 57  | 6    |
| 8597575 | 5.75 | 101 | 57  | 6    |
| 8597576 | 5.76 | 101 | 57  | 6    |
| 8597577 | 5.77 | 101 | 57  | 6    |
| 8597578 | 5.78 | 101 | 57  | 6    |
| 8597579 | 5.79 | 101 | 57  | 6    |
| 62558   | 5.8  | 101 | 57  | 6    |
| 8597581 | 5.81 | 101 | 57  | 6    |
| 8597582 | 5.82 | 101 | 57  | 6    |
| 8597583 | 5.83 | 101 | 57  | 6    |

## For General Purpose Applications

| EDP     | DC   | OAL | LCF | DCON |
|---------|------|-----|-----|------|
| 8597584 | 5.84 | 101 | 57  | 6    |
| 8597585 | 5.85 | 101 | 57  | 6    |
| 8597586 | 5.86 | 101 | 57  | 6    |
| 8597587 | 5.87 | 101 | 57  | 6    |
| 8597588 | 5.88 | 101 | 57  | 6    |
| 8597589 | 5.89 | 101 | 57  | 6    |
| 62559   | 5.9  | 101 | 57  | 6    |
| 8597591 | 5.91 | 101 | 57  | 6    |
| 8597592 | 5.92 | 101 | 57  | 6    |
| 8597593 | 5.93 | 101 | 57  | 6    |
| 8597594 | 5.94 | 101 | 57  | 6    |
| 8597595 | 5.95 | 101 | 57  | 6    |
| 8597596 | 5.96 | 101 | 57  | 6    |
| 8597597 | 5.97 | 101 | 57  | 6    |
| 8597598 | 5.98 | 101 | 57  | 6    |
| 8597599 | 5.99 | 101 | 57  | 6    |
| 62560   | 6    | 101 | 57  | 6    |
| 8597605 | 6.05 | 107 | 63  | 8    |
| 62561   | 6.1  | 107 | 63  | 8    |
| 8597615 | 6.15 | 107 | 63  | 8    |
| 62562   | 6.2  | 107 | 63  | 8    |
| 8597625 | 6.25 | 107 | 63  | 8    |
| 62563   | 6.3  | 107 | 63  | 8    |
| 8597635 | 6.35 | 107 | 63  | 8    |
| 62564   | 6.4  | 107 | 63  | 8    |
| 8597645 | 6.45 | 107 | 63  | 8    |
| 62565   | 6.5  | 107 | 63  | 8    |
| 8597655 | 6.55 | 107 | 63  | 8    |
| 62566   | 6.6  | 107 | 63  | 8    |
| 8597665 | 6.65 | 107 | 63  | 8    |
| 62567   | 6.7  | 107 | 63  | 8    |
| 8597675 | 6.75 | 113 | 69  | 8    |
| 62568   | 6.8  | 113 | 69  | 8    |
| 8597685 | 6.85 | 113 | 69  | 8    |
| 62569   | 6.9  | 113 | 69  | 8    |
| 8597695 | 6.95 | 113 | 69  | 8    |
| 62570   | 7    | 113 | 69  | 8    |
| 8597705 | 7.05 | 113 | 69  | 8    |
| 62571   | 7.1  | 113 | 69  | 8    |
| 8597715 | 7.15 | 113 | 69  | 8    |
| 62572   | 7.2  | 113 | 69  | 8    |
| 8597725 | 7.25 | 113 | 69  | 8    |
| 62573   | 7.3  | 113 | 69  | 8    |
| 8597735 | 7.35 | 113 | 69  | 8    |
| 62574   | 7.4  | 113 | 69  | 8    |
| 8597745 | 7.45 | 113 | 69  | 8    |
| 62575   | 7.5  | 113 | 69  | 8    |
| 8597755 | 7.55 | 119 | 69  | 8    |
| 62576   | 7.6  | 119 | 69  | 8    |
| 8597765 | 7.65 | 119 | 75  | 8    |
| 62577   | 7.7  | 119 | 75  | 8    |
| 8597775 | 7.75 | 119 | 75  | 8    |
| 62578   | 7.8  | 119 | 75  | 8    |
| 8597785 | 7.85 | 119 | 75  | 8    |
| 62579   | 7.9  | 119 | 75  | 8    |
| 8597795 | 7.95 | 119 | 75  | 8    |
| 62580   | 8    | 119 | 75  | 8    |
| 8597805 | 8.05 | 125 | 75  | 10   |
| 62581   | 8.1  | 125 | 75  | 10   |
| 8597815 | 8.15 | 125 | 75  | 10   |
| 62582   | 8.2  | 125 | 75  | 10   |
| 8597825 | 8.25 | 125 | 75  | 10   |
| 62583   | 8.3  | 125 | 75  | 10   |
| 8597835 | 8.35 | 125 | 75  | 10   |

[illegible]



Start manufacturing with WXL Coating of tip from June 2012.



For 10D operation

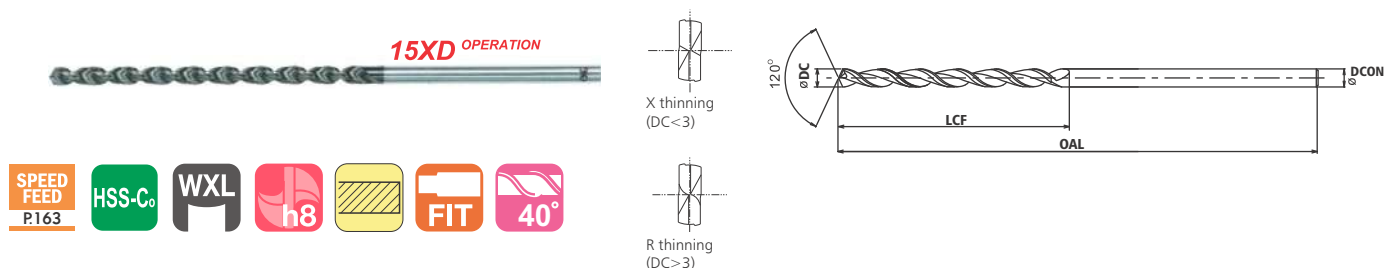
| EDP No. | DC        | LCF | OAL | DCON |
|---------|-----------|-----|-----|------|
|         | 1.5 × 10D | 26  | 70  | 1.5  |
| 8622816 | 1.6 × 10D |     |     | 1.6  |
|         | 1.7 × 10D |     |     | 1.7  |
| 8622818 | 1.8 × 10D |     |     | 1.8  |
|         | 1.9 × 10D |     |     | 1.9  |
| 8622820 | 2 × 10D   | 33  | 75  | 2    |
| 8622821 | 2.1 × 10D |     |     | 2.1  |
| 8622822 | 2.2 × 10D |     |     | 2.2  |
| 8622823 | 2.3 × 10D |     |     | 2.3  |
| 8622824 | 2.4 × 10D |     |     | 2.4  |
| 8622825 | 2.5 × 10D | 40  | 90  | 2.5  |
| 8622826 | 2.6 × 10D |     |     | 2.6  |
| 8622827 | 2.7 × 10D |     |     | 2.7  |
| 8622828 | 2.8 × 10D |     |     | 2.8  |
| 8622829 | 2.9 × 10D |     |     | 2.9  |
| 8622830 | 3 × 10D   | 45  | 100 | 3    |
| 8622831 | 3.1 × 10D |     |     | 3.1  |
| 8622832 | 3.2 × 10D |     |     | 3.2  |
| 8622833 | 3.3 × 10D |     |     | 3.3  |
| 8622834 | 3.4 × 10D |     |     | 3.4  |
| 8622835 | 3.5 × 10D | 50  | 100 | 3.5  |
| 8622836 | 3.6 × 10D |     |     | 3.6  |
| 8622837 | 3.7 × 10D |     |     | 3.7  |
| 8622838 | 3.8 × 10D |     |     | 3.8  |
| 8622839 | 3.9 × 10D |     |     | 3.9  |
| 8622840 | 4 × 10D   | 55  | 115 | 4    |
| 8622841 | 4.1 × 10D |     |     | 4.1  |
| 8622842 | 4.2 × 10D |     |     | 4.2  |
| 8622843 | 4.3 × 10D |     |     | 4.3  |
| 8622844 | 4.4 × 10D |     |     | 4.4  |
| 8622845 | 4.5 × 10D | 60  | 115 | 4.5  |
| 8622846 | 4.6 × 10D |     |     | 4.6  |
| 8622847 | 4.7 × 10D |     |     | 4.7  |
| 8622848 | 4.8 × 10D |     |     | 4.8  |
| 8622849 | 4.9 × 10D |     |     | 4.9  |
| 8622850 | 5 × 10D   | 65  | 128 | 5    |
| 8622851 | 5.1 × 10D |     |     | 5.1  |
| 8622852 | 5.2 × 10D |     |     | 5.2  |
| 8622853 | 5.3 × 10D |     |     | 5.3  |
| 8622854 | 5.4 × 10D |     |     | 5.4  |
| 8622855 | 5.5 × 10D | 78  | 128 | 5.5  |
| 8622856 | 5.6 × 10D |     |     | 5.6  |
| 8622857 | 5.7 × 10D |     |     | 5.7  |
| 8622858 | 5.8 × 10D |     |     | 5.8  |
| 8622859 | 5.9 × 10D |     |     | 5.9  |
| 8622860 | 6 × 10D   | 87  | 140 | 6    |
| 8622861 | 6.1 × 10D |     |     | 6.1  |
| 8622862 | 6.2 × 10D |     |     | 6.2  |
| 8622863 | 6.3 × 10D |     |     | 6.3  |
| 8622864 | 6.4 × 10D |     |     | 6.4  |
| 8622865 | 6.5 × 10D |     |     | 6.5  |
| 8622866 | 6.6 × 10D |     |     | 6.6  |
| 8622867 | 6.7 × 10D |     |     | 6.7  |

For 10D operation

| EDP No. | DC        | LCF | OAL | DCON |
|---------|-----------|-----|-----|------|
| 8622868 | 6.8× 10D  | 90  | 140 | 6.8  |
| 8622869 | 6.9× 10D  |     |     | 6.9  |
| 8622870 | 7 × 10D   |     |     | 7    |
| 8622871 | 7.1× 10D  | 100 | 155 | 7.1  |
| 8622872 | 7.2× 10D  |     |     | 7.2  |
| 8622873 | 7.3× 10D  |     |     | 7.3  |
| 8622874 | 7.4× 10D  |     |     | 7.4  |
| 8622875 | 7.5× 10D  |     |     | 7.5  |
| 8622876 | 7.6× 10D  | 7.6 |     |      |
| 8622877 | 7.7× 10D  | 7.7 |     |      |
| 8622878 | 7.8× 10D  | 7.8 |     |      |
| 8622879 | 7.9× 10D  | 7.9 |     |      |
| 8622880 | 8 × 10D   | 8   |     |      |
| 8622881 | 8.1× 10D  | 110 | 165 | 8.1  |
| 8622882 | 8.2× 10D  |     |     | 8.2  |
| 8622883 | 8.3× 10D  |     |     | 8.3  |
| 8622884 | 8.4× 10D  | 8.4 |     |      |
| 8622885 | 8.5× 10D  | 8.5 |     |      |
| 8622886 | 8.6× 10D  | 8.6 |     |      |
| 8622887 | 8.7× 10D  | 115 |     | 8.7  |
| 8622888 | 8.8× 10D  |     |     | 8.8  |
| 8622889 | 8.9× 10D  |     |     | 8.9  |
| 8622890 | 9 × 10D   |     |     | 9    |
| 8622891 | 9.1× 10D  | 125 | 190 | 9.1  |
| 8622892 | 9.2× 10D  |     |     | 9.2  |
| 8622893 | 9.3× 10D  |     |     | 9.3  |
| 8622894 | 9.4× 10D  |     |     | 9.4  |
| 8622895 | 9.5× 10D  |     |     | 9.5  |
| 8622896 | 9.6× 10D  | 130 |     | 9.6  |
| 8622897 | 9.7× 10D  |     |     | 9.7  |
| 8622898 | 9.8× 10D  |     |     | 9.8  |
| 8622899 | 9.9× 10D  |     |     | 9.9  |
| 8622900 | 10 × 10D  |     |     |      |
| 8622901 | 10.1× 10D | 140 | 205 | 10.1 |
| 8622902 | 10.2× 10D |     |     | 10.2 |
| 8622903 | 10.3× 10D |     |     | 10.3 |
| 8622904 | 10.4× 10D |     |     | 10.4 |
| 8622905 | 10.5× 10D |     |     | 10.5 |
| 8622906 | 10.6× 10D | 145 |     | 10.6 |
| 8622907 | 10.7× 10D |     |     | 10.7 |
| 8622908 | 10.8× 10D |     |     | 10.8 |
| 8622909 | 10.9× 10D |     |     | 10.9 |
| 8622910 | 11 × 10D  |     |     | 11   |
| 8622911 | 11.1× 10D | 155 | 215 | 11.1 |
| 8622912 | 11.2× 10D |     |     | 11.2 |
| 8622913 | 11.3× 10D |     |     | 11.3 |
| 8622914 | 11.4× 10D |     |     | 11.4 |
| 8622915 | 11.5× 10D |     |     | 11.5 |
| 8622916 | 11.6× 10D |     |     | 11.6 |
| 8622917 | 11.7× 10D |     |     | 11.7 |
| 8622918 | 11.8× 10D |     |     | 11.8 |
| 8622919 | 11.9× 10D |     |     | 11.9 |
| 8622920 | 12 × 10D  |     |     | 12   |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel | Quenched and Tempered Steel |             |             |             |  | Stainless Steel | Tool Steel | Cast Iron | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel® | Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-----------------------------|-------------|-------------|-------------|--|-----------------|------------|-----------|-------------------|--------------|----------|------------------------|----------------|----------|--------------------|-----------------|-------------------------------|
|               | C ~ 0.25%        | 0.25 ~ 0.45%        | 0.45% ~           | SCM         | ~ 35 HRC       | 35 ~ 45 HRC                 | 45 ~ 50 HRC | 50 ~ 62 HRC | 62 ~ 70 HRC |  | SUS             | SKD SKS    | FC        | FCD               | Cu           | AL       | AC                     |                |          | CFRP               | AZ91D           |                               |
| Abbreviation  |                  |                     |                   |             |                |                             |             |             |             |  |                 |            |           |                   |              |          |                        |                |          |                    |                 |                               |
| TDXL          | ○                | ○                   | ○                 | ○           |                |                             |             |             |             |  |                 |            | ○         | ○                 |              |          | ○                      |                |          |                    | ○               |                               |

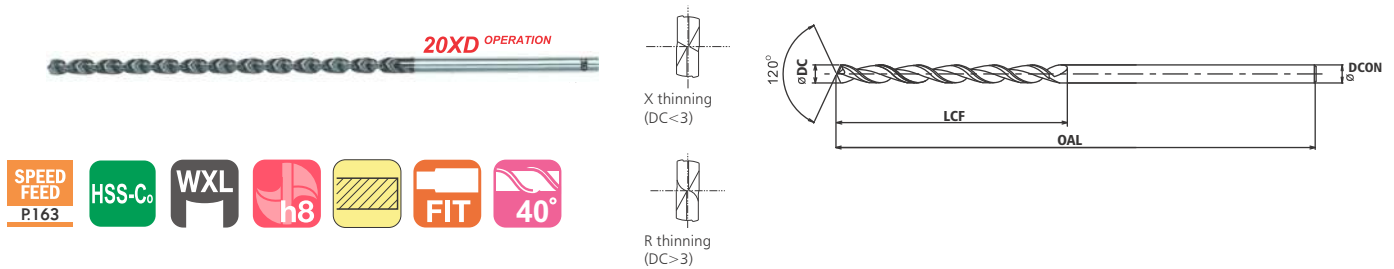




| TDXL    |         | 15XD OPERATION |     |      |
|---------|---------|----------------|-----|------|
| EDP     | DC      | LCF            | OAL | DCON |
| 8623016 | 1.6X15D | 70             | 30  | 1.6  |
| 8623018 | 1.8X15D | 75             | 34  | 1.8  |
| 8623020 | 2X15D   | 80             | 36  | 2    |
| 8623021 | 2.1X15D | 80             | 38  | 2.1  |
| 8623022 | 2.2X15D | 80             | 40  | 2.2  |
| 8623023 | 2.3X15D | 85             | 42  | 2.3  |
| 8623024 | 2.4X15D | 85             | 44  | 2.4  |
| 8623025 | 2.5X15D | 85             | 46  | 2.5  |
| 8623026 | 2.6X15D | 100            | 48  | 2.6  |
| 8623027 | 2.7X15D | 100            | 50  | 2.7  |
| 8623028 | 2.8X15D | 100            | 50  | 2.8  |
| 8623029 | 2.9X15D | 105            | 54  | 2.9  |
| 8623030 | 3X15D   | 105            | 54  | 3    |
| 8623031 | 3.1X15D | 110            | 56  | 3.1  |
| 8623032 | 3.2X15D | 110            | 58  | 3.2  |
| 8623033 | 3.3X15D | 110            | 60  | 3.3  |
| 8623034 | 3.4X15D | 115            | 62  | 3.4  |
| 8623035 | 3.5X15D | 115            | 64  | 3.5  |
| 8623036 | 3.6X15D | 115            | 66  | 3.6  |
| 8623037 | 3.7X15D | 120            | 68  | 3.7  |
| 8623038 | 3.8X15D | 120            | 70  | 3.8  |
| 8623039 | 3.9X15D | 120            | 70  | 3.9  |
| 8623040 | 4X15D   | 120            | 72  | 4    |
| 8623041 | 4.1X15D | 135            | 74  | 4.1  |
| 8623042 | 4.2X15D | 135            | 76  | 4.2  |
| 8623043 | 4.3X15D | 140            | 78  | 4.3  |
| 8623044 | 4.4X15D | 140            | 80  | 4.4  |
| 8623045 | 4.5X15D | 140            | 82  | 4.5  |
| 8623046 | 4.6X15D | 145            | 84  | 4.6  |
| 8623047 | 4.7X15D | 145            | 86  | 4.7  |
| 8623048 | 4.8X15D | 145            | 86  | 4.8  |
| 8623049 | 4.9X15D | 150            | 88  | 4.9  |
| 8623050 | 5X15D   | 150            | 90  | 5    |
| 8623051 | 5.1X15D | 150            | 92  | 5.1  |
| 8623052 | 5.2X15D | 155            | 94  | 5.2  |
| 8623053 | 5.3X15D | 155            | 96  | 5.3  |
| 8623054 | 5.4X15D | 155            | 98  | 5.4  |
| 8623055 | 5.5X15D | 155            | 100 | 5.5  |
| 8623056 | 5.6X15D | 160            | 102 | 5.6  |
| 8623057 | 5.7X15D | 165            | 104 | 5.7  |
| 8623058 | 5.8X15D | 165            | 106 | 5.8  |
| 8623060 | 6X15D   | 170            | 108 | 6    |
| 8623062 | 6.2X15D | 170            | 112 | 6.2  |

| TDXL    |          | 15XD OPERATION |     |      |
|---------|----------|----------------|-----|------|
| EDP     | DC       | LCF            | OAL | DCON |
| 8623063 | 6.3X15D  | 175            | 114 | 6.3  |
| 8623065 | 6.5X15D  | 200            | 118 | 6.5  |
| 8623066 | 6.6X15D  | 200            | 120 | 6.6  |
| 8623068 | 6.8X15D  | 200            | 124 | 6.8  |
| 8623069 | 6.9X15D  | 200            | 126 | 6.9  |
| 8623070 | 7X15D    | 200            | 126 | 7    |
| 8623071 | 7.1X15D  | 200            | 128 | 7.1  |
| 8623075 | 7.5X15D  | 205            | 136 | 7.5  |
| 8623080 | 8X15D    | 215            | 144 | 8    |
| 8623081 | 8.1X15D  | 215            | 146 | 8.1  |
| 8623082 | 8.2X15D  | 220            | 148 | 8.2  |
| 8623085 | 8.5X15D  | 225            | 154 | 8.5  |
| 8623086 | 8.6X15D  | 225            | 156 | 8.6  |
| 8623088 | 8.8X15D  | 230            | 160 | 8.8  |
| 8623090 | 9X15D    | 230            | 162 | 9    |
| 8623093 | 9.3X15D  | 240            | 168 | 9.3  |
| 8623095 | 9.5X15D  | 240            | 172 | 9.5  |
| 8623097 | 9.7X15D  | 245            | 176 | 9.7  |
| 8623098 | 9.8X15D  | 245            | 178 | 9.8  |
| 8623100 | 10X15D   | 250            | 180 | 10   |
| 8623105 | 10.5X15D | 270            | 190 | 10.5 |
| 8623110 | 11X15D   | 280            | 200 | 11.0 |
| 8623115 | 11.5X15D | 290            | 208 | 11.5 |
| 8623118 | 11.8X15D | 295            | 214 | 11.8 |
| 8623120 | 12X15D   | 300            | 216 | 12.0 |





| TDXL    |         | 20XD OPERATION |     |      |
|---------|---------|----------------|-----|------|
| EDP     | DC      | LCF            | OAL | DCON |
| 8623216 | 1.6X20D | 85             | 38  | 1.6  |
| 8623218 | 1.8X20D | 85             | 42  | 1.8  |
| 8623220 | 2X20D   | 85             | 46  | 2    |
| 8623221 | 2.1X20D | 90             | 50  | 2.1  |
| 8623222 | 2.2X20D | 90             | 52  | 2.2  |
| 8623223 | 2.3X20D | 95             | 54  | 2.3  |
| 8623224 | 2.4X20D | 95             | 56  | 2.4  |
| 8623225 | 2.5X20D | 100            | 58  | 2.5  |
| 8623226 | 2.6X20D | 110            | 60  | 2.6  |
| 8623227 | 2.7X20D | 115            | 64  | 2.7  |
| 8623228 | 2.8X20D | 115            | 66  | 2.8  |
| 8623229 | 2.9X20D | 120            | 68  | 2.9  |
| 8623230 | 3X20D   | 120            | 70  | 3    |
| 8623231 | 3.1X20D | 125            | 72  | 3.1  |
| 8623232 | 3.2X20D | 125            | 74  | 3.2  |
| 8623233 | 3.3X20D | 125            | 76  | 3.3  |
| 8623234 | 3.4X20D | 130            | 80  | 3.4  |

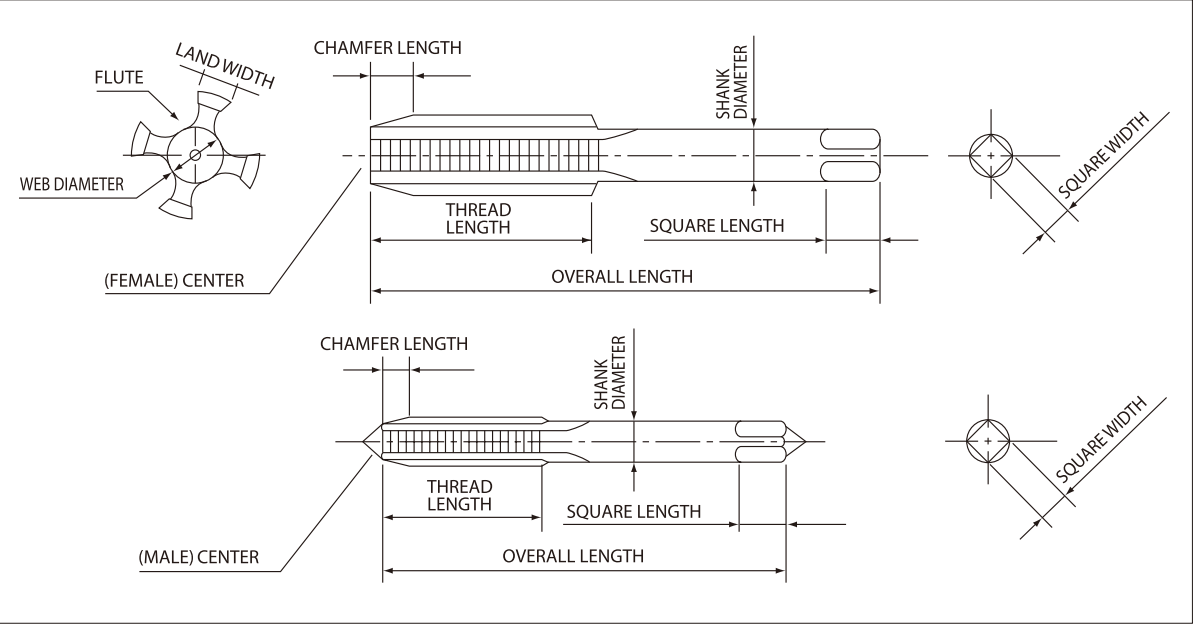
| TDXL    |         | 20XD OPERATION |     |      |
|---------|---------|----------------|-----|------|
| EDP     | DC      | LCF            | OAL | DCON |
| 8623260 | 6X20D   | 200            | 138 | 6    |
| 8623263 | 6.3X20D | 200            | 146 | 6.3  |
| 8623265 | 6.5X20D | 225            | 150 | 6.5  |
| 8623268 | 6.8X20D | 225            | 158 | 6.8  |
| 8623269 | 6.9X20D | 230            | 160 | 6.9  |
| 8623270 | 7X20D   | 230            | 162 | 7.0  |
| 8623275 | 7.5X20D | 245            | 174 | 7.5  |
| 8623280 | 8X20D   | 255            | 184 | 8    |
| 8623281 | 8.1X20D | 255            | 188 | 8.1  |
| 8623282 | 8.2X20D | 260            | 190 | 8.2  |
| 8623285 | 8.5X20D | 265            | 196 | 8.5  |
| 8623290 | 9X20D   | 275            | 208 | 9    |
| 8623300 | 10X20D  | 300            | 230 | 10.0 |
| 8623310 | 11X20D  | 350            | 254 | 11.0 |
| 8623320 | 12X20D  | 350            | 276 | 12.0 |

| TDXL    |         | 20XD OPERATION |     |      |
|---------|---------|----------------|-----|------|
| EDP     | DC      | LCF            | OAL | DCON |
| 8623235 | 3.5X20D | 130            | 82  | 3.5  |
| 8623237 | 3.7X20D | 135            | 86  | 3.7  |
| 8623238 | 3.8X20D | 140            | 88  | 3.8  |
| 8623240 | 4X20D   | 140            | 92  | 4    |
| 8623241 | 4.1X20D | 155            | 96  | 4.1  |
| 8623242 | 4.2X20D | 155            | 98  | 4.2  |
| 8623243 | 4.3X20D | 160            | 100 | 4.3  |
| 8623245 | 4.5X20D | 165            | 104 | 4.5  |
| 8623246 | 4.6X20D | 165            | 106 | 4.6  |
| 8623248 | 4.8X20D | 170            | 112 | 4.8  |
| 8623250 | 5X20D   | 175            | 116 | 5    |
| 8623251 | 5.1X20D | 180            | 118 | 5.1  |
| 8623252 | 5.2X20D | 180            | 120 | 5.2  |
| 8623255 | 5.5X20D | 185            | 128 | 5.5  |
| 8623257 | 5.7X20D | 190            | 132 | 5.7  |
| 8623258 | 5.8X20D | 200            | 134 | 5.8  |

| Work Material | Low Carbon Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | Hardened Steel |             | Quenched and Tempered Steel |             |             |     | Stainless Steel | Tool Steel | Cast Iron | Ductile Cast Iron | Copper Alloy | Aluminum | Aluminum Alloy Casting | Titanium Alloy | Inconel | Composite Material | Magnesium Alloy | (MMC) Metal Matrix Composites |
|---------------|------------------|---------------------|-------------------|-------------|----------------|-------------|-----------------------------|-------------|-------------|-----|-----------------|------------|-----------|-------------------|--------------|----------|------------------------|----------------|---------|--------------------|-----------------|-------------------------------|
|               | C ~ 0.25%        | C 0.25 ~ 0.45%      | C 0.45% ~         | SCM         | ~ 35 HRC       | 35 ~ 45 HRC | 45 ~ 50 HRC                 | 50 ~ 62 HRC | 62 ~ 70 HRC | SUS | SKD SKS         | FC         | FCD       | Cu                | AL           | AC       |                        |                |         | CFRP               | AZ91D           |                               |
| Abbreviation  |                  |                     |                   |             |                |             |                             |             |             |     |                 |            |           |                   |              |          |                        |                |         |                    |                 |                               |
| TDXL          | ○                | ○                   | ○                 | ○           |                |             |                             |             |             |     |                 | ○          | ○         |                   |              | ○        |                        |                |         |                    | ○               |                               |

# INFORMATION FOR THE USER

## ■ TERMINOLOGY



## ■ TYPE OF TAPS & FEATURES

| Type                                                                                                                      | Features                                                                                                                                                                                                                                              | Application                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Spiral Fluted Taps                 | <ul style="list-style-type: none"><li>• Spiral flute</li><li>• Chips flow out against tapping direction (ejected from holes)</li><li>• Lower tapping torque and applicable for tapping to the bottom of holes</li><li>• Good cutting action</li></ul> | <ul style="list-style-type: none"><li>• For blind holes</li><li>• Materials where chips come out continuously in coil shape</li></ul>                                                           |
| <br>Spiral Pointed Taps                | <ul style="list-style-type: none"><li>• Spiral point (Chip Drive)</li><li>• Pushes chips forward with low cutting torque</li><li>• Shallow and unique flute form provides strong structure</li><li>• Good cutting action</li></ul>                    | <ul style="list-style-type: none"><li>• For through holes</li><li>• Materials where chips come out continuously in coil shape</li><li>• High speed tapping</li></ul>                            |
| <br>Fluteless Taps ( Forming Taps )    | <ul style="list-style-type: none"><li>• Fluteless</li><li>• Taps do not produce chips</li><li>• Precise uniformity of tapped thread limit</li><li>• Excellent rigidity</li></ul>                                                                      | <ul style="list-style-type: none"><li>• For both through &amp; blind holes</li><li>• Materials with Formability</li></ul>                                                                       |
| <br>Straight Fluted Taps ( Hand Taps ) | <ul style="list-style-type: none"><li>• Straight flute</li><li>• Strong cutting edges</li><li>• Applicable for various cutting conditions</li><li>• Easy to re-grind</li></ul>                                                                        | <ul style="list-style-type: none"><li>• For both through &amp; blind holes (short thread depth only)</li><li>• Materials where chips come out in powder form</li><li>• Hard materials</li></ul> |

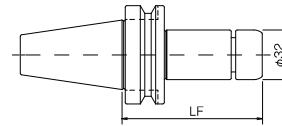


# SynchroMaster

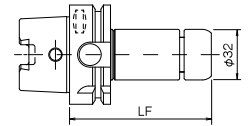
To manufacturers who are looking for a tap holder for equipment with synchronous feed mechanism



BT Shank Holder



HSK Shank Holder



BT Shank Holder

Unit:mm

| EDP NO. | Designation          | LF | Tap Size |
|---------|----------------------|----|----------|
| 79910   | <b>BT30-SMH16-90</b> | 90 | M3 ~ M12 |
| 79911   | <b>BT40-SMH16-90</b> | 90 | M3 ~ M12 |

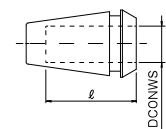
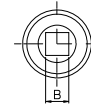
HSK Shank Holder

Unit:mm

| EDP NO. | Designation            | LF | Tap Size |
|---------|------------------------|----|----------|
| 79912 * | <b>HSK40A-SMH16-85</b> | 85 | M3 ~ M12 |
| 79913   | <b>HSK63A-SMH16-90</b> | 90 | M3 ~ M12 |

1. The collet and spanner are sold separately.
2. Refer to the following chart for the corresponding tap size.
3. Please use a machine with synchronous feed capability.

※ The HSK40A is without manual clamping hole.



SynchroMaster Collet

Unit:mm

| EDP NO. | Designation               | DCONWS | B   | ℓ  | Corresponding Tap Size |                | Standard Tightening Torque |
|---------|---------------------------|--------|-----|----|------------------------|----------------|----------------------------|
|         |                           |        |     |    | Old JIS                | End Mill Shank |                            |
| 79914   | <b>ER16GH - 4 - 3.2</b>   | 4      | 3.2 | 15 | M3                     | M3             | 30 ~ 35Nm                  |
| 79915   | <b>ER16GH - 5 - 4</b>     | 5      | 4   | 18 | M4                     | —              |                            |
| 79916   | <b>ER16GH - 5.5 - 4.5</b> | 5.5    | 4.5 | 18 | M5                     | —              |                            |
| 79917   | <b>ER16GH - 6 - 4.5</b>   | 6      | 4.5 | 18 | M6                     | M4、M5、M6       |                            |
| 79918   | <b>ER16GH - 6.2 - 5</b>   | 6.2    | 5   | 18 | M8                     | —              |                            |
| 79919   | <b>ER16GH - 7 - 5.5</b>   | 7      | 5.5 | 18 | M10                    | —              | 45 ~ 50Nm                  |
| 79920   | <b>ER16GH - 8 - 6</b>     | 8      | 6   | 22 | —                      | M8、M10         |                            |
| 79921   | <b>ER16GH - 8.5 - 6.5</b> | 8.5    | 6.5 | 22 | M12                    | —              |                            |

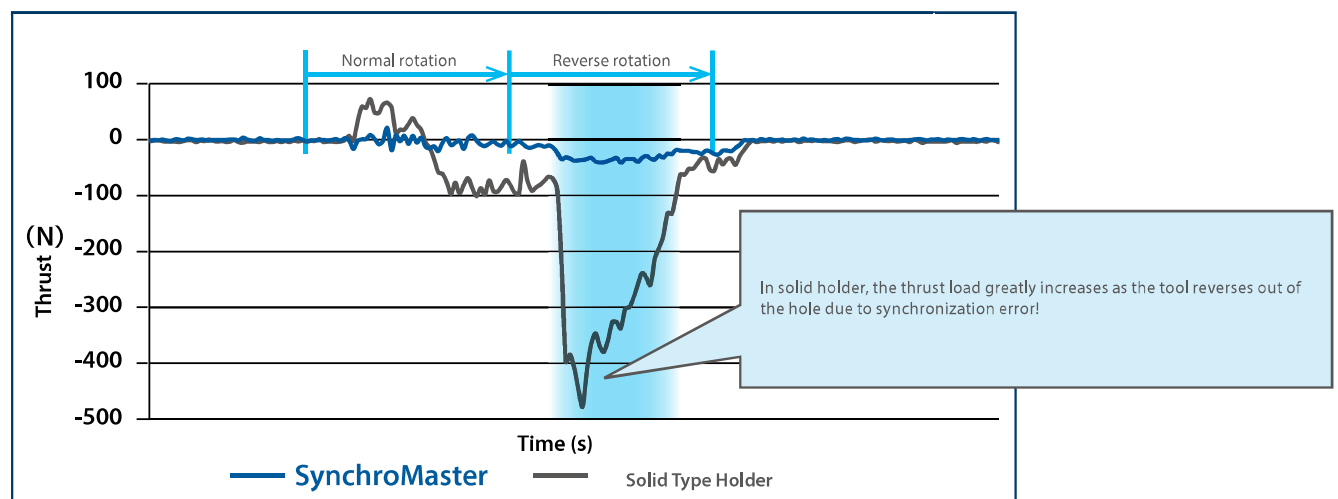
1. For center-through coolant system, please insert the tool all the way to the back of the collet. Coolant leakage may occur if the tool insertion length is too short.
2. Select the appropriate collet after confirming the dimensions of the tap to be used.
3. Please confirm the tightening torque with a torque spanner or similar tool.

Accessories

|  | Spanner | EDP NO. | Designation    |
|-------------------------------------------------------------------------------------|---------|---------|----------------|
|                                                                                     |         | 79923   | <b>FKT-32L</b> |

|  | Nut | EDP NO. | Designation    |
|---------------------------------------------------------------------------------------|-----|---------|----------------|
|                                                                                       |     | 79922   | <b>ERP-16T</b> |

Micro compensator reduces axial forces in the machining process



S45C

Tool : A-SFT M4×0.7

Cutting Speed : 25m/min

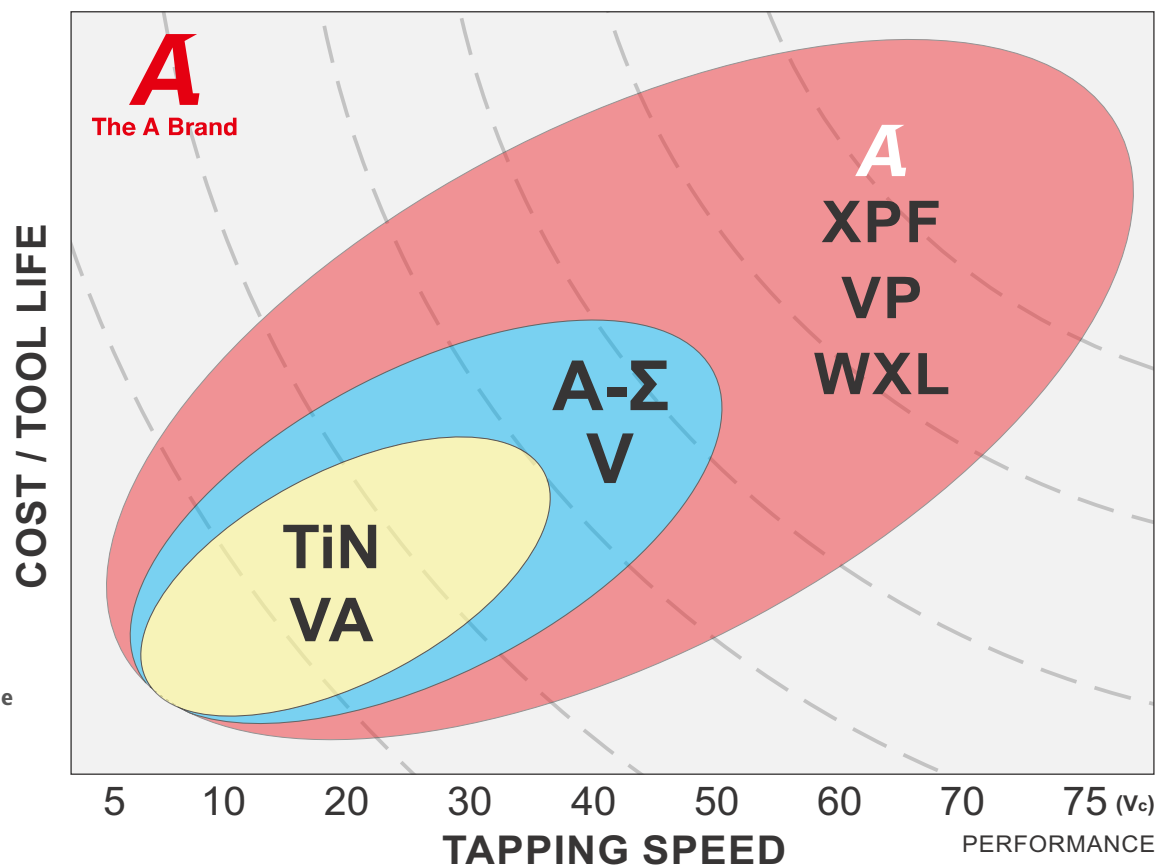


**Sharp Cutting Edge**  
Stabilizes chip shape

**Variable Lead Flute**  
Accelerate chip evacuation

**V Coating**  
High wear resistance

**Powder Metallurgy HSS(CPM)**  
High wear resistance

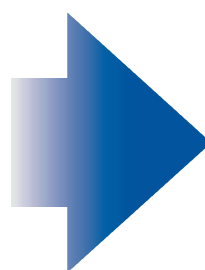


| TOP3 Tapping Troubles |                       |            |
|-----------------------|-----------------------|------------|
| <b>No.1</b>           | Breakage and chipping | <b>26%</b> |
| <b>No.2</b>           | Dimensional error     | <b>17%</b> |
| <b>No.3</b>           | Galling               | <b>14%</b> |
|                       | Others                | <b>43%</b> |

Main factor is chip packing



Conventional Tap



A-SFT



SS400  
Work Material:  
Mild Steel

No Galling

SUS304  
Work Material:  
Stainless Steel



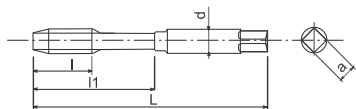
# Table of Contents

| Sr. No. | Tool Abbreviation | Specification                                              | Stocked Size                                                                     | Tool Material | Surface Treatment | Recommended Work Material                                                                        |
|---------|-------------------|------------------------------------------------------------|----------------------------------------------------------------------------------|---------------|-------------------|--------------------------------------------------------------------------------------------------|
| 61.     | A-TAP             | A-SFT Spiral Fluted Tap                                    | M2 ~ M24<br>No.4 ~ 2UN                                                           | PM / HSSE     | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC, MC         |
| 61.     | A-TAP             | A-OIL-SFT Spiral Fluted Tap with Internal Coolant          | M6 ~ M56                                                                         | PM / HSSE     | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC, MC         |
| 65.     | A-TAP             | A-SFT Spiral Fluted tap Rc (ISO) Taper pipe thread         | Rc1/16 ~ Rc1                                                                     | PM            | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC, MC         |
| 65.     | A-TAP             | A-POT Spiral Pointed Tap                                   | M2 ~ M24<br>No.4 ~ 1UN                                                           | PM            | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC, MC         |
| 95.     | A-TAP             | S-XPf Fluteless Tap                                        | M6 ~ M20                                                                         | HSSE          | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC                  |
| 95.     | A-TAP             | R-XPf Fluteless Tap                                        | M3 ~ M6                                                                          | HSSE          | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC                  |
| 96.     | A-TAP             | S-OIL-XPf Fluteless Tap with Internal Coolant              | M6 ~ M18                                                                         | HSSE          | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC                  |
| -       | A-TAP             | A-TPT Spiral Fluted Tap (Taper Pipe Thread)                | PT1/16 ~ PT1<br>Rc1/16 ~ Rc1                                                     | HSSE          | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC             |
| -       | A-TAP             | A-S-TPT Spiral Fluted Tap (Taper Pipe Thread)              | PT1/16 ~ PT1                                                                     | HSSE          | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 36HRC, Cu, Bs, BsC, ZDC             |
| 92.     | WXL-TAP           | WXL-CPM-RFT Spiral Pointed Tap                             | M6 ~ M18                                                                         | PM            | WXL ( Cr )        | Carbon Steel, SCM                                                                                |
| 93.     | VP-TAP            | V-TI-SFT Spiral Fluted Tap                                 | M3 ~ M12<br>No.4 ~ 8/3UNJC· F                                                    | PM            | V ( TiCN )        | Titanium Alloy                                                                                   |
| 93.     | VP-TAP            | V-TI-POT Spiral Pointed Tap                                | M3 ~ M12<br>No.4 ~ 8/4UNJC· F                                                    | PM            | V ( TiCN )        | Titanium Alloy                                                                                   |
| 89.     | VP-TAP            | VP-DC-MT Straight Fluted Tap                               | M5 ~ M24<br>No.4 ~ 1UN                                                           | PM            | V ( TiCN )        | FC, FCD, AC/ADC, MC, ZDC                                                                         |
| 90.     | VP-TAP            | OIL-VP-DC-MT Straight Flute Tap with Internal Coolant      | M5 ~ M24                                                                         | PM            | V ( TiCN )        | FC, FCD, AC/ADC, MC, ZDC                                                                         |
| 91.     | VP-TAP            | VPO-MT Straight Flute Tap with Internal Coolant            | M6 ~ M16                                                                         | PM            | V ( TiCN )        | Carbon Steel, SCM                                                                                |
| 72.     | A-TAP Σ           | A-SFT Σ Spiral Fluted Tap                                  | M2 ~ M52<br>No.2 ~ 1UN                                                           | HSSE          | TiN               | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC, MC         |
| 70.     | A-TAP Σ           | A-POT Σ Spiral Pointed Tap                                 | M2 ~ M52<br>No.2 ~ 1UN                                                           | HSSE          | TiN               | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC, MC         |
| 83.     | V-TAP             | V-AW-SFT Spiral Fluted Tap                                 | M5 ~ M20                                                                         | HSSE          | V ( TiCN )        | Carbon Steel, SCM                                                                                |
| 86.     | V-TAP             | V-DC-MT Straight Fluted Tap                                | M5 ~ M24<br>No.4 ~ 1UN                                                           | HSSE          | V ( TiCN )        | FC, FCD, AC/ADC, MC, ZDC                                                                         |
| 86.     | V-TAP             | OIL-V-DC-MT Straight Flute Tap with Internal Coolant       | M5 ~ M24                                                                         | HSSE          | V ( TiCN )        | FC, FCD, AC/ADC, MC, ZDC                                                                         |
| 94.     | V-TAP             | V-NRT Fluteless Tap                                        | M1 ~ M5                                                                          | HSSE          | V ( TiCN )        | SCM, Carbon Steel, SUS, AC/ADC, Cu, Bs, BsC, ZDC                                                 |
| 75.     | TIN-TAP           | TIN-SFT Spiral Fluted Tap                                  | M3 ~ M24                                                                         | HSSE          | TiN               | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC, MC         |
| 76.     | TIN-TAP           | TIN-POT Spiral Pointed Tap                                 | M3 ~ M24                                                                         | HSSE          | TiN               | SCM, Carbon Steel, SUS, AC/ADC, AL, FCD, Hardened Steel 25 ~ 35HRC, Cu, Bs, BsC, ZDC, MC         |
| 74.     | TIN-TAP           | TIN-MT Straight Fluted Tap                                 | M3 ~ M25                                                                         | HSSE          | TiN               | SCM, Carbon Steel, SUS, AC/ADC, Hardened Steel 25 ~ 35HRC                                        |
| 74.     | TIN-TAP           | TIN-NRT Fluteless Tap                                      | M5 ~ M10                                                                         | HSSE          | TiN               | AC/ADC                                                                                           |
| 77.     | VA-TAP            | VA-SFT Spiral Fluted Tap                                   | M2 ~ M36<br>No.4 ~ 1UN                                                           | HSSE          | OX (Steam Oxide)  | SCM, Carbon Steel, SUS, AC/ADC, Hardened Steel 25 ~ 35HRC                                        |
| 80.     | VA-TAP            | VA-POT Spiral Pointed Tap                                  | M2 ~ M36<br>No.4 ~ 1UN                                                           | HSSE          | OX (Steam Oxide)  | SCM, Carbon Steel, SUS, AC/ADC, Hardened Steel 25 ~ 35HRC                                        |
| 97.     | VA-TAP            | VXL-SFT Spiral Fluted Tap                                  | 1UN ~ 2UN                                                                        | HSSE          | OX (Steam Oxide)  | SCM, Carbon Steel, Hardened Steel 25 ~ 35HRC, SC, FC, FCD                                        |
| 97.     | VA-TAP            | HXL-SFT Spiral Fluted Tap                                  | 1UN ~ 2UN                                                                        | HSSE          | OX (Steam Oxide)  | SCM, Carbon Steel, Hardened Steel 25 ~ 35HRC, SC, FC, FCD                                        |
| 97.     | VA-TAP            | NPT National Pipe Thread DIN2181                           | Rc1/16 ~ Rc1                                                                     | HSSE          | Non coat          | Carbon Steel, AC/ADC, AL, FC, FCD, Cu, Bs, BsC, MC, ZDC                                          |
| 69.     | A-TAP             | AT-1 One Pass Thread Milling Cutter                        | M = P0.5 ~ P3<br>UN = TPI 32 ~ 8<br>Rc/Rp = TPI 28 ~ 11<br>NPT = TPI 27 ~ 11 1/2 | Carbide       | EgiAs ( Cr )      | SCM, Carbon Steel, SUS, AC/ADC, AL, Hardened Steel 25 ~ 45HRC, FC, FCD, Cu, Bs, BsC, PB, MC, ZDC |
| 68.     | A-TAP             | A-CSF Carbide Spiral Fluted Tap with Internal Coolant      | M6 ~ M12                                                                         | Carbide       | FX (TiAlN)        | FC, FCD, AC, ADC, Bs, BsC, PB, ZDC                                                               |
| 68.     | A-TAP             | A-CHT Carbide Straight Fluted Tap with Internal Coolant    | M6 ~ M12                                                                         | Carbide       | FX (TiAlN)        | FC, FCD, AC, ADC, Bs, BsC, PB, ZDC                                                               |
| 98.     | V-TAP             | WH55-OT Carbide Straight Flute For Hardened Steel ~ 55HRC  | M3 ~ M12                                                                         | Carbide       | V ( TiCN )        | Hardened Steel 35 ~ 55HRC                                                                        |
| 98.     | V-TAP             | VX-OT Carbide Straight Flute For Hardened Steel 50 ~ 60HRC | M2 ~ M20                                                                         | Carbide       | V ( TiCN )        | Hardened Steel 50 ~ 60HRC                                                                        |

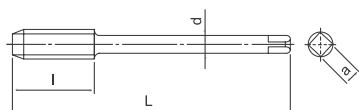
# A DIN TAPS FOR ALL APPLICATIONS

## A-SFT Metric

**A**  
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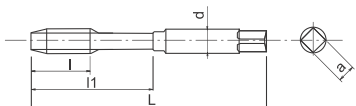
| EDP      | METRIC DIN 371 | L   | l   | l1 | d   | a   | Z |
|----------|----------------|-----|-----|----|-----|-----|---|
| 48139125 | M2X0.4 6HX     | 45  | 3.2 | 10 | 2.8 | 2.1 | 2 |
| 48139133 | M2.5X0.45 6HX  | 50  | 3.6 | 13 | 2.8 | 2.1 | 2 |
| 48139138 | M3X0.5 6HX     | 56  | 4   | 18 | 3.5 | 2.7 | 3 |
| 48139144 | M4X0.7 6HX     | 63  | 5.6 | 21 | 4.5 | 3.4 | 3 |
| 48139149 | M5X0.8 6HX     | 70  | 6.4 | 25 | 6   | 4.9 | 3 |
| 48139155 | M6X1 6HX       | 80  | 8   | 30 | 6   | 4.9 | 3 |
| 48139161 | M8X1.25 6HX    | 90  | 10  | 35 | 8   | 6.2 | 3 |
| 48139169 | M10X1.5 6HX    | 100 | 12  | 39 | 10  | 8   | 3 |



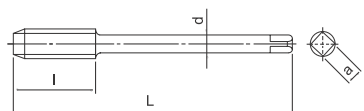
| EDP      | METRIC DIN 376 | L   | l  | d  | a    | Z |
|----------|----------------|-----|----|----|------|---|
| 48139179 | M12X1.75 6HX   | 110 | 14 | 9  | 7    | 3 |
| 48139191 | M14X2 6HX      | 110 | 16 | 11 | 9    | 3 |
| 48139202 | M16 X2 6HX     | 110 | 16 | 12 | 9    | 3 |
| 48139214 | M18X2.5 6HX    | 125 | 25 | 14 | 11   | 4 |
| 48139228 | M20X2.5 6HX    | 140 | 25 | 16 | 12   | 4 |
| 48139238 | M22X2.5 6HX    | 140 | 25 | 18 | 14.5 | 4 |
| 48139247 | M24X3 6HX      | 160 | 30 | 18 | 14.5 | 4 |



## A-OIL-SFT Metric



| EDP      | METRIC DIN 371 | L   | l  | l1 | d  | a   | Z |
|----------|----------------|-----|----|----|----|-----|---|
| 48140155 | M6X1 6HX       | 80  | 8  | 30 | 6  | 4.9 | 3 |
| 48140161 | M8X1.25 6HX    | 90  | 10 | 35 | 8  | 6.2 | 3 |
| 48140169 | M10X1.5 6HX    | 100 | 12 | 39 | 10 | 8   | 3 |



| EDP      | METRIC DIN 376 | L   | l  | d  | a | Z |
|----------|----------------|-----|----|----|---|---|
| 48140179 | M12X1.75 6HX   | 110 | 14 | 9  | 7 | 3 |
| 48140191 | M14X2 6HX      | 110 | 16 | 11 | 9 | 3 |
| 48140202 | M16X2 6HX      | 110 | 16 | 12 | 9 | 3 |

| Applications  |               |               |              |               |               |               |               |              |     |        |               |     |
|---------------|---------------|---------------|--------------|---------------|---------------|---------------|---------------|--------------|-----|--------|---------------|-----|
| C≤0.2%        | 0.25<C≤0.4%   | C≥0.45%       | SCM          | 25-35 HRC     | 35-45 HRC     | 45-52 HRC     | 52-62 HRC     | SUS          | SKD | SC     | GG            | GGG |
| ⊙ 15-60 m/min | ⊙ 15-60 m/min | ⊙ 10-60 m/min | ⊙ 8-30 m/min | ○ 8-20 m/min  |               |               |               | ⊙ 8-20 m/min |     |        |               |     |
| Cu            | BS            | BsC           | PB           | Al            | AC,ADC        | MC            | ZDC           | Ti           | Ni  | Plast. | Vinyl         |     |
| ○ 15-35 m/min |               | ○ 15-30 m/min |              | ○ 15-35 m/min | ○ 15-35 m/min | ○ 15-35 m/min | ○ 15-35 m/min | ○ 5-10 m/min |     |        | ○ 15-20 m/min |     |



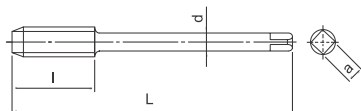


# A

## DIN TAPS FOR ALL APPLICATIONS

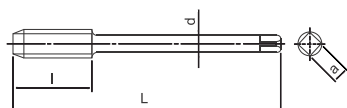
### A-SFT Metric

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| EDP      | METRIC DIN 376 | L   | I  | d  | a  | Z |
|----------|----------------|-----|----|----|----|---|
| 48140262 | M27x3 6HX      | 160 | 36 | 20 | 16 | 4 |
| 48140271 | M30x3.5 6HX    | 180 | 42 | 22 | 18 | 4 |
| 48140281 | M33x3.5 6HX    | 180 | 42 | 25 | 20 | 4 |
| 48140294 | M36x4 6HX      | 200 | 48 | 28 | 22 | 4 |
| 48140304 | M39x4 6HX      | 200 | 48 | 32 | 24 | 4 |
| 48140314 | M42x4.5 6HX    | 200 | 54 | 32 | 24 | 4 |
| 48140319 | M45x4.5 6HX    | 220 | 54 | 36 | 29 | 4 |
| 48140325 | M48x5 6HX      | 250 | 60 | 36 | 29 | 4 |
| 48140337 | M52x5 6HX      | 250 | 60 | 40 | 32 | 4 |
| 48140347 | M56x5.5 6HX    | 250 | 66 | 40 | 32 | 4 |

### A-SFT Metric



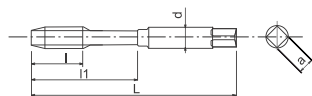
| EDP      | METRIC DIN 374 | L   | I  | d   | a    | Z |
|----------|----------------|-----|----|-----|------|---|
| 48139156 | M6X0.75 6HX    | 80  | 8  | 4.5 | 3.4  | 3 |
| 48139163 | M8X0.75 6HX    | 80  | 8  | 6   | 4.9  | 3 |
| 48139162 | M8X1 6HX       | 90  | 10 | 6   | 4.9  | 3 |
| 48139171 | M10X1 6HX      | 90  | 10 | 7   | 5.5  | 3 |
| 48139170 | M10X1.25 6HX   | 100 | 12 | 7   | 5.5  | 3 |
| 48139182 | M12X1 6HX      | 100 | 12 | 9   | 7    | 3 |
| 48139181 | M12X1.25 6HX   | 100 | 12 | 9   | 7    | 3 |
| 48139180 | M12X1.5 6HX    | 100 | 14 | 9   | 7    | 3 |
| 48139192 | M14X1.5 6HX    | 100 | 16 | 11  | 9    | 3 |
| 48139203 | M16X1.5 6HX    | 100 | 16 | 12  | 9    | 3 |
| 48139216 | M18X1.5 6HX    | 110 | 16 | 14  | 11   | 4 |
| 48139230 | M20X1.5 6HX    | 125 | 16 | 16  | 12   | 4 |
| 48139240 | M22X1.5 6HX    | 125 | 16 | 18  | 14.5 | 4 |
| 48139250 | M24X1.5 6HX    | 140 | 16 | 18  | 14.5 | 4 |

| Applications |             |             |            |             |             |             |             |            |     |        |             |     |
|--------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|------------|-----|--------|-------------|-----|
| C≤0.2%       | 0.25<C≤0.4% | C≥0.45%     | SCM        | 25-35 HRC   | 35-45 HRC   | 45-52 HRC   | 52-62 HRC   | SUS        | SKD | SC     | GG          | GGG |
| 15-60 m/min  | 15-60 m/min | 10-60 m/min | 8-30 m/min | 8-20 m/min  |             |             |             | 8-20 m/min |     |        |             |     |
| Cu           | BS          | BsC         | PB         | Al          | AC,ADC      | MC          | ZDC         | Ti         | Ni  | Plast. | Vinyl       |     |
| 15-35 m/min  |             | 15-30 m/min |            | 15-35 m/min | 15-35 m/min | 15-35 m/min | 15-35 m/min | 5-10 m/min |     |        | 15-20 m/min |     |

# A DIN TAPS FOR ALL APPLICATIONS

## A-SFT UNC

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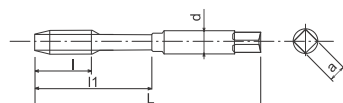
| EDP      | UNC DIN 2184  | L  | l   | l1 | d   | a   | Z |
|----------|---------------|----|-----|----|-----|-----|---|
| 48139457 | 4-40 UNC 2BX  | 56 | 5.1 | 18 | 3.5 | 2.7 | 2 |
| 48139459 | 5-40 UNC 2BX  | 56 | 5.1 | 18 | 3.5 | 2.7 | 2 |
| 48139461 | 6-32 UNC 2BX  | 56 | 6.4 | 20 | 4   | 3   | 2 |
| 48139464 | 8-32 UNC 2BX  | 63 | 6.4 | 21 | 4.5 | 3.4 | 2 |
| 48139466 | 10-24 UNC 2BX | 70 | 8.5 | 25 | 6   | 4.9 | 2 |



| EDP      | UNC DIN 2184   | L   | l    | l1  | d   | a    | Z |
|----------|----------------|-----|------|-----|-----|------|---|
| T1403785 | 1/4-20 UNC 2B  | 80  | 10.2 | 28  | 4.5 | 3.4  | 2 |
| T1403786 | 5/16-18 UNC 2B | 90  | 11.3 | 36  | 6   | 4.9  | 3 |
| T1403787 | 3/8-16 UNC 2B  | 100 | 12.7 | 40  | 7   | 5.5  | 3 |
| T1403788 | 7/16-14 UNC 2B | 100 | 14.5 | 40  | 8   | 6.2  | 3 |
| T1403789 | 1/2-13 UNC 2B  | 110 | 15.6 | 44  | 9   | 7    | 3 |
| T1403790 | 9/16-12 UNC 2B | 110 | 16.9 | 52  | 11  | 9    | 3 |
| T1403791 | 5/8-11 UNC 2B  | 110 | 18.5 | 57  | 12  | 9    | 3 |
| T1403792 | 3/4-10 UNC 2B  | 125 | 25.4 | 67  | 14  | 11   | 4 |
| T1403793 | 7/8-9 UNC 2B   | 140 | 28.2 | 78  | 18  | 14.5 | 4 |
| T1404146 | 1-8 UNC 2B     | 160 | 31.8 | 80  | 18  | 14.5 | 4 |
| T1403650 | 1 1/8-8 UNC 2B | 180 | 38.1 | 97  | 22  | 18   | 4 |
| T1403651 | 1 1/4-8 UNC 2B | 180 | 38.1 | 100 | 22  | 18   | 4 |
| T1403652 | 1 3/8-8 UNC 2B | 200 | 38.1 | 115 | 28  | 22   | 4 |
| T1403653 | 1 1/2-8 UNC 2B | 200 | 38.1 | 115 | 28  | 22   | 4 |
| T1403794 | 1 5/8-8 UNC 2B | 200 | 38.1 | 115 | 32  | 24   | 4 |
| T1403654 | 1 3/4-8 UNC 2B | 200 | 38.1 | 103 | 36  | 29   | 4 |
| T1403795 | 1 7/8-8 UNC 2B | 225 | 38.1 | 130 | 36  | 29   | 4 |
| T1403655 | 2-8 UNC 2B     | 225 | 38.1 | 125 | 40  | 32   | 4 |



## A-SFT UNC



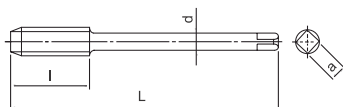
| EDP      | UNF DIN 2184    | L  | l    | l1 | d  | a   | Z |
|----------|-----------------|----|------|----|----|-----|---|
| 48139462 | 6-40 UNF 2BX    | 56 | 6.4  | 20 | 4  | 3   | 2 |
| 48139467 | 10-32 UNF 2BX   | 70 | 8.5  | 25 | 6  | 4.9 | 2 |
| 48139472 | 1/4-28 UNF 2BX  | 80 | 10.2 | 30 | 7  | 5.5 | 2 |
| 48139476 | 5/16-24 UNF 2BX | 90 | 11.3 | 35 | 8  | 6.2 | 3 |
| 48139481 | 3/8-24 UNF 2BX  | 90 | 12.7 | 35 | 10 | 8   | 3 |

| Applications |             |             |            |             |             |             |             |            |     |        |             |     |
|--------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|------------|-----|--------|-------------|-----|
| C≤0.2%       | 0.25<C≤0.4% | C≥0.45%     | SCM        | 25-35 HRC   | 35-45 HRC   | 45-52 HRC   | 52-62 HRC   | SUS        | SKD | SC     | GG          | GGG |
| 15-60 m/min  | 15-60 m/min | 10-60 m/min | 8-30 m/min | 8-20 m/min  |             |             |             | 8-20 m/min |     |        |             |     |
| Cu           | BS          | BsC         | PB         | Al          | AC,ADC      | MC          | ZDC         | Ti         | Ni  | Plast. | Vinyl       |     |
| 15-35 m/min  |             | 15-30 m/min |            | 15-35 m/min | 15-35 m/min | 15-35 m/min | 15-35 m/min | 5-10 m/min |     |        | 15-20 m/min |     |

# A DIN TAPS FOR ALL APPLICATIONS

## A-SFT UNC

**A**  
The A Brand

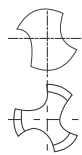
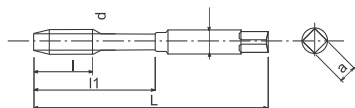


| EDP      | UNF DIN 2184    | L   | I    | d  | a    | Z |  |
|----------|-----------------|-----|------|----|------|---|--|
| 48139486 | 7/16-20 UNF 2BX | 100 | 14.5 | 8  | 6.2  | 3 |  |
| 48139491 | 1/2-20 UNF 2BX  | 100 | 15.6 | 9  | 7    | 3 |  |
| 48139496 | 9/16-18 UNF 2BX | 100 | 16.9 | 11 | 9    | 3 |  |
| 48139504 | 5/8-18 UNF 2BX  | 100 | 18.5 | 12 | 9    | 3 |  |
| 48139517 | 3/4-16 UNF 2BX  | 110 | 25.4 | 14 | 11   | 4 |  |
| 48139528 | 7/8-14 UNF 2BX  | 125 | 28.2 | 18 | 14.5 | 4 |  |
| 48139539 | 1-12 UNF 2BX    | 140 | 31.8 | 18 | 14.5 | 4 |  |

| Applications |             |             |            |             |             |             |             |            |     |        |             |     |
|--------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|------------|-----|--------|-------------|-----|
| C≤0.2%       | 0.25<C≤0.4% | C≥0.45%     | SCM        | 25-35 HRC   | 35-45 HRC   | 45-52 HRC   | 52-62 HRC   | SUS        | SKD | SC     | GG          | GGG |
| 15-60 m/min  | 15-60 m/min | 10-60 m/min | 8-30 m/min | 8-20 m/min  |             |             |             | 8-20 m/min |     |        |             |     |
| Cu           | BS          | BsC         | PB         | Al          | AC,ADC      | MC          | ZDC         | Ti         | Ni  | Plast. | Vinyl       |     |
| 15-35 m/min  |             | 15-30 m/min |            | 15-35 m/min | 15-35 m/min | 15-35 m/min | 15-35 m/min | 5-10 m/min |     |        | 15-20 m/min |     |

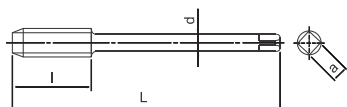


## A-SFT Metric Form E (Short chamfer)



| EDP      | METRIC DIN 371 | L   | I   | I1 | d   | a   | Z | Type | Unit:mm |
|----------|----------------|-----|-----|----|-----|-----|---|------|---------|
| 48203138 | M3X0.5 6HX     | 56  | 4   | 18 | 3.5 | 2.7 | 2 |      |         |
| 48203144 | M4X0.7 6HX     | 63  | 5.6 | 21 | 4.5 | 3.4 | 2 |      |         |
| 48203149 | M5X0.8 6HX     | 70  | 6.4 | 25 | 6   | 4.9 | 3 |      |         |
| 48203155 | M6X1 6HX       | 80  | 8   | 30 | 6   | 4.9 | 3 |      |         |
| 48203161 | M8X1.25 6HX    | 90  | 10  | 35 | 8   | 6.2 | 3 |      |         |
| 48203169 | M10X1.5 6HX    | 100 | 12  | 39 | 10  | 8   | 3 |      |         |

| EDP      | METRIC DIN 376 | L   | I  | d  | a | Z | Type | Unit:mm |
|----------|----------------|-----|----|----|---|---|------|---------|
| 48203179 | M12X1.75 6HX   | 110 | 14 | 9  | 7 | 3 |      |         |
| 48203191 | M14X2 6HX      | 110 | 16 | 11 | 9 | 3 |      |         |
| 48203202 | M16X2 6HX      | 110 | 16 | 12 | 9 | 3 |      |         |



| EDP      | METRIC DIN 374 | L   | I  | d | a   | Z | Type | Unit:mm |
|----------|----------------|-----|----|---|-----|---|------|---------|
| 48203162 | M8X1 6HX       | 90  | 10 | 6 | 4.9 | 3 |      |         |
| 48203171 | M10X1 6HX      | 90  | 10 | 7 | 5.5 | 3 |      |         |
| 48203170 | M10X1.25 6HX   | 100 | 12 | 7 | 5.5 | 3 |      |         |
| 48203181 | M12X1.25 6HX   | 100 | 14 | 9 | 7   | 3 |      |         |
| 48203180 | M12X1.5 6HX    | 100 | 14 | 9 | 7   | 3 |      |         |



shaping your dreams

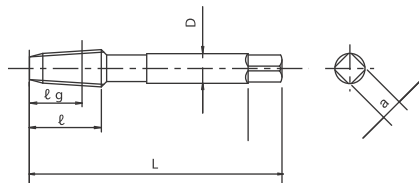
# A DIN TAPS FOR ALL APPLICATIONS

**A**  
The A Brand

Rc (ISO) SPIRAL FLUTED TAP (TAPER PIPE THREAD)



**A-SFT Rc (ISO)**

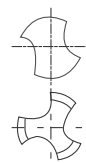
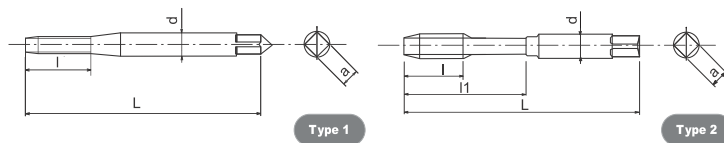


Unit:mm

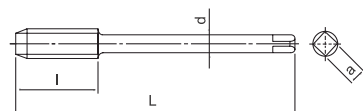
| EDP      | METRIC DIN 5156 | L   | lg   | l  | d  | a   | Z |
|----------|-----------------|-----|------|----|----|-----|---|
| 48302374 | Rc1/16-28       | 90  | 10.1 | 14 | 6  | 4.9 | 3 |
| 48302384 | Rc1/8-28        | 90  | 10.1 | 15 | 7  | 5.5 | 3 |
| 48302394 | Rc1/4-19        | 100 | 15   | 19 | 11 | 9   | 3 |
| 48302404 | Rc3/8-19        | 100 | 15.4 | 21 | 12 | 9   | 4 |
| 48302414 | Rc1/2-14        | 125 | 20.5 | 26 | 16 | 12  | 4 |
| 48302434 | Rc3/4-14        | 140 | 21.8 | 28 | 20 | 16  | 4 |
| 48302454 | Rc1-11          | 160 | 26   | 33 | 25 | 23  | 4 |



**A-POT Metric**



| EDP      | METRIC DIN 371 | L   | l  | l1 | d   | a   | Z | Type |
|----------|----------------|-----|----|----|-----|-----|---|------|
| 48145125 | M2X0.4 6HX     | 45  | 8  | -  | 2.8 | 2.1 | 2 | 1    |
| 48145133 | M2.5X0.45 6HX  | 50  | 9  | -  | 2.8 | 2.1 | 2 | 1    |
| 48145138 | M3X0.5 6HX     | 56  | 11 | 18 | 3.5 | 2.7 | 3 | 2    |
| 48145144 | M4X0.7 6HX     | 63  | 13 | 21 | 4.5 | 3.4 | 3 | 2    |
| 48145149 | M5X0.8 6HX     | 70  | 16 | 25 | 6   | 4.9 | 3 | 2    |
| 48145155 | M6X1 6HX       | 80  | 19 | 30 | 6   | 4.9 | 3 | 2    |
| 48145161 | M8X1.25 6HX    | 90  | 22 | 35 | 8   | 6.2 | 3 | 2    |
| 48145169 | M10X1.5 6HX    | 100 | 24 | 39 | 10  | 8   | 3 | 2    |



| EDP      | METRIC DIN 376 | L   | l  | d  | a    | Z |
|----------|----------------|-----|----|----|------|---|
| 48145179 | M12X1.75 6HX   | 110 | 29 | 9  | 7    | 3 |
| 48145191 | M14X2 6HX      | 110 | 30 | 11 | 9    | 3 |
| 48145202 | M16X2 6HX      | 110 | 32 | 12 | 9    | 3 |
| 48145214 | M18X2.5 6HX    | 125 | 34 | 14 | 11   | 3 |
| 48145228 | M20X2.5 6HX    | 140 | 34 | 16 | 12   | 3 |
| 48145238 | M22X2.5 6HX    | 140 | 34 | 18 | 14.5 | 3 |
| 48145247 | M24X3 6HX      | 160 | 38 | 18 | 14.5 | 3 |

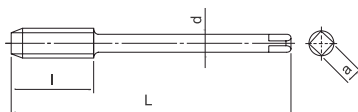
| Applications |             |             |            |             |             |             |             |            |     |        |             |     |
|--------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|------------|-----|--------|-------------|-----|
| C≤0.2%       | 0.25<C≤0.4% | C≥0.45%     | SCM        | 25-35 HRC   | 35-45 HRC   | 45-52 HRC   | 52-62 HRC   | SUS        | SKD | SC     | GG          | GGG |
| 15-60 m/min  | 15-60 m/min | 10-60 m/min | 8-30 m/min | 8-20 m/min  |             |             |             | 8-20 m/min |     |        |             |     |
| Cu           | BS          | BsC         | PB         | Al          | AC,ADC      | MC          | ZDC         | Ti         | Ni  | Plast. | Vinyl       |     |
| 15-35 m/min  |             | 15-30 m/min |            | 15-35 m/min | 15-35 m/min | 15-35 m/min | 15-35 m/min | 5-10 m/min |     |        | 15-20 m/min |     |

# A

## DIN TAPS FOR ALL APPLICATIONS

### A-POT Metric Fine

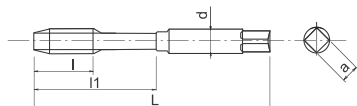
**A**  
The A Brand



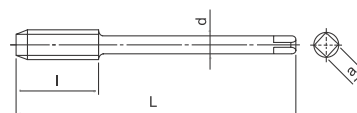
| EDP      | METRIC DIN 374 | L   | I  | d   | a    | Z |  |
|----------|----------------|-----|----|-----|------|---|--|
| 48145156 | M6X0.75 6HX    | 80  | 13 | 4.5 | 3.4  | 3 |  |
| 48145163 | M8X0.75 6HX    | 80  | 19 | 6   | 4.9  | 3 |  |
| 48145162 | M8X1 6HX       | 90  | 22 | 6   | 4.9  | 3 |  |
| 48145171 | M10X1 6HX      | 90  | 20 | 7   | 5.5  | 3 |  |
| 48145170 | M10X1.25 6HX   | 100 | 24 | 7   | 5.5  | 3 |  |
| 48145182 | M12X1 6HX      | 100 | 22 | 9   | 7    | 3 |  |
| 48145181 | M12X1.25 6HX   | 100 | 22 | 9   | 7    | 3 |  |
| 48145180 | M12X1.5 6HX    | 100 | 22 | 9   | 7    | 3 |  |
| 48145192 | M14X1.5 6HX    | 100 | 22 | 11  | 9    | 4 |  |
| 48145203 | M16X1.5 6HX    | 100 | 22 | 12  | 9    | 4 |  |
| 48145216 | M18X1.5 6HX    | 110 | 25 | 14  | 11   | 4 |  |
| 48145230 | M20X1.5 6HX    | 125 | 25 | 16  | 12   | 4 |  |
| 48145240 | M22X1.5 6HX    | 125 | 25 | 18  | 14.5 | 4 |  |
| 48145250 | M24X1.5 6HX    | 140 | 28 | 18  | 14.5 | 4 |  |



### A-POT UNC



| EDP      | UNC DIN 2184    | L   | I  | I1 | d   | a   | Z |  |
|----------|-----------------|-----|----|----|-----|-----|---|--|
| 48145457 | 4-40 UNC 2BX    | 56  | 11 | 18 | 3.5 | 2.7 | 2 |  |
| 48145459 | 5-40 UNC 2BX    | 56  | 11 | 18 | 3.5 | 2.7 | 3 |  |
| 48145461 | 6-32 UNC 2BX    | 56  | 12 | 20 | 4   | 3   | 3 |  |
| 48145464 | 8-32 UNC 2BX    | 63  | 13 | 21 | 4.5 | 3.4 | 3 |  |
| 48145466 | 10-24 UNC 2BX   | 70  | 16 | 25 | 6   | 4.9 | 3 |  |
| 48145471 | 1/4-20 UNC 2BX  | 80  | 19 | 30 | 7   | 5.5 | 3 |  |
| 48145474 | 5/16-18 UNC 2BX | 90  | 22 | 35 | 8   | 6.2 | 3 |  |
| 48145479 | 3/8-16 UNC 2BX  | 100 | 24 | 39 | 10  | 8   | 3 |  |

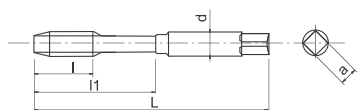


| EDP      | UNC DIN 2184    | L   | I  | d  | a    | Z |  |
|----------|-----------------|-----|----|----|------|---|--|
| 48145484 | 7/16-14 UNC 2BX | 100 | 24 | 8  | 6.2  | 3 |  |
| 48145489 | 1/2-13 UNC 2BX  | 110 | 28 | 9  | 7    | 3 |  |
| 48145494 | 9/16-12 UNC 2BX | 110 | 30 | 11 | 9    | 3 |  |
| 48145501 | 5/8-11 UNC 2BX  | 110 | 32 | 12 | 9    | 3 |  |
| 48145515 | 3/4-10 UNC 2BX  | 125 | 34 | 14 | 11   | 3 |  |
| 48145526 | 7/8-9 UNC 2BX   | 140 | 34 | 18 | 14.5 | 3 |  |
| 48145538 | 1-8 UNC 2BX     | 160 | 38 | 18 | 14.5 | 3 |  |

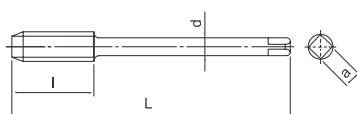
# A DIN TAPS FOR ALL APPLICATIONS

## A-POT UNF

The A Brand

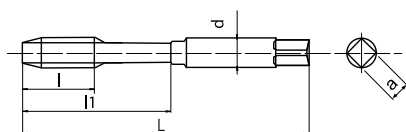


| EDP      | UNF DIN 2184    | L  | l  | l1 | d  | a   | Z |  |
|----------|-----------------|----|----|----|----|-----|---|--|
| 48145462 | 6-40 UNF 2BX    | 56 | 12 | 20 | 4  | 3   | 3 |  |
| 48145467 | 10-32 UNF 2BX   | 70 | 16 | 25 | 6  | 4.9 | 3 |  |
| 48145472 | 1/4-28 UNF 2BX  | 80 | 19 | 30 | 7  | 5.5 | 3 |  |
| 48145476 | 5/16-24 UNF 2BX | 90 | 22 | 35 | 8  | 6.2 | 3 |  |
| 48145481 | 3/8-24 UNF 2BX  | 90 | 20 | 35 | 10 | 8   | 3 |  |

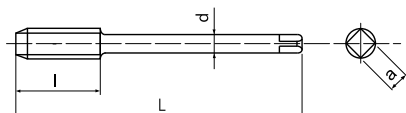


| EDP      | UNF DIN 2184    | L   | l  | d  | a    | Z |  |
|----------|-----------------|-----|----|----|------|---|--|
| 48145486 | 7/16-20 UNF 2BX | 100 | 24 | 8  | 6.2  | 3 |  |
| 48145491 | 1/2-20 UNF 2BX  | 100 | 22 | 9  | 7    | 3 |  |
| 48145496 | 9/16-18 UNF 2BX | 100 | 22 | 11 | 9    | 3 |  |
| 48145504 | 5/8-18 UNF 2BX  | 100 | 22 | 12 | 9    | 3 |  |
| 48145517 | 3/4-16 UNF 2BX  | 110 | 25 | 14 | 11   | 3 |  |
| 48145528 | 7/8-14 UNF 2BX  | 125 | 25 | 18 | 14.5 | 3 |  |
| 48145539 | 1-12 UNF 2BX    | 140 | 28 | 18 | 14.5 | 3 |  |

## A-CSF



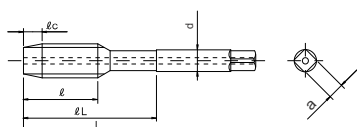
Type 1



Type 2



| EDP      | DIN 371 / 376 | L   | l  | l1 | d  | a   | Z | Type |
|----------|---------------|-----|----|----|----|-----|---|------|
| 48267149 | M5 x 0.8      | 70  | 10 | 25 | 6  | 4.9 | 3 | 1    |
| 48267155 | M6 x 1        | 80  | 12 | 30 | 6  | 4.9 | 3 | 1    |
| 48267161 | M8 x 1.25     | 90  | 15 | 35 | 8  | 6.2 | 4 | 1    |
| 48267169 | M10 x 1.5     | 100 | 18 | 39 | 10 | 8   | 4 | 1    |
| 48267179 | M12 x 1.75    | 110 | 21 | -  | 9  | 7   | 4 | 2    |



## M

Unit:mm CARBIDE FX HAN h6 15°

| EDP     | Thread Size     | Grade | TAP Limit | ℓc   | L   | ℓ  | ℓ L | d  | a | z   |
|---------|-----------------|-------|-----------|------|-----|----|-----|----|---|-----|
| 8330860 | M6 x 1 - 6      | STD   | OH3       | 1.5P | 80  | 19 | 30  | 6  | 3 | 4.5 |
| 8330870 | M8 x 1.25 - 8   |       | OH4       |      | 90  | 22 | 37  | 8  |   | 6   |
| 8330880 | M10 x 1.5 - 8   |       |           |      | 100 | 24 | -   | 8  |   | 6   |
| 8330881 | M10 x 1.25 - 8  |       |           |      | 100 | 24 | -   | 8  |   | 6   |
| 8330890 | M12 x 1.75 - 10 |       |           |      | 110 | 29 | -   | 10 |   | 8   |
| 8330892 | M12 x 1.25 - 10 |       |           |      | 100 | 29 | -   | 10 |   | 8   |

| Work Material | Low Carbon Steel<br>Mild Steel | Medium Carbon Steel | High Carbon Steel | Alloy Steel | ~ardened Steel |           |           |           | Stainless Steel | Tool Steel | Cast Steel | Cast Iron | Ductile Cast Iron | Copper | Brass | Brass Casting | Bronze | Aluminum Rolled | Aluminum Alloy Casting | Magnesium Alloy Casting | Zinc Alloy Casting | Titanium Alloy | Nickel Alloy | Thermosetting Plastic | Thermoplastic |
|---------------|--------------------------------|---------------------|-------------------|-------------|----------------|-----------|-----------|-----------|-----------------|------------|------------|-----------|-------------------|--------|-------|---------------|--------|-----------------|------------------------|-------------------------|--------------------|----------------|--------------|-----------------------|---------------|
|               | C<br>~0.25%                    | C0.25%~0.45%        | C<br>0.45%~       | SCM         | 25~35 HRC      | 35~45 HRC | 45~50 HRC | 50~60 HRC | SUS             | SKD        | SC         | FC        | FCD               | Cu     | Bs    | BsC           | PB     | AL              | AC/ADC                 | MC                      | ZDC                |                |              |                       |               |
| Abbreviation  |                                |                     |                   |             |                |           |           |           |                 |            |            |           |                   |        |       |               |        |                 |                        |                         |                    |                |              |                       |               |
| A-CSF         |                                |                     |                   |             |                |           |           |           |                 |            |            |           |                   |        |       |               |        |                 |                        |                         |                    |                |              |                       |               |



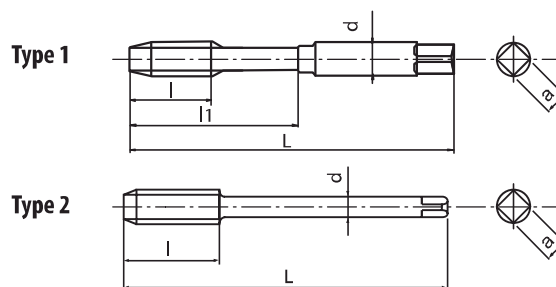
shaping your dreams



# A CARBIDE STRAIGHT FLUTED TAP

## A-CHT OIL Center

**A**  
The A Brand



| EDP      | DIN 371 / 376 | L   | l  | l1 | d  | a   | Z | Type |
|----------|---------------|-----|----|----|----|-----|---|------|
| 48264149 | M5 x 0.8      | 70  | 10 | 25 | 6  | 4.9 | 3 | 1    |
| 48264155 | M6 x 1        | 80  | 12 | 30 | 6  | 4.9 | 3 | 1    |
| 48264161 | M8 x 1.25     | 90  | 15 | 35 | 8  | 6.2 | 4 | 1    |
| 48264169 | M10 x 1.5     | 100 | 18 | 39 | 10 | 8   | 4 | 1    |
| 48264179 | M12 x 1.75    | 110 | 21 | -  | 9  | 7   | 4 | 2    |



| EDP      | DIN 371 / 376 | L   | l  | d  | a   | Z |
|----------|---------------|-----|----|----|-----|---|
| 48264162 | MF8 x 1       | 90  | 15 | 6  | 4.9 | 4 |
| 48264171 | MF10 x 1      | 90  | 18 | 7  | 5.5 | 4 |
| 48264180 | MF12 x 1.5    | 100 | 21 | 9  | 7   | 4 |
| 48264182 | MF12 X 1      | 100 | 21 | 9  | 7   | 4 |
| 48264192 | MF14 X 1.5    | 100 | 24 | 11 | 9   | 4 |
| 48264203 | MF16 X 1.5    | 100 | 24 | 12 | 9   | 4 |
| 48264230 | MF20 X 1.5    | 125 | 30 | 16 | 12  | 4 |

### A-CHT OIL Side



| EDP      | DIN 371 / 376 | L   | l  | l1 | d  | a   | Z | Type |
|----------|---------------|-----|----|----|----|-----|---|------|
| 48265149 | M5 x 0.8      | 70  | 10 | 25 | 6  | 4.9 | 3 | 1    |
| 48265155 | M6 x 1        | 80  | 12 | 30 | 6  | 4.9 | 3 | 1    |
| 48265161 | M8 x 1.25     | 90  | 15 | 35 | 8  | 6.2 | 4 | 1    |
| 48265169 | M10 x 1.5     | 100 | 18 | 39 | 10 | 8   | 4 | 1    |
| 48265179 | M12 x 1.75    | 110 | 21 | -  | 9  | 7   | 4 | 2    |



| EDP      | DIN 371 / 376 | L   | l  | d  | a   | Z |
|----------|---------------|-----|----|----|-----|---|
| 48265162 | MF8 x 1       | 90  | 15 | 6  | 4.9 | 4 |
| 48265171 | MF10 x 1      | 90  | 18 | 7  | 5.5 | 4 |
| 48265180 | MF12 x 1.5    | 100 | 21 | 9  | 7   | 4 |
| 48265182 | MF12 X 1      | 100 | 21 | 9  | 7   | 4 |
| 48265192 | MF14 X 1.5    | 100 | 24 | 11 | 9   | 4 |
| 48265203 | MF16 X 1.5    | 100 | 24 | 12 | 9   | 4 |
| 48265230 | MF20 X 1.5    | 125 | 30 | 16 | 12  | 4 |

### A-CHT OIL FORM E



| EDP      | DIN 371 / 376 | L   | l  | l1 | d  | a   | Z | Type |
|----------|---------------|-----|----|----|----|-----|---|------|
| 48263149 | M5 x 0.8      | 70  | 10 | 25 | 6  | 4.9 | 3 | 1    |
| 48263155 | M6 x 1        | 80  | 12 | 30 | 6  | 4.9 | 3 | 1    |
| 48263161 | M8 x 1.25     | 90  | 15 | 35 | 8  | 6.2 | 4 | 1    |
| 48263169 | M10 x 1.5     | 100 | 18 | 39 | 10 | 8   | 4 | 1    |
| 48263179 | M12 x 1.75    | 110 | 21 | -  | 9  | 7   | 4 | 2    |



| EDP      | DIN 371 / 376 | L   | l  | d  | a   | Z |
|----------|---------------|-----|----|----|-----|---|
| 48263171 | MF10 x 1      | 90  | 18 | 7  | 5.5 | 3 |
| 48263180 | MF12 x 1.5    | 100 | 21 | 9  | 7   | 3 |
| 48263182 | MF12 X 1      | 100 | 21 | 9  | 7   | 3 |
| 48263192 | MF14 X 1.5    | 100 | 24 | 11 | 9   | 4 |
| 48263203 | MF16 X 1.5    | 100 | 24 | 12 | 9   | 4 |

# A ONE PASS THREAD MILLING CUTTER

## AT - 1

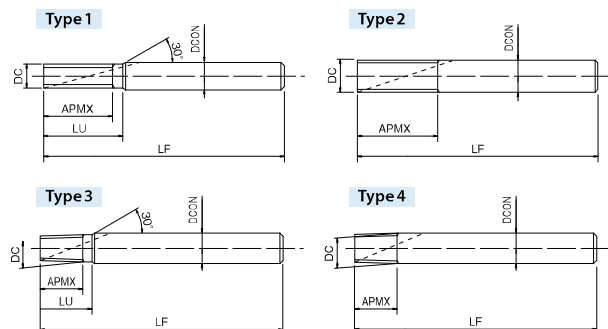
**A**  
The A Brand

CARBIDE

EgiAs

9°-11°

SHRINK  
h6



### M

| EDP No. | Min. Cutting Bore Dia | TP   | DC   | LF  | APMX  | LU   | DCON | FLUTES | TYPE |
|---------|-----------------------|------|------|-----|-------|------|------|--------|------|
| 8331000 | M 6                   | 0.75 | 4.5  | 75  | 13.5  | 16   | 6    | 4      | 1    |
| 8331001 |                       | 1    |      |     | 14    |      |      |        |      |
| 8331002 | M 8                   | 0.5  | 5.7  | 85  | 17    | 22   | 8    | 4      | 2    |
| 8331003 |                       | 1    |      |     | 18    |      |      |        |      |
| 8331004 |                       | 1.25 |      |     | 18.75 |      |      |        |      |
| 8331005 | M 10                  | 1    | 7.7  | 100 | 22    | 34.5 | 10   | 5      | 1    |
| 8331006 |                       | 1.25 |      |     | 22.5  |      |      |        |      |
| 8331007 |                       | 1.5  |      |     | 24    |      |      |        |      |
| 8331008 | M 12                  | 1    | 9.7  | 120 | 26    | 50   | 12   | 6      | 2    |
| 8331009 |                       | 1.25 |      |     | 27.5  |      |      |        |      |
| 8331010 |                       | 1.5  |      |     | 27    |      |      |        |      |
| 8331011 | M 14                  | 1.75 | 11.7 | 135 | 28    | 54   | 16   | 6      | 2    |
| 8331012 |                       | 0.5  |      |     | 29    |      |      |        |      |
| 8331013 |                       | 0.75 |      |     | 30    |      |      |        |      |
| 8331014 | M 16                  | 1    | 13.7 | 150 | 31.5  | 58   | 20   | 6      | 2    |
| 8331015 |                       | 1.5  |      |     | 34.5  |      |      |        |      |
| 8331016 |                       | 2    |      |     | 36    |      |      |        |      |
| 8331017 | M 18                  | 1    | 15.7 | 165 | 36    | 60   | 20   | 6      | 2    |
| 8331018 |                       | 1.5  |      |     | 36    |      |      |        |      |
| 8331019 |                       | 2    |      |     | 36    |      |      |        |      |
| 8331020 | M 20                  | 2.5  | 17.7 | 180 | 42.5  | 66   | 24   | 6      | 2    |
| 8331021 |                       | 1.5  |      |     | 43.5  |      |      |        |      |
| 8331022 |                       | 2.5  |      |     | 45    |      |      |        |      |
| 8331023 | M 24                  | 1.5  | 19.7 | 210 | 51    | 78   | 30   | 6      | 2    |
| 8331024 |                       | 2    |      |     | 52    |      |      |        |      |
| 8331025 |                       | 3    |      |     | 54    |      |      |        |      |

### U, UNJ

| EDP No. | Min. Cutting Bore Dia | TPI | DC   | LF  | APMX  | LU    | DCON | FLUTES | TYPE |
|---------|-----------------------|-----|------|-----|-------|-------|------|--------|------|
| 8331026 | 1/4                   | 20  | 4.55 | 75  | 15.24 | 17.78 | 6    | 4      | 1    |
| 8331027 |                       | 28  |      |     | 15.42 |       |      |        |      |
| 8331028 | 5/16                  | 18  | 5.7  | 85  | 19.75 | 25.41 | 8    | 5      | 2    |
| 8331029 |                       | 24  |      |     | 19.04 |       |      |        |      |
| 8331030 |                       | 32  |      |     | 17.47 |       |      |        |      |
| 8331031 | 3/8                   | 16  | 6.7  | 100 | 22.23 | 28.28 | 10   | 6      | 1    |
| 8331032 |                       | 24  |      |     | 22.22 |       |      |        |      |
| 8331033 |                       | 32  |      |     | 20.64 |       |      |        |      |
| 8331034 | 7/16                  | 14  | 7.7  | 120 | 27.21 | 33.87 | 12   | 7      | 2    |
| 8331035 |                       | 20  |      |     | 25.40 |       |      |        |      |
| 8331036 |                       | 13  |      |     | 29.31 |       |      |        |      |
| 8331037 | 1/2                   | 20  | 8.7  | 140 | 27.94 | 37.03 | 14   | 8      | 1    |
| 8331038 |                       | 28  |      |     | 28.12 |       |      |        |      |
| 8331039 |                       | 12  |      |     | 33.87 |       |      |        |      |
| 8331040 | 9/16                  | 18  | 9.7  | 160 | 32.45 | 41.29 | 16   | 9      | 2    |
| 8331041 |                       | 11  |      |     | 36.94 |       |      |        |      |
| 8331042 |                       | 18  |      |     | 35.28 |       |      |        |      |
| 8331043 | 5/8                   | 18  | 10.7 | 180 | 34.91 | 47.03 | 18   | 10     | 1    |
| 8331044 |                       | 24  |      |     | 34.91 |       |      |        |      |
| 8331045 |                       | 10  |      |     | 43.18 |       |      |        |      |
| 8331046 | 3/4                   | 16  | 11.7 | 200 | 41.29 | 56.44 | 20   | 12     | 2    |
| 8331047 |                       | 9   |      |     | 50.80 |       |      |        |      |
| 8331048 |                       | 14  |      |     | 48.98 |       |      |        |      |
| 8331049 | 7/8                   | 14  | 13.7 | 220 | 52.61 | 63.50 | 22   | 14     | 1    |
| 8331048 |                       | 8   |      |     | 57.15 |       |      |        |      |
| 8331049 |                       | 20  |      |     | 53.34 |       |      |        |      |

### R(PT), Rc(PT)

| EDP No. | RANGE OF THREAD SIZE DIA | TPI | DC    | LF  | APMX | LU    | DCON | FLUTES | TYPE |
|---------|--------------------------|-----|-------|-----|------|-------|------|--------|------|
| 8331075 | 1/16 - 1/8               | 28  | 5.67  | 60  | 9.1  | 10.35 | 6    | 4      | 4    |
| 8331076 | 1/8                      |     | 7.67  |     |      |       |      |        |      |
| 8331077 | 1/4 - 3/8                | 19  | 9.67  | 75  | 14.7 | 15.52 | 10   | 5      | 4    |
| 8331078 | 3/8                      |     | 11.67 |     |      |       |      |        |      |
| 8331079 | 1/2 - 3/4                | 14  | 15.67 | 95  | 20   | 24.3  | 12   | 5      | 4    |
| 8331080 | 3/4                      |     | 15.67 |     |      |       |      |        |      |
| 8331081 | 1~2                      | 11  | 19.67 | 105 | 27.7 | 28.7  | 20   | 6      | 3    |

### Rp(PS), G(PF)

| EDP No. | RANGE OF THREAD SIZE DIA | TPI | DC    | LF  | APMX | LU   | DCON | FLUTES | TYPE |
|---------|--------------------------|-----|-------|-----|------|------|------|--------|------|
| 8331082 | 1/16 - 1/8               | 28  | 5.67  | 60  | 11.8 | 12.7 | 6    | 4      | 2    |
| 8331083 | 1/8                      |     | 7.67  |     |      |      |      |        |      |
| 8331084 | 1/4 - 3/8                | 19  | 9.67  | 80  | 20.1 | 21.1 | 10   | 5      | 2    |
| 8331085 | 3/8                      |     | 11.67 |     |      |      |      |        |      |
| 8331086 | 1/2 - 3/4                | 14  | 15.67 | 100 | 32.7 | 33.7 | 12   | 5      | 2    |
| 8331087 | 3/4                      |     | 15.67 |     |      |      |      |        |      |
| 8331088 | 1~2                      | 11  | 19.67 | 130 | 50.8 | 51.8 | 20   | 6      | 3    |

### NPT

| EDP No. | RANGE OF THREAD SIZE DIA | TPI | DC    | LF | APMX  | LU   | DCON | FLUTES | TYPE |
|---------|--------------------------|-----|-------|----|-------|------|------|--------|------|
| 8331089 | 1/16 - 1/8               | 27  | 5.67  | 60 | 10.35 | 11.3 | 6    | 4      | 4    |
| 8331090 | 1/8                      |     | 7.67  |    |       |      |      |        |      |
| 8331091 | 1/4 - 3/8                | 18  | 9.67  | 75 | 15.52 | 16.5 | 10   | 5      | 4    |
| 8331092 | 3/8                      |     | 11.67 |    |       |      |      |        |      |
| 8331093 | 1/2 - 3/4                | 14  | 15.67 | 95 | 19.96 | 20.9 | 16   | 6      | 3    |
| 8331094 | 1~2                      |     | 18.72 |    |       |      |      |        |      |

# A

## DIN TAPS FOR ALL APPLICATIONS

### A - SIGMA TAP

SPEED  
FEED  
P.164

HSSE

TiN

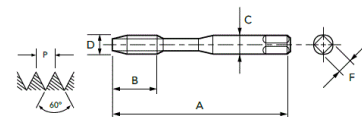
4,5



M

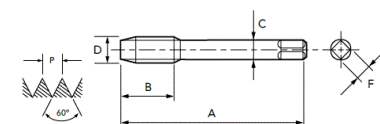
#### 2000/0 A-SIGMA-POT 6HX

| EDP      | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|----------|----------------|-----|----|-----|-----|---|
| 49100124 | M2 X 0.4 6HX   | 45  | 8  | 2.8 | 2.1 | 2 |
| 49100174 | M3 X 0.5 6HX   | 56  | 11 | 3.5 | 2.7 | 3 |
| 49100204 | M4 X 0.7 6HX   | 63  | 13 | 4.5 | 3.4 | 3 |
| 49100234 | M5 X 0.8 6HX   | 70  | 16 | 6   | 4.9 | 3 |
| 49100254 | M6 X 1 6HX     | 80  | 19 | 6   | 4.9 | 3 |
| 49100274 | M8 X 1.25 6HX  | 90  | 22 | 8   | 6.2 | 3 |
| 49100294 | M10 X 1.5 6HX  | 100 | 24 | 10  | 8   | 3 |



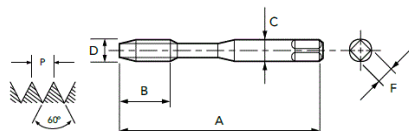
#### 2000/4 A-SIGMA-POT

| EDP      | METRIC DIN 376 | L   | l1 | d   | a    | Z |
|----------|----------------|-----|----|-----|------|---|
| 49140174 | M3 X 0.5 6HX   | 56  | 11 | 2.2 | -    | 3 |
| 49140204 | M4 X 0.7 6HX   | 63  | 13 | 2.8 | 2.1  | 3 |
| 49140254 | M6 X 1 6HX     | 80  | 19 | 4.5 | 3.4  | 3 |
| 49140274 | M8 X 1.25 6HX  | 90  | 22 | 6   | 4.9  | 3 |
| 49140294 | M10 X 1.5 6HX  | 100 | 24 | 7   | 5.5  | 3 |
| 49140314 | M12 X 1.75 6HX | 110 | 29 | 9   | 7    | 3 |
| 49140324 | M14 X 2 6HX    | 110 | 30 | 11  | 9    | 3 |
| 49140334 | M16 X 2 6HX    | 110 | 32 | 12  | 9    | 3 |
| 49140344 | M18 X 2.5 6HX  | 125 | 34 | 14  | 11   | 3 |
| 49140354 | M20 X 2.5 6HX  | 140 | 34 | 16  | 12   | 3 |
| 49140364 | M22 X 2.5 6HX  | 140 | 34 | 18  | 14.5 | 3 |
| 49140374 | M24 X 3 6HX    | 160 | 38 | 18  | 14.5 | 3 |



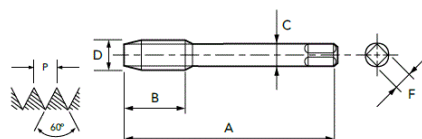
#### 2004/0 A-SIGMA-POT 6GX

| EDP      | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|----------|----------------|-----|----|-----|-----|---|
| 49100127 | M2 X 0.4 6GX   | 45  | 8  | 2.8 | 2.1 | 2 |
| 49100177 | M3 X 0.5 6GX   | 56  | 11 | 3.5 | 2.7 | 3 |
| 49100207 | M4 X 0.7 6GX   | 63  | 13 | 4.5 | 3.4 | 3 |
| 49100237 | M5 X 0.8 6GX   | 70  | 16 | 6   | 4.9 | 3 |
| 49100257 | M6 X 1 6GX     | 80  | 19 | 6   | 4.9 | 3 |
| 49100277 | M8 X 1.25 6GX  | 90  | 22 | 8   | 6.2 | 3 |
| 49100297 | M10 X 1.5 6GX  | 100 | 24 | 10  | 8   | 3 |



#### 2004/4 A-SIGMA-POT 6GX

| EDP      | METRIC DIN 376 | L   | l1 | d   | a    | Z |
|----------|----------------|-----|----|-----|------|---|
| 49140177 | M3 X 0.5 6GX   | 56  | 11 | 2.2 | -    | 3 |
| 49140207 | M4 X 0.7 6GX   | 63  | 13 | 2.8 | 2.1  | 3 |
| 49140237 | M5 X 0.8 6GX   | 70  | 16 | 3.5 | 2.7  | 3 |
| 49140257 | M6 X 1 6GX     | 80  | 19 | 4.5 | 3.4  | 3 |
| 49140277 | M8 X 1.25 6GX  | 90  | 22 | 6   | 4.9  | 3 |
| 49140297 | M10 X 1.5 6GX  | 100 | 24 | 7   | 5.5  | 3 |
| 49140317 | M12 X 1.75 6GX | 110 | 29 | 9   | 7    | 3 |
| 49140327 | M14 X 2 6GX    | 110 | 30 | 11  | 9    | 3 |
| 49140337 | M16 X 2 6GX    | 110 | 32 | 12  | 9    | 3 |
| 49140347 | M18 X 2.5 6GX  | 125 | 34 | 14  | 11   | 3 |
| 49140357 | M20 X 2.5 6GX  | 140 | 34 | 16  | 12   | 3 |
| 49140367 | M22 X 2.5 6GX  | 140 | 34 | 18  | 14.5 | 3 |
| 49140377 | M24 X 3 6GX    | 160 | 38 | 18  | 14.5 | 3 |



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# A

## DIN TAPS FOR ALL APPLICATIONS

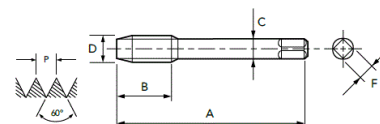


### A - SIGMA TAP

MF

#### 2000/5 A-SIGMA-POT

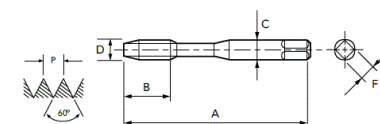
| EDP      | METRIC DIN 374 | L   | l1 | d   | a    | Z |
|----------|----------------|-----|----|-----|------|---|
| 49151704 | M6 X 0.75 6HX  | 80  | 14 | 4.5 | 3.4  | 3 |
| 49151744 | M8 X 0.75 6HX  | 80  | 19 | 6   | 4.9  | 3 |
| 49151964 | M8 X 1.0 6HX   | 90  | 22 | 6   | 4.9  | 3 |
| 49152004 | M10 X 1.0 6HX  | 90  | 20 | 7   | 5.5  | 3 |
| 49152524 | M10 X 1.25 6HX | 100 | 24 | 7   | 5.5  | 3 |
| 49152044 | M12 X 1.0 6HX  | 100 | 22 | 9   | 7    | 3 |
| 49152534 | M12 X 1.25 6HX | 100 | 22 | 9   | 7    | 3 |
| 49152554 | M12 X 1.5 6HX  | 100 | 22 | 9   | 7    | 3 |
| 49152564 | M14 X 1.5 6HX  | 100 | 22 | 11  | 9    | 3 |
| 49152584 | M16 X 1.5 6HX  | 100 | 22 | 12  | 9    | 3 |
| 49152604 | M18 X 1.5 6HX  | 110 | 25 | 14  | 11   | 3 |
| 49152614 | M20 X 1.5 6HX  | 125 | 25 | 16  | 12   | 3 |
| 49152624 | M22 X 1.5 6HX  | 125 | 25 | 18  | 14.5 | 3 |
| 49152634 | M24 X 1.5 6HX  | 140 | 28 | 18  | 14.5 | 3 |



UNC

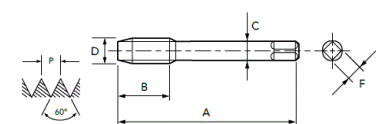
#### 2000/1 A-SIGMA-POT

| EDP      | UNC DIN 2182      | L   | l1 | d   | a   | Z |
|----------|-------------------|-----|----|-----|-----|---|
| 49114024 | 2 - 56 UNC 2BX    | 50  | 9  | 2.8 | 2.1 |   |
| 49114044 | 4 - 40 UNC 2BX    | 56  | 11 | 3.5 | 2.7 |   |
| 49114054 | 5 - 40 UNC 2BX    | 56  | 11 | 3.5 | 2.7 |   |
| 49114064 | 6 - 32 UNC 2BX    | 56  | 13 | 4   | 3   |   |
| 49114074 | 8 - 32 UNC 2BX    | 63  | 13 | 4.5 | 3.4 |   |
| 49114084 | 10 - 24 UNC 2BX   | 70  | 16 | 5.5 | 4.3 |   |
| 49114104 | 1/4 - 20 UNC 2BX  | 80  | 19 | 7   | 5.5 |   |
| 49114114 | 5/16 - 18 UNC 2BX | 90  | 22 | 8   | 6.2 |   |
| 49114124 | 3/8 - 16 UNC 2BX  | 100 | 22 | 9   | 7   |   |



#### 2000/6 A-SIGMA-POT

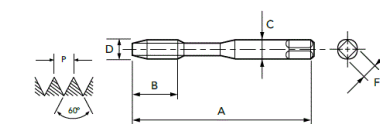
| EDP      | UNC DIN 2184      | L   | l1 | d  | a    | Z |
|----------|-------------------|-----|----|----|------|---|
| 49164134 | 7/16 - 14 UNC 2BX | 100 | 24 | 8  | 6.2  |   |
| 49164144 | 1/2 - 13 UNC 2BX  | 110 | 29 | 9  | 7    |   |
| 49164154 | 9/16 - 12 UNC 2BX | 110 | 30 | 11 | 9    |   |
| 49164164 | 5/8 - 11 UNC 2BX  | 110 | 32 | 12 | 9    |   |
| 49164174 | 3/4 - 10 UNC 2BX  | 125 | 34 | 14 | 11   |   |
| 49164184 | 7/8 - 9 UNC 2BX   | 140 | 34 | 18 | 14.5 |   |
| 49164194 | 1 - 8 UNC 2BX     | 160 | 38 | 20 | 16   |   |



UNF

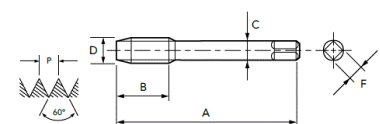
#### 2000/2 A-SIGMA-POT

| EDP      | UNF DIN 2182      | L   | l1 | d   | a   | Z |
|----------|-------------------|-----|----|-----|-----|---|
| 49124364 | 6 - 40 UNF 2BX    | 56  | 13 | 4   | 3   |   |
| 49124384 | 10 - 32 UNF 2BX   | 70  | 16 | 5.5 | 4.3 |   |
| 49124404 | 1/4 - 28 UNF 2BX  | 80  | 19 | 7   | 5.5 |   |
| 49124414 | 5/16 - 24 UNF 2BX | 90  | 22 | 8   | 6.2 |   |
| 49124424 | 3/8 - 24 UNF 2BX  | 100 | 22 | 9   | 7   |   |



#### 2000/7 A-SIGMA-POT

| EDP      | UNF DIN 2183      | L   | l1 | d  | a    | Z |
|----------|-------------------|-----|----|----|------|---|
| 49174434 | 7/16 - 20 UNF 2BX | 100 | 20 | 8  | 6.2  |   |
| 49174444 | 1/2 - 20 UNF 2BX  | 100 | 22 | 9  | 7    |   |
| 49174454 | 9/16 - 18 UNF 2BX | 100 | 22 | 11 | 9    |   |
| 49174464 | 5/8 - 18 UNF 2BX  | 100 | 22 | 12 | 9    |   |
| 49174474 | 3/4 - 16 UNF 2BX  | 110 | 25 | 14 | 11   |   |
| 49174484 | 7/8 - 14 UNF 2BX  | 125 | 25 | 18 | 14.5 |   |
| 49174494 | 1 - 12 UNF 2BX    | 125 | 25 | 20 | 16   |   |



# A

## DIN TAPS FOR ALL APPLICATIONS

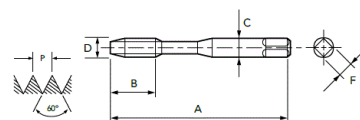


### A - SIGMA TAP

M

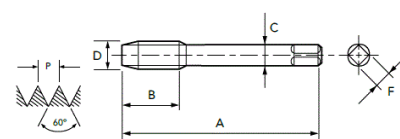
#### 2002/0 A-SIGMA-SFT

| EDP      | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|----------|----------------|-----|----|-----|-----|---|
| 49200124 | M2 X 0.4 6HX   | 45  | 4  | 2.8 | 2.1 | 2 |
| 49200174 | M3 X 0.5 6HX   | 56  | 5  | 3.5 | 2.7 | 3 |
| 49200204 | M4 X 0.7 6HX   | 63  | 7  | 4.5 | 3.4 | 3 |
| 49200234 | M5 X 0.8 6HX   | 70  | 8  | 6   | 4.9 | 3 |
| 49200254 | M6 X 1 6HX     | 80  | 10 | 6   | 4.9 | 3 |
| 49200274 | M8 X 1.25 6HX  | 90  | 13 | 8   | 6.2 | 3 |
| 49200294 | M10 X 1.5 6HX  | 100 | 15 | 10  | 8   | 3 |



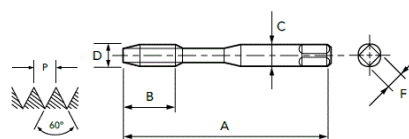
#### 2002/4 A-SIGMA-SFT

| EDP      | METRIC DIN 376 | L   | l1 | d   | a    | Z |
|----------|----------------|-----|----|-----|------|---|
| 49240174 | M3 X 0.5 6HX   | 56  | 5  | 2.2 | -    | 3 |
| 49240204 | M4 X 0.7 6HX   | 63  | 7  | 2.8 | 2.1  | 3 |
| 49240254 | M6 X 1 6HX     | 80  | 10 | 4.5 | 3.4  | 3 |
| 49240274 | M8 X 1.25 6HX  | 90  | 13 | 6   | 4.9  | 3 |
| 49240294 | M10 X 1.5 6HX  | 100 | 15 | 7   | 5.5  | 3 |
| 49240314 | M12 X 1.75 6HX | 110 | 18 | 9   | 7    | 3 |
| 49240324 | M14 X 2 6HX    | 110 | 20 | 11  | 9    | 3 |
| 49240334 | M16 X 2 6HX    | 110 | 20 | 12  | 9    | 3 |
| 49240344 | M18 X 2.5 6HX  | 125 | 25 | 14  | 11   | 4 |
| 49240354 | M20 X 2.5 6HX  | 140 | 25 | 16  | 12   | 4 |
| 49240364 | M22 X 2.5 6HX  | 140 | 25 | 18  | 14.5 | 4 |
| 49240374 | M24 X 3 6HX    | 160 | 30 | 18  | 14.5 | 4 |
| 49240384 | M27 X 3 6HX    | 160 | 30 | 20  | 16   | 4 |
| 49240394 | M30 X 3.5 6HX  | 180 | 35 | 22  | 18   | 4 |
| 49240404 | M33 X 3.5 6HX  | 180 | 35 | 25  | 20   | 4 |
| 49240414 | M36 X 4 6HX    | 200 | 40 | 28  | 22   | 4 |
| 49240424 | M39 X 4 6HX    | 200 | 40 | 32  | 24   | 4 |
| 49240434 | M42 X 4.5 6HX  | 200 | 45 | 32  | 24   | 4 |
| 49240444 | M45 X 4.5 6HX  | 220 | 45 | 36  | 29   | 4 |
| 49240454 | M48 X 5 6HX    | 250 | 50 | 36  | 29   | 4 |
| 49240464 | M52 X 5 6HX    | 250 | 50 | 40  | 32   | 4 |



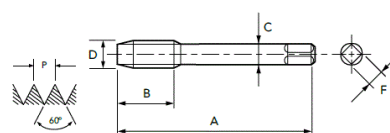
#### 2005/0 A-SIGMA-SFT 6GX

| EDP      | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|----------|----------------|-----|----|-----|-----|---|
| 49200127 | M2 X 0.4 6GX   | 45  | 4  | 2.8 | 2.1 | 2 |
| 49200177 | M3 X 0.5 6GX   | 56  | 5  | 3.5 | 2.7 | 3 |
| 49200207 | M4 X 0.7 6GX   | 63  | 7  | 4.5 | 3.4 | 3 |
| 49200237 | M5 X 0.8 6GX   | 70  | 8  | 6   | 4.9 | 3 |
| 49200257 | M6 X 1 6GX     | 80  | 10 | 6   | 4.9 | 3 |
| 49200277 | M8 X 1.25 6GX  | 90  | 13 | 8   | 6.2 | 3 |
| 49200297 | M10 X 1.5 6GX  | 100 | 15 | 10  | 8   | 3 |



#### 2005/4 A-SIGMA-SFT 6GX

| EDP      | METRIC DIN 376 | L   | l1 | d   | a    | Z |
|----------|----------------|-----|----|-----|------|---|
| 49240177 | M3 X 0.5 6GX   | 56  | 5  | 2.2 | -    | 3 |
| 49240207 | M4 X 0.7 6GX   | 63  | 7  | 2.8 | 2.1  | 3 |
| 49240237 | M5 X 0.8 6GX   | 70  | 8  | 3.5 | 2.7  | 3 |
| 49240257 | M6 X 1 6GX     | 80  | 10 | 4.5 | 3.4  | 3 |
| 49240277 | M8 X 1.25 6GX  | 90  | 13 | 6   | 4.9  | 3 |
| 49240297 | M10 X 1.5 6GX  | 100 | 15 | 7   | 5.5  | 3 |
| 49240317 | M12 X 1.75 6GX | 110 | 18 | 9   | 7    | 3 |
| 49240327 | M14 X 2 6GX    | 110 | 20 | 11  | 9    | 3 |
| 49240337 | M16 X 2 6GX    | 110 | 20 | 12  | 9    | 3 |
| 49240347 | M18 X 2.5 6GX  | 125 | 25 | 14  | 11   | 4 |
| 49240357 | M20 X 2.5 6GX  | 140 | 25 | 16  | 12   | 4 |
| 49240367 | M22 X 2.5 6GX  | 140 | 25 | 18  | 14.5 | 4 |
| 49240377 | M24 X 3 6GX    | 160 | 30 | 18  | 14.5 | 4 |



# A

## DIN TAPS FOR ALL APPLICATIONS

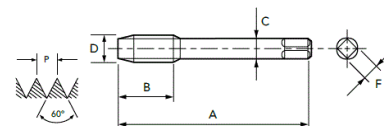


### A - SIGMA TAP

#### MF

#### 2002/5 A-SIGMA-SFT

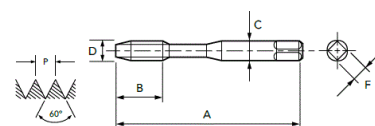
| EDP      | METRIC DIN 374 | L   | l1   | d   | a    | Z |
|----------|----------------|-----|------|-----|------|---|
| 49251704 | M6 X 0.75 6HX  | 80  | 7.5  | 4.5 | 3.4  | 3 |
| 49251744 | M8 X 0.75 6HX  | 80  | 7.5  | 6   | 4.9  | 3 |
| 49251964 | M8 X 1.0 6HX   | 90  | 10   | 6   | 4.9  | 3 |
| 49252004 | M10 X 1.0 6HX  | 90  | 10   | 7   | 5.5  | 4 |
| 49252524 | M10 X 1.25 6HX | 100 | 12.5 | 7   | 5.5  | 4 |
| 49252044 | M12 X 1.0 6HX  | 100 | 10   | 9   | 7    | 4 |
| 49252534 | M12 X 1.25 6HX | 100 | 12.5 | 9   | 7    | 4 |
| 49252554 | M12 X 1.5 6HX  | 100 | 15   | 9   | 7    | 4 |
| 49252564 | M14 X 1.5 6HX  | 100 | 15   | 11  | 9    | 3 |
| 49252584 | M16 X 1.5 6HX  | 100 | 15   | 12  | 9    | 5 |
| 49252604 | M18 X 1.5 6HX  | 110 | 15   | 14  | 11   | 5 |
| 49252614 | M20 X 1.5 6HX  | 125 | 15   | 16  | 12   | 5 |
| 49252624 | M22 X 1.5 6HX  | 125 | 15   | 18  | 14.5 | 4 |
| 49252634 | M24 X 1.5 6HX  | 140 | 15   | 18  | 14.5 | 4 |



#### UNC

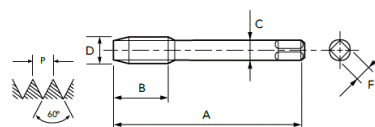
#### 2002/1 A-SIGMA-SFT

| EDP      | UNC DIN 2182      | L   | l1   | d   | a   | Z |
|----------|-------------------|-----|------|-----|-----|---|
| 49214024 | 2 - 56 UNC 2BX    | 50  | 4.5  | 2.8 | 2.1 |   |
| 49214044 | 4 - 40 UNC 2BX    | 56  | 6.5  | 3.5 | 2.7 |   |
| 49214054 | 5 - 40 UNC 2BX    | 56  | 6.5  | 3.5 | 2.7 |   |
| 49214064 | 6 - 32 UNC 2BX    | 56  | 8    | 4   | 3   |   |
| 49214074 | 8 - 32 UNC 2BX    | 63  | 8    | 4.5 | 3.4 |   |
| 49214084 | 10 - 24 UNC 2BX   | 70  | 10.5 | 5.5 | 4.3 |   |
| 49214104 | 1/4 - 20 UNC 2BX  | 80  | 12.5 | 7   | 5.5 |   |
| 49214114 | 5/16 - 18 UNC 2BX | 90  | 14   | 8   | 6.2 |   |
| 49214124 | 3/8 - 16 UNC 2BX  | 100 | 16   | 9   | 7   |   |



#### 2002/6 A-SIGMA-SFT

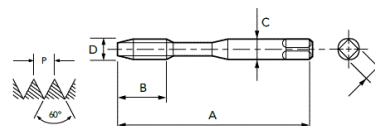
| EDP      | UNC DIN 2182      | L   | l1   | d  | a    | Z |
|----------|-------------------|-----|------|----|------|---|
| 49264134 | 7/16 - 14 UNC 2BX | 100 | 18   | 8  | 6.2  |   |
| 49264144 | 1/2 - 13 UNC 2BX  | 110 | 19.5 | 9  | 7    |   |
| 49264154 | 9/16 - 12 UNC 2BX | 110 | 22   | 11 | 9    |   |
| 49264164 | 5/8 - 11 UNC 2BX  | 110 | 23   | 12 | 9    |   |
| 49264174 | 3/4 - 10 UNC 2BX  | 125 | 25.5 | 14 | 11   |   |
| 49264184 | 7/8 - 9 UNC 2BX   | 140 | 28   | 18 | 14.5 |   |
| 49264194 | 1 - 8 UNC 2BX     | 160 | 32   | 18 | 14.5 |   |



#### UNF

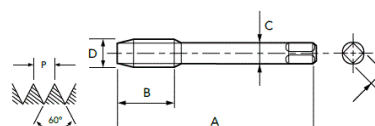
#### 2002/2 A-SIGMA-SFT

| EDP      | UNF DIN 2182      | L   | l1   | d   | a   | Z |
|----------|-------------------|-----|------|-----|-----|---|
| 49224364 | 6 - 40 UNF 2BX    | 56  | 6.5  | 4   | 3   |   |
| 49224384 | 10 - 32 UNF 2BX   | 70  | 8    | 5.5 | 4.3 |   |
| 49224404 | 1/4 - 28 UNF 2BX  | 80  | 9    | 7   | 5.5 |   |
| 49224414 | 5/16 - 24 UNF 2BX | 90  | 10.5 | 8   | 6.2 |   |
| 49224424 | 3/8 - 24 UNF 2BX  | 100 | 10.5 | 9   | 7   |   |



#### 2002/7 A-SIGMA-SFT

| EDP      | UNF DIN 2183      | L   | l1 | d  | a    | Z |
|----------|-------------------|-----|----|----|------|---|
| 49274434 | 7/16 - 20 UNF 2BX | 100 | 13 | 8  | 6.2  |   |
| 49274444 | 1/2 - 20 UNF 2BX  | 100 | 13 | 9  | 7    |   |
| 49274454 | 9/16 - 18 UNF 2BX | 100 | 14 | 11 | 9    |   |
| 49274464 | 5/8 - 18 UNF 2BX  | 100 | 14 | 12 | 9    |   |
| 49274474 | 3/4 - 16 UNF 2BX  | 110 | 16 | 14 | 11   |   |
| 49274484 | 7/8 - 14 UNF 2BX  | 125 | 18 | 18 | 14.5 |   |
| 49274494 | 1 - 12 UNF 2BX    | 125 | 21 | 20 | 16   |   |





# DIN TAPS FOR THE GENERAL INDUSTRY

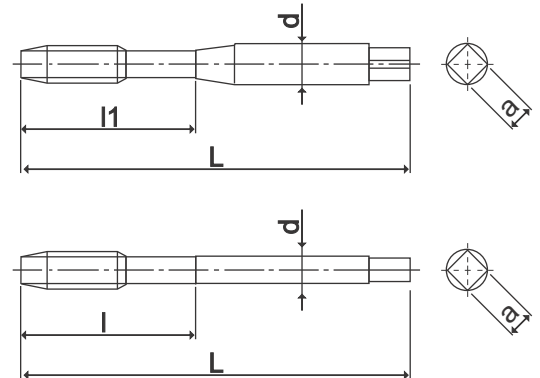


## TIN-NRT Metric

| EDP      | METRIC DIN 371 | L   | l1 | d  | a   | Z |
|----------|----------------|-----|----|----|-----|---|
| T1911168 | M5 x 0.8 6HX   | 70  | 25 | 6  | 4.9 |   |
| T1910954 | M6 x 1 6HX     | 80  | 30 | 6  | 4.9 |   |
| T1911170 | M8 x 1.25 6HX  | 90  | 35 | 8  | 6.2 |   |
| T1911171 | M10 x 1.5 6HX  | 100 | 39 | 10 | 8   |   |

## TIN-MT Metric

- TIN coating for increased durability and wear resistance for longer tool life at high speeds
- For pilot hole use OSG HPD Drill Series
- For Cast Iron (GG, GGG) and Aluminium Diecast
- Manufactured from OSG's HSS-EV3

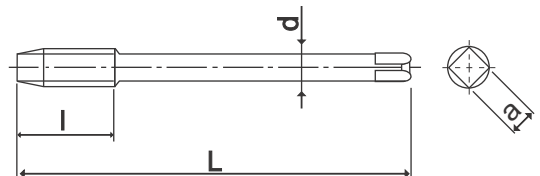


| EDP        | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|------------|----------------|-----|----|-----|-----|---|
| TM11030501 | M3 x 0.5 6HX   | 56  | 18 | 3.5 | 2.7 | 3 |
| TM11040701 | M4 x 0.7 6HX   | 63  | 21 | 4.5 | 3.4 | 3 |
| TM11050801 | M5 x 0.8 6HX   | 70  | 25 | 6   | 4.9 | 3 |
| TM11061001 | M6 x 1 6HX     | 80  | 30 | 6   | 4.9 | 3 |
| TM11081301 | M8 x 1.25 6HX  | 90  | 35 | 8   | 6.2 | 4 |
| TM11101501 | M10 x 1.5 6HX  | 100 | 39 | 10  | 8   | 4 |

| EDP        | METRIC DIN 376 | L   | d  | a    | Z |
|------------|----------------|-----|----|------|---|
| TM16121801 | M12 x 1.75 6HX | 110 | 9  | 7    | 4 |
| TM16142001 | M14 x 2 6HX    | 110 | 11 | 9    | 4 |
| TM16162001 | M16 x 2 6HX    | 110 | 12 | 9    | 4 |
| TM16182501 | M18 x 2.5 6HX  | 125 | 14 | 11   | 4 |
| TM16202501 | M20 x 2.5 6HX  | 140 | 16 | 12   | 4 |
| TM16222501 | M22 x 2.5 6HX  | 140 | 18 | 14.5 | 5 |
| TM16243001 | M24 x 3 6HX    | 160 | 18 | 14.5 | 5 |



## TIN-MT Metric Fine pitch



| EDP        | METRIC DIN 374 | L   | d  | a    | Z |
|------------|----------------|-----|----|------|---|
| TM14081001 | M8 x 1 6HX     | 90  | 6  | 4.9  | 4 |
| TM14101001 | M10 x 1 6HX    | 90  | 7  | 5.5  | 4 |
| TM14101301 | M10 x 1.25 6HX | 100 | 7  | 5.5  | 4 |
| TM14121301 | M12 x 1.25 6HX | 100 | 9  | 7    | 4 |
| TM14121501 | M12 x 1.5 6HX  | 100 | 9  | 7    | 4 |
| TM14141501 | M14 x 1.5 6HX  | 100 | 11 | 9    | 4 |
| TM14161501 | M16 x 1.5 6HX  | 100 | 12 | 9    | 4 |
| TM14181501 | M18 x 1.5 6HX  | 110 | 14 | 11   | 4 |
| TM14201501 | M20 x 1.5 6HX  | 125 | 16 | 12   | 4 |
| TM14241501 | M24 x 1.5 6HX  | 140 | 18 | 14.5 | 5 |



# DIN TAPS FOR THE GENERAL INDUSTRY

## TIN-SFT Metric

- This tap is made for cutting materials whose chips are produced in continuous coil form, such as carbon steels.
- Alloy steels and nonferrous metals.



SPEED  
FEED  
P165

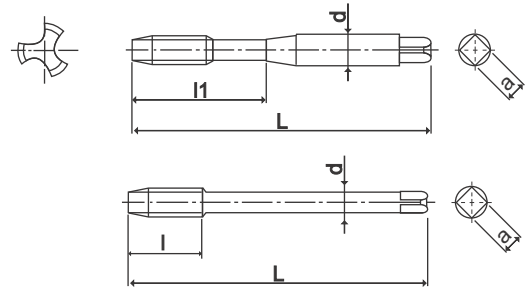
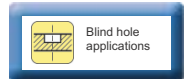
M

HSSE

TiN

40°

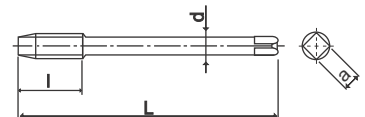
2.5



| EDP        | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|------------|----------------|-----|----|-----|-----|---|
| 6131386001 | M3 x 0.5 6HX   | 56  | 18 | 3.5 | 2.7 | 3 |
| 6131446001 | M4 x 0.7 6HX   | 63  | 21 | 4.5 | 3.4 | 3 |
| 6131496001 | M5 x 0.8 6HX   | 70  | 25 | 6   | 4.9 | 3 |
| 6131556001 | M6 x 1 6HX     | 80  | 30 | 6   | 4.9 | 3 |
| 6131616001 | M8 x 1.25 6HX  | 90  | 35 | 8   | 6.2 | 4 |
| 6131696001 | M10 x 1.5 6HX  | 100 | 39 | 10  | 8   | 4 |

| EDP        | METRIC DIN 376 | L   | d  | a    | Z |
|------------|----------------|-----|----|------|---|
| 6141796001 | M12 x 1.75 6HX | 110 | 9  | 7    | 3 |
| 6141916001 | M14 x 2 6HX    | 110 | 11 | 9    | 3 |
| 6142026001 | M16 x 2 6HX    | 110 | 12 | 9    | 3 |
| 6142146001 | M18 x 2.5 6HX  | 125 | 14 | 11   | 4 |
| 6142286001 | M20 x 2.5 6HX  | 140 | 16 | 12   | 4 |
| 6142386001 | M22 x 2.5 6HX  | 140 | 18 | 14.5 | 4 |
| 6142476001 | M24 x 3 6HX    | 160 | 18 | 14.5 | 4 |

## TIN-SFT Metric Fine pitch



| EDP        | METRIC DIN 374 | L   | d   | a    | Z |
|------------|----------------|-----|-----|------|---|
| 6121516001 | M5 x 0.5 6HX   | 70  | 3.5 | 2.7  | 3 |
| 6121626001 | M8 x 1 6HX     | 90  | 6   | 4.9  | 3 |
| 6121716001 | M10 x 1 6HX    | 90  | 7   | 5.5  | 3 |
| 6121706001 | M10 x 1.25 6HX | 100 | 7   | 5.5  | 3 |
| 6121816001 | M12 x 1.25 6HX | 100 | 9   | 7    | 3 |
| 6121806001 | M12 x 1.5 6HX  | 100 | 9   | 7    | 3 |
| 6121926001 | M14 x 1.5 6HX  | 100 | 11  | 9    | 3 |
| 6122036001 | M16 x 1.5 6HX  | 100 | 12  | 9    | 3 |
| 6122166001 | M18 x 1.5 6HX  | 110 | 14  | 11   | 4 |
| 6122306001 | M20 x 1.5 6HX  | 125 | 16  | 12   | 4 |
| 6122506001 | M24 x 1.5 6HX  | 140 | 18  | 14.5 | 4 |

## TIN-SFT

| EDP        | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|------------|----------------|-----|----|-----|-----|---|
| 6131389001 | M3 x 0.5 6G    | 56  | 18 | 3.5 | 2.7 | 3 |
| 6131449001 | M4 x 0.7 6G    | 63  | 21 | 4.5 | 3.4 | 3 |
| 6131499001 | M5 x 0.8 6G    | 70  | 25 | 6   | 4.9 | 3 |
| 6131559001 | M6 x 1.0 6G    | 80  | 30 | 6   | 4.9 | 3 |
| 6131619001 | M8 x 1.25 6G   | 90  | 35 | 8   | 6.2 | 4 |
| 6131699001 | M10 x 1.5 6G   | 100 | 39 | 10  | 8   | 4 |



shaping your dreams

# DIN TAPS FOR THE GENERAL INDUSTRY

SPEED  
FEED  
P165

M

HSSE

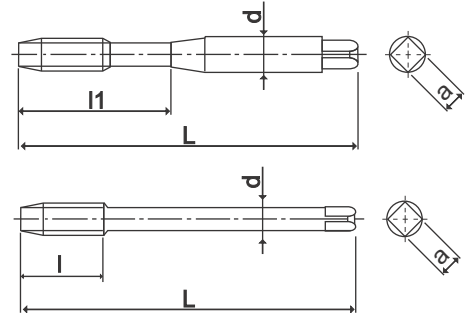
TiN

4

Through hole applications

## TIN-POT Metric

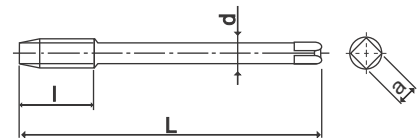
- Suitable for through hole tapping of carbon steels, alloy steels and nonferrous metals whose chips are produced in continuous coil form.
- These taps discharge chips through the hole.



| EDP        | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|------------|----------------|-----|----|-----|-----|---|
| 6071386001 | M3 x 0.5 6HX   | 56  | 18 | 3.5 | 2.7 | 3 |
| 6071446001 | M4 x 0.7 6HX   | 63  | 21 | 4.5 | 3.4 | 3 |
| 6071496001 | M5 x 0.8 6HX   | 70  | 25 | 6   | 4.9 | 3 |
| 6071556001 | M6 x 1 6HX     | 80  | 30 | 6   | 4.9 | 3 |
| 6071616001 | M8 x 1.25 6HX  | 90  | 35 | 8   | 6.2 | 4 |
| 6071696001 | M10 x 1.5 6HX  | 100 | 39 | 10  | 8   | 4 |

| EDP        | METRIC DIN 376 | L   | d  | a    | Z |
|------------|----------------|-----|----|------|---|
| 6081796001 | M12 x 1.75 6HX | 110 | 9  | 7    | 3 |
| 6081916001 | M14 x 2 6HX    | 110 | 11 | 9    | 3 |
| 6082026001 | M16 x 2 6HX    | 110 | 12 | 9    | 3 |
| 6082146001 | M18 x 2.5 6HX  | 125 | 14 | 11   | 3 |
| 6082286001 | M20 x 2.5 6HX  | 140 | 16 | 12   | 3 |
| 6082386001 | M22 x 2.5 6HX  | 140 | 18 | 14.5 | 3 |
| 6082476001 | M24 x 3 6HX    | 160 | 18 | 14.5 | 3 |

## TIN-POT Metric Fine pitch



| EDP        | METRIC DIN 374 | L   | d   | a    | Z |
|------------|----------------|-----|-----|------|---|
| 6061516001 | M5 x 0.5 6HX   | 70  | 3.5 | 2.7  | 3 |
| 6061626001 | M8 x 1 6HX     | 90  | 6   | 4.9  | 3 |
| 6061716001 | M10 x 1 6HX    | 90  | 7   | 5.5  | 3 |
| 6061706001 | M10 x 1.25 6HX | 100 | 7   | 5.5  | 3 |
| 6061816001 | M12 x 1.25 6HX | 100 | 9   | 7    | 3 |
| 6061806001 | M12 x 1.5 6HX  | 100 | 9   | 7    | 3 |
| 6061926001 | M14 x 1.5 6HX  | 100 | 11  | 9    | 3 |
| 6062036001 | M16 x 1.5 6HX  | 100 | 12  | 9    | 3 |
| 6062166001 | M18 x 1.5 6HX  | 110 | 14  | 11   | 3 |
| 6062306001 | M20 x 1.5 6HX  | 125 | 16  | 12   | 3 |
| 6062506001 | M24 x 1.5 6HX  | 140 | 18  | 14.5 | 3 |

## TIN-POT

| EDP        | METRIC DIN 371 | L   | l1 | d   | a   | Z |
|------------|----------------|-----|----|-----|-----|---|
| 6091386001 | M3 x 0.5 6G    | 56  | 18 | 3.5 | 2.7 | 3 |
| 6091446001 | M4 x 0.7 6G    | 63  | 21 | 4.5 | 3.4 | 3 |
| 6091496001 | M5 x 0.8 6G    | 70  | 25 | 6   | 4.9 | 3 |
| 6091556001 | M6 x 1.0 6G    | 80  | 30 | 6   | 4.9 | 3 |
| 6091616001 | M8 x 1.25 6G   | 90  | 35 | 8   | 6.2 | 4 |
| 6091696001 | M10 x 1.5 6G   | 100 | 39 | 10  | 8   | 4 |

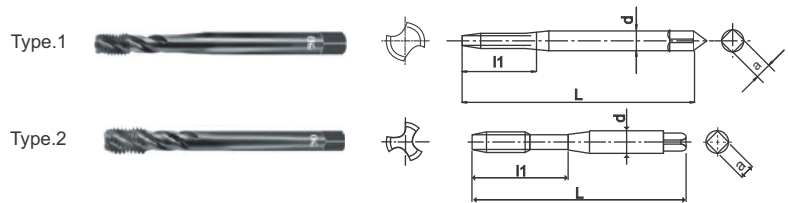


shaping your dreams

# DIN TAPS FOR THE GENERAL INDUSTRY

## VA-SFT

- For stainless steels and alloy steels
- Displays superb cutting characteristics and durability
- For pilot hole use OSG HPD Drill Series



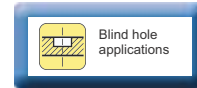
SPEED  
FEED  
P165

HSSE

OX

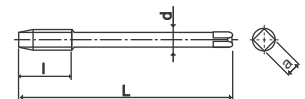
40°

±2.5μm

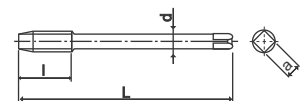


Unit:mm

| EDP      | METRIC DIN 371 | L   | I1 | d   | a   | Z | Type |
|----------|----------------|-----|----|-----|-----|---|------|
| 65312560 | M2x0.4 6H      | 45  | 8  | 2.8 | 2.1 | 2 | 1    |
| 65312860 | M2.2x0.45 6H   | 45  | 9  | 2.8 | 2.1 | 2 | 1    |
| 65313360 | M2.5x0.45 6H   | 50  | 9  | 2.8 | 2.1 | 2 | 1    |
| 65313860 | M3x0.5 6H      | 56  | 18 | 3.5 | 2.7 | 3 | 2    |
| 65314060 | M3.5x0.6 6H    | 56  | 20 | 4   | 3   | 3 | 2    |
| 65314460 | M4x0.7 6H      | 63  | 21 | 4.5 | 3.4 | 3 | 2    |
| 65314960 | M5x0.8 6H      | 70  | 25 | 6   | 4.9 | 3 | 2    |
| 65315560 | M6x1 6H        | 80  | 30 | 6   | 4.9 | 3 | 2    |
| 65316160 | M8x1.25 6H     | 90  | 35 | 8   | 6.2 | 3 | 2    |
| 65316960 | M10x1.5 6H     | 100 | 39 | 10  | 8   | 3 | 2    |



| EDP      | METRIC DIN 376 | L   | I  | d  | a    | Z |
|----------|----------------|-----|----|----|------|---|
| 65417960 | M12x1.75 6H    | 110 | 18 | 9  | 7    | 4 |
| 65419160 | M14x2 6H       | 110 | 20 | 11 | 9    | 4 |
| 65420260 | M16x2 6H       | 110 | 20 | 12 | 9    | 4 |
| 65421460 | M18x2.5 6H     | 125 | 25 | 14 | 11   | 4 |
| 65422860 | M20x2.5 6H     | 140 | 25 | 16 | 12   | 4 |
| 65423860 | M22x2.5 6H     | 140 | 25 | 18 | 14.5 | 4 |
| 65424760 | M24x3 6H       | 160 | 30 | 18 | 14.5 | 4 |
| 65426260 | M27x3 6H       | 160 | 30 | 20 | 16   | 5 |
| 65427160 | M30x3.5 6H     | 180 | 35 | 22 | 18   | 5 |
| 65428160 | M33x3.5 6H     | 180 | 35 | 25 | 20   | 5 |
| 65429460 | M36x4 6H       | 200 | 40 | 28 | 22   |   |



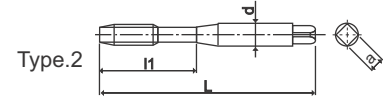
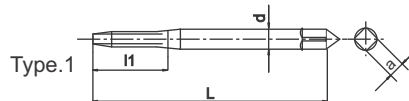
| EDP      | METRIC FINE DIN 374 | L   | I  | d   | a    | Z |
|----------|---------------------|-----|----|-----|------|---|
| 65513960 | M3x0.35 6H          | 56  | 4  | 2.2 | -    | 3 |
| 65514560 | M4x0.5 6H           | 63  | 6  | 2.8 | 2.1  | 3 |
| 65515160 | M5x0.5 6H           | 70  | 7  | 3.5 | 2.7  | 3 |
| 65515760 | M6x0.5 6H           | 80  | 8  | 4.5 | 3.4  | 3 |
| 65515660 | M6x0.75 6H          | 80  | 8  | 4.5 | 3.4  | 3 |
| 65516360 | M8x0.75 6H          | 80  | 10 | 6   | 4.9  | 3 |
| 65516260 | M8x1 6H             | 90  | 10 | 6   | 4.9  | 3 |
| 65517160 | M10x1 6H            | 90  | 12 | 7   | 5.5  | 4 |
| 65517060 | M10x1.25 6H         | 100 | 12 | 7   | 5.5  | 4 |
| 65518260 | M12x1 6H            | 100 | 14 | 9   | 7    | 4 |
| 65518160 | M12x1.25 6H         | 100 | 14 | 9   | 7    | 4 |
| 65518060 | M12x1.5 6H          | 100 | 14 | 9   | 7    | 4 |
| 65519260 | M14x1.5 6H          | 100 | 16 | 11  | 9    | 4 |
| 65520360 | M16x1.5 6H          | 100 | 16 | 12  | 9    | 5 |
| 65521660 | M18x1.5 6H          | 110 | 20 | 14  | 11   | 5 |
| 65523060 | M20x1.5 6H          | 125 | 20 | 16  | 12   | 5 |
| 65524060 | M22x1.5 6H          | 125 | 20 | 18  | 14.5 | 5 |
| 65525060 | M24x1.5 6H          | 140 | 24 | 18  | 14.5 | 5 |



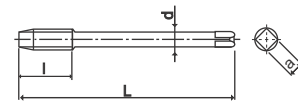
shaping your dreams

# DIN TAPS FOR THE GENERAL INDUSTRY

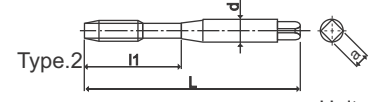
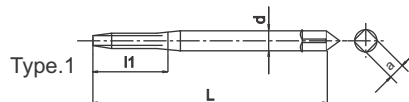
## VA-SFT



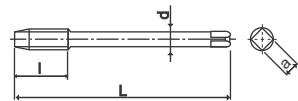
| EDP      | METRIC 6G DIN 371 | L   | l1 | d   | a   | Z | Type |
|----------|-------------------|-----|----|-----|-----|---|------|
| 65312599 | M2x0.4 6G         | 45  | 8  | 2.8 | 2.1 | 2 | 1    |
| 65313399 | M2.5x0.45 6G      | 50  | 9  | 2.8 | 2.1 | 2 | 1    |
| 65313899 | M3x0.5 6G         | 56  | 18 | 3.5 | 2.7 | 3 | 2    |
| 65314499 | M4x0.7 6G         | 63  | 21 | 4.5 | 3.4 | 3 | 2    |
| 65314999 | M5x0.8 6G         | 70  | 25 | 6   | 4.9 | 3 | 2    |
| 65315599 | M6x1 6G           | 80  | 30 | 6   | 4.9 | 3 | 2    |
| 65316199 | M8x1.25 6G        | 90  | 35 | 8   | 6.2 | 3 | 2    |
| 65316999 | M10x1.5 6G        | 100 | 39 | 10  | 8   | 3 | 2    |



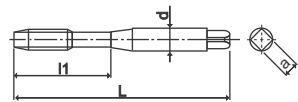
| EDP      | METRIC 6G DIN 376 | L   | l  | d  | a | Z | Type |
|----------|-------------------|-----|----|----|---|---|------|
| 65417999 | M12x1.75 6G       | 110 | 18 | 9  | 7 | 4 |      |
| 65419199 | M14x2 6G          | 110 | 20 | 11 | 9 | 4 |      |
| 65420299 | M16x2 6G          | 110 | 20 | 12 | 9 | 4 |      |



| EDP      | UNC DIN 2182   | L  | l1 | d   | a   | Z | Type |
|----------|----------------|----|----|-----|-----|---|------|
| 74945730 | 4-40 UNC 2B    | 56 | 11 | 3.5 | 2.7 | 2 | 1    |
| 74945930 | 5-40 UNC 2B    | 56 | 18 | 3.5 | 2.7 | 3 | 2    |
| 74946130 | 6-32 UNC 2B    | 56 | 20 | 4   | 3   | 3 | 2    |
| 74946430 | 8-32 UNC 2B    | 63 | 21 | 4.5 | 3.4 | 3 | 2    |
| 74946630 | 10-24 UNC 2B   | 70 | 25 | 6   | 4.9 | 3 | 2    |
| 74947150 | 1/4-20 UNC 2B  | 80 | 30 | 7   | 5.5 | 3 | 2    |
| 74947450 | 5/16-18 UNC 2B | 90 | 35 | 8   | 6.2 | 3 | 2    |
| 74947950 | 3/8-16 UNC 2B  | 90 | 35 | 9   | 7   | 3 | 2    |



| EDP      | UNC DIN 2183   | L   | l  | d  | a    | Z | Type |
|----------|----------------|-----|----|----|------|---|------|
| 75248450 | 7/16-14 UNC 2B | 100 | 19 | 8  | 6.2  | 4 |      |
| 75248950 | 1/2-13 UNC 2B  | 110 | 20 | 9  | 7    | 4 |      |
| 75249450 | 9/16-12 UNC 2B | 110 | 22 | 11 | 9    | 4 |      |
| 75250150 | 5/8-11 UNC 2B  | 110 | 24 | 12 | 9    | 4 |      |
| 75251550 | 3/4-10 UNC 2B  | 125 | 26 | 14 | 11   | 4 |      |
| 75252660 | 7/8-9 UNC 2B   | 140 | 29 | 18 | 14.5 | 4 |      |
| 75253860 | 1"-8 UNC 2B    | 160 | 32 | 18 | 14.5 | 5 |      |

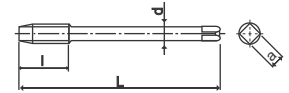


| EDP      | UNF DIN 2182   | L  | l1 | d | a   | Z | Type |
|----------|----------------|----|----|---|-----|---|------|
| 75246220 | 6-40 UNF 2B    | 56 | 20 | 4 | 3   | 3 |      |
| 75246730 | 10-32 UNF 2B   | 70 | 25 | 6 | 4.9 | 3 |      |
| 75247240 | 1/4-28 UNF 2B  | 80 | 30 | 7 | 5.5 | 3 |      |
| 75247640 | 5/16-24 UNF 2B | 90 | 35 | 8 | 6.2 | 3 |      |
| 75248140 | 3/8-24 UNF 2B  | 90 | 35 | 9 | 7   | 3 |      |



# DIN TAPS FOR THE GENERAL INDUSTRY

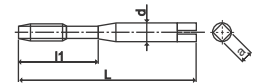
## VA-SFT



| EDP      | UNF DIN 2183   | L   | I  | d  | a    | Z |  |
|----------|----------------|-----|----|----|------|---|--|
| 75248650 | 7/16-20 UNF 2B | 100 | 15 | 8  | 6.2  | 4 |  |
| 75249150 | 1/2-20 UNF 2B  | 100 | 16 | 9  | 7    | 4 |  |
| 75249650 | 9/16-18 UNF 2B | 100 | 17 | 11 | 9    | 4 |  |
| 75250450 | 5/8-18 UNF 2B  | 100 | 18 | 12 | 9    | 4 |  |
| 75251750 | 3/4-16 UNF 2B  | 110 | 21 | 14 | 11   | 4 |  |
| 75252860 | 7/8-14 UNF 2B  | 125 | 23 | 18 | 14.5 | 4 |  |
| 75253960 | 1"-12 UNF 2B   | 125 | 25 | 18 | 14.5 | 5 |  |



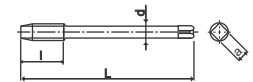
| EDP      | UNJC DIN 2182 | L  | I1 | d   | a   | Z | Type |
|----------|---------------|----|----|-----|-----|---|------|
| 48001457 | 4-40 UNJC 3B  | 56 | 11 | 3.5 | 2.7 | 2 | 1    |
| 48001461 | 6-32 UNJC 3B  | 56 | 20 | 4   | 3   | 3 | 2    |
| 48001464 | 8-32 UNJC 3B  | 63 | 21 | 4.5 | 3.4 | 3 | 2    |



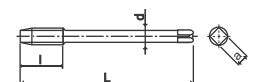
| EDP      | UNJF DIN 2182   | L  | I1 | d | a   | Z |  |
|----------|-----------------|----|----|---|-----|---|--|
| 48001467 | 10-32 UNJF 3B   | 70 | 25 | 6 | 4.9 | 3 |  |
| 48001472 | 1/4-28 UNJF 3B  | 80 | 30 | 7 | 5.5 | 3 |  |
| 48001476 | 5/16-24 UNJF 3B | 90 | 35 | 8 | 6.2 | 3 |  |
| 48001481 | 3/8-24 UNJF 3B  | 90 | 35 | 9 | 7   | 3 |  |



| EDP      | UNJF DIN 2183   | L   | I  | d | a   | Z |  |
|----------|-----------------|-----|----|---|-----|---|--|
| 48001486 | 7/16-20 UNJF 3B | 100 | 15 | 8 | 6.2 | 4 |  |
| 48001491 | 1/2-20 UNJF 3B  | 100 | 16 | 9 | 7   | 4 |  |



| EDP      | BSP DIN5156 | L   | I  | d  | a    | Z |  |
|----------|-------------|-----|----|----|------|---|--|
| 65881909 | G 1/8-28    | 90  | 11 | 7  | 5.5  | 4 |  |
| 65882009 | G 1/4-19    | 100 | 16 | 11 | 9    | 4 |  |
| 65882109 | G 3/8-19    | 100 | 16 | 12 | 9    | 5 |  |
| 65882209 | G 1/2-14    | 125 | 22 | 16 | 12   | 5 |  |
| 65882309 | G 5/8-14    | 125 | 22 | 18 | 14.5 | 5 |  |
| 65882409 | G 3/4-14    | 140 | 22 | 20 | 16   | 5 |  |
| 65882509 | G 7/8-14    | 150 | 22 | 22 | 18   | 5 |  |
| 65882609 | G 1-11      | 160 | 28 | 25 | 20   | 5 |  |



## VA-SFT Form E 1.5P (SHORT CHAMFER)

SPEED  
FEED  
P165

HSSE

OX

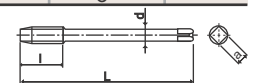
40°

1.5P

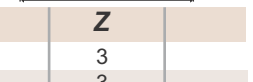
Blind hole applications



| EDP      | METRIC DIN 371 | L   | I  | d   | a   | Z |  |
|----------|----------------|-----|----|-----|-----|---|--|
| 48036138 | M3x0.5 6H      | 56  | 18 | 3.5 | 2.7 | 3 |  |
| 48036144 | M4x0.7 6H      | 63  | 21 | 4.5 | 3.4 | 3 |  |
| 48036149 | M5x0.8 6H      | 70  | 25 | 6   | 4.9 | 3 |  |
| 48036155 | M6x1 6H        | 80  | 30 | 6   | 4.9 | 3 |  |
| 48036161 | M8x1.25 6H     | 90  | 35 | 8   | 6.2 | 3 |  |
| 48036169 | M10x1.5 6H     | 100 | 39 | 10  | 8   | 3 |  |



| EDP      | METRIC DIN 376 | L   | I  | d  | a | Z |  |
|----------|----------------|-----|----|----|---|---|--|
| 48036179 | M12x1.75 6H    | 110 | 18 | 9  | 7 | 3 |  |
| 48036191 | M14x2 6H       | 110 | 20 | 11 | 9 | 3 |  |
| 48036202 | M16x2 6H       | 110 | 20 | 12 | 9 | 3 |  |



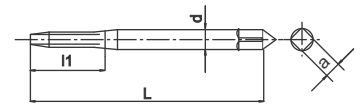


# DIN TAPS FOR THE GENERAL INDUSTRY

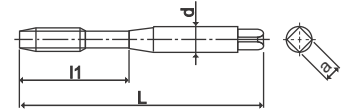
## VA-POT

- For stainless steels and alloy steels
- Displays superb cutting characteristics and durability
- For pilot hole use OSG HPD Drill Series

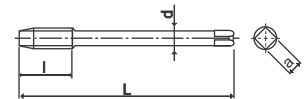
Type.1



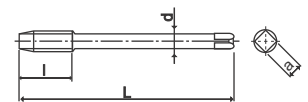
Type.2



| EDP      | METRIC DIN 371 | L   | I1 | d   | a   | Z | Type | Unit:mm |
|----------|----------------|-----|----|-----|-----|---|------|---------|
| 63812560 | M2x0.4 6H      | 45  | 8  | 2.8 | 2.1 | 2 | 1    |         |
| 63812860 | M2.2x0.45 6H   | 45  | 9  | 2.8 | 2.1 | 2 | 1    |         |
| 63813360 | M2.5x0.45 6H   | 50  | 9  | 2.8 | 2.1 | 2 | 1    |         |
| 63813860 | M3x0.5 6H      | 56  | 18 | 3.5 | 2.7 | 3 | 2    |         |
| 63814060 | M3.5x0.6 6H    | 56  | 20 | 4   | 3   | 3 | 2    |         |
| 63814460 | M4x0.7 6H      | 63  | 21 | 4.5 | 3.4 | 3 | 2    |         |
| 63814960 | M5x0.8 6H      | 70  | 25 | 6   | 4.9 | 3 | 2    |         |
| 63815560 | M6x1 6H        | 80  | 30 | 6   | 4.9 | 3 | 2    |         |
| 63816160 | M8x1.25 6H     | 90  | 35 | 8   | 6.2 | 3 | 2    |         |
| 63816960 | M10x1.5 6H     | 100 | 39 | 10  | 8   | 3 | 2    |         |



| EDP      | METRIC DIN 376 | L   | I  | d  | a    | Z |  |
|----------|----------------|-----|----|----|------|---|--|
| 63917960 | M12x1.75 6H    | 110 | 29 | 9  | 7    | 3 |  |
| 63919160 | M14x2 6H       | 110 | 30 | 11 | 9    | 3 |  |
| 63920260 | M16x2 6H       | 110 | 32 | 12 | 9    | 3 |  |
| 63921460 | M18x2.5 6H     | 125 | 34 | 14 | 11   | 3 |  |
| 63922860 | M20x2.5 6H     | 140 | 34 | 16 | 12   | 3 |  |
| 63923860 | M22x2.5 6H     | 140 | 34 | 18 | 14.5 | 3 |  |
| 63924760 | M24x3 6H       | 160 | 38 | 18 | 14.5 | 3 |  |
| 63926260 | M27x3 6H       | 160 | 38 | 20 | 16   | 4 |  |
| 63927160 | M30x3.5 6H     | 180 | 45 | 22 | 18   | 4 |  |
| 63928160 | M33x3.5 6H     | 180 | 50 | 25 | 20   | 4 |  |
| 63929460 | M36x4 6H       | 200 | 56 | 28 | 22   | 4 |  |

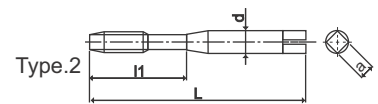
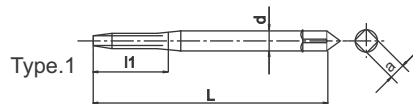


| EDP      | METRIC FINE DIN 374 | L   | I  | d   | a    | Z |  |
|----------|---------------------|-----|----|-----|------|---|--|
| 63713960 | M3x0.35 6H          | 56  | 9  | 2.2 | -    | 3 |  |
| 63714560 | M4x0.5 6H           | 36  | 10 | 2.8 | 2.1  | 3 |  |
| 63715160 | M5x0.5 6H           | 70  | 12 | 3.5 | 2.7  | 3 |  |
| 63715760 | M6x0.5 6H           | 80  | 14 | 4.5 | 3.4  | 3 |  |
| 63715660 | M6x0.75 6H          | 80  | 14 | 4.5 | 3.4  | 3 |  |
| 63716360 | M8x0.75 6H          | 80  | 19 | 6   | 4.9  | 3 |  |
| 63716260 | M8x1 6H             | 90  | 22 | 6   | 4.9  | 3 |  |
| 63717160 | M10x1 6H            | 90  | 20 | 7   | 5.5  | 3 |  |
| 63717060 | M10x1.25 6H         | 100 | 24 | 7   | 5.5  | 3 |  |
| 63718260 | M12x1 6H            | 100 | 22 | 9   | 7    | 3 |  |
| 63718160 | M12x1.25 6H         | 100 | 22 | 9   | 7    | 3 |  |
| 63718060 | M12x1.5 6H          | 100 | 22 | 9   | 7    | 3 |  |
| 63719260 | M14x1.5 6H          | 100 | 22 | 11  | 9    | 3 |  |
| 63720360 | M16x1.5 6H          | 100 | 22 | 12  | 9    | 3 |  |
| 63721660 | M18x1.5 6H          | 110 | 25 | 14  | 11   | 3 |  |
| 63723060 | M20x1.5 6H          | 125 | 25 | 16  | 12   | 3 |  |
| 63724060 | M22x1.5 6H          | 125 | 25 | 18  | 14.5 | 3 |  |
| 63725060 | M24x1.5 6H          | 140 | 28 | 18  | 14.5 | 3 |  |

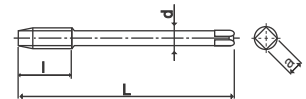


# DIN TAPS FOR THE GENERAL INDUSTRY

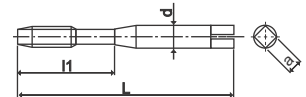
## VA-POT



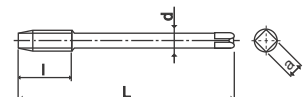
| EDP      | METRIC 6G DIN 371 | L   | l1 | d   | a   | Z | Type |
|----------|-------------------|-----|----|-----|-----|---|------|
| 63812599 | M2x0.4 6G         | 45  | 8  | 2.8 | 2.1 | 2 | 1    |
| 63813399 | M2.5x0.45 6G      | 50  | 9  | 2.8 | 2.1 | 2 | 1    |
| 63813899 | M3x0.5 6G         | 56  | 18 | 3.5 | 2.7 | 3 | 2    |
| 63814499 | M4x0.7 6G         | 63  | 21 | 4.5 | 3.4 | 3 | 2    |
| 63814999 | M5x0.8 6G         | 70  | 25 | 6   | 4.9 | 3 | 2    |
| 63815599 | M6x1 6G           | 80  | 30 | 6   | 4.9 | 3 | 2    |
| 63816199 | M8x1.25 6G        | 90  | 35 | 8   | 6.2 | 3 | 2    |
| 63816999 | M10x1.5 6G        | 100 | 39 | 10  | 8   | 3 | 2    |



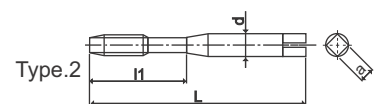
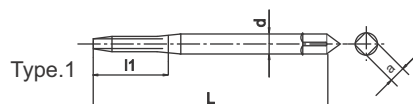
| EDP      | METRIC 6G DIN 376 | L   | l1 | d  | a | Z |
|----------|-------------------|-----|----|----|---|---|
| 63917999 | M12x1.75 6G       | 110 | 29 | 9  | 7 | 3 |
| 63919199 | M14x2 6G          | 110 | 30 | 11 | 9 | 3 |
| 63920299 | M16x2 6G          | 110 | 32 | 12 | 9 | 3 |



| EDP      | UNC DIN 2182   | L  | l1 | d   | a   | Z |
|----------|----------------|----|----|-----|-----|---|
| 74845720 | 4-40 UNC 2B    | 56 | 18 | 3.5 | 2.7 | 2 |
| 74845920 | 5-40 UNC 2B    | 56 | 18 | 3.5 | 2.7 | 3 |
| 74846130 | 6-32 UNC 2B    | 56 | 20 | 4   | 3   | 3 |
| 74846430 | 8-32 UNC 2B    | 63 | 21 | 4.5 | 3.4 | 3 |
| 74846630 | 10-24 UNC 2B   | 70 | 25 | 6   | 4.9 | 3 |
| 74847150 | 1/4-20 UNC 2B  | 80 | 30 | 7   | 5.5 | 3 |
| 74847450 | 5/16-18 UNC 2B | 90 | 35 | 8   | 6.2 | 3 |
| 74847950 | 3/8-16 UNC 2B  | 90 | 35 | 9   | 7   | 3 |



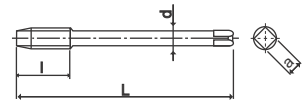
| EDP      | UNC DIN 2183   | L   | l1 | d  | a    | Z |
|----------|----------------|-----|----|----|------|---|
| 75148450 | 7/16-14 UNC 2B | 100 | 24 | 8  | 6.2  | 3 |
| 75148950 | 1/2-13 UNC 2B  | 110 | 29 | 9  | 7    | 3 |
| 75149450 | 9/16-12 UNC 2B | 110 | 30 | 11 | 9    | 3 |
| 75150150 | 5/8-11 UNC 2B  | 110 | 32 | 12 | 9    | 3 |
| 75151550 | 3/4-10 UNC 2B  | 125 | 34 | 14 | 11   | 3 |
| 75152660 | 7/8-9 UNC 2B   | 140 | 34 | 18 | 14.5 | 3 |
| 75153860 | 1"-8 UNC 2B    | 160 | 38 | 18 | 14.5 | 3 |



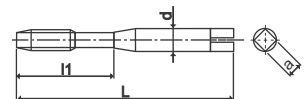
| EDP      | UNF DIN 2182   | L  | l1 | d | a   | Z | Type |
|----------|----------------|----|----|---|-----|---|------|
| 75146220 | 6-40 UNF 2B    | 56 | 13 | 4 | 3   | 3 | 1    |
| 75146730 | 10-32 UNF 2B   | 70 | 25 | 6 | 4.9 | 3 | 2    |
| 75147240 | 1/4-28 UNF 2B  | 80 | 30 | 7 | 5.5 | 3 | 2    |
| 75147640 | 5/16-24 UNF 2B | 90 | 35 | 8 | 6.2 | 3 | 2    |
| 75148140 | 3/8-24 UNF 2B  | 90 | 35 | 9 | 7   | 3 | 2    |

# DIN TAPS FOR THE GENERAL INDUSTRY

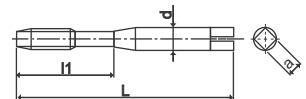
## VA-POT



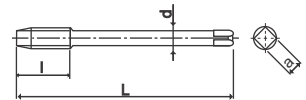
| EDP      | UNF DIN 2183   | L   | l  | d  | a    | Z |
|----------|----------------|-----|----|----|------|---|
| 75148650 | 7/16-20 UNF 2B | 100 | 20 | 8  | 6.2  | 3 |
| 75149150 | 1/2-20 UNF 2B  | 100 | 22 | 9  | 7    | 3 |
| 75149650 | 9/16-18 UNF 2B | 100 | 22 | 11 | 9    | 3 |
| 75150450 | 5/8-18 UNF 2B  | 100 | 22 | 12 | 9    | 3 |
| 75151750 | 3/4-16 UNF 2B  | 110 | 25 | 14 | 11   | 3 |
| 75152860 | 7/8-14 UNF 2B  | 125 | 25 | 18 | 14.5 | 3 |
| 75153960 | 1"-12 UNF 2B   | 125 | 25 | 18 | 14.5 | 3 |



| EDP      | UNJC DIN 2182 | L  | l  | d   | a   | Z |
|----------|---------------|----|----|-----|-----|---|
| 48002457 | 4-40 UNJC 3B  | 56 | 18 | 3.5 | 2.7 | 2 |
| 48002461 | 6-32 UNJC 3B  | 56 | 20 | 4   | 3   | 3 |
| 48002464 | 8-32 UNJC 3B  | 63 | 21 | 4.5 | 3.4 | 3 |



| EDP      | UNJF DIN 2182   | L  | l  | d | a   | Z |
|----------|-----------------|----|----|---|-----|---|
| 48002467 | 10-32 UNJF 3B   | 70 | 25 | 6 | 4.9 | 3 |
| 48002472 | 1/4-28 UNJF 3B  | 80 | 30 | 7 | 5.5 | 3 |
| 48002476 | 5/16-24 UNJF 3B | 90 | 35 | 8 | 6.2 | 3 |
| 48002481 | 3/8-24 UNJF 3B  | 90 | 35 | 9 | 7   | 3 |



| EDP      | UNJF DIN 2183   | L   | l  | d | a   | Z |
|----------|-----------------|-----|----|---|-----|---|
| 48002486 | 7/16-20 UNJF 3B | 100 | 20 | 8 | 6.2 | 3 |
| 48002491 | 1/2-20 UNJF 3B  | 100 | 22 | 9 | 7   | 3 |



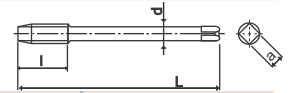
# DIN TAPS FOR CAST IRON, ADC & STEEL APPLICATION

## V-AW-SFT

Especially Good For Cast Iron & Steel on Horizontal Machine



| EDP      | METRIC DIN 371 | L   | I1 | d  | a   | Z |
|----------|----------------|-----|----|----|-----|---|
| T1503379 | M5X0.8 6H      | 70  | 30 | 6  | 4.9 | 3 |
| T1503380 | M6X1 6H        | 80  | 40 | 6  | 4.9 | 3 |
| T1503381 | M8X1.25 6H     | 90  | 36 | 8  | 6.2 | 3 |
| T1503382 | M10X1.5 6H     | 100 | 44 | 10 | 8   | 3 |

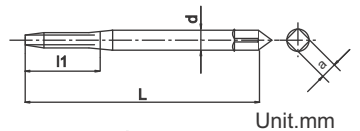


| EDP      | METRIC DIN 376 | L   | I  | d  | a | Z |
|----------|----------------|-----|----|----|---|---|
| T1503383 | M12X1.75 6H    | 110 | 18 | 9  | 7 | 3 |
| T1503384 | M14X2 6H       | 110 | 20 | 11 | 9 | 3 |
| T1503385 | M16X2 6H       | 110 | 20 | 12 | 9 | 3 |

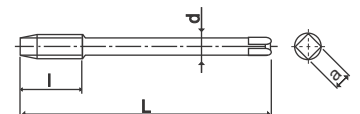
| EDP      | METRIC DIN 374 | L   | I  | d  | a   | Z |
|----------|----------------|-----|----|----|-----|---|
| T1503386 | M10X1 6H       | 90  | 10 | 7  | 5.5 | 3 |
| T1503387 | M10X1.25 6H    | 100 | 13 | 7  | 5.5 | 3 |
| T1503388 | M12X1.25 6H    | 100 | 13 | 9  | 7   | 3 |
| T1503389 | M12X1.5 6H     | 100 | 15 | 9  | 7   | 3 |
| T1503390 | M14X1.5 6H     | 100 | 15 | 11 | 9   | 3 |
| T1503391 | M16X1.5 6H     | 100 | 15 | 12 | 9   | 3 |
| T1503392 | M18X1.5 6H     | 110 | 15 | 14 | 11  | 4 |
| T1503393 | M20X1.5 6H     | 125 | 15 | 16 | 12  | 4 |

## AW-SFT

Especially Good For Cast Iron & ADC on Horizontal Machine



| EDP      | METRIC DIN 371 | L   | I1 | d  | a   | Z |
|----------|----------------|-----|----|----|-----|---|
| 48063149 | M5x0.8 6H      | 70  | 30 | 6  | 4.9 | 3 |
| 48063155 | M6x1 6H        | 80  | 40 | 6  | 4.9 | 3 |
| 48063161 | M8x1.25 6H     | 90  | 36 | 8  | 6.2 | 3 |
| 48063169 | M10x1.5 6H     | 100 | 44 | 10 | 8   | 3 |



| EDP      | METRIC DIN 376 | L   | I  | d  | a | Z |
|----------|----------------|-----|----|----|---|---|
| 48063179 | M12x1.75 6H    | 100 | 18 | 9  | 7 | 3 |
| 48063191 | M14x2 6H       | 110 | 20 | 11 | 9 | 3 |
| 48063202 | M16x2 6H       | 110 | 20 | 12 | 9 | 3 |

| EDP      | METRIC FINE DIN 374 | L   | I  | d  | a   | Z |
|----------|---------------------|-----|----|----|-----|---|
| 48063171 | M10x1 6H            | 90  | 12 | 7  | 5.5 | 3 |
| 48063170 | M10x1.25 6H         | 100 | 12 | 7  | 5.5 | 3 |
| 48063181 | M12x1.25 6H         | 100 | 14 | 9  | 7   | 3 |
| 48063180 | M12x1.5 6H          | 100 | 14 | 9  | 7   | 3 |
| 48063192 | M14x1.5 6H          | 100 | 16 | 11 | 9   | 3 |
| 48063203 | M16x1.5 6H          | 100 | 16 | 12 | 9   | 3 |
| 48063216 | M18X1.5 6H          | 110 | 20 | 14 | 11  | 4 |
| 48063230 | M20X1.5 6H          | 125 | 20 | 16 | 12  | 4 |



shaping your dreams

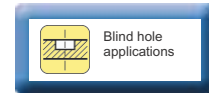
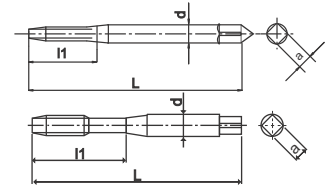
# DIN TAP WITH CHIP CONTROL

## CC-SFT / CC-HL-SFT

- For stainless steels, 17-4 PH, steels, aluminium & copper
- For threading up to two times diameter
- Developed for CNC machines equipped for rigid tapping
- For pilot hole use OSG HPD Drill Series

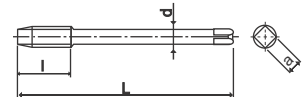
Type 1

Type 2

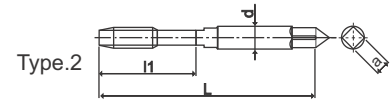
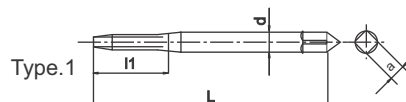


Unit:mm

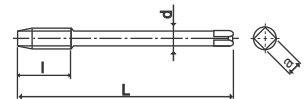
| EDP      | METRIC DIN 371  | L   | l1 | d   | a   | Z | Type |
|----------|-----------------|-----|----|-----|-----|---|------|
| 48032125 | M2 x 0.4 6HX    | 45  | 8  | 2.8 | 2.1 | 2 | 1    |
| 48032133 | M2.5 x 0.45 6HX | 50  | 10 | 2.8 | 2.1 | 2 | 1    |
| 48032138 | M3 x 0.5 6HX    | 56  | 12 | 3.5 | 2.7 | 3 | 1    |
| 48032144 | M4 x 0.7 6HX    | 63  | 16 | 4.5 | 3.4 | 3 | 1    |
| 48032149 | M5 x 0.8 6HX    | 70  | 20 | 6   | 4.9 | 3 | 1    |
| 48032155 | M6 x 1.0 6HX    | 80  | 24 | 6   | 4.9 | 3 | 1    |
| 48032161 | M8 x 1.25 6HX   | 90  | 35 | 8   | 6.2 | 3 | 2    |
| 48032169 | M10 x 1.5 6HX   | 100 | 39 | 10  | 8   | 4 | 2    |



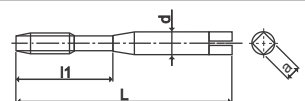
| EDP      | METRIC DIN 376 | L   | l  | d  | a    | Z |
|----------|----------------|-----|----|----|------|---|
| 48032179 | M12 x 1.75 6HX | 110 | 16 | 9  | 7    | 4 |
| 48032191 | M14 x 2.0 6HX  | 110 | 18 | 11 | 9    | 4 |
| 48032202 | M16 x 2.0 6HX  | 110 | 18 | 12 | 9    | 4 |
| 48032214 | M18 x 2.5 6HX  | 125 | 23 | 14 | 11   | 4 |
| 48032228 | M20 x 2.5 6HX  | 140 | 23 | 16 | 12   | 4 |
| 48032247 | M24 x 3.0 6HX  | 160 | 27 | 18 | 14.5 | 4 |



| EDP      | UNC DIN 2182      | L  | l1   | d   | a   | Z | Type |
|----------|-------------------|----|------|-----|-----|---|------|
| 48032464 | 8-32 UNC 2B/3B    | 63 | 16.7 | 4.5 | 3.4 | 3 | 1    |
| 48032466 | 10-24 UNC 2B/3B   | 70 | 19.3 | 6   | 4.9 | 3 | 1    |
| 48032471 | 1/4-20 UNC 2B/3B  | 80 | 25.4 | 7   | 5.5 | 3 | 1    |
| 48032474 | 5/16-18 UNC 2B/3B | 90 | 13   | 8   | 6.2 | 3 | 2    |
| 48032479 | 3/8-16 UNC 2B/3B  | 90 | 15   | 9   | 7   | 3 | 2    |



| EDP      | UNC DIN 2183      | L   | l  | d  | a    | Z |
|----------|-------------------|-----|----|----|------|---|
| 48032484 | 7/16-14 UNC 2B/3B | 100 | 17 | 8  | 6.2  | 4 |
| 48032489 | 1/2-13 UNC 2B/3B  | 110 | 18 | 9  | 7    | 4 |
| 48032501 | 5/8-11 UNC 2B/3B  | 110 | 21 | 12 | 9    | 4 |
| 48032515 | 3/4-10 UNC 2B/3B  | 125 | 23 | 14 | 11   | 4 |
| 48032526 | 7/8-9 UNC 2B/3B   | 140 | 26 | 18 | 14.5 | 4 |
| 48032538 | 1"-8 UNC 2B/3B    | 160 | 29 | 18 | 14.5 | 4 |



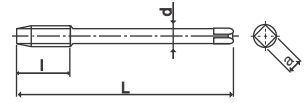
| EDP      | UNJF DIN 2182     | L  | l1   | d | a   | Z |
|----------|-------------------|----|------|---|-----|---|
| 48032467 | 10-32 UNF 2B/3B   | 70 | 19.3 | 6 | 4.9 | 3 |
| 48032472 | 1/4-28 UNF 2B/3B  | 80 | 25.4 | 7 | 5.5 | 3 |
| 48032476 | 5/16-24 UNF 2B/3B | 90 | 11   | 8 | 6.2 | 3 |
| 48032481 | 3/8-24 UNF 2B/3B  | 90 | 12   | 9 | 7   | 3 |



shaping your dreams

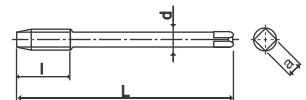
# DIN TAP WITH CHIP CONTROL

## CC-SFT



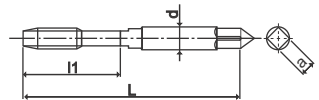
| EDP      | UNF DIN 2183      | L   | I  | d | a | Z |  |
|----------|-------------------|-----|----|---|---|---|--|
| 48032486 | 7/16-20 UNF 2B/3B | 100 | 14 | 9 | 7 | 4 |  |
| 48032491 | 1/2-20 UNF 2B/3B  | 100 | 15 | 9 | 7 | 4 |  |

## CC-SFT-SPT



| EDP      | G SERIES DIN 5156 | L   | I  | d  | a   | Z |  |
|----------|-------------------|-----|----|----|-----|---|--|
| 48034838 | G 1/8-28          | 90  | 10 | 7  | 5.5 | 3 |  |
| 48034839 | G 1/4-19          | 100 | 15 | 11 | 9.0 | 4 |  |
| 48034840 | G 3/8-19          | 100 | 15 | 12 | 9   | 4 |  |
| 48034841 | G 1/2-14          | 125 | 20 | 16 | 12  | 4 |  |

## CC-HL-SFT



### Helical Coil Wire Insert

| EDP      | UNF DIN 2182      | L   | I1   | d  | a   | Z |  |
|----------|-------------------|-----|------|----|-----|---|--|
| 48033467 | 10-32 UNF 2B/3B   | 80  | 25.4 | 7  | 5.5 | 3 |  |
| 48033472 | 1/4-28 UNF 2B/3B  | 90  | 11   | 8  | 6.2 | 3 |  |
| 48033476 | 5/16-24 UNF 2B/3B | 90  | 12   | 9  | 7.0 | 3 |  |
| 48033481 | 3/8-24 UNF 2B/3B  | 100 | 14   | 11 | 9   | 3 |  |





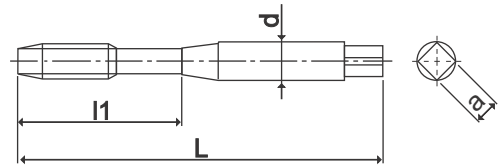
# TAPPING TECHNOLOGY FOR CAST IRON & ALUMINIUM DIECAST FOR THE AUTOMOTIVE INDUSTRY

## V-DC-MT / OIL-V-DC-MT

- For Cast Iron (GG, GGG) and Aluminium Diecast
- Manufactured from OSG's HSS-EV3

- V coating (OSG original developed TiCN coating) for increased durability and wear resistance for longer tool life at high speeds
- For pilot hole use OSG HPD Drill Series

### V-DC-MT



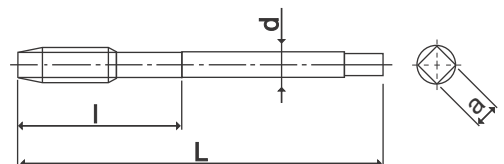
SPEED  
FEED  
P.165

HSSE

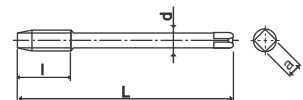
V

±2,5%

| EDP      | METRIC DIN 371 | L   | l1 | d  | a   | Z |  |
|----------|----------------|-----|----|----|-----|---|--|
| 48039149 | M5x0.8 6HX     | 70  | 25 | 6  | 4.9 | 3 |  |
| 48039155 | M6x1.0 6HX     | 80  | 30 | 6  | 4.9 | 3 |  |
| 48039161 | M8x1.25 6HX    | 90  | 35 | 8  | 6.2 | 4 |  |
| 48039169 | M10x1.5 6HX    | 100 | 39 | 10 | 8   | 4 |  |

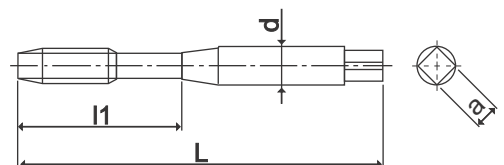


| EDP      | METRIC DIN 376 | L   | l  | d  | a    | Z |  |
|----------|----------------|-----|----|----|------|---|--|
| 48039179 | M12x1.75 6HX   | 110 | 21 | 9  | 7    | 4 |  |
| 48039191 | M14x2 6HX      | 110 | 24 | 11 | 9    | 4 |  |
| 48039202 | M16x2 6HX      | 110 | 24 | 12 | 9    | 4 |  |
| 48039214 | M18x2.5 6HX    | 125 | 30 | 14 | 11   | 4 |  |
| 48039228 | M20x2.5 6HX    | 140 | 30 | 16 | 12   | 4 |  |
| 48039238 | M22x2.5 6HX    | 140 | 30 | 18 | 14.5 | 4 |  |
| 48039247 | M24x3 6HX      | 160 | 36 | 18 | 14.5 | 4 |  |



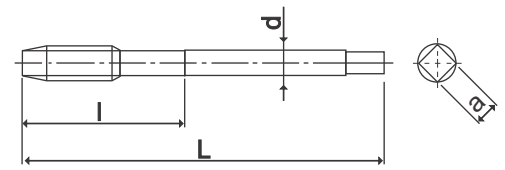
| EDP      | METRIC FINE DIN 374 | L   | l  | d  | a    | Z |  |
|----------|---------------------|-----|----|----|------|---|--|
| 48039170 | M10x1.25 6HX        | 100 | 18 | 7  | 5.5  | 4 |  |
| 48039181 | M12x1.25 6HX        | 100 | 21 | 9  | 7    | 4 |  |
| 48039180 | M12x1.5 6HX         | 100 | 21 | 9  | 7    | 4 |  |
| 48039192 | M14x1.5 6HX         | 100 | 24 | 11 | 9    | 4 |  |
| 48039203 | M16x1.5 6HX         | 100 | 24 | 12 | 9    | 4 |  |
| 48039216 | M18x1.5 6HX         | 110 | 30 | 14 | 11   | 4 |  |
| 48039250 | M24x1.5 6HX         | 140 | 24 | 18 | 14.5 | 4 |  |

### OIL-V-DC-MT

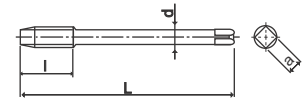


| EDP      | METRIC DIN 371 | L   | l1 | d  | a   | Z |          |
|----------|----------------|-----|----|----|-----|---|----------|
| 48040149 | M5x0.8 6HX     | 70  | 25 | 6  | 4.9 | 3 | Oil Hole |
| 48040155 | M6x1.0 6HX     | 80  | 30 | 6  | 4.9 | 3 | Oil Hole |
| 48040161 | M8x1.25 6HX    | 90  | 35 | 8  | 6.2 | 4 | Oil Hole |
| 48040169 | M10x1.5 6HX    | 100 | 39 | 10 | 8   | 4 | Oil Hole |

# TAPPING TECHNOLOGY FOR CAST IRON & ALUMINIUM DIECAST FOR THE AUTOMOTIVE INDUSTRY

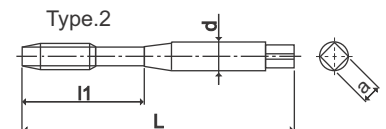
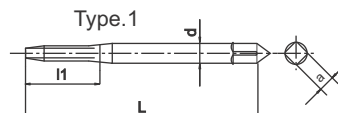


| EDP      | METRIC DIN 376 |          | L   | I  | d  | a  | Z |  |
|----------|----------------|----------|-----|----|----|----|---|--|
| 48040179 | M12x1.75 6HX   | Oil Hole | 110 | 21 | 9  | 7  | 4 |  |
| 48040191 | M14x2 6HX      | Oil Hole | 110 | 24 | 11 | 9  | 4 |  |
| 48040202 | M16x2 6HX      | Oil Hole | 110 | 24 | 12 | 9  | 4 |  |
| 48040214 | M18x2.5 6HX    | Oil Hole | 125 | 30 | 14 | 11 | 4 |  |

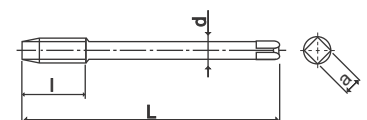


| EDP      | METRIC FINE DIN 374 |          | L   | I  | d  | a    | Z |  |
|----------|---------------------|----------|-----|----|----|------|---|--|
| 48040162 | M8x1 6HX            | Oil Hole | 90  | 15 | 6  | 4.9  | 4 |  |
| 48040170 | M10x1.25 6HX        | Oil Hole | 100 | 18 | 7  | 5.5  | 4 |  |
| 48040181 | M12x1.25 6HX        | Oil Hole | 100 | 21 | 9  | 7    | 4 |  |
| 48040180 | M12x1.5 6HX         | Oil Hole | 100 | 21 | 9  | 7    | 4 |  |
| 48040192 | M14x1.5 6HX         | Oil Hole | 100 | 24 | 11 | 9    | 4 |  |
| 48040203 | M16x1.5 6HX         | Oil Hole | 100 | 24 | 12 | 9    | 4 |  |
| 48040216 | M18x1.5 6HX         | Oil Hole | 110 | 30 | 14 | 11   | 4 |  |
| 48040240 | M22x1.5 6HX         | Oil Hole | 125 | 20 | 18 | 14.5 | 4 |  |
| 48040250 | M24x1.5 6HX         | Oil Hole | 140 | 24 | 18 | 14.5 | 4 |  |

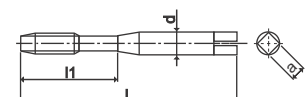
## V-DC-MT



| EDP      | UNC DIN 2182   |  | L  | I1 | d   | a   | Z | Type |
|----------|----------------|--|----|----|-----|-----|---|------|
| 48039457 | 4-40 UNC 2B    |  | 56 | 18 | 3.5 | 2.7 | 2 | 1    |
| 48039459 | 5-40 UNC 2B    |  | 56 | 18 | 3.5 | 2.7 | 3 | 2    |
| 48039461 | 6-32 UNC 2B    |  | 56 | 20 | 4   | 3   | 3 | 2    |
| 48039464 | 8-32 UNC 2B    |  | 63 | 21 | 4.5 | 3.4 | 3 | 2    |
| 48039466 | 10-24 UNC 2B   |  | 70 | 25 | 6   | 4.9 | 3 | 2    |
| 48039471 | 1/4-20 UNC 2B  |  | 80 | 30 | 7   | 5.5 | 3 | 2    |
| 48039474 | 5/16-18 UNC 2B |  | 90 | 35 | 8   | 6.2 | 3 | 2    |
| 48039479 | 3/8-16 UNC 2B  |  | 90 | 35 | 9   | 7   | 3 | 2    |

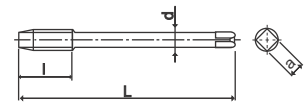


| EDP      | UNC DIN 2183   |  | L   | I  | d  | a    | Z |  |
|----------|----------------|--|-----|----|----|------|---|--|
| 48039484 | 7/16-14 UNC 2B |  | 100 | 24 | 8  | 6.2  | 3 |  |
| 48039489 | 1/2-13 UNC 2B  |  | 110 | 29 | 9  | 7    | 3 |  |
| 48039494 | 9/16-12 UNC 2B |  | 110 | 30 | 11 | 9    | 3 |  |
| 48039501 | 5/8-11 UNC 2B  |  | 110 | 32 | 12 | 9    | 3 |  |
| 48039515 | 3/4-10 UNC 2B  |  | 125 | 34 | 14 | 11   | 3 |  |
| 48039526 | 7/8-9 UNC 2B   |  | 140 | 34 | 18 | 14.5 | 3 |  |
| 48039538 | 1-8 UNC 2B     |  | 160 | 30 | 18 | 14.5 | 3 |  |



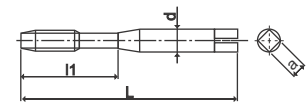
| EDP      | UNF DIN2182    |  | L  | I1 | d | a   | Z |  |
|----------|----------------|--|----|----|---|-----|---|--|
| 48039462 | 6-40 UNF 2B    |  | 56 | 13 | 4 | 3   | 3 |  |
| 48039467 | 10-32 UNF 2B   |  | 70 | 25 | 6 | 4.9 | 3 |  |
| 48039472 | 1/4-28 UNF 2B  |  | 80 | 30 | 7 | 5.5 | 3 |  |
| 48039476 | 5/16-24 UNF 2B |  | 90 | 35 | 8 | 6.2 | 3 |  |
| 48039481 | 3/8-24 UNF 2B  |  | 90 | 35 | 9 | 7   | 3 |  |

# TAPPING TECHNOLOGY FOR CAST IRON & ALUMINIUM DIECAST FOR THE AUTOMOTIVE INDUSTRY

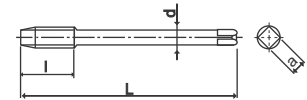


| EDP      | UNF DIN2183    | L   | l  | d  | a    | Z |  |
|----------|----------------|-----|----|----|------|---|--|
| 48039486 | 7/16-20 UNF 2B | 100 | 20 | 8  | 6.2  | 3 |  |
| 48039491 | 1/2-20 UNF 2B  | 100 | 22 | 9  | 7    | 3 |  |
| 48039496 | 9/16-18 UNF 2B | 100 | 22 | 11 | 9    | 3 |  |
| 48039504 | 5/8-18 UNF 2B  | 100 | 22 | 12 | 9    | 3 |  |
| 48039517 | 3/4-16 UNF 2B  | 110 | 25 | 14 | 11   | 3 |  |
| 48039528 | 7/8-14 UNF 2B  | 125 | 25 | 18 | 14.5 | 3 |  |
| 48039539 | 1-12 UNF 2B    | 125 | 25 | 18 | 14.5 | 3 |  |

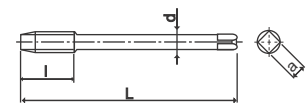
## V-DC-SC-MT(1.5P SHORT CHAMFER)



| EDP      | METRIC DIN 371 | L   | l1 | d  | a   | Z |  |
|----------|----------------|-----|----|----|-----|---|--|
| 48096155 | M6X1 6HX       | 80  | 30 | 6  | 4.9 | 3 |  |
| 48096161 | M8X1.25 6HX    | 90  | 35 | 8  | 6.2 | 3 |  |
| 48096169 | M10X1.5 6HX    | 100 | 39 | 10 | 8   | 3 |  |



| EDP      | METRIC DIN 376 | L   | l  | d | a | Z |  |
|----------|----------------|-----|----|---|---|---|--|
| 48096179 | M12X1.75 6HX   | 110 | 18 | 9 | 7 | 3 |  |



| EDP      | METRIC FINE DIN 374 | L   | l  | d | a   | Z |  |
|----------|---------------------|-----|----|---|-----|---|--|
| 48096162 | M8X1 6HX            | 90  | 10 | 6 | 4.9 | 3 |  |
| 48096170 | M10X1.25 6HX        | 100 | 12 | 7 | 5.5 | 3 |  |
| 48096171 | M10X1 6HX           | 90  | 12 | 7 | 5.5 | 3 |  |
| 48096180 | M12X1.5 6HX         | 100 | 14 | 9 | 7   | 4 |  |
| 48096181 | M12X1.25 6HX        | 100 | 14 | 9 | 7   | 4 |  |

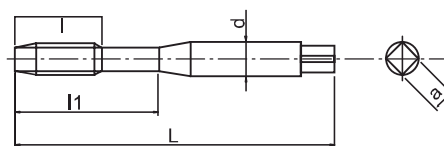


# TAPPING TECHNOLOGY FOR CAST IRON & ALUMINIUM DIECAST FOR THE AUTOMOTIVE INDUSTRY

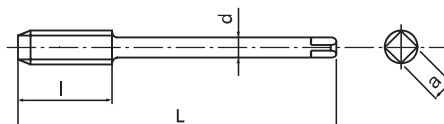
## VP-DC-MT



Type 1



Type 2



|            |            |            |            |            |            |            |       |
|------------|------------|------------|------------|------------|------------|------------|-------|
| <b>P</b> ○ | <b>P</b> ○ | <b>K</b> ● | <b>K</b> ● | <b>N</b> ● | <b>H</b> ○ | <b>H</b> ○ |       |
| C>0.45%    | SCM        | GG         | GGG        | AC,ADC     | 25-35 HRC  | 35-45 HRC  |       |
| 10-25      | 10-20      | 15-60      | 15-40      | 25-70      | 8-20       | 8-20       | m/min |



| EDP      | METRIC DIN 371 / 376 |     | L   | I  | I1 | d   | a    | Z | Type |
|----------|----------------------|-----|-----|----|----|-----|------|---|------|
| 48020125 | M2 x 0.4             | 6HX | 45  |    |    | 2.8 | 2.1  | 3 | 1    |
| 48020133 | M2.5 x 0.45          | 6HX | 50  | 12 | 30 | 7   | 5.5  | 3 | 1    |
| 48020138 | M3 x 0.5             | 6HX | 56  | -  | 18 | 3.5 | 2.7  | 3 | 1    |
| 48020142 | M3.5 x 0.6           | 6HX | 56  | 18 | -  | 8   | 6.2  | 4 | 2    |
| 48020144 | M4 x 0.7             | 6HX | 63  | -  | 21 | 4.5 | 3.4  | 3 | 1    |
| 48020149 | M5 x 0.8             | 6HX | 70  | -  | 25 | 6   | 4.9  | 3 | 1    |
| 48020155 | M6 x 1               | 6HX | 80  | -  | 30 | 6   | 4.9  | 3 | 1    |
| 48020158 | M7 x 1               | 6HX | 80  | 30 | -  | 18  | 14.5 | 5 | 2    |
| 48020161 | M8 x 1.25            | 6HX | 90  | -  | 35 | 8   | 6.2  | 4 | 1    |
| 48020169 | M10 x 1.5            | 6HX | 100 | -  | 39 | 10  | 8    | 4 | 1    |
| 48020175 | M11 x 1.5            | 6HX | 100 | 36 | -  | 18  | 14.5 | 5 | 1    |
| 48020179 | M12 x 1.75           | 6HX | 110 | 21 | -  | 9   | 7    | 4 | 2    |
| 48022191 | M14 x 2              | 6HX | 110 | 24 | -  | 11  | 9    | 4 | 2    |
| 48022202 | M16 x 2              | 6HX | 110 | 24 | -  | 12  | 9    | 4 | 2    |
| 48022214 | M18 x 2.5            | 6HX | 125 | 30 | -  | 14  | 11   | 4 | 2    |
| 48022228 | M20 x 2.5            | 6HX | 140 | 30 | -  | 16  | 12   | 4 | 2    |
| 48020238 | M22 x 2.5            | 6HX | 140 | 42 | -  | 22  | 18   | 6 | 2    |
| 48020247 | M24 x 3              | 6HX | 160 | -  | -  | -   | -    | - | 2    |
| 48020271 | M30 x 3.5            | 6HX | 180 | -  | -  | -   | -    | - | 2    |

## VP-DC-MT FORM E

|            |            |            |            |            |            |            |       |
|------------|------------|------------|------------|------------|------------|------------|-------|
| <b>P</b> ○ | <b>P</b> ○ | <b>K</b> ● | <b>K</b> ● | <b>N</b> ● | <b>H</b> ○ | <b>H</b> ○ |       |
| C>0.45%    | SCM        | GG         | GGG        | AC,ADC     | 25-35 HRC  | 35-45 HRC  |       |
| 10-25      | 10-20      | 15-60      | 15-40      | 25-70      | 8-20       | 8-20       | m/min |



| EDP      | METRIC DIN 371 / 376 |     | L   | I1 | d   | a    | Z | Type |
|----------|----------------------|-----|-----|----|-----|------|---|------|
| 48037138 | M3 x 0.5             | 6HX | 56  | -  | 3.5 | 2.7  | 3 | 1    |
| 48037144 | M4 x 0.7             | 6HX | 63  | -  | 4.5 | 3.4  | 3 | 1    |
| 48037149 | M5 x 0.8             | 6HX | 70  | -  | 6   | 4.9  | 3 | 1    |
| 48037155 | M6 x 1               | 6HX | 80  | -  | 6   | 4.9  | 3 | 1    |
| 48037161 | M8 x 1.25            | 6HX | 90  | -  | 8   | 6.2  | 4 | 1    |
| 48037169 | M10 x 1.5            | 6HX | 100 | -  | 10  | 8    | 4 | 1    |
| 48037179 | M12 x 1.75           | 6HX | 110 | 21 | 9   | 7    | 4 | 2    |
| 48037191 | M14 x 2              | 6HX | 110 | 24 | 11  | 9    | 4 | 2    |
| 48037202 | M16 x 2              | 6HX | 110 | 24 | 12  | 9    | 4 | 2    |
| 48037214 | M18 x 2.5            | 6HX | 125 | 30 | 14  | 11   | 4 | 2    |
| 48037228 | M20 x 2.5            | 6HX | 140 | 30 | 16  | 12   | 4 | 2    |
| 48037238 | M22 x 2.5            | 6HX | 140 | 30 | 18  | 14.5 | 5 | 2    |
| 48037247 | M24 x 3              | 6HX | 160 | 36 | 18  | 14.5 | 5 | 2    |

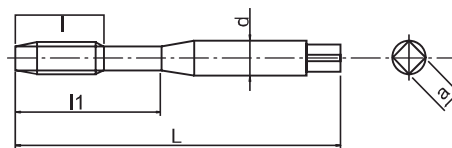
# TAPPING TECHNOLOGY FOR CAST IRON & ALUMINIUM DIECAST FOR THE AUTOMOTIVE INDUSTRY

## VPO-DC-MT Center

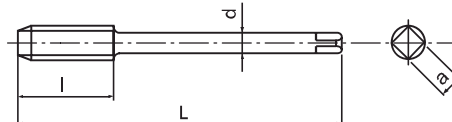


|          |          |          |          |          |           |           |       |
|----------|----------|----------|----------|----------|-----------|-----------|-------|
| <b>P</b> | <b>P</b> | <b>K</b> | <b>K</b> | <b>N</b> | <b>H</b>  | <b>H</b>  |       |
| C>0.45%  | SCM      | GG       | GGG      | AC,ADC   | 25-35 HRC | 35-45 HRC |       |
| 10-25    | 10-20    | 15-60    | 15-40    | 25-70    | 8-20      | 8-20      | m/min |

Type 1



Type 2



| EDP      | METRIC DIN 371 / 376 | L   | l  | l1 | d  | a   | Z | Type |
|----------|----------------------|-----|----|----|----|-----|---|------|
| 48021155 | M6 x 1 6HX           | 80  | -  | 30 | 6  | 4.9 | 3 | 1    |
| 48021161 | M8 x 1.25 6HX        | 90  | -  | 35 | 8  | 6.2 | 4 | 1    |
| 48021169 | M10 x 1.5 6HX        | 100 | -  | 39 | 10 | 8   | 4 | 1    |
| 48300179 | M12 x 1.75 6HX       | 110 | 28 | -  | 9  | 7   | 3 | 2    |
| 48300191 | M14 x 2 6HX          | 110 | 24 | -  | 11 | 9   | 3 | 2    |
| 48300202 | M16 x 2 6HX          | 110 | 24 | -  | 12 | 9   | 3 | 2    |
| 48300214 | M18 x 2.5 6HX        | 125 | 30 | -  | 14 | 11  | 4 | 2    |
| 48300228 | M20 x 2.5 6HX        | 140 | 30 | -  | 16 | 12  | 4 | 2    |

## VPO-DC-MT FORM E

|          |          |          |          |          |           |           |       |
|----------|----------|----------|----------|----------|-----------|-----------|-------|
| <b>P</b> | <b>P</b> | <b>K</b> | <b>K</b> | <b>N</b> | <b>H</b>  | <b>H</b>  |       |
| C>0.45%  | SCM      | GG       | GGG      | AC,ADC   | 25-35 HRC | 35-45 HRC |       |
| 10-25    | 10-20    | 15-60    | 15-40    | 25-70    | 8-20      | 8-20      | m/min |



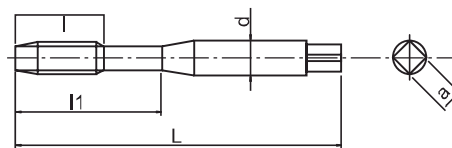
| EDP      | METRIC DIN 371 / 376 | L   | l  | l1 | d  | a    | Z | Type |
|----------|----------------------|-----|----|----|----|------|---|------|
| 48038155 | M6 x 1 6HX           | 80  | -  | 30 | 6  | 4.9  | 3 | 1    |
| 48038161 | M8 x 1.25 6HX        | 90  | -  | 35 | 8  | 6.2  | 4 | 1    |
| 48038169 | M10 x 1.5 6HX        | 100 | -  | 39 | 10 | 8    | 4 | 1    |
| 48038179 | M12 x 1.75 6HX       | 110 | 28 | -  | 9  | 7    | 3 | 2    |
| 48038191 | M14 x 2 6HX          | 110 | 24 | -  | 11 | 9    | 3 | 2    |
| 48038202 | M16 x 2 6HX          | 110 | 24 | -  | 12 | 9    | 3 | 2    |
| 48038214 | M18 x 2.5 6HX        | 125 | 30 | -  | 14 | 11   | 4 | 2    |
| 48038228 | M20 x 2.5 6HX        | 140 | 30 | -  | 16 | 12   | 4 | 2    |
| 48038238 | M22 x 2.5 6HX        | 140 | 30 | -  | 18 | 14.5 | 5 | 2    |
| 48038247 | M24 x 3 6HX          | 160 | 36 | -  | 18 | 14.5 | 5 | 2    |

## VPO-DC-MT Side



|          |          |          |          |          |           |           |       |
|----------|----------|----------|----------|----------|-----------|-----------|-------|
| <b>P</b> | <b>P</b> | <b>K</b> | <b>K</b> | <b>N</b> | <b>H</b>  | <b>H</b>  |       |
| C>0.45%  | SCM      | GG       | GGG      | AC,ADC   | 25-35 HRC | 35-45 HRC |       |
| 10-25    | 10-20    | 15-60    | 15-40    | 25-70    | 8-20      | 8-20      | m/min |

Type 1



Type 2



| EDP      | METRIC DIN 371 / 376 | L   | l  | l1 | d  | a   | Z | Type |
|----------|----------------------|-----|----|----|----|-----|---|------|
| 48299155 | M6 x 1 6HX           | 80  | 8  | 30 | 6  | 4.9 | 3 | 1    |
| 48299161 | M8 x 1.25 6HX        | 90  | 10 | 35 | 8  | 6.2 | 3 | 1    |
| 48299169 | M10 x 1.5 6HX        | 100 | 12 | 39 | 10 | 8   | 3 | 1    |
| 48021179 | M12 x 1.75 6HX       | 110 | 21 | -  | 9  | 7   | 4 | 2    |
| 48024191 | M14 x 2 6HX          | 110 | 24 | -  | 11 | 9   | 4 | 2    |
| 48024202 | M16 x 2 6HX          | 110 | 24 | -  | 12 | 9   | 4 | 2    |
| 48024214 | M18 x 2.5 6HX        | 125 | 30 | -  | 14 | 11  | 4 | 2    |
| 48024228 | M20 x 2.5 6HX        | 140 | 30 | -  | 16 | 12  | 4 | 2    |



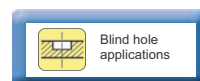
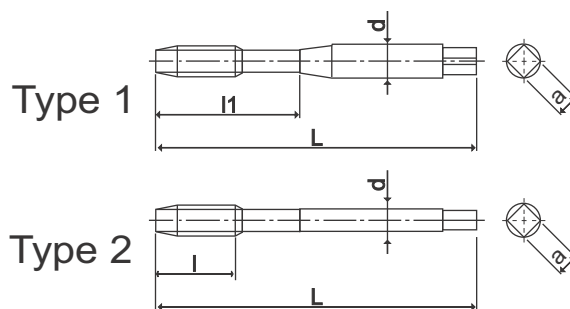
shaping your dreams

# TAPPING TECHNOLOGY FOR CAST IRON & FORGED STEEL FOR THE AUTOMOTIVE INDUSTRY

## VPO-LW-SFT (CRANK SHAFT TAP)



- Designed specially for steel & cast iron Crank shafts, Connecting rods & Tie rods.
- Excellent chip evacuation due to lapped flutes and oil hole.
- Especially excellent for blind hole and horizontal MC.
- Also suitable for forged steel automotive components
- Cutting speed range between 5~30m/min



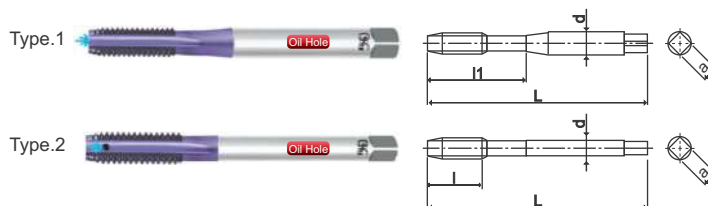
| EDP      | METRIC DIN 371 | Chamfer Length | L   | l  | d  | a   | Z | Type |
|----------|----------------|----------------|-----|----|----|-----|---|------|
| T1503078 | M6X1 6HX       | 2.5P           | 80  | 30 | 6  | 4.9 | 3 | 1    |
| T1503079 | M8X1.25 6HX    | 2.5P           | 90  | 35 | 8  | 6.2 | 3 | 1    |
| T1503080 | M10X1.5 6HX    | 2.5P           | 100 | 39 | 10 | 8   | 3 | 1    |

| EDP      | METRIC DIN 376 | Chamfer Length | L   | l  | d  | a | Z | Type |
|----------|----------------|----------------|-----|----|----|---|---|------|
| T1506978 | M12X1.75 6HX   | 2.5P           | 110 | 18 | 9  | 7 | 3 | 2    |
| T1503370 | M14X2 6HX      | 2.5P           | 110 | 20 | 11 | 9 | 3 | 2    |
| T1503371 | M16X2 6HX      | 2.5P           | 110 | 20 | 12 | 9 | 3 | 2    |

| EDP      | METRIC DIN 374 | Chamfer Length | L   | l  | d  | a   | Z | Type |
|----------|----------------|----------------|-----|----|----|-----|---|------|
| T1503372 | M9X1 6HX       | 2.5P           | 90  | 10 | 7  | 5.5 | 3 | 2    |
| T1503373 | M10X1 6HX      | 2.5P           | 90  | 10 | 7  | 5.5 | 3 | 2    |
| T1503374 | M10X1.25 6HX   | 2.5P           | 100 | 13 | 7  | 5.5 | 3 | 2    |
| T1503413 | M11x1.25 6HX   | 2.5P           | 100 | 13 | 8  | 6.2 | 3 | 2    |
| T1503375 | M12X1.25 6HX   | 2.5P           | 100 | 13 | 9  | 7   | 3 | 2    |
| T1503376 | M12X1.5 6HX    | 2.5P           | 100 | 15 | 9  | 7   | 3 | 2    |
| T1503377 | M14X1.5 6HX    | 2.5P           | 100 | 15 | 11 | 9   | 3 | 2    |
| T1503378 | M16X1.5 6HX    | 2.5P           | 100 | 15 | 12 | 9   | 3 | 2    |

## VPO-MT (CRANK SHAFT TAP)

- Designed specially for steel & cast iron crankshafts
- Excellent chip evacuation due to lapped flutes and oil hole.
- Also suitable for forged steel automotive components
- Cutting speed range between 5~30m/min



| EDP      | METRIC DIN 371   | L  | l  | d | a   | Z | Type |
|----------|------------------|----|----|---|-----|---|------|
| T1102171 | M6x1 2.5P 6HX    | 80 | 30 | 6 | 4.9 | 3 | 2    |
| T1102176 | M8x1.25 2.5P 6HX | 90 | 35 | 8 | 6.2 | 4 | 2    |

| EDP      | METRIC DIN 376 | L   | l  | d  | a | Z | Type |
|----------|----------------|-----|----|----|---|---|------|
| T0803923 | M14x2 2.5P 6HX | 110 | 24 | 11 | 9 | 4 | 1    |
| T0803925 | M16x2 2.5P 6HX | 110 | 24 | 12 | 9 | 4 | 1    |

| EDP      | METRIC FINE DIN 374 | L   | l  | d  | a   | Z | Type |
|----------|---------------------|-----|----|----|-----|---|------|
| T0803919 | M10x1 5P 6HX        | 90  | 12 | 7  | 5.5 | 4 | 2    |
| T0803920 | M10x1.25 5P 6HX     | 100 | 15 | 7  | 5.5 | 4 | 2    |
| T0803921 | M12x1.25 2.5P 6HX   | 100 | 15 | 9  | 7   | 4 | 1    |
| T0803922 | M12x1.5 2.5P 6HX    | 100 | 18 | 9  | 7   | 4 | 1    |
| T0803924 | M14x1.5 2.5P 6HX    | 100 | 18 | 11 | 9   | 4 | 1    |
| T0803926 | M16x1.5 2.5P 6HX    | 100 | 18 | 12 | 9   | 4 | 1    |

Unit:mm

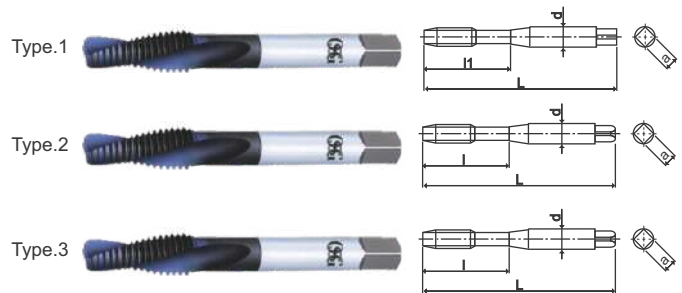




# TAPPING TECHNOLOGY FOR CAST IRON & FORGED STEEL FOR THE AUTOMOTIVE INDUSTRY

## WXL-CPM-RFT

- Designed specially for through holes in connecting rods and wheel hubs
- High speed tapping up to 40m/min for mass production
- Also suitable for forged steel automotive components.



Unit:mm

| EDP      | METRIC DIN 371 | L   | I  | d  | a   | Z | Type |
|----------|----------------|-----|----|----|-----|---|------|
| 48043155 | M6X1 6HX       | 80  | 30 | 6  | 4.9 | 3 | 1    |
| 48043158 | M7X1 6HX       | 80  | 30 | 7  | 5.5 | 4 | 1    |
| 48043161 | M8X1.25 6HX    | 90  | 35 | 8  | 6.2 | 4 | 1    |
| 48043165 | M9X1.25 6HX    | 90  | 35 | 9  | 7   | 4 | 1    |
| 48043169 | M10X1.5 6HX    | 100 | 39 | 10 | 8   | 4 | 1    |

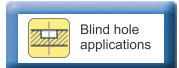
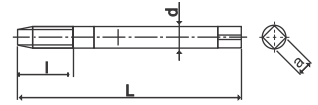
| EDP      | METRIC DIN 376 | L   | I1 | d  | a   | Z | Type |
|----------|----------------|-----|----|----|-----|---|------|
| 48043174 | M11X1.5 6HX    | 100 | 24 | 8  | 6.2 | 5 | 2    |
| 48043179 | M12X1.75 6HX   | 110 | 29 | 9  | 7   | 5 | 2    |
| 48043191 | M14X2 6HX      | 110 | 30 | 11 | 9   | 5 | 2    |
| 48043202 | M16X2 6HX      | 110 | 32 | 12 | 9   | 5 | 2    |
| 48043214 | M18X2.5 6HX    | 125 | 34 | 14 | 11  | 5 | 2    |

| EDP      | METRIC FINE DIN 374 | L   | I1 | d  | a   | Z | Type |
|----------|---------------------|-----|----|----|-----|---|------|
| 48043162 | M8X1 6HX            | 90  | 22 | 6  | 4.9 | 4 | 3    |
| 48043166 | M9X1 6HX            | 90  | 22 | 7  | 5.5 | 5 | 3    |
| 48043171 | M10X1 6HX           | 90  | 20 | 7  | 5.5 | 5 | 3    |
| 48043170 | M10X1.25 6HX        | 100 | 24 | 7  | 5.5 | 5 | 3    |
| 48043175 | M11X1.25 6HX        | 100 | 24 | 8  | 6.2 | 5 | 3    |
| 48043181 | M12X1.25 6HX        | 100 | 22 | 9  | 7   | 5 | 3    |
| 48043180 | M12X1.5 6HX         | 100 | 22 | 9  | 7   | 5 | 3    |
| 48043192 | M14X1.5 6HX         | 100 | 22 | 11 | 9   | 5 | 3    |
| 48043203 | M16X1.5 6HX         | 100 | 22 | 12 | 9   | 5 | 3    |
| 48043216 | M18X1.5 6HX         | 110 | 25 | 14 | 11  | 5 | 3    |

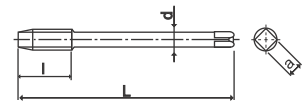
# TAPS FOR THE AEROSPACE INDUSTRY

## V-TI-SFT

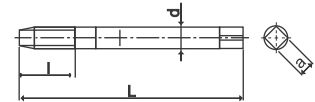
- This tap provides high performance and longer tool life when tapping titanium alloy steels (Ti-6Al-4V) which are used in the aerospace and chemical industries.
- These materials have a hardness of 40~45 HRC after the process of age hardening by solution treatment.



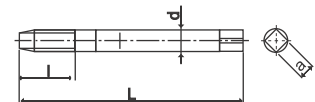
| EDP      | METRIC DIN 371 | L   | l1 | d    | a   | Z |
|----------|----------------|-----|----|------|-----|---|
| 48011138 | M3x0.5 6H      | 56  | 11 | 3.5  | 2.7 | 3 |
| 48011144 | M4x0.7 6H      | 63  | 14 | 4.5  | 3.4 | 3 |
| 48011149 | M5x0.8 6H      | 70  | 17 | 6.0  | 4.9 | 3 |
| 48011155 | M6x1.0 6H      | 80  | 21 | 6.0  | 4.9 | 3 |
| 48011161 | M8x1.25 6H     | 90  | 28 | 8.0  | 6.2 | 3 |
| 48011169 | M10x1.5 6H     | 100 | 35 | 10.0 | 8.0 | 3 |



| EDP      | METRIC DIN 376 | L   | l  | d  | a | Z |
|----------|----------------|-----|----|----|---|---|
| 48011179 | M12x1.75 6H    | 110 | 18 | 10 | 8 | 3 |



| EDP      | UNJC DIN 2184-1 | L  | l  | d   | a   | Z |
|----------|-----------------|----|----|-----|-----|---|
| 48013457 | 4-40UNJC 3B     | 56 | 10 | 3.5 | 2.7 | 3 |
| 48013461 | 6-32UNJC 3B     | 56 | 13 | 4.0 | 3.0 | 3 |
| 48013464 | 8-32UNJC 3B     | 63 | 15 | 4.5 | 3.4 | 3 |

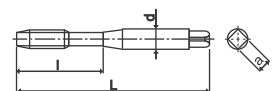


| EDP      | UNJF DIN 2184-1 | L  | l  | d  | a   | Z |
|----------|-----------------|----|----|----|-----|---|
| 48013467 | 10-32UNJF 3B    | 70 | 25 | 6  | 4.9 | 3 |
| 48013472 | 1/4-28UNJF 3B   | 80 | 30 | 7  | 5.5 | 3 |
| 48013476 | 5/16-24UNJF 3B  | 90 | 35 | 8  | 6.2 | 3 |
| 48013481 | 3/8-24UNJF 3B   | 90 | 35 | 10 | 8.0 | 3 |

## V-TI-POT

- This tap provides high performance and longer tool life when tapping titanium alloy steels (Ti-6Al-4V) which are used in the aerospace and chemical industries.
- These materials have a hardness of 40~45 HRC after the process of age hardening by solution treatment.

Type.1



Type.2

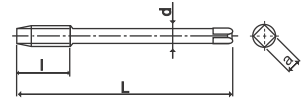


| EDP      | METRIC DIN 371 | L   | l  | d    | a   | Z |
|----------|----------------|-----|----|------|-----|---|
| 48012138 | M3x0.5 6H      | 56  | 12 | 3.5  | 2.7 | 3 |
| 48012144 | M4x0.7 6H      | 63  | 16 | 4.5  | 3.4 | 3 |
| 48012149 | M5x0.8 6H      | 70  | 19 | 6.0  | 4.9 | 3 |
| 48012155 | M6x1.0 6H      | 80  | 23 | 6.0  | 4.9 | 3 |
| 48012161 | M8x1.25 6H     | 90  | 30 | 8.0  | 6.2 | 3 |
| 48012169 | M10x1.5 6H     | 100 | 38 | 10.0 | 8.0 | 3 |



# TAPS FOR THE AEROSPACE INDUSTRY

## V-TI-POT



| EDP      | METRIC DIN 376 | L   | I  | d  | a | Z |
|----------|----------------|-----|----|----|---|---|
| 48012179 | M12x1.75 6H    | 110 | 28 | 10 | 8 | 3 |

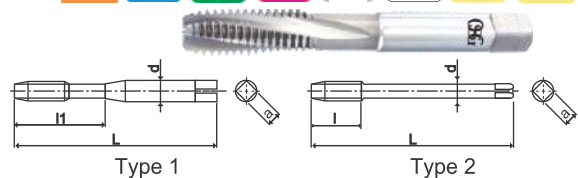


| EDP      | UNJC DIN 2184-1 | L  | I  | d   | a   | Z |
|----------|-----------------|----|----|-----|-----|---|
| 48014457 | 4-40 UNJC 3B    | 56 | 12 | 3.5 | 2.7 | 3 |
| 48014461 | 6-32 UNJC 3B    | 56 | 14 | 4.0 | 3.0 | 3 |
| 48014464 | 8-32 UNJC 3B    | 63 | 16 | 4.5 | 3.4 | 3 |

| EDP      | UNJF DIN 2184-1 | L  | I  | d  | a   | Type |
|----------|-----------------|----|----|----|-----|------|
| 48014467 | 10-32 UNJF 3B   | 70 | 25 | 6  | 4.9 | 3    |
| 48014472 | 1/4-28 UNJF 3B  | 80 | 30 | 7  | 5.5 | 3    |
| 48014476 | 5/16-24 UNJF 3B | 90 | 31 | 8  | 6.2 | 3    |
| 48014481 | 3/8-24 UNJF 3B  | 90 | 35 | 10 | 8   | 3    |

## WHR-NI-SFT

- This tap provides high performance and longer tool life when tapping Nickel alloy steels (Inconel, Waspalloy) which are used in the aerospace and chemical industries.
- These materials have a hardness of 40~45 HRC after the process of age hardening by solution treatment.

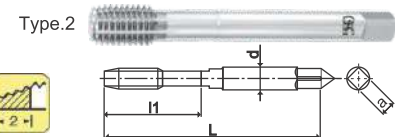
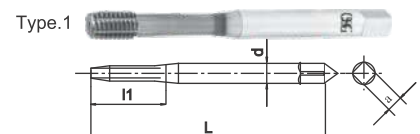


| EDP      | UNJF DIN 2184-1 | L  | I  | d  | a   | Z | Type |
|----------|-----------------|----|----|----|-----|---|------|
| 48078467 | 10-32 UNJF 3B   | 70 | 18 | 6  | 4.9 | 3 | 1    |
| 48078472 | 1/4-28 UNJF 3B  | 80 | 23 | 7  | 5.5 | 3 | 1    |
| 48078476 | 5/16-24 UNJF 3B | 90 | 35 | 8  | 6.2 | 3 | 2    |
| 48078481 | 3/8-24 UNJF 3B  | 90 | 35 | 10 | 8   | 3 | 2    |

| EDP      | UNJF DIN 2184-1 | L   | I  | d | a   | Z |
|----------|-----------------|-----|----|---|-----|---|
| 48078486 | 7/16-20 UNJF 3B | 100 | 15 | 8 | 6.2 | 3 |
| 48078491 | 1/2-20 UNJF 3B  | 100 | 16 | 9 | 7   | 3 |

## V-NRT-B ( Without oil Hole )

- For aluminium, stainless & steels < 850 N/mm<sup>2</sup>
- Manufactured from OSG's high performance cobalt steel
- 2 pitch lead / Eliminate swarf problems
- For pilot hole use OSG Drills.



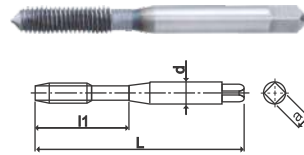
| EDP      | METRIC DIN 371  | L  | I   | d   | a   | Z | Type |
|----------|-----------------|----|-----|-----|-----|---|------|
| 48003111 | M1 x 0.25 4HX   | 40 | 5.5 | 2.5 | 2.1 | 0 | 1    |
| 48003113 | M1.2 x 0.25 4HX | 40 | 5.5 | 2.5 | 2.1 | 0 | 1    |
| 66711568 | M1.4 x 0.3 6HX  | 40 | 7   | 2.5 | 2.1 | 0 | 1    |
| 66711868 | M1.6 x 0.35 6HX | 40 | 8   | 2.5 | 2.1 | 0 | 1    |
| 66712568 | M2 x 0.4 6HX    | 45 | 8   | 2.8 | 2.1 | 0 | 1    |
| 66712868 | M2.2 x 0.45 6HX | 45 | 9   | 2.8 | 2.1 | 0 | 1    |
| 66713368 | M2.5 x 0.45 6HX | 50 | 9   | 2.8 | 2.1 | 0 | 1    |
| 66713868 | M3 x 0.5 6HX    | 56 | 18  | 3.5 | 2.7 | 2 | 2    |
| 66714068 | M3.5 x 0.6 6HX  | 56 | 20  | 4   | 3   | 2 | 2    |
| 66714468 | M4 x 0.7 6HX    | 63 | 21  | 4.5 | 3.4 | 2 | 2    |
| 66714968 | M5 x 0.8 6HX    | 70 | 25  | 6   | 4.9 | 2 | 2    |

ISO 2/4HX For M1 and M1.2

# FORMING TAPS FOR THE AUTOMOTIVE INDUSTRY

## R-XPf

- Long tool life in Carbon and Alloy steels
- No problems with swarf, typically found with cutting taps.
- Stable tapping performance thanks to the high wear resistance and toughness of the Colbalt HSS substrate
- Excellent wear resistance due to OSG's special V coating

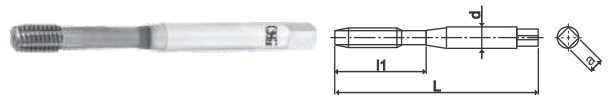


Unit:mm

| EDP      | METRIC DIN 371 | L  | l1 | d   | a   |  |
|----------|----------------|----|----|-----|-----|--|
| 48116138 | M3 x 0.5 6HX   | 56 | 11 | 3.5 | 2.7 |  |
| 48116144 | M4 x 0.7 6HX   | 63 | 13 | 4.5 | 3.4 |  |
| 48116149 | M5 x 0.8 6HX   | 70 | 16 | 6   | 4.9 |  |
| 48116155 | M6 x 1 6HX     | 80 | 19 | 6   | 4.9 |  |
| 48118138 | M3 x 0.5 6GX   | 56 | 18 | 3.5 | 2.7 |  |
| 48118144 | M4 x 0.7 6GX   | 63 | 21 | 4.5 | 3.4 |  |
| 48118149 | M5 x 0.8 6GX   | 70 | 25 | 6   | 4.9 |  |
| 48118155 | M6 x 1 6GX     | 80 | 30 | 6   | 4.9 |  |

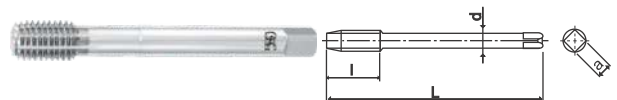
## S-XPf ( Without oil Hole )

- Long tool life in Carbon and Alloy steels
- No problems with swarf, typically found with cutting taps.
- Stable tapping performance thanks to the high wear resistance and toughness of the Colbalt HSS substrate
- Excellent wear resistance due to OSG's special V coating

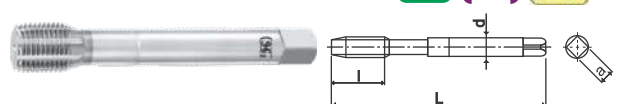


Unit:mm

| EDP      | METRIC DIN 371 | L   | l1 | d  | a   | Z |  |
|----------|----------------|-----|----|----|-----|---|--|
| 48030155 | M6 x 1.0 6HX   | 80  | 30 | 6  | 4.9 | 5 |  |
| 48030161 | M8 x 1.25 6HX  | 90  | 35 | 8  | 6.2 | 8 |  |
| 48030169 | M10 x 1.5 6HX  | 100 | 39 | 10 | 8   | 8 |  |



| EDP      | METRIC DIN 376 | L   | l  | d  | a   | Z |  |
|----------|----------------|-----|----|----|-----|---|--|
| 48030179 | M12 x 1.75 6HX | 110 | 30 | 6  | 4.9 | 8 |  |
| 48030191 | M14 x 2 6HX    | 110 | 20 | 11 | 9   | 8 |  |
| 48030202 | M16 x 2 6HX    | 110 | 20 | 12 | 9   | 5 |  |



| EDP      | METRIC FINE DIN 374 | L   | l1 | d  | a   | Z |  |
|----------|---------------------|-----|----|----|-----|---|--|
| 48030162 | M8 x 1 6HX          | 90  | 10 | 6  | 4.9 | 5 |  |
| 48030171 | M10 x 1 6HX         | 90  | 12 | 7  | 5.5 | 8 |  |
| 48030170 | M10 x 1.25 6HX      | 100 | 12 | 7  | 5.5 | 8 |  |
| 48030182 | M12 x 1 6HX         | 100 | 15 | 9  | 7   | 8 |  |
| 48030181 | M12 x 1.25 6HX      | 100 | 15 | 9  | 7   | 8 |  |
| 48030180 | M12 x 1.5 6HX       | 100 | 15 | 9  | 7   | 8 |  |
| 48030192 | M14 x 1.5 6HX       | 100 | 15 | 11 | 9   | 8 |  |
| 48030203 | M16 x 1.5 6HX       | 100 | 15 | 12 | 9   | 8 |  |
| 48030216 | M18 x 1.5 6HX       | 110 | 15 | 14 | 11  | 8 |  |
| 48030230 | M20 x 1.5 6HX       | 125 | 15 | 16 | 12  | 8 |  |

# FORMING TAPS FOR THE AUTOMOTIVE INDUSTRY

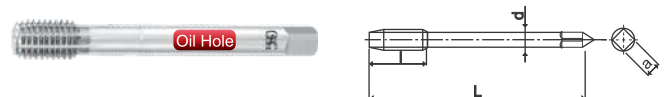
## S-OIL-XPF ( With oil Hole )

- Long tool life in Carbon and Alloy steels
- No problems with swarf, typically found with cutting taps.
- Stable tapping performance thanks to the high wear resistance and toughness of the Colbalt HSS substrate
- Excellent wear resistance due to OSG's special V coating

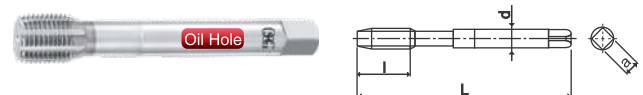


Unit:mm

| EDP      | METRIC DIN 371 | L   | I  | d  | a   | Z |  |
|----------|----------------|-----|----|----|-----|---|--|
| 48042155 | M6X1 6HX       | 80  | 30 | 6  | 4.9 | 5 |  |
| 48042161 | M8X1.25 6HX    | 90  | 35 | 8  | 6.2 | 5 |  |
| 48042169 | M10X1.5 6HX    | 100 | 39 | 10 | 8   | 8 |  |



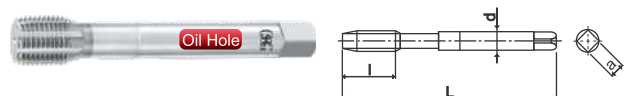
| EDP      | METRIC DIN 376 | L   | I  | d  | a  | Z |  |
|----------|----------------|-----|----|----|----|---|--|
| 48042179 | M12X1.75 6HX   | 110 | 17 | 9  | 7  | 8 |  |
| 48042191 | M14X2 6HX      | 110 | 20 | 11 | 9  | 8 |  |
| 48042202 | M16X2 6HX      | 110 | 20 | 12 | 9  | 8 |  |
| 48042214 | M18X2.5 6HX    | 125 | 25 | 14 | 11 | 8 |  |



| EDP      | METRIC FINE DIN 374 | L   | I  | d  | a   | Z |  |
|----------|---------------------|-----|----|----|-----|---|--|
| 48042162 | M8 x 1 6HX          | 90  | 10 | 6  | 4.9 | 5 |  |
| 48042171 | M10 x 1 6HX         | 90  | 12 | 7  | 5.5 | 8 |  |
| 48042170 | M10 x 1.25 6HX      | 100 | 12 | 7  | 5.5 | 8 |  |
| 48042181 | M12 x 1.25 6HX      | 100 | 15 | 9  | 7   | 8 |  |
| 48042180 | M12 x 1.5 6HX       | 100 | 15 | 9  | 7   | 8 |  |
| 48042192 | M14 x 1.5 6HX       | 100 | 15 | 11 | 9   | 8 |  |
| 48042203 | M16 x 1.5 6HX       | 100 | 15 | 12 | 9   | 8 |  |
| 48042216 | M18 x 1.5 6HX       | 110 | 20 | 14 | 11  | 8 |  |

## OIL-SP-XPF ( FINE PITCH )

- Long tool life in Carbon and Alloy steels
- Especially good for C70 material & Conrod application
- Stable tapping performance thanks to the high wear resistance and toughness of the powder metal HSS substrate
- Excellent wear resistance due to OSG's special V coating



| EDP      | METRIC DIN 376 | L  | I  | d | a   | Z |  |
|----------|----------------|----|----|---|-----|---|--|
| T1503394 | M7X1 4HX       | 80 | 10 | 7 | 5.5 | 5 |  |

| EDP      | METRIC FINE DIN 374 | L   | I  | d | a   | Z |  |
|----------|---------------------|-----|----|---|-----|---|--|
| T1503395 | M8X1 4HX            | 90  | 12 | 6 | 4.9 | 5 |  |
| T1503397 | M9X1 4HX            | 90  | 12 | 7 | 5.5 | 8 |  |
| T1503398 | M10X1 4HX           | 90  | 15 | 7 | 5.5 | 8 |  |
| T1503399 | M11X1.25 4HX        | 100 | 15 | 8 | 6.2 | 8 |  |

# TAPPING FOR CAST IRON & STEEL FOR THE PETROCHEMICAL AND POWER INDUSTRY

## VXL-SFT Vertical Application

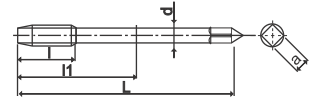
SPEED  
FEED  
P165

HSSE

OX

45°

2.5-3



| EDP      | UNC/UN        | L   | I    | I1 flute | d  | a    | Z |  |
|----------|---------------|-----|------|----------|----|------|---|--|
| 48051538 | 1"-8 UNC 2B   | 160 | 25.4 | 90       | 18 | 14.5 | 5 |  |
| 48051552 | 1.1/8-8 UN 2B | 180 | 25.4 | 100      | 22 | 18   | 5 |  |
| 48051565 | 1.1/4-8 UN 2B | 180 | 25.4 | 100      | 22 | 18   | 5 |  |
| 48051578 | 1.3/8-8 UN 2B | 200 | 25.4 | 115      | 28 | 22   | 5 |  |
| 48051592 | 1.1/2-8 UN 2B | 200 | 25.4 | 115      | 32 | 24   | 5 |  |
| 48051618 | 1.3/4-8 UN 2B | 200 | 25.4 | 101      | 36 | 29   | 6 |  |
| 48051639 | 2"-8 UN 2B    | 225 | 25.4 | 125      | 40 | 32   | 6 |  |

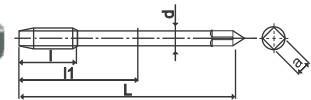
## HXL-SFT Horizontal Application

HSSE

OX

15°

2.5-3

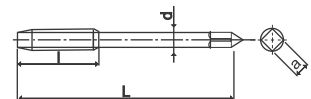


| EDP      | UNC/UN        | L   | I    | I1 flute | d  | a    | Z |  |
|----------|---------------|-----|------|----------|----|------|---|--|
| 48050538 | 1"-8 UNC 2B   | 160 | 25.4 | 90       | 18 | 14.5 | 5 |  |
| 48050552 | 1.1/8-8 UN 2B | 180 | 25.4 | 100      | 22 | 18   | 5 |  |
| 48050565 | 1.1/4-8 UN 2B | 180 | 25.4 | 100      | 22 | 18   | 5 |  |
| 48050578 | 1.3/8-8 UN 2B | 200 | 25.4 | 115      | 28 | 22   | 5 |  |
| 48050592 | 1.1/2-8 UN 2B | 200 | 25.4 | 115      | 32 | 24   | 5 |  |
| 48050618 | 1.3/4-8 UN 2B | 200 | 25.4 | 101      | 36 | 29   | 6 |  |
| 48050639 | 2"-8 UN 2B    | 225 | 25.4 | 125      | 40 | 32   | 6 |  |

## NPT (NATIONAL PIPE THREAD) DIN 2181

HSSE

2.5-3

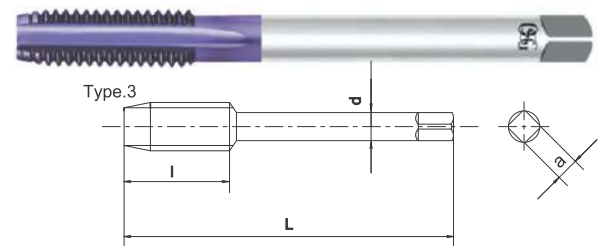
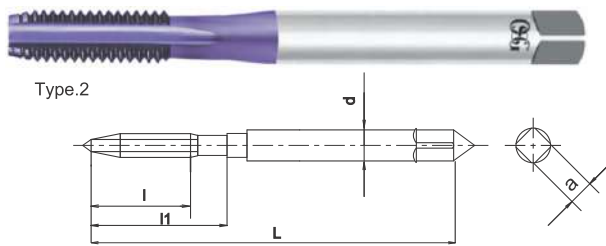


| EDP      | NPT     | L   | I  |   | d  | a   | Z |  |
|----------|---------|-----|----|---|----|-----|---|--|
| 60087500 | 1/16-27 | 56  | 14 | - | 6  | 4.9 | 4 |  |
| 60087600 | 1/8-27  | 63  | 15 | - | 7  | 5.5 | 4 |  |
| 60087700 | 1/4-18  | 63  | 21 | - | 11 | 9   | 4 |  |
| 60087800 | 3/8-18  | 70  | 21 | - | 12 | 9   | 4 |  |
| 60087900 | 1/2-14  | 80  | 27 | - | 16 | 12  | 4 |  |
| 60088000 | 3/4-14  | 100 | 27 | - | 20 | 16  | 5 |  |
| 60088100 | 1-11.5  | 100 | 32 | - | 25 | 20  | 5 |  |



# TAPPING FOR HARDENED STEEL (38 ~ 60 HRC)

## V-XPM-HT



| EDP      | METRIC DIN 371 | L  | l1 | d   | a   | Type |
|----------|----------------|----|----|-----|-----|------|
| 89913868 | M3X0.5 6HX     | 46 | 19 | 3.5 | 2.7 | 2    |
| 89914468 | M4X0.7 6HX     | 53 | 21 | 4.5 | 3.4 | 2    |
| 89914968 | M5X0.8 6HX     | 60 | 24 | 6   | 4.9 | 2    |
| 89915568 | M6X1.0 6HX     | 62 | 29 | 6   | 4.9 | 2    |
| 89916168 | M8X1.25 6HX    | 70 | 22 | 6   | 4.9 | 3    |
| 89916968 | M10X1.5 6HX    | 75 | 24 | 7   | 5.5 | 3    |

| EDP      | METRIC DIN 376 | L  | l1 | d | a | Type |
|----------|----------------|----|----|---|---|------|
| 89917968 | M12X1.75 6HX   | 82 | 29 | 9 | 7 | 3    |

## WH55 - OT(Carbide TAP~55 HRC)

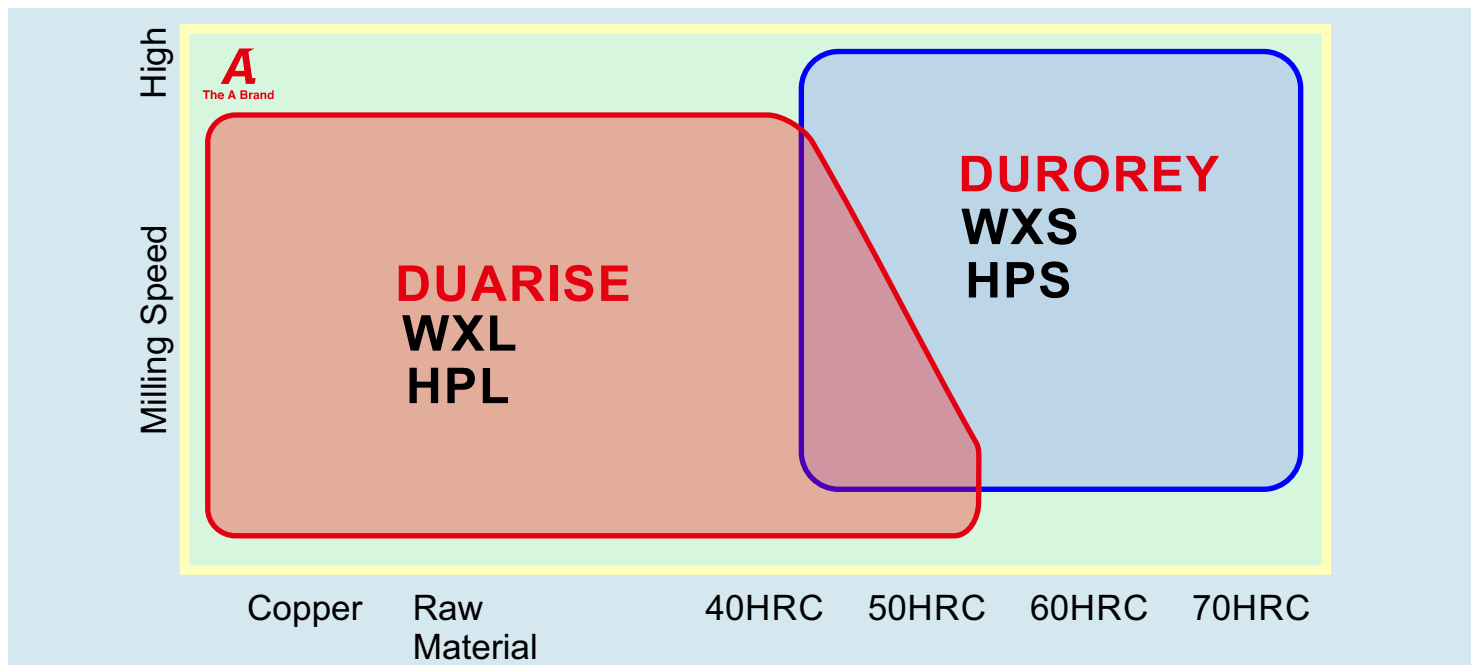
| EDP     | THREAD SIZE | GRADE | TAP Limit | ℓc   | LF | THLGTH | LU | DCON | NOF |
|---------|-------------|-------|-----------|------|----|--------|----|------|-----|
| 3901010 | M3X0.5      | STD   | OH3       | 5P   | 46 | 11     | 19 | 4    | 4   |
| 3901011 | M3X0.5      | STD   | OH3       | 2.5P | 46 | 11     | 19 | 4    | 4   |
| 3901014 | M4X0.7      | STD   | OH3       | 5P   | 52 | 13     | 21 | 5    | 4   |
| 3901015 | M4X0.7      | STD   | OH3       | 2.5P | 52 | 13     | 21 | 5    | 4   |
| 3901018 | M5X0.8      | STD   | OH3       | 5P   | 60 | 16     | 24 | 5.5  | 4   |
| 3901019 | M5X0.8      | STD   | OH3       | 2.5P | 60 | 16     | 24 | 5.5  | 4   |
| 3901022 | M6X1        | STD   | OH3       | 5P   | 62 | 19     | 29 | 6    | 4   |
| 3901023 | M6X1        | STD   | OH3       | 2.5P | 62 | 19     | 29 | 6    | 4   |
| 3901026 | M8X1.25     | STD   | OH3       | 5P   | 70 | 22     | -  | 6.2  | 5   |
| 3901027 | M8X1.25     | STD   | OH3       | 2.5P | 70 | 22     | -  | 6.2  | 5   |
| 3901030 | M10X1.5     | STD   | OH3       | 5P   | 75 | 24     | -  | 7    | 5   |
| 3901031 | M10X1.5     | STD   | OH3       | 2.5P | 75 | 24     | -  | 7    | 5   |
| 3901034 | M12X1.75    | STD   | OH3       | 5P   | 82 | 29     | -  | 8.5  | 5   |
| 3901035 | M12X1.75    | STD   | OH3       | 2.5P | 82 | 29     | -  | 8.5  | 5   |

## VX - OT(Carbide TAP~60 HRC)

| EDP     | THREAD SIZE | GRADE | TAP Limit | ℓc | LF  | THLGTH | LU | DCON | NOF |
|---------|-------------|-------|-----------|----|-----|--------|----|------|-----|
| 8330029 | M2X0.4      | STD   | OH3       | 3P | 40  | 12     | -  | 3    | 3   |
| 8330039 | M2.3X0.4    | STD   | OH3       | 3P | 42  | 13     | -  | 3    | 4   |
| 8330045 | M2.5X0.45   | STD   | OH3       | 3P | 44  | 14     | -  | 3    | 4   |
| 8330049 | M2.6X0.45   | STD   | OH3       | 3P | 44  | 14     | -  | 3    | 4   |
| 8330055 | M3X0.5      | STD   | OH3       | 3P | 46  | 11     | 19 | 4    | 4   |
| 8330061 | M4X0.7      | STD   | OH3       | 3P | 52  | 13     | 21 | 5    | 4   |
| 8330067 | M5X0.8      | STD   | OH3       | 3P | 60  | 16     | 24 | 5.5  | 4   |
| 8330073 | M6X1        | STD   | OH3       | 3P | 62  | 19     | 29 | 6    | 5   |
| 8330085 | M8X1.25     | STD   | OH3       | 3P | 70  | 22     | -  | 6.2  | 5   |
| 8330087 | M8X1        | STD   | OH3       | 3P | 70  | 22     | -  | 6.2  | 5   |
| 8330097 | M10X1.5     | STD   | OH3       | 3P | 75  | 24     | -  | 7    | 5   |
| 8330099 | M10X1.25    | STD   | OH3       | 3P | 75  | 24     | -  | 7    | 5   |
| 8330101 | M10X1       | STD   | OH3       | 3P | 75  | 24     | -  | 7    | 5   |
| 8330115 | M12X1.75    | STD   | OH3       | 3P | 82  | 29     | -  | 8.5  | 5   |
| 8330117 | M12X1.5     | STD   | OH3       | 3P | 82  | 29     | -  | 8.5  | 5   |
| 8330119 | M12X1.25    | STD   | OH4       | 3P | 82  | 29     | -  | 8.5  | 5   |
| 8330121 | M12X1       | STD   | OH3       | 3P | 82  | 29     | -  | 8.5  | 5   |
| 8330123 | M14X2       | STD   | OH4       | 3P | 88  | 30     | -  | 10.5 | 6   |
| 8330125 | M14X1.5     | STD   | OH3       | 3P | 88  | 30     | -  | 10.5 | 6   |
| 8330131 | M16X2       | STD   | OH4       | 3P | 95  | 32     | -  | 12.5 | 6   |
| 8330133 | M16X1.5     | STD   | OH3       | 3P | 95  | 32     | -  | 12.5 | 6   |
| 8330139 | M18X2.5     | STD   | OH4       | 3P | 100 | 37     | -  | 14   | 6   |
| 8330141 | M18X1.5     | STD   | OH4       | 3P | 100 | 37     | -  | 14   | 6   |
| 8330147 | M20X2.5     | STD   | OH4       | 3P | 105 | 37     | -  | 15   | 6   |
| 8330149 | M20X1.5     | STD   | OH4       | 3P | 105 | 37     | -  | 15   | 6   |



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| 101.     | DUARISE           | AE-VML Anti-Vibration long                               | $\phi 6 \sim \phi 12$   |                           |
| 102.     | DUARISE           | AE-BM-H 4 Flute For High-Efficiency Processing           | R1 ~ R6                 |                           |
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| 109.     | WXL               | WXL-EMS 4 Flutes Short                                   | $\phi 1 \sim \phi 30$   |                           |
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| 117.     | HPS               | 4522 HPE MOON BALL 2 Flute Ball Nose Long Length         | R0.5 ~ R6               |                           |
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| 118.     | HPL               | 402 404 4 Flutes Regular                                 | $\phi 0.5 \sim \phi 25$ |                           |
| 119.     | HPL               | 462 464 4 Flutes Long                                    | $\phi 3 \sim \phi 25$   |                           |
| 119.     | HPL               | 462 484 4 Flutes Extra Long                              | $\phi 3 \sim \phi 25$   |                           |
| 120.     | HPL               | 452/4527 Unequal Helix For SUS, Ti & Ni                  | $\phi 1 \sim \phi 25$   | c0.1 ~ c0.5 / R0.5 ~ R1.0 |
| 120.     | HPL               | 483 Roughing                                             | $\phi 3 \sim \phi 25$   |                           |

# ANTI - VIBRATION CARBIDE END MILL

## AE-VMS

Type 1

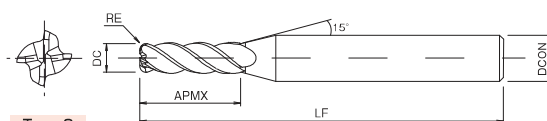


Type 2

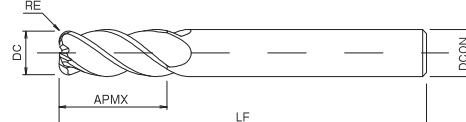


0~-0.02

Type 1



Type 2



### AE-VMS Square

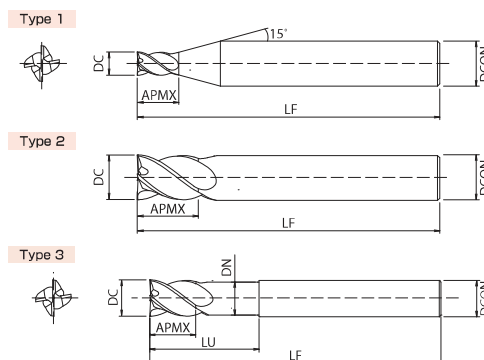
| EDP No. | DC | RE | LF  | APMX | DN | DCON | Z | TYPE |
|---------|----|----|-----|------|----|------|---|------|
| 8555830 | 3  | -  | 60  | 8    | -  | 6    | 4 | 1    |
| 8555840 | 4  | -  | 60  | 11   | -  | 6    | 4 | 1    |
| 8555850 | 5  | -  | 60  | 13   | -  | 6    | 4 | 1    |
| 8555860 | 6  | -  | 60  | 13   | -  | 6    | 4 | 2    |
| 8555880 | 8  | -  | 70  | 19   | -  | 8    | 4 | 2    |
| 8555900 | 10 | -  | 80  | 22   | -  | 10   | 4 | 2    |
| 8555920 | 12 | -  | 90  | 26   | -  | 12   | 4 | 2    |
| 8555960 | 16 | -  | 100 | 32   | -  | 16   | 4 | 2    |
| 8556000 | 20 | -  | 110 | 40   | -  | 20   | 4 | 2    |
| 8556010 | 25 | -  | 120 | 50   | -  | 25   | 4 | 2    |

### AE-VMS Corner R

| EDP No. | DC | RE  | LF | APMX | DN | DCON | Z | TYPE |
|---------|----|-----|----|------|----|------|---|------|
| 8556050 | 3  | 0.2 | 60 | 8    | -  | 6    | 4 | 1    |
| 8556060 | 3  | 0.5 | 60 | 8    | -  | 6    | 4 | 1    |
| 8556070 | 4  | 0.2 | 60 | 11   | -  | 6    | 4 | 1    |
| 8556080 | 4  | 0.5 | 60 | 11   | -  | 6    | 4 | 1    |
| 8556090 | 4  | 1   | 60 | 11   | -  | 6    | 4 | 1    |
| 8556100 | 5  | 0.2 | 60 | 13   | -  | 6    | 4 | 1    |
| 8556110 | 5  | 0.5 | 60 | 13   | -  | 6    | 4 | 1    |
| 8556120 | 5  | 1   | 60 | 13   | -  | 6    | 4 | 1    |
| 8556130 | 6  | 0.3 | 60 | 13   | -  | 6    | 4 | 2    |
| 8556140 | 6  | 0.5 | 60 | 13   | -  | 6    | 4 | 2    |
| 8556150 | 6  | 1   | 60 | 13   | -  | 6    | 4 | 2    |
| 8556160 | 8  | 0.3 | 70 | 19   | -  | 8    | 4 | 2    |
| 8556170 | 8  | 0.5 | 70 | 19   | -  | 8    | 4 | 2    |
| 8556180 | 8  | 1   | 70 | 19   | -  | 8    | 4 | 2    |
| 8556190 | 8  | 1.5 | 70 | 19   | -  | 8    | 4 | 2    |
| 8556200 | 8  | 2   | 70 | 19   | -  | 8    | 4 | 2    |
| 8556210 | 10 | 0.3 | 80 | 22   | -  | 10   | 4 | 2    |
| 8556220 | 10 | 0.5 | 80 | 22   | -  | 10   | 4 | 2    |
| 8556230 | 10 | 1   | 80 | 22   | -  | 10   | 4 | 2    |
| 8556240 | 10 | 1.5 | 80 | 22   | -  | 10   | 4 | 2    |
| 8556250 | 10 | 2   | 80 | 22   | -  | 10   | 4 | 2    |
| 8556260 | 10 | 3   | 80 | 22   | -  | 10   | 4 | 2    |
| 8556270 | 12 | 0.5 | 90 | 26   | -  | 12   | 4 | 2    |
| 8556280 | 12 | 1   | 90 | 26   | -  | 12   | 4 | 2    |
| 8556290 | 12 | 1.5 | 90 | 26   | -  | 12   | 4 | 2    |
| 8556300 | 12 | 2   | 90 | 26   | -  | 12   | 4 | 2    |
| 8556310 | 12 | 3   | 90 | 26   | -  | 12   | 4 | 2    |

| Work Material | Carbon Steel      | Alloy Steel | Prehardened Steel |         |         |         |         | Stainless Steel | Cast Iron         | Copper Alloy | Aluminum Alloy | Graphite | Titanium Alloy | Heat Resistant Alloy | Plastic |
|---------------|-------------------|-------------|-------------------|---------|---------|---------|---------|-----------------|-------------------|--------------|----------------|----------|----------------|----------------------|---------|
|               | Prehardened Steel | Tool Steel  | Hardened Steel    |         |         |         |         |                 | Ductile Cast Iron |              |                |          |                |                      |         |
| Abbreviation  | ~ 40HRC           |             | ~ 45HRC           | ~ 55HRC | ~ 60HRC | ~ 65HRC | ~ 35HRC | ~ 350HB         |                   |              |                |          |                |                      |         |
| <b>AE-VMS</b> | ⊙                 | ○           |                   |         |         |         | ⊙       | ⊙               | ○                 | ○            |                |          | ○              | ○                    |         |

## AE-VMSS



| EDP No. | DC   | LF | APMX | DCON | Type |  |
|---------|------|----|------|------|------|--|
| 8556410 | 1    | 40 | 1.5  | 4    | 1    |  |
| 8556415 | 1.5  |    | 2.3  |      |      |  |
| 8556420 | 2    |    | 3    |      |      |  |
| 8556425 | 2.5  |    | 3.8  |      |      |  |
| 8556430 | 3    | 45 | 4.5  | 6    |      |  |
| 8556435 | 3.5  |    | 5.3  |      |      |  |
| 8556440 | 4    |    | 6    |      |      |  |
| 8556445 | 4.5  |    | 6.8  |      |      |  |
| 8556450 | 5    |    | 7.5  |      |      |  |
| 8556455 | 5.5  |    | 8.3  |      |      |  |
| 8556460 | 6    |    | 9    |      | 2    |  |
| 8556465 | 6.5  | 60 | 9.8  | 8    | 1    |  |
| 8556470 | 7    |    | 10.5 |      |      |  |
| 8556475 | 7.5  |    | 11.3 |      | 2    |  |
| 8556480 | 8    |    | 12   |      |      |  |
| 8556485 | 8.5  | 70 | 12.8 | 10   | 1    |  |
| 8556490 | 9    |    | 13.5 |      |      |  |
| 8556495 | 9.5  |    | 14.3 |      | 2    |  |
| 8556500 | 10   |    | 15   |      |      |  |
| 8556505 | 10.5 | 75 | 15.8 | 12   | 1    |  |
| 8556510 | 11   |    | 16.5 |      |      |  |
| 8556515 | 11.5 |    | 17.3 |      | 2    |  |
| 8556520 | 12   |    | 18   |      |      |  |

| EDP No. | DC × LU | LF  | APMX | DCON | DN   | Type |
|---------|---------|-----|------|------|------|------|
| 8556618 | 6 × 18  | 60  | 9    | 6    | 5.8  | 3    |
| 8556630 | 6 × 30  | 70  |      |      |      |      |
| 8556724 | 8 × 24  |     | 80   | 12   | 8    |      |
| 8556740 | 8 × 40  |     |      |      |      |      |
| 8556830 | 10 × 30 | 100 | 15   | 10   | 9.7  |      |
| 8556850 | 10 × 50 |     |      |      |      |      |
| 8556936 | 12 × 36 | 90  | 18   | 12   | 11.7 |      |
| 8556960 | 12 × 60 | 110 |      |      |      |      |

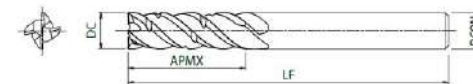
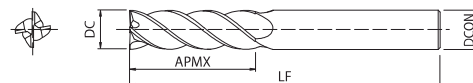
| Work Material  | Carbon Steel      | Alloy Steel | Prehardened Steel |         |         |         |         | Stainless Steel | Cast Iron         | Copper Alloy | Aluminum Alloy | Graphite | Titanium Alloy | Heat Resistant Alloy | Plastic |
|----------------|-------------------|-------------|-------------------|---------|---------|---------|---------|-----------------|-------------------|--------------|----------------|----------|----------------|----------------------|---------|
|                | Prehardened Steel | Tool Steel  | Hardened Steel    |         |         |         |         |                 | Ductile Cast Iron |              |                |          |                |                      |         |
| Abbreviation   | ~ 40HRC           |             | ~ 45HRC           | ~ 55HRC | ~ 60HRC | ~ 65HRC | ~ 35HRC | ~ 350HB         |                   |              |                |          |                |                      |         |
| <b>AE-VMSS</b> | ⊙                 |             | ⊙                 |         |         |         | ⊙       | ⊙               |                   | ⊙            | ⊙              |          | ⊙              | ⊙                    |         |

# ANTI - VIBRATION CARBIDE END MILL

## AE-VML



Type 1



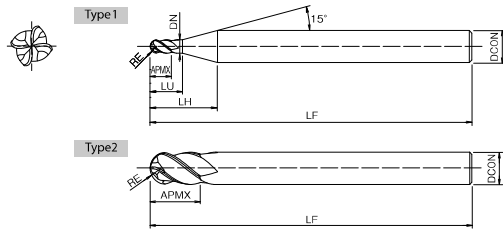
| EDP No. | DC × APMX | LF  | APMX | DCON | L/D |
|---------|-----------|-----|------|------|-----|
| 8556320 | 6 × 19    | 70  | 19   | 6    | 3   |
| 8556328 | 6 × 24    |     | 24   |      | 4   |
| 8556322 | 8 × 25    | 80  | 25   | 8    | 3   |
| 8556330 | 8 × 32    | 90  | 32   |      | 4   |
| 8556324 | 10 × 31   |     | 31   | 10   | 3   |
| 8556332 | 10 × 40   | 100 | 40   |      | 4   |
| 8556326 | 12 × 38   |     | 38   | 12   | 3   |
| 8556334 | 12 × 48   | 110 | 48   |      | 4   |

| EDP No. | DC × APMX   | LF  | APMX | DCON | L/D |
|---------|-------------|-----|------|------|-----|
| 8556321 | 6 × 19 - N  | 70  | 19   | 6    | 3   |
| 8556329 | 6 × 24 - N  |     | 24   |      | 4   |
| 8556323 | 8 × 25 - N  | 80  | 25   | 8    | 3   |
| 8556331 | 8 × 32 - N  | 90  | 32   |      | 4   |
| 8556325 | 10 × 31 - N |     | 31   | 10   | 3   |
| 8556333 | 10 × 40 - N | 100 | 40   |      | 4   |
| 8556327 | 12 × 38 - N |     | 38   | 12   | 3   |
| 8556335 | 12 × 48 - N | 110 | 48   |      | 4   |

| Work Material | Carbon Steel      | Alloy Steel | Prehardened Steel |         |         |         |         | Stainless Steel | Cast Iron         | Copper Alloy | Aluminum Alloy | Graphite | Titanium Alloy | Heat Resistant Alloy | Plastic |
|---------------|-------------------|-------------|-------------------|---------|---------|---------|---------|-----------------|-------------------|--------------|----------------|----------|----------------|----------------------|---------|
|               | Prehardened Steel | Tool Steel  | Hardened Steel    |         |         |         |         |                 | Ductile Cast Iron |              |                |          |                |                      |         |
| Abbreviation  | ~ 40HRC           |             | ~ 45HRC           | ~ 55HRC | ~ 60HRC | ~ 65HRC | ~ 35HRC | ~ 350HB         |                   |              |                |          |                |                      |         |
| AE-VML        | ○                 |             | ○                 | ○       |         |         | ○       | ○               | ○                 | ○            | ○              |          | ○              | ○                    |         |

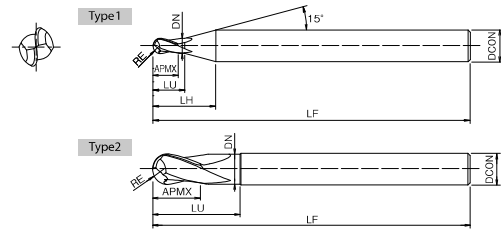
# 4 & 2 FLUTE FOR HIGH-EFFICIENCY PROCESSING

## AE-BM-H

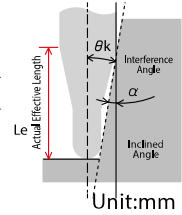


|                              |         |             |             |            |              |     |                        |
|------------------------------|---------|-------------|-------------|------------|--------------|-----|------------------------|
| CARBIDE                      | DUROREY | R<br>±0.005 | R<br>±0.007 | R<br>±0.01 | SHANK<br>FIT | 40° | SPEED<br>FEED<br>P.128 |
| RE ≤ 1.5 1.5 < RE ≤ 3 3 < RE |         |             |             |            |              |     |                        |

## AE-BD-H



|         |         |             |             |              |     |
|---------|---------|-------------|-------------|--------------|-----|
| CARBIDE | DUROREY | R<br>±0.005 | SHANK<br>h4 | SHANK<br>FIT | 25° |
|---------|---------|-------------|-------------|--------------|-----|



Unit:mm

## AE-BM-H

| EDP No. | RE × LU   | LF | APMX | LH   | DCON | DN   | θk     | Effective length by inclined angles Le |       |       |       |      | Type |
|---------|-----------|----|------|------|------|------|--------|----------------------------------------|-------|-------|-------|------|------|
|         |           |    |      |      |      |      |        | 0.5°                                   | 1°    | 1.5°  | 2°    | 3°   |      |
| 8549602 | R1 × 4    | 50 | 2    | 12   | 6    | 1.95 | 10.64° | 4.19                                   | 4.3   | 4.42  | 4.55  | 4.85 | 1    |
| 8549603 | R1.5 × 6  | 50 | 3    | 12   | 6    | 2.85 | 8.15°  | 6.44                                   | 6.61  | 6.79  | 7     | 7.45 |      |
| 8549604 | R2 × 8    | 60 | 4    | 12.1 | 6    | 3.85 | 5.65°  | 8.49                                   | 8.71  | 8.96  | 9.22  | 9.81 |      |
| 8549605 | R2.5 × 10 | 60 | 5    | 12.2 | 6    | 4.85 | 2.95°  | 10.54                                  | 10.82 | 11.12 | 11.45 | —    |      |
| 8549606 | R3        | 60 | 9    | —    | 6    | —    | —      | —                                      | —     | —     | —     | —    | 2    |
| 8549608 | R4        | 70 | 12   | —    | 8    | —    | —      | —                                      | —     | —     | —     | —    |      |
| 8549610 | R5        | 80 | 15   | —    | 10   | —    | —      | —                                      | —     | —     | —     | —    |      |
| 8549612 | R6        | 90 | 18   | —    | 12   | —    | —      | —                                      | —     | —     | —     | —    |      |

## AE-BD-H

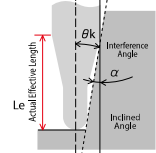
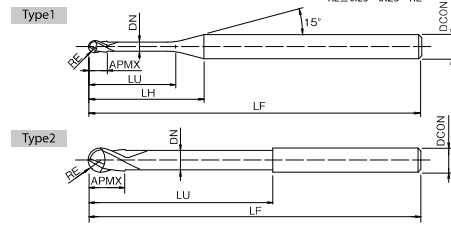
| EDP No. | RE × LU     | Short Shank | LF  | APMX | LH   | DCON | DN   | θk     | Effective length by inclined angles Le |      |       |       |      | Type |
|---------|-------------|-------------|-----|------|------|------|------|--------|----------------------------------------|------|-------|-------|------|------|
|         |             |             |     |      |      |      |      |        | 0.5°                                   | 1°   | 1.5°  | 2°    | 3°   |      |
| 3042001 | R0.5 × 2    | —           | 50  | 0.8  | 7.7  | 4    | 0.95 | 11.71° | 2.14                                   | 2.2  | 2.26  | 2.33  | 2.48 | 1    |
| 3042002 | R0.75 × 3   | —           | 50  | 1.2  | 7.9  | 4    | 1.45 | 10.03° | 3.17                                   | 3.25 | 3.34  | 3.44  | 3.66 |      |
| 3042003 | R1 × 4      | —           | 50  | 1.6  | 12   | 6    | 1.95 | 10.64° | 4.19                                   | 4.3  | 4.42  | 4.55  | 4.85 |      |
| 3042004 | R1.5 × 6    | —           | 60  | 2.4  | 11.9 | 6    | 2.85 | 8.15°  | 6.44                                   | 6.61 | 6.79  | 7     | 7.45 |      |
| 3042005 | R2 × 8-4    | —           | 60  | 3.2  | —    | 4    | 3.85 | —      | —                                      | —    | —     | —     | —    | 2    |
| 3042006 | R2 × 8      | —           | 70  |      | 12.1 | 6    |      | 5.65°  | 8.49                                   | 8.71 | 8.96  | 9.22  | 9.81 | 1    |
| 3042007 | R2 × 8-S    | ○           | 45  |      |      |      |      |        |                                        |      |       |       |      |      |
| 3042008 | R2.5 × 10   | —           | 80  | 4    | 12.2 | 6    | 4.8  | 2.92°  | 10.63                                  | 10.9 | 11.22 | 11.55 | —    |      |
| 3042009 | R2.5 × 10-S | ○           | 50  |      |      |      |      |        |                                        |      |       |       |      |      |
| 3042010 | R3 × 18     | —           | 90  | 9    | —    | 6    | 5.8  | —      | —                                      | —    | —     | —     | —    | 2    |
| 3042011 | R3 × 18-S   | ○           | 55  |      |      |      |      |        |                                        |      |       |       |      |      |
| 3042012 | R4 × 24     | —           | 100 | 12   | —    | 8    | 7.7  | —      | —                                      | —    | —     | —     | —    |      |
| 3042013 | R4 × 24-S   | ○           | 75  |      |      |      |      |        |                                        |      |       |       |      |      |
| 3042014 | R5 × 30     | —           | 100 | 15   | —    | 10   | 9.7  | —      | —                                      | —    | —     | —     | —    |      |
| 3042015 | R5 × 30-S   | ○           | 75  |      |      |      |      |        |                                        |      |       |       |      |      |
| 3042016 | R6 × 36     | —           | 110 | 18   | —    | 12   | 11.7 | —      | —                                      | —    | —     | —     | —    |      |
| 3042017 | R6 × 36-S   | ○           | 80  |      |      |      |      |        |                                        |      |       |       |      |      |

| Work Material | Carbon Steel      | Alloy Steel | Prehardened Steel |        |        |        | Stainless Steel | Cast Iron         | Copper Alloy | Aluminum Alloy | Graphite | Titanium Alloy | Heat Resistant Alloy | Plastic |
|---------------|-------------------|-------------|-------------------|--------|--------|--------|-----------------|-------------------|--------------|----------------|----------|----------------|----------------------|---------|
|               | Prehardened Steel | Tool Steel  | Hardened Steel    |        |        |        | ~35HRC          | Ductile Cast Iron |              |                |          |                |                      |         |
| Abbreviation  | ~40HRC            |             | ~45HRC            | ~55HRC | ~60HRC | ~65HRC | ~35HRC          | ~350HB            |              |                |          |                |                      |         |
| AE-BM/D-H     |                   |             | ○                 | ○      | ○      | ○      |                 |                   |              |                |          |                | ○                    |         |



# 2 FLUTE LONG NECK FOR HIGH-PRECISION FINISHING

## AE-LNBD-H



Unit:mm

| EDP No. | RE × LU × DCON   | LF | APMX | LH   | DN    | θk     | Effective length by inclined angles |      |      |      |      | Type |
|---------|------------------|----|------|------|-------|--------|-------------------------------------|------|------|------|------|------|
|         |                  |    |      |      |       |        | 0.5°                                | 1°   | 1.5° | 2°   | 3°   |      |
| 3056100 | R0.05 × 0.2 × 4  | 45 | 0.08 | 7.5  | 0.095 | 14.69° | 0.21                                | 0.22 | 0.22 | 0.23 | 0.24 | 1    |
| 3056101 | R0.05 × 0.3 × 4  |    |      | 7.6  |       | 14.52° | 0.3                                 | 0.31 | 0.32 | 0.33 | 0.36 |      |
| 3056102 | R0.05 × 0.5 × 4  |    |      | 7.8  |       | 14.16° | 0.51                                | 0.53 | 0.54 | 0.56 | 0.6  |      |
| 3056103 | R0.1 × 0.3 × 4   | 45 | 0.16 | 7.4  | 0.19  | 14.55° | 0.32                                | 0.33 | 0.34 | 0.35 | 0.37 | 1    |
| 3056104 | R0.1 × 0.5 × 4   |    |      | 7.6  |       | 14.18° | 0.53                                | 0.54 | 0.56 | 0.58 | 0.62 |      |
| 3056105 | R0.1 × 0.75 × 4  |    |      | 7.9  |       | 13.74° | 0.79                                | 0.81 | 0.84 | 0.86 | 0.93 |      |
| 3056106 | R0.1 × 1 × 4     |    |      | 8.1  |       | 13.33° | 1.04                                | 1.08 | 1.11 | 1.15 | 1.24 |      |
| 3056107 | R0.1 × 1 × 6     |    |      | 11.8 |       | 13.86° |                                     |      |      |      |      |      |
| 3056108 | R0.1 × 1.25 × 4  |    |      | 8.4  |       | 12.94° | 1.3                                 | 1.35 | 1.39 | 1.44 | 1.55 |      |
| 3056109 | R0.1 × 1.5 × 4   |    |      | 8.6  |       | 12.58° | 1.56                                | 1.61 | 1.67 | 1.73 | 1.86 |      |
| 3056110 | R0.1 × 1.75 × 4  |    |      | 8.9  |       | 12.23° | 1.82                                | 1.88 | 1.94 | 2.01 | 2.17 |      |
| 3056111 | R0.1 × 2 × 4     |    |      | 9.1  |       | 11.9°  | 2.08                                | 2.15 | 2.22 | 2.3  | 2.48 |      |
| 3056112 | R0.1 × 2.5 × 4   |    |      | 9.6  |       | 11.29° | 2.6                                 | 2.68 | 2.78 | 2.88 | 3.1  |      |
| 3056113 | R0.1 × 3 × 4     |    |      | 10.1 |       | 10.74° | 3.11                                | 3.22 | 3.33 | 3.45 | 3.72 |      |
| 3056114 | R0.15 × 0.5 × 4  | 45 | 0.24 | 7.4  | 0.29  | 14.24° | 0.53                                | 0.54 | 0.55 | 0.57 | 0.6  | 1    |
| 3056115 | R0.15 × 0.6 × 4  |    |      | 7.5  |       | 14.06° | 0.63                                | 0.65 | 0.66 | 0.68 | 0.73 |      |
| 3056116 | R0.15 × 0.75 × 4 |    |      | 7.7  |       | 13.79° | 0.78                                | 0.81 | 0.83 | 0.86 | 0.92 |      |
| 3056117 | R0.15 × 1 × 4    |    |      | 7.9  |       | 13.36° | 1.04                                | 1.07 | 1.11 | 1.14 | 1.23 |      |
| 3056118 | R0.15 × 1.25 × 4 |    |      | 8.2  |       | 12.96° | 1.3                                 | 1.34 | 1.39 | 1.43 | 1.54 |      |
| 3056119 | R0.15 × 1.5 × 4  |    |      | 8.4  |       | 12.59° | 1.56                                | 1.61 | 1.66 | 1.72 | 1.85 |      |
| 3056120 | R0.15 × 1.5 × 6  |    |      | 12.2 |       | 13.34° |                                     |      |      |      |      |      |
| 3056121 | R0.15 × 1.75 × 4 |    |      | 8.7  |       | 12.23° | 1.82                                | 1.88 | 1.94 | 2.01 | 2.16 |      |
| 3056122 | R0.15 × 2 × 4    |    |      | 8.9  |       | 11.89° | 2.08                                | 2.14 | 2.22 | 2.29 | 2.47 |      |
| 3056123 | R0.15 × 2.25 × 4 |    |      | 9.2  |       | 11.57° | 2.34                                | 2.41 | 2.49 | 2.58 | 2.78 |      |
| 3056124 | R0.15 × 2.5 × 4  |    |      | 9.4  |       | 11.27° | 2.59                                | 2.68 | 2.77 | 2.87 | 3.09 |      |
| 3056125 | R0.15 × 3 × 4    |    |      | 9.9  |       | 10.71° | 3.11                                | 3.21 | 3.32 | 3.44 | 3.71 |      |
| 3056126 | R0.15 × 3.5 × 4  |    |      | 10.4 |       | 10.2°  | 3.63                                | 3.75 | 3.88 | 4.02 | 4.33 |      |
| 3056127 | R0.15 × 4 × 4    |    |      | 10.9 |       | 9.74°  | 4.14                                | 4.28 | 4.43 | 4.59 | 4.96 |      |
| 3056128 | R0.15 × 4.5 × 4  |    |      | 11.4 |       | 9.31°  | 4.66                                | 4.82 | 4.99 | 5.17 | 5.58 |      |
| 3056129 | R0.15 × 5 × 4    |    |      | 11.9 |       | 8.93°  | 5.18                                | 5.35 | 5.54 | 5.74 | 6.2  |      |
| 3056130 | R0.2 × 0.5 × 4   | 45 | 0.3  | 7.3  | 0.38  | 14.27° | 0.54                                | 0.56 | 0.57 | 0.58 | 0.62 | 1    |
| 3056131 | R0.2 × 0.75 × 4  |    |      | 7.5  |       | 13.8°  | 0.8                                 | 0.82 | 0.85 | 0.87 | 0.93 |      |
| 3056132 | R0.2 × 0.8 × 4   |    |      | 7.6  |       | 13.71° | 0.85                                | 0.88 | 0.9  | 0.93 | 0.99 |      |
| 3056133 | R0.2 × 1 × 4     |    |      | 7.8  |       | 13.37° | 1.06                                | 1.09 | 1.12 | 1.16 | 1.24 |      |
| 3056134 | R0.2 × 1 × 6     |    |      | 11.5 |       | 13.91° |                                     |      |      |      |      |      |
| 3056135 | R0.2 × 1.5 × 4   |    |      | 8.3  |       | 12.57° | 1.58                                | 1.63 | 1.68 | 1.73 | 1.86 |      |
| 3056136 | R0.2 × 2 × 4     |    |      | 8.8  |       | 11.86° | 2.09                                | 2.16 | 2.23 | 2.31 | 2.48 |      |
| 3056137 | R0.2 × 2 × 6     |    |      | 12.5 |       | 12.82° |                                     |      |      |      |      |      |
| 3056138 | R0.2 × 2.5 × 4   |    |      | 9.3  |       | 11.22° | 2.61                                | 2.7  | 2.79 | 2.88 | 3.1  |      |
| 3056139 | R0.2 × 3 × 4     |    |      | 9.8  |       | 10.65° | 3.13                                | 3.23 | 3.34 | 3.46 | 3.72 |      |
| 3056140 | R0.2 × 3.5 × 4   |    |      | 10.3 |       | 10.14° | 3.64                                | 3.76 | 3.89 | 4.03 | 4.35 |      |
| 3056141 | R0.2 × 4 × 4     |    |      | 10.8 |       | 9.67°  | 4.16                                | 4.3  | 4.45 | 4.61 | 4.97 |      |
| 3056142 | R0.2 × 4.5 × 4   |    |      | 11.3 |       | 9.24°  | 4.68                                | 4.83 | 5    | 5.18 | 5.59 |      |
| 3056143 | R0.2 × 5 × 4     |    |      | 11.8 |       | 8.85°  | 5.2                                 | 5.37 | 5.56 | 5.76 | 6.21 |      |
| 3056144 | R0.2 × 5.5 × 4   |    |      | 12.3 |       | 8.49°  | 5.71                                | 5.9  | 6.11 | 6.33 | 6.83 |      |
| 3056145 | R0.2 × 6 × 4     |    |      | 12.8 |       | 8.15°  | 6.23                                | 6.44 | 6.66 | 6.91 | 7.45 |      |



## 2 FLUTE LONG NECK FOR HIGH-PRECISION FINISHING

| EDP No. | RE × LU × DCON   | LF | APMX | LH   | DN   | θk     | Effective length by inclined angles |       |       |       |       | Type |  |
|---------|------------------|----|------|------|------|--------|-------------------------------------|-------|-------|-------|-------|------|--|
|         |                  |    |      |      |      |        | 0.5°                                | 1°    | 1.5°  | 2°    | 3°    |      |  |
| 3056146 | R0.25 × 0.75 × 4 | 45 | 0.4  | 7.3  | 0.48 | 13.85° | 0.8                                 | 0.82  | 0.84  | 0.86  | 0.91  | 1    |  |
| 3056147 | R0.25 × 1 × 4    |    |      | 7.6  |      | 13.4°  | 1.06                                | 1.09  | 1.12  | 1.15  | 1.23  |      |  |
| 3056148 | R0.25 × 1.5 × 4  |    |      | 8.1  |      | 12.58° | 1.58                                | 1.62  | 1.67  | 1.73  | 1.85  |      |  |
| 3056149 | R0.25 × 2 × 4    |    |      | 8.6  |      | 11.85° | 2.09                                | 2.16  | 2.23  | 2.3   | 2.47  |      |  |
| 3056150 | R0.25 × 2.5 × 4  |    |      | 9.1  |      | 11.2°  | 2.61                                | 2.69  | 2.78  | 2.88  | 3.09  |      |  |
| 3056151 | R0.25 × 3 × 4    |    |      | 9.6  |      | 10.62° | 3.13                                | 3.23  | 3.33  | 3.45  | 3.71  |      |  |
| 3056152 | R0.25 × 3.5 × 4  |    |      | 10.1 |      | 10.09° | 3.64                                | 3.76  | 3.89  | 4.03  | 4.33  |      |  |
| 3056153 | R0.25 × 4 × 4    |    |      | 10.6 |      | 9.61°  | 4.16                                | 4.3   | 4.44  | 4.6   | 4.95  |      |  |
| 3056154 | R0.25 × 4.5 × 4  |    |      | 11.1 |      | 9.18°  | 4.68                                | 4.83  | 5     | 5.18  | 5.58  |      |  |
| 3056155 | R0.25 × 5 × 4    |    |      | 11.6 |      | 8.78°  | 5.19                                | 5.37  | 5.55  | 5.75  | 6.2   |      |  |
| 3056156 | R0.25 × 5.5 × 4  |    |      | 12.1 |      | 8.41°  | 5.71                                | 5.9   | 6.11  | 6.33  | 6.82  |      |  |
| 3056157 | R0.25 × 6 × 4    |    |      | 12.6 |      | 8.08°  | 6.23                                | 6.44  | 6.66  | 6.9   | 7.44  |      |  |
| 3056158 | R0.25 × 7 × 4    |    |      | 13.6 |      | 7.48°  | 7.26                                | 7.51  | 7.77  | 8.05  | 8.68  |      |  |
| 3056159 | R0.25 × 8 × 4    |    |      | 14.6 |      | 6.97°  | 8.29                                | 8.58  | 8.88  | 9.2   | 9.93  |      |  |
| 3056160 | R0.25 × 9 × 4    |    |      | 15.6 |      | 6.52°  | 9.33                                | 9.64  | 9.98  | 10.35 | 11.17 |      |  |
| 3056161 | R0.25 × 10 × 4   |    |      | 16.6 |      | 6.12°  | 10.36                               | 10.71 | 11.09 | 11.5  | 12.41 |      |  |
| 3056162 | R0.3 × 0.75 × 4  | 45 | 0.5  | 7.2  | 0.55 | 13.8°  | 0.86                                | 0.88  | 0.9   | 0.92  | 0.97  | 1    |  |
| 3056163 | R0.3 × 1 × 4     |    |      | 7.4  |      | 13.34° | 1.12                                | 1.14  | 1.17  | 1.21  | 1.28  |      |  |
| 3056164 | R0.3 × 1.2 × 4   |    |      | 7.6  |      | 12.99° | 1.32                                | 1.36  | 1.4   | 1.44  | 1.53  |      |  |
| 3056165 | R0.3 × 1.5 × 4   |    |      | 7.9  |      | 12.5°  | 1.63                                | 1.68  | 1.73  | 1.78  | 1.9   |      |  |
| 3056166 | R0.3 × 2 × 4     |    |      | 8.4  |      | 11.76° | 2.15                                | 2.21  | 2.28  | 2.36  | 2.53  |      |  |
| 3056167 | R0.3 × 2 × 6     |    |      | 12.2 |      | 12.78° |                                     |       |       |       |       |      |  |
| 3056168 | R0.3 × 2.5 × 4   |    |      | 8.9  |      | 11.1°  | 2.67                                | 2.75  | 2.84  | 2.93  | 3.15  |      |  |
| 3056169 | R0.3 × 3 × 4     |    |      | 9.4  |      | 10.51° | 3.18                                | 3.28  | 3.39  | 3.51  | 3.77  |      |  |
| 3056170 | R0.3 × 3 × 6     |    |      | 13.2 |      | 11.83° |                                     |       |       |       |       |      |  |
| 3056171 | R0.3 × 3.5 × 4   |    |      | 9.9  |      | 9.98°  | 3.7                                 | 3.82  | 3.95  | 4.08  | 4.39  |      |  |
| 3056172 | R0.3 × 4 × 4     |    |      | 10.4 |      | 9.5°   | 4.22                                | 4.35  | 4.5   | 4.66  | 5.01  |      |  |
| 3056173 | R0.3 × 4 × 6     |    |      | 14.2 |      | 11°    |                                     |       |       |       |       |      |  |
| 3056174 | R0.3 × 4.5 × 4   |    |      | 10.9 |      | 9.06°  | 4.73                                | 4.89  | 5.05  | 5.23  | 5.63  |      |  |
| 3056175 | R0.3 × 5 × 4     |    |      | 11.4 |      | 8.67°  | 5.25                                | 5.42  | 5.61  | 5.81  | 6.26  |      |  |
| 3056176 | R0.3 × 5.5 × 4   |    |      | 11.9 |      | 8.3°   | 5.77                                | 5.96  | 6.16  | 6.38  | 6.88  |      |  |
| 3056177 | R0.3 × 6 × 4     |    |      | 12.4 |      | 7.96°  | 6.28                                | 6.49  | 6.72  | 6.96  | 7.5   |      |  |
| 3056178 | R0.3 × 6.5 × 4   |    |      | 12.9 |      | 7.65°  | 6.8                                 | 7.03  | 7.27  | 7.53  | 8.12  |      |  |
| 3056179 | R0.3 × 7 × 4     |    |      | 13.4 |      | 7.37°  | 7.32                                | 7.56  | 7.82  | 8.11  | 8.74  |      |  |
| 3056180 | R0.3 × 7.5 × 4   |    |      | 13.9 |      | 7.1°   | 7.83                                | 8.1   | 8.38  | 8.68  | 9.36  |      |  |
| 3056181 | R0.3 × 8 × 4     |    |      | 14.4 |      | 6.85°  | 8.35                                | 8.63  | 8.93  | 9.26  | 9.99  |      |  |
| 3056182 | R0.3 × 8.5 × 4   |    |      | 14.9 |      | 6.62°  | 8.87                                | 9.17  | 9.49  | 9.83  | 10.61 |      |  |
| 3056183 | R0.3 × 9 × 4     |    |      | 15.4 |      | 6.41°  | 9.38                                | 9.7   | 10.04 | 10.41 | 11.23 |      |  |
| 3056184 | R0.3 × 9.5 × 4   |    |      | 15.9 |      | 6.2°   | 9.9                                 | 10.24 | 10.6  | 10.98 | 11.85 |      |  |
| 3056185 | R0.3 × 10 × 4    |    |      | 16.4 |      | 6.01°  | 10.42                               | 10.77 | 11.15 | 11.56 | 12.47 |      |  |
| 3056186 | R0.3 × 11 × 4    | 50 |      | 17.4 |      | 5.67°  | 11.45                               | 11.84 | 12.26 | 12.71 | 13.71 |      |  |
| 3056187 | R0.3 × 12 × 4    |    |      | 18.4 |      | 5.36°  | 12.49                               | 12.91 | 13.37 | 13.86 | 14.96 |      |  |
| 3056188 | R0.4 × 1 × 4     | 45 | 0.6  | 7.1  | 0.75 | 13.41° | 1.11                                | 1.14  | 1.16  | 1.19  | 1.26  | 1    |  |
| 3056189 | R0.4 × 1.5 × 4   |    |      | 7.6  |      | 12.52° | 1.63                                | 1.67  | 1.72  | 1.77  | 1.88  |      |  |
| 3056190 | R0.4 × 2 × 4     |    |      | 8.1  |      | 11.74° | 2.15                                | 2.21  | 2.27  | 2.34  | 2.5   |      |  |
| 3056191 | R0.4 × 2 × 6     |    |      | 11.8 |      | 12.81° |                                     |       |       |       |       |      |  |
| 3056192 | R0.4 × 2.5 × 4   |    |      | 8.6  |      | 11.04° | 2.66                                | 2.74  | 2.83  | 2.92  | 3.12  |      |  |
| 3056193 | R0.4 × 3 × 4     |    |      | 9.1  |      | 10.42° | 3.18                                | 3.28  | 3.38  | 3.49  | 3.75  |      |  |
| 3056194 | R0.4 × 4 × 4     |    |      | 10.1 |      | 9.37°  | 4.21                                | 4.35  | 4.49  | 4.64  | 4.99  |      |  |
| 3056195 | R0.4 × 5 × 4     |    |      | 11.1 |      | 8.51°  | 5.25                                | 5.42  | 5.6   | 5.79  | 6.23  |      |  |
| 3056196 | R0.4 × 6 × 4     |    |      | 12.1 |      | 7.8°   | 6.28                                | 6.49  | 6.71  | 6.94  | 7.48  |      |  |
| 3056197 | R0.4 × 7 × 4     |    |      | 13.1 |      | 7.19°  | 7.31                                | 7.55  | 7.81  | 8.09  | 8.72  |      |  |
| 3056198 | R0.4 × 8 × 4     |    |      | 14.1 |      | 6.67°  | 8.35                                | 8.62  | 8.92  | 9.24  | 9.96  |      |  |
| 3056199 | R0.4 × 9 × 4     |    |      | 15.1 |      | 6.22°  | 9.38                                | 9.69  | 10.03 | 10.39 | 11.2  |      |  |
| 3056200 | R0.4 × 10 × 4    |    |      | 16.1 |      | 5.83°  | 10.41                               | 10.76 | 11.14 | 11.54 | 12.45 |      |  |
| 3056201 | R0.4 × 12 × 4    | 50 |      | 18.1 |      | 5.18°  | 12.48                               | 12.9  | 13.36 | 13.84 | 14.93 |      |  |



## 2 FLUTE LONG NECK FOR HIGH-PRECISION FINISHING

| EDP No. | RE × LU × DCON  | LF   | APMX   | LH    | DN    | θk     | Effective length by inclined angles |       |        |       |       | Type |       |
|---------|-----------------|------|--------|-------|-------|--------|-------------------------------------|-------|--------|-------|-------|------|-------|
|         |                 |      |        |       |       |        | 0.5°                                | 1°    | 1.5°   | 2°    | 3°    |      |       |
| 3056202 | R0.5 × 1.5 × 4  | 45   | 0.8    | 7.2   | 0.95  | 12.54° | 1.63                                | 1.66  | 1.71   | 1.75  | 1.86  | 1    |       |
| 3056203 | R0.5 × 2 × 4    |      |        | 7.7   |       | 11.71° | 2.14                                | 2.2   | 2.26   | 2.33  | 2.48  |      |       |
| 3056204 | R0.5 × 2 × 6    |      |        | 11.4  |       | 12.83° |                                     |       |        |       |       |      |       |
| 3056205 | R0.5 × 2.5 × 4  |      |        | 8.2   |       | 10.97° | 2.66                                | 2.73  | 2.82   | 2.9   | 3.1   |      |       |
| 3056206 | R0.5 × 3 × 4    |      |        | 8.7   |       | 10.33° | 3.18                                | 3.27  | 3.37   | 3.48  | 3.72  |      |       |
| 3056207 | R0.5 × 3 × 6    |      |        | 12.4  |       | 11.8°  |                                     |       |        |       |       |      |       |
| 3056208 | R0.5 × 4 × 4    |      |        | 9.7   |       | 9.23°  | 4.21                                | 4.34  | 4.48   | 4.63  | 4.97  |      |       |
| 3056209 | R0.5 × 4 × 6    |      |        | 13.4  |       | 10.91° |                                     |       |        |       |       |      |       |
| 3056210 | R0.5 × 5 × 4    |      |        | 10.7  |       | 8.35°  | 5.24                                | 5.41  | 5.59   | 5.78  | 6.21  |      |       |
| 3056211 | R0.5 × 5 × 6    |      |        | 14.4  |       | 10.15° |                                     |       |        |       |       |      |       |
| 3056212 | R0.5 × 6 × 4    |      |        | 11.7  |       | 7.62°  | 6.28                                | 6.48  | 6.69   | 6.93  | 7.45  |      |       |
| 3056213 | R0.5 × 6 × 6    |      |        | 15.4  |       | 9.49°  |                                     |       |        |       |       |      |       |
| 3056214 | R0.5 × 7 × 4    |      |        | 12.7  |       | 7°     | 7.31                                | 7.55  | 7.8    | 8.08  | 8.69  |      |       |
| 3056215 | R0.5 × 7 × 6    |      |        | 16.4  |       | 8.91°  |                                     |       |        |       |       |      |       |
| 3056216 | R0.5 × 8 × 4    |      |        | 13.7  |       | 6.48°  | 8.34                                | 8.62  | 8.91   | 9.23  | 9.94  |      |       |
| 3056217 | R0.5 × 8 × 6    |      |        | 17.4  |       | 8.39°  |                                     |       |        |       |       |      |       |
| 3056218 | R0.5 × 9 × 4    |      |        | 14.7  |       | 6.03°  | 9.38                                | 9.69  | 10.02  | 10.38 | 11.18 |      |       |
| 3056219 | R0.5 × 10 × 4   |      |        | 15.7  |       | 5.64°  | 10.41                               | 10.76 | 11.13  | 11.53 | 12.42 |      |       |
| 3056220 | R0.5 × 10 × 6   |      |        | 50    |       | 19.4   |                                     |       |        |       |       |      | 7.52° |
| 3056221 | R0.5 × 12 × 4   |      |        | 45    |       | 17.7   | 4.99°                               | 12.48 | 12.9   | 13.34 | 13.83 |      | 14.91 |
| 3056222 | R0.5 × 13 × 4   |      |        | 50    |       | 18.7   | 4.71°                               | 13.51 | 13.97  | 14.45 | 14.98 |      | 16.15 |
| 3056223 | R0.5 × 14 × 4   |      |        |       |       | 19.7   | 4.47°                               | 14.55 | 15.04  | 15.56 | 16.13 |      | 17.4  |
| 3056224 | R0.5 × 16 × 4   |      |        | 55    |       | 21.7   | 4.05°                               | 16.61 | 17.18  | 17.78 | 18.43 |      | 19.88 |
| 3056225 | R0.5 × 18 × 4   |      |        |       |       | 23.7   | 3.7°                                | 18.68 | 19.31  | 19.99 | 20.73 |      | 22.37 |
| 3056226 | R0.5 × 20 × 4   |      |        | 60    |       | 25.7   | 3.41°                               | 20.75 | 21.45  | 22.21 | 23.03 |      | 24.86 |
| 3056227 | R0.5 × 22 × 4   |      |        |       |       | 27.7   | 3.16°                               | 22.82 | 23.59  | 24.43 | 25.33 |      | 27.34 |
| 3056228 | R0.5 × 22 × 6   |      |        | 31.4  |       | 4.62°  |                                     |       |        |       |       |      |       |
| 3056229 | R0.6 × 2 × 4    |      |        | 45    |       | 1      | 7.3                                 | 1.15  | 11.67° | 2.14  | 2.19  |      | 2.25  |
| 3056230 | R0.6 × 2 × 6    | 11.1 | 12.86° |       |       |        |                                     |       |        |       |       |      |       |
| 3056231 | R0.6 × 2.4 × 4  | 7.7  | 11.04° |       | 2.55  |        | 2.62                                |       | 2.69   | 2.77  | 2.95  |      |       |
| 3056232 | R0.6 × 2.5 × 4  | 7.8  | 10.9°  |       | 2.66  |        | 2.73                                |       | 2.81   | 2.89  | 3.08  |      |       |
| 3056233 | R0.6 × 3 × 4    | 8.3  | 10.22° |       | 3.17  |        | 3.26                                |       | 3.36   | 3.46  | 3.7   |      |       |
| 3056234 | R0.6 × 4 × 4    | 9.3  | 9.08°  |       | 4.21  |        | 4.33                                |       | 4.47   | 4.61  | 4.94  |      |       |
| 3056235 | R0.6 × 4 × 6    | 13.1 | 10.87° |       |       |        |                                     |       |        |       |       |      |       |
| 3056236 | R0.6 × 6 × 4    | 11.3 | 7.42°  |       | 6.27  |        | 6.47                                |       | 6.68   | 6.91  | 7.43  |      |       |
| 3056237 | R0.6 × 8 × 4    | 13.3 | 6.27°  |       | 8.34  |        | 8.61                                |       | 8.9    | 9.21  | 9.91  |      |       |
| 3056238 | R0.6 × 10 × 4   | 15.3 | 5.43°  |       | 10.41 |        | 10.75                               |       | 11.12  | 11.51 | 12.4  |      |       |
| 3056239 | R0.6 × 12 × 4   | 17.3 | 4.78°  |       | 12.48 |        | 12.89                               |       | 13.33  | 13.81 | 14.89 |      |       |
| 3056240 | R0.6 × 14 × 4   | 50   | 19.3   | 4.28° | 14.54 | 15.03  | 15.55                               | 16.11 | 17.37  |       |       |      |       |
| 3056241 | R0.6 × 16 × 4   |      | 21.3   | 3.87° | 16.61 | 17.17  | 17.77                               | 18.41 | 19.86  |       |       |      |       |
| 3056242 | R0.6 × 18 × 4   | 55   | 23.3   | 3.53° | 18.68 | 19.31  | 19.98                               | 20.71 | 22.35  |       |       |      |       |
| 3056243 | R0.6 × 20 × 4   |      | 25.3   | 3.24° | 20.74 | 21.45  | 22.2                                | 23.01 | 24.83  |       |       |      |       |
| 3056244 | R0.75 × 2 × 4   | 45   | 1.2    | 6.8   | 1.45  | 11.61° | 2.13                                | 2.18  | 2.23   | 2.29  | 2.42  | 1    |       |
| 3056245 | R0.75 × 2.5 × 4 |      |        | 7.3   |       | 10.76° | 2.65                                | 2.72  | 2.79   | 2.87  | 3.04  |      |       |
| 3056246 | R0.75 × 3 × 4   |      |        | 7.8   |       | 10.03° | 3.17                                | 3.25  | 3.34   | 3.44  | 3.66  |      |       |
| 3056247 | R0.75 × 3 × 6   |      |        | 11.5  |       | 11.75° |                                     |       |        |       |       |      |       |
| 3056248 | R0.75 × 4 × 4   |      |        | 8.8   |       | 8.81°  | 4.2                                 | 4.32  | 4.45   | 4.59  | 4.91  |      |       |
| 3056249 | R0.75 × 5 × 4   |      |        | 9.8   |       | 7.86°  | 5.23                                | 5.39  | 5.56   | 5.74  | 6.15  |      |       |
| 3056250 | R0.75 × 5 × 6   |      |        | 13.5  |       | 9.97°  |                                     |       |        |       |       |      |       |
| 3056251 | R0.75 × 6 × 4   |      |        | 10.8  |       | 7.09°  | 6.27                                | 6.46  | 6.67   | 6.89  | 7.39  |      |       |
| 3056252 | R0.75 × 6 × 6   |      |        | 14.5  |       | 9.26°  |                                     |       |        |       |       |      |       |
| 3056253 | R0.75 × 8 × 4   |      |        | 12.8  |       | 5.93°  | 8.34                                | 8.6   | 8.88   | 9.19  | 9.88  |      |       |
| 3056254 | R0.75 × 8 × 6   |      |        | 16.5  |       | 8.11°  |                                     |       |        |       |       |      |       |
| 3056255 | R0.75 × 10 × 4  |      |        | 14.8  |       | 5.09°  | 10.4                                | 10.74 | 11.1   | 11.49 | 12.36 |      |       |
| 3056256 | R0.75 × 12 × 4  |      |        | 16.8  |       | 4.46°  | 12.47                               | 12.88 | 13.32  | 13.79 | 14.85 |      |       |



## 2 FLUTE LONG NECK FOR HIGH-PRECISION FINISHING

| EDP No. | RE × LU × DCON | LF   | APMX | LH    | DN   | θk     | Effective length by inclined angles |       |       |       |       | Type |      |
|---------|----------------|------|------|-------|------|--------|-------------------------------------|-------|-------|-------|-------|------|------|
|         |                |      |      |       |      |        | 0.5°                                | 1°    | 1.5°  | 2°    | 3°    |      |      |
| 3056257 | R0.75 × 14 × 4 | 50   | 1.2  | 18.8  | 1.45 | 3.97°  | 14.54                               | 15.02 | 15.53 | 16.09 | 17.34 | 1    |      |
| 3056258 | R0.75 × 16 × 4 |      |      | 20.8  |      | 3.58°  | 16.6                                | 17.16 | 17.75 | 18.39 | 19.82 |      |      |
| 3056259 | R0.75 × 18 × 4 | 55   |      | 22.8  |      | 3.25°  | 18.67                               | 19.3  | 19.97 | 20.69 | 22.31 |      |      |
| 3056260 | R0.75 × 20 × 4 |      |      | 24.8  |      | 2.98°  | 20.74                               | 21.44 | 22.18 | 22.99 | —     |      |      |
| 3056261 | R0.75 × 22 × 4 | 60   |      | 26.8  |      | 2.75°  | 22.81                               | 23.58 | 24.4  | 25.29 |       |      |      |
| 3056262 | R0.75 × 25 × 4 | 65   |      | 29.8  |      | 2.47°  | 25.91                               | 26.79 | 27.73 | 28.74 |       |      |      |
| 3056263 | R0.75 × 30 × 4 | 70   |      | 34.8  |      | 2.11°  | 31.08                               | 32.13 | 33.27 | 34.49 |       |      |      |
| 3056264 | R0.8 × 4 × 4   | 45   | 1.3  | 8.6   | 1.55 | 8.72°  | 4.2                                 | 4.32  | 4.45  | 4.58  | 4.89  | 1    |      |
| 3056265 | R0.8 × 8 × 4   |      |      | 12.6  |      | 5.81°  | 8.33                                | 8.6   | 8.88  | 9.18  | 9.87  |      |      |
| 3056266 | R0.8 × 12 × 4  | 16.6 |      | 4.35° |      | 12.47  | 12.88                               | 13.31 | 13.78 | 14.84 |       |      |      |
| 3056267 | R0.8 × 16 × 4  | 50   |      | 20.6  |      | 3.47°  | 16.6                                | 17.15 | 17.75 | 18.38 | 19.81 |      |      |
| 3056268 | R0.8 × 20 × 4  | 55   |      | 24.6  |      | 2.89°  | 20.74                               | 21.43 | 22.18 | 22.98 | —     |      |      |
| 3056269 | R1 × 2.5 × 4   | 45   | 1.6  | 6.3   | 1.95 | 10.46° | 2.64                                | 2.7   | 2.76  | 2.83  | 2.98  | 1    |      |
| 3056270 | R1 × 3 × 4     |      |      | 6.8   |      | 9.61°  | 3.16                                | 3.23  | 3.32  | 3.4   | 3.6   |      |      |
| 3056271 | R1 × 3 × 6     |      |      | 10.6  |      | 11.7°  |                                     |       |       |       |       |      |      |
| 3056272 | R1 × 4 × 4     |      |      | 7.8   |      | 8.25°  | 4.19                                | 4.3   | 4.42  | 4.55  | 4.85  |      |      |
| 3056273 | R1 × 4 × 6     |      |      | 11.6  |      | 10.64° |                                     |       |       |       |       |      |      |
| 3056274 | R1 × 5 × 4     |      |      | 8.8   |      | 7.23°  | 5.23                                | 5.37  | 5.53  | 5.7   | 6.09  |      |      |
| 3056275 | R1 × 6 × 4     |      |      | 9.8   |      | 6.43°  |                                     |       |       |       |       |      |      |
| 3056276 | R1 × 6 × 6     |      |      | 13.6  |      | 9°     | 6.26                                | 6.44  | 6.64  | 6.85  | 7.33  |      |      |
| 3056277 | R1 × 8 × 4     |      |      | 11.8  |      | 5.26°  |                                     |       |       |       |       |      | 8.33 |
| 3056278 | R1 × 8 × 6     |      |      | 15.6  |      | 7.79°  |                                     |       |       |       |       |      |      |
| 3056279 | R1 × 10 × 4    |      |      | 13.8  |      | 4.45°  | 10.39                               | 10.72 | 11.07 | 11.45 | 12.31 |      |      |
| 3056280 | R1 × 10 × 6    | 50   |      | 17.6  |      | 6.87°  |                                     |       |       |       |       |      |      |
| 3056281 | R1 × 12 × 4    | 45   |      | 15.8  |      | 3.86°  | 12.46                               | 12.86 | 13.29 | 13.75 | 14.79 |      |      |
| 3056282 | R1 × 12 × 6    | 50   |      | 19.6  |      | 6.14°  |                                     |       |       |       |       |      |      |
| 3056283 | R1 × 13 × 4    |      |      | 16.8  |      | 3.61°  | 13.5                                | 13.93 | 14.4  | 14.9  | 16.04 |      |      |
| 3056284 | R1 × 14 × 4    |      |      | 17.8  |      | 3.4°   | 14.53                               | 15    | 15.51 | 16.05 | 17.28 |      |      |
| 3056285 | R1 × 16 × 4    | 55   |      | 19.8  |      | 3.04°  | 16.6                                | 17.14 | 17.72 | 18.35 | 19.76 |      |      |
| 3056286 | R1 × 16 × 6    |      |      | 23.6  |      | 5.06°  |                                     |       |       |       |       |      |      |
| 3056287 | R1 × 18 × 4    |      |      | 60    |      | 21.8   | 2.75°                               | 18.66 | 19.28 | 19.94 | 20.65 |      | —    |
| 3056288 | R1 × 20 × 4    | 23.8 |      |       |      | 2.51°  | 20.73                               | 21.42 | 22.16 | 22.95 |       |      |      |
| 3056289 | R1 × 20 × 6    | 27.6 |      |       |      | 4.31°  |                                     |       |       |       | 24.74 |      |      |
| 3056290 | R1 × 22 × 4    | 65   |      | 25.8  |      | 2.31°  | 22.8                                | 23.56 | 24.37 | 25.25 | —     |      |      |
| 3056291 | R1 × 25 × 4    |      |      | 28.8  |      | 2.06°  | 25.9                                | 26.77 | 27.7  | 28.7  |       |      |      |
| 3056292 | R1 × 25 × 6    |      |      | 32.6  |      | 3.63°  |                                     |       |       |       | 30.95 |      |      |
| 3056293 | R1 × 30 × 4    | 70   |      | 33.8  |      | 1.75°  | 31.07                               | 32.12 | 33.24 | —     | —     |      |      |
| 3056294 | R1 × 35 × 4    |      |      | 38.8  |      | 1.52°  | 36.24                               | 37.46 | 38.78 |       |       |      |      |
| 3056295 | R1 × 40 × 4    |      |      | 80    |      | 43.8   | 1.34°                               | 41.4  | 42.81 |       |       |      | —    |
| 3056296 | R1.25 × 6 × 4  | 45   | 2    | 9.1   | 2.35 | 5.44°  | 6.44                                | 6.63  | 6.82  | 7.03  | 7.51  | 1    |      |
| 3056297 | R1.25 × 8 × 4  |      |      | 11.1  |      | 4.35°  | 8.51                                | 8.77  | 9.04  | 9.33  | 9.99  |      |      |
| 3056298 | R1.25 × 10 × 4 |      |      | 13.1  |      | 3.62°  | 10.58                               | 10.9  | 11.25 | 11.63 | 12.48 |      |      |
| 3056299 | R1.25 × 15 × 4 | 50   |      | 18.1  |      | 2.55°  | 15.75                               | 16.25 | 16.8  | 17.38 | —     |      | —    |
| 3056300 | R1.25 × 20 × 4 | 55   |      | 23.1  |      | 1.97°  | 20.92                               | 21.6  | 22.34 |       |       |      |      |
| 3056301 | R1.25 × 25 × 4 | 65   |      | 28.1  |      | 1.61°  | 26.08                               | 26.95 | 27.88 |       |       |      |      |
| 3056302 | R1.25 × 30 × 4 | 70   |      | 33.1  |      | 1.35°  | 31.25                               | 32.3  | —     | —     | —     |      |      |
| 3056303 | R1.25 × 35 × 4 |      |      | 38.1  |      | 1.17°  | 36.42                               | 37.65 |       |       |       |      |      |
| 3056304 | R1.5 × 6 × 6   | 50   | 2.4  | 11.9  | 2.85 | 8.15°  | 6.44                                | 6.61  | 6.79  | 7     | 7.45  | 1    |      |
| 3056305 | R1.5 × 8 × 6   |      |      | 13.9  |      | 6.87°  | 8.5                                 | 8.75  | 9.01  | 9.29  | 9.93  |      |      |
| 3056306 | R1.5 × 10 × 6  |      |      | 15.9  |      | 5.93°  | 10.57                               | 10.89 | 11.23 | 11.59 | 12.42 |      |      |
| 3056307 | R1.5 × 12 × 6  | 55   |      | 17.9  |      | 5.22°  | 12.64                               | 13.03 | 13.44 | 13.89 | 14.91 |      |      |
| 3056308 | R1.5 × 13 × 6  |      |      | 18.9  |      | 4.92°  | 13.67                               | 14.1  | 14.55 | 15.04 | 16.15 |      |      |
| 3056309 | R1.5 × 14 × 6  |      |      | 19.9  |      | 4.66°  | 14.71                               | 15.17 | 15.66 | 16.19 | 17.39 |      |      |
| 3056310 | R1.5 × 15 × 6  |      |      | 20.9  |      | 4.42°  | 15.74                               | 16.24 | 16.77 | 17.34 | 18.63 |      |      |

# 2 FLUTE LONG NECK FOR HIGH-PRECISION FINISHING

| EDP No. | RE × LU × DCON | LF   | APMX | LH    | DN   | θk    | Effective length by inclined angles |       |       |       |       | Type |   |
|---------|----------------|------|------|-------|------|-------|-------------------------------------|-------|-------|-------|-------|------|---|
|         |                |      |      |       |      |       | 0.5°                                | 1°    | 1.5°  | 2°    | 3°    |      |   |
| 3056311 | R1.5 × 16 × 6  |      | 2.4  | 21.9  | 2.85 | 4.2°  | 16.77                               | 17.31 | 17.88 | 18.49 | 19.88 | 1    |   |
| 3056312 | R1.5 × 20 × 6  | 60   |      | 25.9  |      | 3.52° | 20.91                               | 21.58 | 22.31 | 23.09 | 24.85 |      |   |
| 3056313 | R1.5 × 25 × 6  | 65   |      | 30.9  |      | 2.92° | 26.08                               | 26.93 | 27.85 | 28.84 | —     |      |   |
| 3056314 | R1.5 × 30 × 6  | 70   |      | 35.9  |      | 2.5°  | 31.24                               | 32.28 | 33.39 | 34.59 |       |      |   |
| 3056315 | R1.5 × 35 × 6  | 80   |      | 40.9  |      | 2.18° | 36.41                               | 37.63 | 38.94 | 40.34 |       |      |   |
| 3056316 | R1.5 × 40 × 6  | 90   |      | 45.9  |      | 1.94° | 41.58                               | 42.98 | 44.48 | —     |       |      |   |
| 3056317 | R1.75 × 10 × 6 | 50   | 2.8  | 14.9  | 3.35 | 5.38° | 10.56                               | 10.87 | 11.2  | 11.56 | 12.36 | 1    |   |
| 3056318 | R1.75 × 15 × 6 | 55   |      | 19.9  |      | 3.92° | 15.73                               | 16.22 | 16.74 | 17.31 | 18.58 |      |   |
| 3056319 | R1.75 × 16 × 6 |      |      | 20.9  |      | 3.72° | 16.76                               | 17.29 | 17.85 | 18.46 | 19.82 |      |   |
| 3056320 | R1.75 × 20 × 6 | 60   |      | 24.9  |      | 3.08° | 20.9                                | 21.57 | 22.28 | 23.06 | 24.79 |      |   |
| 3056321 | R1.75 × 25 × 6 | 65   |      | 29.9  |      | 2.54° | 26.07                               | 26.92 | 27.83 | 28.81 | —     |      |   |
| 3056322 | R1.75 × 30 × 6 | 70   |      | 34.9  |      | 2.16° | 31.24                               | 32.26 | 33.37 | 34.55 |       |      |   |
| 3056323 | R1.75 × 35 × 6 | 80   |      | 39.9  |      | 1.88° | 36.4                                | 37.61 | 38.91 | —     |       |      |   |
| 3056324 | R1.75 × 40 × 6 | 90   |      | 44.9  |      | 1.66° | 41.57                               | 42.96 | 44.45 |       |       |      |   |
| 3056325 | R1.75 × 45 × 6 |      |      | 49.9  |      | 1.49° | 46.74                               | 48.31 | —     |       |       |      |   |
| 3056326 | R2 × 8 × 4     | 55   | 3.2  | —     | 3.85 | —     | —                                   | —     | —     | —     | —     | 2    |   |
| 3056327 | R2 × 8 × 6     | 60   |      | 12    |      | 5.65° | 8.49                                | 8.71  | 8.96  | 9.22  | 9.81  | 1    |   |
| 3056328 | R2 × 10 × 6    |      |      | 14    |      | 4.73° | 10.55                               | 10.85 | 11.17 | 11.52 | 12.3  |      |   |
| 3056329 | R2 × 12 × 6    |      |      | 16    |      | 4.07° | 12.62                               | 12.99 | 13.39 | 13.82 | 14.79 |      |   |
| 3056330 | R2 × 13 × 6    |      |      | 17    |      | 3.8°  | 13.65                               | 14.06 | 14.5  | 14.97 | 16.03 |      |   |
| 3056331 | R2 × 14 × 6    |      |      | 18    |      | 3.56° | 14.69                               | 15.13 | 15.61 | 16.12 | 17.27 |      |   |
| 3056332 | R2 × 15 × 6    |      |      | 19    |      | 3.36° | 15.72                               | 16.2  | 16.72 | 17.27 | 18.52 |      |   |
| 3056333 | R2 × 16 × 6    |      |      | 20    |      | 3.17° | 16.76                               | 17.27 | 17.82 | 18.42 | 19.76 |      |   |
| 3056334 | R2 × 20 × 6    |      |      | 65    |      | 24    | 2.6°                                | 20.89 | 21.55 | 22.26 | 23.02 |      | — |
| 3056335 | R2 × 25 × 6    | 70   |      | 29    |      | 2.12° | 26.06                               | 26.9  | 27.8  | 28.77 |       |      |   |
| 3056336 | R2 × 30 × 6    | 80   |      | 34    |      | 1.79° | 31.23                               | 32.25 | 33.34 | —     |       |      |   |
| 3056337 | R2 × 35 × 6    |      |      | 39    |      | 1.55° | 36.4                                | 37.6  | 38.88 |       |       |      |   |
| 3056338 | R2 × 40 × 6    | 90   |      | 44    |      | 1.37° | 41.56                               | 42.94 | —     |       |       |      |   |
| 3056339 | R2 × 45 × 6    |      |      | 49    |      | 1.22° | 46.73                               | 48.29 |       |       | —     |      |   |
| 3056340 | R2 × 50 × 6    |      |      | 100   |      | 54    | 1.11°                               | 51.9  |       |       | 53.64 |      |   |
| 3056341 | R2.5 × 10 × 6  | 60   | 4    | 12.1  | 4.85 | 2.95° | 10.54                               | 10.82 | 11.12 | 11.45 | 1     |      |   |
| 3056342 | R2.5 × 15 × 6  | 70   |      | 17.1  |      | 1.95° | 15.71                               | 16.17 | 16.66 | —     |       | —    | — |
| 3056343 | R2.5 × 20 × 6  |      |      | 22.1  |      | 1.46° | 20.87                               | 21.52 |       |       |       |      |   |
| 3056344 | R2.5 × 25 × 6  | 27.1 |      | 1.17° |      | 26.04 | 26.86                               | —     | —     | —     |       | —    |   |
| 3056345 | R2.5 × 30 × 6  | 80   |      | 32.1  |      | 0.97° | 31.21                               |       |       |       |       |      |   |
| 3056346 | R2.5 × 35 × 6  | 37.1 |      | 0.83° |      | 36.38 |                                     |       |       |       |       |      |   |
| 3056347 | R2.5 × 40 × 6  | 90   |      | 42.1  |      | 0.73° | 41.55                               | —     | —     | —     |       | —    |   |
| 3056348 | R2.5 × 45 × 6  | 100  |      | 47.1  |      | 0.65° | 46.72                               |       |       |       |       |      |   |
| 3056349 | R2.5 × 50 × 6  |      |      | 52.1  |      | 0.58° | 51.88                               |       |       |       |       |      |   |
| 3056350 | R3 × 10 × 6    | 60   | 4.8  | —     | 5.85 | —     | —                                   | —     | —     | —     | 2     |      |   |
| 3056351 | R3 × 12 × 6    | —    |      |       |      |       |                                     |       |       |       |       |      |   |
| 3056352 | R3 × 15 × 6    | 65   |      | —     |      |       |                                     |       |       |       |       |      |   |
| 3056353 | R3 × 20 × 6    | 70   |      | —     |      |       |                                     |       |       |       |       |      |   |
| 3056354 | R3 × 25 × 6    |      |      | —     |      |       |                                     |       |       |       |       |      |   |
| 3056355 | R3 × 30 × 6    | 80   |      | —     |      |       |                                     |       |       |       |       |      |   |
| 3056356 | R3 × 35 × 6    | —    |      |       |      |       |                                     |       |       |       |       |      |   |
| 3056357 | R3 × 40 × 6    | 90   |      | —     |      |       |                                     |       |       |       |       |      |   |
| 3056358 | R3 × 45 × 6    | 100  |      | —     |      |       |                                     |       |       |       |       |      |   |
| 3056359 | R3 × 50 × 6    | 120  |      | —     |      |       |                                     |       |       |       |       |      |   |
| 3056360 | R3 × 60 × 6    |      |      | —     |      |       |                                     |       |       |       |       |      |   |

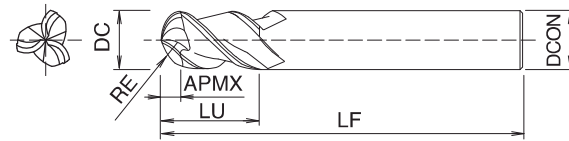
| Work Material | Carbon Steel      | Alloy Steel | Prehardened Steel |         |         |         |         | Stainless Steel | Cast Iron         | Copper Alloy | Aluminum Alloy | Graphite | Titanium Alloy | Heat Resistant Alloy | Cobalt Chromium Based Alloy (Stellite) |
|---------------|-------------------|-------------|-------------------|---------|---------|---------|---------|-----------------|-------------------|--------------|----------------|----------|----------------|----------------------|----------------------------------------|
|               | Prehardened Steel | Tool Steel  | Hardened Steel    |         |         |         |         |                 | Ductile Cast Iron |              |                |          |                |                      |                                        |
| Abbreviation  | ~ 40HRC           |             | ~ 45HRC           | ~ 55HRC | ~ 60HRC | ~ 65HRC | ~ 35HRC | ~ 350HB         |                   |              |                |          |                |                      |                                        |
| AM-EBT        | ○                 |             | ⊗                 | ⊗       | ⊗       | ⊗       |         |                 |                   |              |                |          |                |                      |                                        |



# END MILLS FOR ADDITIVE MANUFACTURING

## AM-EBT

|         |         |            |           |     |                  |
|---------|---------|------------|-----------|-----|------------------|
| CARBIDE | DUROREY | $\pm 0.01$ | SHANK FIT | 30° | SPEED FEED P.132 |
|---------|---------|------------|-----------|-----|------------------|

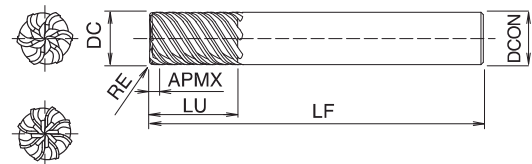


Unit:mm

| EDP No. | RE × DC  | LF  | APMX | LU | DCON | ZEFP |
|---------|----------|-----|------|----|------|------|
| 3188060 | R3 × 6   | 60  | 3    | 9  | 6    | 3    |
| 3188080 | R4 × 8   | 70  | 4    | 12 | 8    | 3    |
| 3188100 | R5 × 10  | 80  | 5    | 15 | 10   | 3    |
| 3188120 | R6 × 12  | 90  | 6    | 18 | 12   | 3    |
| 3188160 | R8 × 16  | 105 | 8    | 24 | 16   | 3    |
| 3188200 | R10 × 20 | 110 | 10   | 30 | 20   | 3    |

## AM-CRE

|         |         |            |            |           |     |
|---------|---------|------------|------------|-----------|-----|
| CARBIDE | DUROREY | $\pm 0.03$ | $\pm 0.01$ | SHANK FIT | 60° |
|---------|---------|------------|------------|-----------|-----|



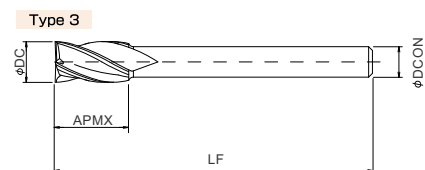
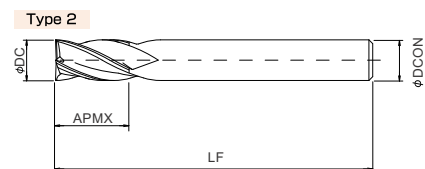
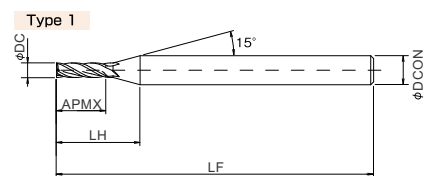
Unit:mm

| EDP No. | DC × RE  | LF  | APMX | LU | DCON | ZEFP |
|---------|----------|-----|------|----|------|------|
| 3183015 | 6 × R1.5 | 60  | 1.5  | 9  | 6    | 6    |
| 3183020 | 8 × R2   | 70  | 2    | 12 | 8    | 6    |
| 3183120 | 10 × R2  | 80  | 2    | 15 | 10   | 6    |
| 3183220 | 12 × R2  | 90  | 2    | 18 | 12   | 8    |
| 3183230 | 16 × R3  | 105 | 3    | 24 | 16   | 8    |
| 3183330 | 20 × R3  | 110 | 3    | 30 | 20   | 8    |

| Work Material | Carbon Steel      | Alloy Steel | Prehardened Steel |        |        |        | Stainless Steel | Cast Iron | Copper Alloy | Aluminum Alloy | Graphite | Titanium Alloy | Heat Resistant Alloy | Cobalt Chromium Based Alloy (Stellite) |
|---------------|-------------------|-------------|-------------------|--------|--------|--------|-----------------|-----------|--------------|----------------|----------|----------------|----------------------|----------------------------------------|
|               | Prehardened Steel | Tool Steel  | Hardened Steel    | ~45HRC | ~55HRC | ~60HRC | ~65HRC          | ~35HRC    | ~350HB       |                |          |                |                      |                                        |
| Abbreviation  | ~40HRC            |             |                   |        |        |        |                 |           |              |                |          |                |                      |                                        |
| AM-EBT        | ⊙                 |             | ⊙                 | ⊙      | ⊙      | ⊙      | ⊙               | ⊙         |              |                |          | ⊙              | ⊙                    | ⊙                                      |
| AM-CRE        |                   |             | ⊙                 | ⊙      | ⊙      | ⊙      | ⊙               | ⊙         |              |                |          | ⊙              | ⊙                    | ⊙                                      |

# WXL COATED 4 FLUTES ENDMILL

## WXL-EMS



| EDP No. | DC  | LF | APMX | LH   | DCON | Type |
|---------|-----|----|------|------|------|------|
| 3130510 | 1   | 40 | 2.5  | 7.9  | 4    | 1    |
| 3130515 | 1.5 |    | 4    | 8.5  |      |      |
| 3130520 | 2   |    | 6    | 10.1 |      |      |
| 3130525 | 2.5 |    | 8    | 11.4 |      |      |
| 3130530 | 3   | 45 | 10   | 15   | 6    |      |
| 3130535 | 3.5 |    | 11   | 16   |      |      |
| 3130540 | 4   |    | 11   | 16.1 |      |      |
| 3130545 | 4.5 |    | 11   | 15.1 |      |      |
| 3130550 | 5   | 50 | 13   | 16.2 |      |      |
| 3130555 | 5.5 |    | 13   | 16.3 |      |      |
| 3130560 | 6   |    | -    |      |      |      |
| 3130565 | 6.5 | 60 | 16   | 21.1 | 8    | 2    |
| 3130570 | 7   |    | 16   | 19.2 |      | 1    |
| 3130575 | 7.5 |    | 16   | 19.3 |      |      |
| 3130580 | 8   |    |      | -    |      |      |
| 3130585 | 8.5 | 70 | 19   | 24.1 | 10   | 1    |
| 3130590 | 9   |    | 19   | 22.2 |      |      |
| 3130595 | 9.5 |    | 19   | 22.3 |      |      |
| 3130600 | 10  |    |      | -    |      |      |

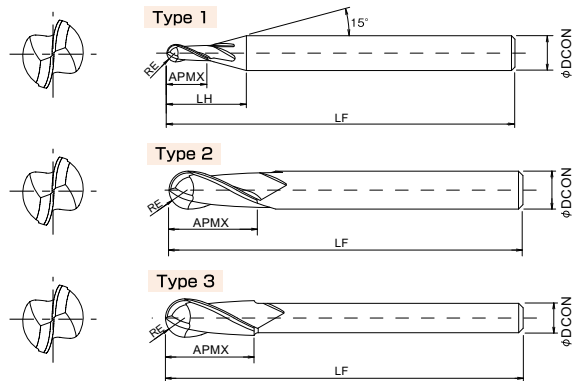
| EDP No. | DC   | LF  | APMX | LH   | DCON | Type |
|---------|------|-----|------|------|------|------|
| 3130605 | 10.5 | 75  | 22   | 27.1 | 12   | 1    |
| 3130610 | 11   |     |      | 26.2 |      |      |
| 3130615 | 11.5 |     |      | 25.3 |      |      |
| 3130620 | 12   |     |      | -    |      |      |
| 3130625 | 12.5 | 85  | 26   | -    | 16   | 2    |
| 3130630 | 13   |     |      | -    |      |      |
| 3130640 | 14   |     |      | -    |      |      |
| 3130650 | 15   |     |      | 30.1 |      |      |
| 3130660 | 16   | 100 | 32   | -    | 20   | 3    |
| 3130670 | 17   |     |      | -    |      |      |
| 3130680 | 18   |     |      | -    |      |      |
| 3130690 | 19   |     |      | 37.4 |      |      |
| 3130700 | 20   | 105 | 38   | -    | 25   | 1    |
| 3130710 | 21   |     |      | -    |      |      |
| 3130720 | 22   |     |      | -    |      |      |
| 3130730 | 23   |     |      | 52.3 |      |      |
| 3130740 | 24   | 120 | 45   | 50.4 | 32   | 2    |
| 3130750 | 25   |     |      | -    |      |      |
| 3130760 | 26   |     |      | -    |      |      |
| 3130800 | 30   | 125 | -    | 50.8 | -    | 1    |

| Work Material | Carbon Steel      | Alloy Steel | Prehardened Steel |         |         |         | Stainless Steel | Cast Iron         | Copper Alloy | Aluminum Alloy | Graphite | Titanium Alloy | Heat Resistant Alloy | Plastic |
|---------------|-------------------|-------------|-------------------|---------|---------|---------|-----------------|-------------------|--------------|----------------|----------|----------------|----------------------|---------|
|               | Prehardened Steel | Tool Steel  | Hardened Steel    |         |         |         |                 | Ductile Cast Iron |              |                |          |                |                      |         |
| Abbreviation  | ~ 40HRC           |             | ~ 45HRC           | ~ 55HRC | ~ 60HRC | ~ 65HRC | ~ 35HRC         | ~ 350HB           |              |                |          |                |                      |         |
| WXL-EMS       | ○                 | ○           | ○                 |         |         |         | ○               | ○                 | ○            | ○              |          | ○              | ○                    |         |



# WXL COATED 2 FLUTES BALL NOSE ENDMILL

## WXL-EBD



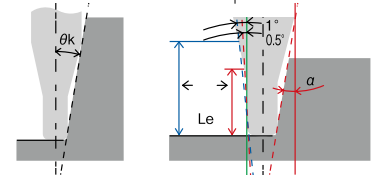
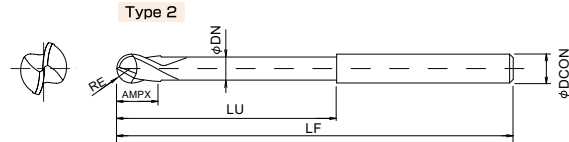
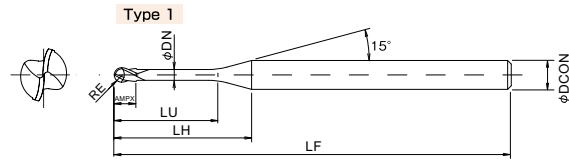
| EDP No. | RE X APMX X DCON | LF   | APMX | LH   | DCON | Type |
|---------|------------------|------|------|------|------|------|
| 3105010 | R0.05 × 0.2 × 4  | 40   | 0.2  | 6.5  | 4    | 1    |
| 3105020 | R0.1 × 0.4 × 4   |      | 0.4  |      |      |      |
| 3105030 | R0.15 × 0.6 × 4  | 50   | 0.6  | 6.7  | 6    |      |
| 3106030 | R0.15 × 0.6 × 6  |      |      | 10.4 |      |      |
| 3105040 | R0.2 × 0.8 × 4   | 40   | 0.8  | 7.2  | 4    |      |
| 3106040 | R0.2 × 0.8 × 6   | 50   |      | 10.7 | 6    |      |
| 3105050 | R0.25 × 1.1 × 4  | 40   | 1.1  | 7.1  | 4    |      |
| 3106050 | R0.25 × 1.1 × 6  | 50   |      | 10.8 | 6    |      |
| 3105060 | R0.3 × 1.1 × 4   | 40   |      | 6.9  | 4    |      |
| 3106060 | R0.3 × 1.1 × 6   | 50   |      | 10.6 | 6    |      |
| 3106710 | R0.35 × 1.5 × 4  | 40   | 1.5  | 8.2  | 4    |      |
| 3105080 | R0.4 × 2 × 4     |      | 2    | 7.4  |      |      |
| 3106080 | R0.4 × 2 × 6     | 50   |      | 11.1 | 6    |      |
| 3106720 | R0.45 × 2.2 × 4  |      | 2.2  | 8.5  | 4    |      |
| 3105100 | R0.5 × 1.5 × 4   |      | 1.5  | 6.7  |      |      |
| 3105101 | R0.5 × 2.5 × 4   |      | 2.5  | 7.7  | 6    |      |
| 3106100 | R0.5 × 2.5 × 6   | 11.5 |      |      |      |      |
| 3106730 | R0.55 × 2.7 × 4  | 60   | 2.7  | 8.9  | 4    |      |
| 3105120 | R0.6 × 3 × 4     |      | 3    | 7.9  |      |      |
| 3106740 | R0.65 × 3.2 × 4  | 3.2  | 9.1  |      |      |      |
| 3105140 | R0.7 × 3.5 × 4   | 3.5  | 8.1  |      |      |      |
| 3105150 | R0.75 × 2 × 4    | 2    | 6.4  |      |      |      |
| 3105151 | R0.75 × 4 × 4    | 4    | 8.4  | 6    |      |      |
| 3106150 | R0.75 × 4 × 6    |      | 12.1 |      |      |      |
| 3105160 | R0.8 × 4 × 4     | 50   | 8.2  | 4    |      |      |
| 3106750 | R0.85 × 4.2 × 4  |      | 4.2  |      | 9.3  |      |
| 3106760 | R0.9 × 4.5 × 4   |      | 4.5  |      | 9.4  |      |
| 3106770 | R0.95 × 4.7 × 4  |      | 4.7  |      |      |      |
| 3105200 | R1 × 3 × 4       | 60   | 3    | 7.1  | 6    |      |
| 3106200 | R1 × 5 × 6       |      | 5    | 12.8 |      |      |
| 3105201 | R1 × 6 × 4       | 70   | 6    | 10.1 | 4    |      |
| 3106780 | R1.05 × 4.8 × 6  |      | 4.8  | 13.5 | 6    |      |
| 3106790 | R1.1 × 4.9 × 6   |      | 4.9  | 13.4 |      |      |
| 3106800 | R1.15 × 5 × 6    |      | 5    | 13.3 |      |      |
| 3106810 | R1.2 × 5.1 × 6   | 5.1  | 13.2 |      |      |      |
| 3105250 | R1.25 × 3 × 4    | 80   | 3    | 6.1  | 4    |      |
| 3105251 | R1.25 × 6 × 4    |      | 6    | 9.1  |      |      |
| 3106250 | R1.25 × 6 × 6    | 60   | 6    | 12.9 | 6    |      |

| EDP No. | RE X APMX X DCON | LF  | APMX | LH   | DCON | Type |   |
|---------|------------------|-----|------|------|------|------|---|
| 3106820 | R1.3 X 5.2 X 6   | 50  | 5.2  | 13.5 | 6    | 1    |   |
| 3106830 | R1.35 X 5.4 X 6  |     | 5.4  |      |      |      |   |
| 3106840 | R1.4 X 5.6 X 6   | 5.6 |      |      |      |      |   |
| 3106850 | R1.45 X 5.8 X 6  | 5.8 |      |      |      |      |   |
| 3105300 | R1.5 X 4.5 X 4   | 60  | 4.5  | 7.9  | 4    |      |   |
| 3106300 | R1.5 X 4.5 X 6   |     |      | 11.6 | 6    |      |   |
| 3106301 | R1.5 X 8 X 6     | 70  | 8    | 15.1 |      |      |   |
| 3106350 | R1.75 X 8 X 6    |     |      | 14.2 |      |      |   |
| 3106400 | R2 X 6 X 6       |     | 6    | 11.2 |      |      |   |
| 3105400 | R2 X 8 X 4       | 60  | 8    | -    | 4    |      | 2 |
| 3106401 | R2 X 8 X 6       | 70  |      |      |      |      |   |
| 3106860 | R2.25 X 8 X 6    | 80  |      |      | 13.2 | 6    | 1 |
| 3106500 | R2.5 X 8         |     |      |      | 13.6 |      |   |
| 3106501 | R2.5 X 10        |     |      | 11.4 |      |      |   |
| 3106502 | R2.5 X 12        |     |      | 10   | 13.4 |      |   |
| 3106870 | R2.75 X 10       | 90  | 12   | 15.4 |      |      |   |
| 3106600 | R3 X 10          |     | 10   | 13.7 |      |      |   |
| 3106601 | R3 X 12          |     | 12   | -    | 2    |      |   |
| 3106880 | R3.25 X 13       |     | 13   | -    | 3    |      |   |
| 3106610 | R3.5 X 14        | 14  | -    |      |      |      |   |
| 3106890 | R3.75 X 14       | 100 | 12   | -    | 8    |      |   |
| 3106620 | R4 X 12          |     | 14   | -    |      |      |   |
| 3106621 | R4 X 14          |     | 16   | -    |      | 3    |   |
| 3106900 | R4.25 X 16       |     | 18   | -    |      |      |   |
| 3106630 | R4.5 X 18        |     | 18   | -    | 10   | 2    |   |
| 3106910 | R4.75 X 18       |     | 15   | -    |      | 3    |   |
| 3106640 | R5 X 15          |     | 18   | -    |      |      |   |
| 3106641 | R5 X 18          |     | 22   | -    |      |      |   |
| 3106650 | R5.5 X 22        | 110 | 18   | -    | 12   | 2    |   |
| 3106560 | R6 X 18          |     | 22   | -    |      | 3    |   |
| 3106661 | R6 X 22          |     | 24   | -    |      | 2    |   |
| 3106920 | R6.5 X 24        |     | 26   | -    |      |      |   |
| 3106670 | R7 X 26          |     | 28   | -    |      |      |   |
| 3106930 | R7.5 X 28        |     | 140  | 30   | -    | 16   | 2 |
| 3106680 | R8 X 30          | 34  |      | -    | 3    |      |   |
| 3106690 | R9 X 34          | 160 |      | 38   | -    | 20   | 2 |
| 3106700 | R10 X 38         |     |      |      |      |      |   |

| Work Material | Carbon Steel      | Alloy Steel | Prehardened Steel |         |         |         | Stainless Steel | Cast Iron         | Copper Alloy | Aluminum Alloy | Graphite | Titanium Alloy | Heat Resistant Alloy | Plastic |
|---------------|-------------------|-------------|-------------------|---------|---------|---------|-----------------|-------------------|--------------|----------------|----------|----------------|----------------------|---------|
|               | Prehardened Steel | Tool Steel  | Hardened Steel    |         |         |         |                 | Ductile Cast Iron |              |                |          |                |                      |         |
| Abbreviation  | ~ 40HRC           |             | ~ 45HRC           | ~ 55HRC | ~ 60HRC | ~ 65HRC | ~ 35HRC         | ~ 350HB           |              |                |          |                |                      |         |
| WXL-EBD       | ⊙                 | ⊙           | ⊙                 | ⊙       |         |         | ⊙               | ⊙                 | ⊙            | ⊙              |          | ⊙              | ⊙                    |         |

# WXL COATED 2 FLUTES BALL NOSE ENDMILL

WXL-LN-EBD



| EDP No. | RE X LU X DCON   | LF  | APMX | LH     | DCON | DN     | θ <sub>k</sub> | Le     |        |      |      |      | Type |      |      |
|---------|------------------|-----|------|--------|------|--------|----------------|--------|--------|------|------|------|------|------|------|
|         |                  |     |      |        |      |        |                | 0.5°   | 1°     | 1.5° | 2°   | 3°   |      |      |      |
| 3110103 | R0.05 × 0.3 × 4  | 45  | 0.08 | 7.5    | 4    | 0.085  | 14.46°         | 0.34   | 0.35   | 0.36 | 0.37 | 0.4  | 1    |      |      |
| 3110105 | R0.05 × 0.5 × 4  |     |      | 7.7    |      |        | 14.1°          | 0.54   | 0.56   | 0.58 | 0.6  | 0.64 |      |      |      |
| 3110203 | R0.1 × 0.3 × 4   |     |      | 7.3    |      |        | 14.59°         | 0.3    | 0.31   | 0.32 | 0.33 | 0.35 |      |      |      |
| 3110205 | R0.1 × 0.5 × 4   |     |      | 7.5    |      |        | 14.44°         | 0.53   | 0.55   | 0.57 | 0.59 | 0.63 |      |      |      |
| 3120205 | R0.1 × 0.5 × 6   | 50  | 0.16 | 11.3   | 6    | 0.18   | 14.16°         | 0.53   | 0.55   | 0.57 | 0.59 | 0.63 |      |      |      |
| 3110207 | R0.1 × 0.75 × 4  | 45  |      | 7.8    | 4    |        | 13.72°         | 0.79   | 0.82   | 0.85 | 0.88 | 0.94 |      |      |      |
| 3110210 | R0.1 × 1 × 4     |     |      | 8      |      |        | 13.31°         | 1.05   | 1.09   | 1.13 | 1.17 | 1.26 |      |      |      |
| 3120210 | R0.1 × 1 × 6     | 50  |      | 11.8   | 6    |        | 13.85°         | 1.05   | 1.09   | 1.13 | 1.17 | 1.26 |      |      |      |
| 3110212 | R0.1 × 1.25 × 4  | 45  |      | 8.3    | 4    |        | 12.92°         | 1.31   | 1.36   | 1.41 | 1.46 | 1.57 |      |      |      |
| 3110215 | R0.1 × 1.5 × 4   |     |      | 8.5    |      |        | 12.56°         | 1.57   | 1.63   | 1.68 | 1.74 | 1.88 |      |      |      |
| 3120215 | R0.1 × 1.5 × 6   | 50  |      | 12.3   | 6    |        | 13.3°          | 1.57   | 1.63   | 1.68 | 1.74 | 1.88 |      |      |      |
| 3110217 | R0.1 × 1.75 × 4  | 45  |      | 8.8    | 4    |        | 12.21°         | 1.83   | 1.9    | 1.96 | 2.03 | 2.19 |      |      |      |
| 3110220 | R0.1 × 2 × 4     |     |      | 9      |      |        | 11.88°         | 2.09   | 2.16   | 2.24 | 2.32 | 2.5  |      |      |      |
| 3120220 | R0.1 × 2 × 6     | 50  |      | 12.8   | 6    |        | 12.8°          | 2.09   | 2.16   | 2.24 | 2.32 | 2.5  |      |      |      |
| 3110225 | R0.1 × 2.5 × 4   | 45  |      | 0.16   | 9.5  | 4      | 0.28           | 11.28° | 2.61   | 2.7  | 2.79 | 2.89 |      | 3.12 |      |
| 3110230 | R0.1 × 3 × 4     |     |      |        | 10   |        |                | 10.73° | 3.13   | 3.23 | 3.35 | 3.47 |      | 3.74 |      |
| 3110305 | R0.15 × 0.5 × 4  |     | 0.24 |        | 7.3  |        |                | 4      | 14.22° | 0.52 | 0.54 | 0.56 |      | 0.58 | 0.62 |
| 3110306 | R0.15 × 0.6 × 4  |     |      |        | 7.4  |        |                |        | 14.03° | 0.63 | 0.65 | 0.68 |      | 0.7  | 0.75 |
| 3110307 | R0.15 × 0.75 × 4 | 7.6 |      | 13.77° | 0.79 | 0.82   |                |        | 0.85   | 0.87 | 0.93 |      |      |      |      |
| 3110310 | R0.15 × 1 × 4    | 7.8 |      | 13.34° | 1.05 | 1.09   |                |        | 1.12   | 1.16 | 1.24 |      |      |      |      |
| 3120310 | R0.15 × 1 × 6    | 50  |      | 11.6   | 6    | 13.88° |                | 1.05   | 1.09   | 1.12 | 1.16 | 1.24 |      |      |      |
| 3110312 | R0.15 × 1.25 × 4 | 45  |      | 8.1    | 4    | 12.94° |                | 1.31   | 1.36   | 1.4  | 1.45 | 1.55 |      |      |      |
| 3110315 | R0.15 × 1.5 × 4  |     |      | 8.3    |      | 12.57° |                | 1.57   | 1.63   | 1.68 | 1.74 | 1.87 |      |      |      |
| 3120315 | R0.15 × 1.5 × 6  | 50  |      | 12.1   | 6    | 13.33° |                | 1.57   | 1.63   | 1.68 | 1.74 | 1.87 |      |      |      |
| 3110317 | R0.15 × 1.75 × 4 | 45  |      | 8.6    | 4    | 12.21° |                | 1.83   | 1.89   | 1.96 | 2.02 | 2.18 |      |      |      |
| 3110320 | R0.15 × 2 × 4    |     |      | 8.8    |      | 11.87° |                | 2.09   | 2.16   | 2.23 | 2.31 | 2.49 |      |      |      |
| 3120320 | R0.15 × 2 × 6    | 50  |      | 12.6   | 6    | 12.81° |                | 2.09   | 2.16   | 2.23 | 2.31 | 2.49 |      |      |      |
| 3110322 | R0.15 × 2.25 × 4 | 45  |      | 9.1    | 4    | 11.56° |                | 2.35   | 2.43   | 2.51 | 2.6  | 2.8  |      |      |      |
| 3110325 | R0.15 × 2.5 × 4  |     |      | 9.3    |      | 11.25° |                | 2.61   | 2.69   | 2.79 | 2.89 | 3.11 |      |      |      |
| 3120325 | R0.15 × 2.5 × 6  | 50  |      | 13.1   | 6    | 12.34° |                | 2.61   | 2.69   | 2.79 | 2.89 | 3.11 |      |      |      |

| EDP No. | RE X LU X DCON   | LF | APMX | LH   | DCON | DN   | θ <sub>k</sub> | Le     |        |      |      |      | Type |      |      |
|---------|------------------|----|------|------|------|------|----------------|--------|--------|------|------|------|------|------|------|
|         |                  |    |      |      |      |      |                | 0.5°   | 1°     | 1.5° | 2°   | 3°   |      |      |      |
| 3110327 | R0.15 × 2.75 × 4 | 45 | 0.24 | 9.6  | 4    | 0.28 | 10.97°         | 2.87   | 2.96   | 3.06 | 3.17 | 3.42 | 1    |      |      |
| 3110330 | R0.15 × 3 × 4    |    |      | 9.8  |      |      | 10.69°         | 3.13   | 3.23   | 3.34 | 3.46 | 3.73 |      |      |      |
| 3120330 | R0.15 × 3 × 6    | 50 |      | 13.6 | 6    |      | 11.89°         | 3.13   | 3.23   | 3.34 | 3.46 | 3.73 |      |      |      |
| 3110335 | R0.15 × 3.5 × 4  | 45 |      | 10.3 | 4    |      | 0.28           | 10.19° | 3.64   | 3.76 | 3.9  | 4.04 |      | 4.35 |      |
| 3110340 | R0.15 × 4 × 4    |    |      | 10.8 |      |      |                | 9.72°  | 4.16   | 4.3  | 4.45 | 4.61 |      | 4.97 |      |
| 3110345 | R0.15 × 4.5 × 4  |    |      | 11.3 |      |      |                | 9.3°   | 4.68   | 4.83 | 5    | 5.19 |      | 5.59 |      |
| 3110350 | R0.15 × 5 × 4    |    |      | 11.8 |      |      |                | 8.91°  | 5.19   | 5.37 | 5.56 | 5.76 |      | 6.22 |      |
| 3110405 | R0.2 × 0.5 × 4   |    | 0.24 | 7.1  |      | 4    |                | 0.28   | 14.3°  | 0.52 | 0.53 | 0.55 |      | 0.56 | 0.6  |
| 3110407 | R0.2 × 0.75 × 4  |    |      | 7.4  |      |      |                |        | 13.83° | 0.78 | 0.8  | 0.83 |      | 0.85 | 0.91 |
| 3110410 | R0.2 × 1 × 4     |    |      | 7.6  |      |      |                |        | 13.39° | 1.04 | 1.07 | 1.11 |      | 1.14 | 1.22 |
| 3120410 | R0.2 × 1 × 6     | 50 |      | 11.4 | 6    |      | 13.93°         |        | 1.04   | 1.07 | 1.11 | 1.14 |      | 1.22 |      |
| 3110415 | R0.2 × 1.5 × 4   | 45 |      | 8.1  | 4    |      | 12.59°         |        | 1.56   | 1.61 | 1.66 | 1.72 |      | 1.84 |      |
| 3120415 | R0.2 × 1.5 × 6   | 50 |      | 11.9 | 6    |      | 13.36°         |        | 1.56   | 1.61 | 1.66 | 1.72 |      | 1.84 |      |
| 3110420 | R0.2 × 2 × 4     | 45 |      | 8.6  | 4    |      | 11.88°         |        | 2.08   | 2.14 | 2.21 | 2.29 |      | 2.46 |      |



shaping your dreams

# WXL COATED 2 FLUTES BALL NOSE ENDMILL

| EDP No. | RE X LU X DCON  | LF | APMX | LH   | DCON | DN   | $\theta_k$ | Le    |       |       |       |       | Type |
|---------|-----------------|----|------|------|------|------|------------|-------|-------|-------|-------|-------|------|
|         |                 |    |      |      |      |      |            | 0.5°  | 1°    | 1.5°  | 2°    | 3°    |      |
| 3120420 | R0.2 X 2 X 6    | 50 | 0.3  | 12.4 | 6    | 0.37 | 12.83°     | 2.08  | 2.14  | 2.21  | 2.29  | 2.46  | 1    |
| 3110425 | R0.2 X 2.5 X 4  | 45 |      | 9.1  | 4    |      | 11.24°     | 2.6   | 2.68  | 2.77  | 2.87  | 3.08  |      |
| 3120425 | R0.2 X 2.5 X 6  | 50 |      | 12.9 | 6    |      | 12.35°     | 2.6   | 2.68  | 2.77  | 2.87  | 3.08  |      |
| 3110430 | R0.2 X 3 X 4    | 45 |      | 9.6  | 4    |      | 10.67°     | 3.11  | 3.21  | 3.32  | 3.44  | 3.7   |      |
| 3120430 | R0.2 X 3 X 6    | 50 |      | 13.4 | 6    |      | 11.9°      | 3.11  | 3.21  | 3.32  | 3.44  | 3.7   |      |
| 3110435 | R0.2 X 3.5 X 4  | 45 |      | 10.1 | 4    |      | 10.15°     | 3.63  | 3.75  | 3.88  | 4.02  | 4.33  |      |
| 3110440 | R0.2 X 4 X 4    | 45 |      | 10.6 | 4    |      | 9.68°      | 4.15  | 4.28  | 4.43  | 4.59  | 4.95  |      |
| 3120440 | R0.2 X 4 X 6    | 50 |      | 14.4 | 6    |      | 11.09°     | 4.15  | 4.28  | 4.43  | 4.59  | 4.95  |      |
| 3110445 | R0.2 X 4.5 X 4  | 45 |      | 11.1 | 4    |      | 9.25°      | 4.66  | 4.82  | 4.99  | 5.17  | 5.57  |      |
| 3110450 | R0.2 X 5 X 4    | 45 |      | 11.6 | 4    |      | 8.86°      | 5.18  | 5.35  | 5.54  | 5.74  | 6.19  |      |
| 3120450 | R0.2 X 5 X 6    | 50 |      | 15.4 | 6    |      | 10.38°     | 5.18  | 5.35  | 5.54  | 5.74  | 6.19  |      |
| 3110455 | R0.2 X 5.5 X 4  | 45 |      | 12.1 | 4    |      | 8.5°       | 5.7   | 5.89  | 6.09  | 6.32  | 6.81  |      |
| 3110460 | R0.2 X 6 X 4    | 45 | 0.4  | 12.6 | 4    | 0.45 | 8.16°      | 6.21  | 6.42  | 6.65  | 6.89  | 7.43  |      |
| 3120460 | R0.2 X 6 X 6    | 50 |      | 16.4 | 6    |      | 9.76°      | 6.21  | 6.42  | 6.65  | 6.89  | 7.43  |      |
| 3110510 | R0.25 X 1 X 4   | 45 |      | 7.6  | 4    |      | 13.45°     | 1.03  | 1.06  | 1.09  | 1.12  | 1.19  |      |
| 3110515 | R0.25 X 1.5 X 4 | 45 |      | 8.1  | 4    |      | 12.62°     | 1.55  | 1.59  | 1.64  | 1.69  | 1.81  |      |
| 3120515 | R0.25 X 1.5 X 6 | 50 |      | 11.9 | 6    |      | 13.4°      | 1.55  | 1.59  | 1.64  | 1.69  | 1.81  |      |
| 3110520 | R0.25 X 2 X 4   | 45 |      | 8.6  | 4    |      | 11.89°     | 2.06  | 2.13  | 2.2   | 2.27  | 2.43  |      |
| 3120520 | R0.25 X 2 X 6   | 50 |      | 12.4 | 6    |      | 12.86°     | 2.06  | 2.13  | 2.2   | 2.27  | 2.43  |      |
| 3110525 | R0.25 X 2.5 X 4 | 45 |      | 9.1  | 4    |      | 11.23°     | 2.58  | 2.66  | 2.75  | 2.84  | 3.05  |      |
| 3120525 | R0.25 X 2.5 X 6 | 50 |      | 12.9 | 6    |      | 12.36°     | 2.58  | 2.66  | 2.75  | 2.84  | 3.05  |      |
| 3110530 | R0.25 X 3 X 4   | 45 |      | 9.6  | 4    |      | 10.65°     | 3.1   | 3.2   | 3.3   | 3.42  | 3.68  |      |
| 3120530 | R0.25 X 3 X 6   | 50 |      | 13.4 | 6    |      | 11.9°      | 3.1   | 3.2   | 3.3   | 3.42  | 3.68  |      |
| 3110535 | R0.25 X 3.5 X 4 | 45 |      | 10.1 | 4    |      | 10.12°     | 3.61  | 3.73  | 3.86  | 3.99  | 4.3   |      |
| 3110540 | R0.25 X 4 X 4   | 45 |      | 10.6 | 4    |      | 9.64°      | 4.13  | 4.27  | 4.41  | 4.57  | 4.92  |      |
| 3120540 | R0.25 X 4 X 6   | 50 |      | 14.4 | 6    |      | 11.08°     | 4.13  | 4.27  | 4.41  | 4.57  | 4.92  |      |
| 3110545 | R0.25 X 4.5 X 4 | 45 |      | 11.1 | 4    |      | 9.2°       | 4.65  | 4.8   | 4.97  | 5.14  | 5.54  |      |
| 3110550 | R0.25 X 5 X 4   | 45 |      | 11.6 | 4    |      | 8.8°       | 5.17  | 5.34  | 5.52  | 5.72  | 6.16  |      |
| 3120550 | R0.25 X 5 X 6   | 50 |      | 15.4 | 6    |      | 10.36°     | 5.17  | 5.34  | 5.52  | 5.72  | 6.16  |      |
| 3110555 | R0.25 X 5.5 X 4 | 45 |      | 12.1 | 4    |      | 8.43°      | 5.68  | 5.87  | 6.07  | 6.29  | 6.78  |      |
| 3110560 | R0.25 X 6 X 4   | 45 |      | 12.6 | 4    |      | 8.1°       | 6.2   | 6.41  | 6.63  | 6.87  | 7.41  |      |
| 3120560 | R0.25 X 6 X 6   | 50 |      | 16.4 | 6    |      | 9.73°      | 6.2   | 6.41  | 6.63  | 6.87  | 7.41  |      |
| 3110570 | R0.25 X 7 X 4   | 45 |      | 13.6 | 4    |      | 7.49°      | 7.23  | 7.48  | 7.74  | 8.02  | 8.65  |      |
| 3110580 | R0.25 X 8 X 4   | 45 |      | 14.6 | 4    |      | 6.98°      | 8.27  | 8.55  | 8.85  | 9.17  | 9.89  |      |
| 3120580 | R0.25 X 8 X 6   | 50 |      | 18.4 | 6    |      | 8.67°      | 8.27  | 8.55  | 8.85  | 9.17  | 9.89  |      |
| 3110590 | R0.25 X 9 X 4   | 45 |      | 15.6 | 4    |      | 6.52°      | 9.3   | 9.62  | 9.95  | 10.32 | 11.14 |      |
| 3110600 | R0.25 X 10 X 4  | 45 |      | 16.6 | 4    |      | 6.13°      | 10.33 | 10.68 | 11.06 | 11.47 | 12.38 |      |
| 3110610 | R0.3 X 1 X 4    | 45 | 0.5  | 7.4  | 4    | 0.55 | 13.49°     | 1.03  | 1.05  | 1.08  | 1.11  | 1.18  |      |
| 3110615 | R0.3 X 1.5 X 4  | 45 |      | 7.9  | 4    |      | 12.64°     | 1.55  | 1.59  | 1.64  | 1.69  | 1.8   |      |
| 3120615 | R0.3 X 1.5 X 6  | 50 |      | 11.7 | 6    |      | 13.42°     | 1.55  | 1.59  | 1.64  | 1.69  | 1.8   |      |
| 3110620 | R0.3 X 2 X 4    | 45 |      | 8.4  | 4    |      | 11.88°     | 2.06  | 2.12  | 2.19  | 2.26  | 2.42  |      |
| 3120620 | R0.3 X 2 X 6    | 50 |      | 12.2 | 6    |      | 12.87°     | 2.06  | 2.12  | 2.19  | 2.26  | 2.42  |      |
| 3110625 | R0.3 X 2.5 X 4  | 45 |      | 8.9  | 4    |      | 11.21°     | 2.58  | 2.66  | 2.74  | 2.84  | 3.04  |      |
| 3120625 | R0.3 X 2.5 X 6  | 50 |      | 12.7 | 6    |      | 12.37°     | 2.58  | 2.66  | 2.74  | 2.84  | 3.04  |      |
| 3110630 | R0.3 X 3 X 4    | 45 |      | 9.4  | 4    |      | 10.61°     | 3.1   | 3.19  | 3.3   | 3.41  | 3.66  |      |
| 3120630 | R0.3 X 3 X 6    | 50 |      | 13.2 | 6    |      | 11.9°      | 3.1   | 3.19  | 3.3   | 3.41  | 3.66  |      |
| 3110635 | R0.3 X 3.5 X 4  | 45 |      | 9.9  | 4    |      | 10.07°     | 3.61  | 3.73  | 3.85  | 3.99  | 4.29  |      |
| 3110640 | R0.3 X 4 X 4    | 45 |      | 10.4 | 4    |      | 9.58°      | 4.13  | 4.26  | 4.41  | 4.56  | 4.91  |      |
| 3120640 | R0.3 X 4 X 6    | 50 |      | 14.2 | 6    |      | 11.06°     | 4.13  | 4.26  | 4.41  | 4.56  | 4.91  |      |
| 3110645 | R0.3 X 4.5 X 4  | 45 |      | 10.9 | 4    |      | 9.13°      | 4.65  | 4.8   | 4.96  | 5.14  | 5.53  |      |
| 3120650 | R0.3 X 5 X 4    | 45 |      | 11.4 | 4    |      | 8.73°      | 5.16  | 5.33  | 5.51  | 5.71  | 6.15  |      |
| 3120650 | R0.3 X 5 X 6    | 50 |      | 15.2 | 6    |      | 10.33°     | 5.16  | 5.33  | 5.51  | 5.71  | 6.15  |      |
| 3110655 | R0.3 X 5.5 X 4  | 45 |      | 11.9 | 4    |      | 8.36°      | 5.68  | 5.87  | 6.07  | 6.29  | 6.77  |      |
| 3110660 | R0.3 X 6 X 4    | 45 |      | 12.4 | 4    |      | 8.02°      | 6.2   | 6.4   | 6.62  | 6.86  | 7.39  |      |
| 3120660 | R0.3 X 6 X 6    | 50 |      | 16.2 | 6    |      | 9.69°      | 6.2   | 6.4   | 6.62  | 6.86  | 7.39  |      |
| 3110665 | R0.3 X 6.5 X 4  | 45 |      | 12.9 | 4    |      | 7.7°       | 6.71  | 6.94  | 7.18  | 7.44  | 8.02  |      |
| 3110670 | R0.3 X 7 X 4    | 45 |      | 13.4 | 4    |      | 7.41°      | 7.23  | 7.47  | 7.73  | 8.01  | 8.64  |      |
| 3110675 | R0.3 X 7.5 X 4  | 45 |      | 13.9 | 4    |      | 7.14°      | 7.75  | 8.01  | 8.29  | 8.59  | 9.26  |      |
| 3120680 | R0.3 X 8 X 4    | 50 |      | 14.4 | 6    |      | 6.89°      | 8.26  | 8.54  | 8.84  | 9.16  | 9.88  |      |
| 3110685 | R0.3 X 8.5 X 4  | 45 |      | 18.2 | 6    |      | 8.62°      | 8.26  | 8.54  | 8.84  | 9.16  | 9.88  |      |
| 3120685 | R0.3 X 8.5 X 6  | 50 |      | 14.9 | 6    |      | 6.66°      | 8.78  | 9.08  | 9.39  | 9.74  | 10.5  |      |
| 3110690 | R0.3 X 9 X 4    | 45 |      | 15.4 | 4    |      | 6.44°      | 9.3   | 9.61  | 9.95  | 10.31 | 11.12 |      |
| 3110695 | R0.3 X 9.5 X 4  | 45 |      | 15.9 | 4    |      | 6.23°      | 9.81  | 10.15 | 10.5  | 10.89 | 11.75 |      |
| 3110700 | R0.3 X 10 X 4   | 45 |      | 16.4 | 4    |      | 6.04°      | 10.33 | 10.68 | 11.06 | 11.46 | 12.37 |      |
| 3120700 | R0.3 X 10 X 6   | 50 |      | 20.2 | 6    |      | 7.76°      | 10.33 | 10.68 | 11.06 | 11.46 | 12.37 |      |
| 3110711 | R0.3 X 11 X 4   | 45 |      | 17.4 | 4    |      | 5.69°      | 11.37 | 11.75 | 12.16 | 12.61 | 13.61 |      |
| 3110712 | R0.3 X 12 X 4   | 45 |      | 18.4 | 4    |      | 5.38°      | 12.4  | 12.82 | 13.27 | 13.76 | 14.85 |      |
| 3110820 | R0.4 X 2 X 4    | 45 |      | 8.1  | 4    |      | 11.86°     | 2.06  | 2.12  | 2.18  | 2.25  | 2.4   |      |

# WXL COATED 2 FLUTES BALL NOSE ENDMILL

| EDP No. | RE X LU X DCON | LF | APMX | LH   | DCON | DN   | $\theta_k$ | Le    |       |       |       |       | Type |
|---------|----------------|----|------|------|------|------|------------|-------|-------|-------|-------|-------|------|
|         |                |    |      |      |      |      |            | 0.5°  | 1°    | 1.5°  | 2°    | 3°    |      |
| 3120820 | R0.4 × 2 × 6   | 50 | 0.6  | 11.8 | 6    | 0.75 | 12.9°      | 2.06  | 2.12  | 2.18  | 2.25  | 2.4   | 1    |
| 3110830 | R0.4 × 3 × 4   | 45 |      | 9.1  | 4    |      | 10.52°     | 3.09  | 3.19  | 3.29  | 3.4   | 3.64  |      |
| 3120830 | R0.4 × 3 × 6   | 50 |      | 12.8 | 6    |      | 11.89°     | 3.09  | 3.19  | 3.29  | 3.4   | 3.64  |      |
| 3110840 | R0.4 × 4 × 4   | 45 |      | 10.1 | 4    |      | 9.45°      | 4.13  | 4.26  | 4.4   | 4.55  | 4.88  |      |
| 3120840 | R0.4 × 4 × 6   | 50 |      | 13.8 | 6    |      | 11.02°     | 4.13  | 4.26  | 4.4   | 4.55  | 4.88  |      |
| 3110850 | R0.4 × 5 × 4   | 45 |      | 11.1 | 4    |      | 8.58°      | 5.16  | 5.33  | 5.5   | 5.7   | 6.13  |      |
| 3120850 | R0.4 × 5 × 6   | 50 |      | 14.8 | 6    |      | 10.27°     | 5.16  | 5.33  | 5.5   | 5.7   | 6.13  |      |
| 3110860 | R0.4 × 6 × 4   | 45 |      | 12.1 | 4    |      | 7.85°      | 6.19  | 6.4   | 6.61  | 6.85  | 7.37  |      |
| 3120860 | R0.4 × 6 × 6   | 50 |      | 15.8 | 6    |      | 9.62°      | 6.19  | 6.4   | 6.61  | 6.85  | 7.37  |      |
| 3110870 | R0.4 × 7 × 4   | 45 |      | 13.1 | 4    |      | 7.24°      | 7.23  | 7.47  | 7.72  | 8     | 8.61  |      |
| 3110880 | R0.4 × 8 × 4   | 50 |      | 14.1 | 6    |      | 6.71°      | 8.26  | 8.54  | 8.83  | 9.15  | 9.86  |      |
| 3120880 | R0.4 × 8 × 6   | 50 |      | 17.8 | 6    |      | 8.53°      | 8.26  | 8.54  | 8.83  | 9.15  | 9.86  |      |
| 3110890 | R0.4 × 9 × 4   | 45 | 0.5  | 15.1 | 4    | 0.95 | 6.25°      | 9.29  | 9.6   | 9.94  | 10.3  | 11.1  |      |
| 3110900 | R0.4 × 10 × 4  | 50 |      | 16.1 | 6    |      | 5.86°      | 10.33 | 10.67 | 11.05 | 11.45 | 12.34 |      |
| 3120900 | R0.4 × 10 × 6  | 50 |      | 19.8 | 6    |      | 7.66°      | 10.33 | 10.67 | 11.05 | 11.45 | 12.34 |      |
| 3110912 | R0.4 × 12 × 4  | 45 |      | 18.1 | 4    |      | 5.2°       | 12.4  | 12.81 | 13.26 | 13.75 | 14.83 |      |
| 3111025 | R0.5 × 2.5 × 4 | 50 |      | 8.2  | 4    |      | 11.09°     | 2.57  | 2.64  | 2.72  | 2.81  | 3     |      |
| 3111030 | R0.5 × 3 × 4   | 50 |      | 8.7  | 6    |      | 10.43°     | 3.09  | 3.18  | 3.28  | 3.38  | 3.62  |      |
| 3121030 | R0.5 × 3 × 6   | 45 |      | 12.4 | 4    |      | 11.88°     | 3.09  | 3.18  | 3.28  | 3.38  | 3.62  |      |
| 3111040 | R0.5 × 4 × 4   | 50 |      | 9.7  | 6    |      | 9.32°      | 4.12  | 4.25  | 4.39  | 4.53  | 4.86  |      |
| 3121040 | R0.5 × 4 × 6   | 45 |      | 13.4 | 4    |      | 10.98°     | 4.12  | 4.25  | 4.39  | 4.53  | 4.86  |      |
| 3111050 | R0.5 × 5 × 4   | 50 |      | 10.7 | 6    |      | 8.41°      | 5.16  | 5.32  | 5.49  | 5.68  | 6.1   |      |
| 3121050 | R0.5 × 5 × 6   | 45 |      | 14.4 | 6    |      | 10.21°     | 5.16  | 5.32  | 5.49  | 5.68  | 6.1   |      |
| 3111060 | R0.5 × 6 × 4   | 50 | 0.8  | 11.7 | 4    | 1.15 | 7.67°      | 6.19  | 6.39  | 6.6   | 6.83  | 7.35  |      |
| 3121060 | R0.5 × 6 × 6   | 45 |      | 15.4 | 6    |      | 9.54°      | 6.19  | 6.39  | 6.6   | 6.83  | 7.35  |      |
| 3111070 | R0.5 × 7 × 4   | 50 |      | 12.7 | 4    |      | 7.05°      | 7.22  | 7.46  | 7.71  | 7.98  | 8.59  |      |
| 3121070 | R0.5 × 7 × 6   | 45 |      | 16.4 | 6    |      | 8.95°      | 7.22  | 7.46  | 7.71  | 7.98  | 8.59  |      |
| 3111080 | R0.5 × 8 × 4   | 50 |      | 13.7 | 4    |      | 6.52°      | 8.26  | 8.53  | 8.82  | 9.13  | 9.83  |      |
| 3121080 | R0.5 × 8 × 6   | 45 |      | 17.4 | 6    |      | 8.43°      | 8.26  | 8.53  | 8.82  | 9.13  | 9.83  |      |
| 3111090 | R0.5 × 9 × 4   | 50 |      | 14.7 | 4    |      | 6.06°      | 9.29  | 9.6   | 9.93  | 10.28 | 11.08 |      |
| 3111100 | R0.5 × 10 × 4  | 50 |      | 15.7 | 6    |      | 5.66°      | 10.33 | 10.67 | 11.04 | 11.43 | 12.32 |      |
| 3121100 | R0.5 × 10 × 6  | 45 |      | 19.4 | 6    |      | 7.55°      | 10.33 | 10.67 | 11.04 | 11.43 | 12.32 |      |
| 3111112 | R0.5 × 12 × 4  | 50 |      | 17.7 | 4    |      | 5.01°      | 12.39 | 12.81 | 13.25 | 13.73 | 14.81 |      |
| 3121112 | R0.5 × 12 × 6  | 45 |      | 21.4 | 6    |      | 6.83°      | 12.39 | 12.81 | 13.25 | 13.73 | 14.81 |      |
| 3111114 | R0.5 × 14 × 4  | 60 | 1    | 19.7 | 4    | 1.35 | 4.49°      | 14.46 | 14.95 | 15.47 | 16.03 | 17.29 |      |
| 3121114 | R0.5 × 14 × 6  | 50 |      | 23.4 | 6    |      | 6.24°      | 14.46 | 14.95 | 15.47 | 16.03 | 17.29 |      |
| 3111116 | R0.5 × 16 × 4  | 60 |      | 21.7 | 4    |      | 4.06°      | 16.53 | 17.09 | 17.69 | 18.33 | 19.78 |      |
| 3121116 | R0.5 × 16 × 6  | 50 |      | 25.4 | 6    |      | 5.74°      | 16.53 | 17.09 | 17.69 | 18.33 | 19.78 |      |
| 3111118 | R0.5 × 18 × 4  | 55 |      | 23.7 | 4    |      | 3.71°      | 18.59 | 19.23 | 19.9  | 20.63 | 22.26 |      |
| 3121120 | R0.5 × 20 × 4  | 60 |      | 25.7 | 4    |      | 4.95°      | 20.66 | 21.36 | 22.12 | 22.93 | 24.75 |      |
| 3111122 | R0.5 × 22 × 6  | 60 |      | 29.4 | 6    |      | 3.42°      | 20.66 | 21.36 | 22.12 | 22.93 | 24.75 |      |
| 3121122 | R0.5 × 22 × 6  | 45 |      | 31.4 | 6    |      | 4.63°      | 22.73 | 23.5  | 24.33 | 25.23 | 27.24 |      |
| 3111240 | R0.6 × 4 × 4   | 50 | 1.1  | 9.4  | 4    | 1.45 | 9.07°      | 4.19  | 4.34  | 4.48  | 4.62  | 4.95  |      |
| 3111260 | R0.6 × 6 × 4   | 50 |      | 11.4 | 6    |      | 7.41°      | 6.27  | 6.48  | 6.69  | 6.92  | 7.44  |      |
| 3121260 | R0.6 × 6 × 6   | 45 |      | 15.2 | 4    |      | 9.4°       | 6.27  | 6.48  | 6.69  | 6.92  | 7.44  |      |
| 3111280 | R0.6 × 8 × 4   | 50 |      | 13.4 | 6    |      | 6.26°      | 8.35  | 8.62  | 8.91  | 9.22  | 9.93  |      |
| 3121280 | R0.6 × 8 × 6   | 45 |      | 17.1 | 4    |      | 8.28°      | 8.35  | 8.62  | 8.91  | 9.22  | 9.93  |      |
| 3111300 | R0.6 × 10 × 4  | 50 |      | 15.4 | 6    |      | 5.42°      | 10.42 | 10.76 | 11.13 | 11.52 | 12.41 |      |
| 3121300 | R0.6 × 10 × 6  | 45 |      | 19.2 | 6    |      | 7.39°      | 10.42 | 10.76 | 11.13 | 11.52 | 12.41 |      |
| 3111312 | R0.6 × 12 × 4  | 50 |      | 17.4 | 4    |      | 4.78°      | 12.49 | 12.9  | 13.34 | 13.82 | 14.9  |      |
| 3121312 | R0.6 × 12 × 6  | 45 |      | 21.2 | 6    |      | 6.68°      | 12.49 | 12.9  | 13.34 | 13.82 | 14.9  |      |
| 3111314 | R0.6 × 14 × 4  | 50 |      | 19.4 | 4    |      | 4.27°      | 14.55 | 15.04 | 15.56 | 16.12 | 17.38 |      |
| 3121316 | R0.6 × 16 × 4  | 60 |      | 21.4 | 6    |      | 3.86°      | 16.62 | 17.18 | 17.78 | 18.42 | 19.87 |      |
| 3111318 | R0.6 × 18 × 4  | 55 | 1.2  | 25.2 | 6    | 1.45 | 5.6°       | 16.62 | 17.18 | 17.78 | 18.42 | 19.87 |      |
| 3121318 | R0.6 × 18 × 6  | 45 |      | 23.4 | 4    |      | 3.52°      | 18.69 | 19.32 | 19.99 | 20.72 | 22.36 |      |
| 3111320 | R0.6 × 20 × 4  | 60 |      | 25.4 | 6    |      | 3.24°      | 20.75 | 21.46 | 22.21 | 23.02 | 24.84 |      |
| 3121324 | R0.6 × 24 × 4  | 45 |      | 29.4 | 6    |      | 2.79°      | 24.89 | 25.74 | 26.64 | 27.62 | -     |      |
| 3111480 | R0.7 × 8 × 4   | 50 |      | 13.1 | 4    |      | 6.04°      | 8.35  | 8.61  | 8.9   | 9.21  | 9.9   |      |
| 3121512 | R0.7 × 12 × 4  | 45 |      | 17.1 | 4    |      | 4.57°      | 12.48 | 12.89 | 13.33 | 13.81 | 14.87 |      |
| 3111516 | R0.7 × 16 × 4  | 50 |      | 21.1 | 6    |      | 3.67°      | 16.62 | 17.17 | 17.77 | 18.41 | 19.85 |      |
| 3121530 | R0.75 × 3 × 4  | 45 |      | 7.9  | 4    |      | 10.01°     | 3.13  | 3.25  | 3.35  | 3.45  | 3.67  |      |
| 3111540 | R0.75 × 4 × 4  | 50 |      | 8.9  | 6    |      | 8.8°       | 4.18  | 4.33  | 4.46  | 4.6   | 4.92  |      |
| 3121560 | R0.75 × 6 × 4  | 45 |      | 10.9 | 4    |      | 7.08°      | 6.27  | 6.47  | 6.68  | 6.9   | 7.4   |      |
| 3111580 | R0.75 × 8 × 4  | 50 |      | 14.6 | 6    |      | 9.26°      | 6.27  | 6.47  | 6.68  | 6.9   | 7.4   |      |
| 3121580 | R0.75 × 8 × 6  | 45 |      | 12.9 | 4    |      | 5.92°      | 8.34  | 8.61  | 8.9   | 9.2   | 9.89  |      |
| 3111600 | R0.75 × 10 × 4 | 50 | 1.2  | 16.6 | 6    | 1.45 | 8.11°      | 8.34  | 8.61  | 8.9   | 9.2   | 9.89  |      |
| 3121600 | R0.75 × 10 × 6 | 45 |      | 14.9 | 4    |      | 5.09°      | 10.41 | 10.75 | 11.11 | 11.5  | 12.38 |      |
| 3121600 | R0.75 × 10 × 6 | 50 |      | 18.6 | 6    |      | 7.21°      | 10.41 | 10.75 | 11.11 | 11.5  | 12.38 |      |



# WXL COATED 2 FLUTES BALL NOSE ENDMILL

| EDP No. | RE X LU X DCON | LF  | APMX | LH   | DCON | DN   | $\theta_k$ | Le    |       |       |       |       | Type |
|---------|----------------|-----|------|------|------|------|------------|-------|-------|-------|-------|-------|------|
|         |                |     |      |      |      |      |            | 0.5°  | 1°    | 1.5°  | 2°    | 3°    |      |
| 3111612 | R0.75 × 12 × 4 | 45  | 1.2  | 16.9 | 4    | 1.45 | 4.46°      | 12.48 | 12.89 | 13.33 | 13.8  | 14.86 | 1    |
| 3121612 | R0.75 × 12 × 6 | 50  |      | 20.6 | 6    |      | 6.49°      | 12.48 | 12.89 | 13.33 | 13.8  | 14.86 |      |
| 3111614 | R0.75 × 14 × 4 | 55  |      | 18.9 | 4    |      | 3.96°      | 14.55 | 15.03 | 15.55 | 16.1  | 17.35 |      |
| 3111616 | R0.75 × 16 × 4 | 55  |      | 20.9 | 4    |      | 3.57°      | 16.62 | 17.17 | 17.76 | 18.4  | 19.83 |      |
| 3121616 | R0.75 × 16 × 6 | 60  |      | 24.6 | 6    |      | 5.4°       | 16.62 | 17.17 | 17.76 | 18.4  | 19.83 |      |
| 3111618 | R0.75 × 18 × 4 | 55  |      | 22.9 | 4    |      | 3.25°      | 18.68 | 19.31 | 19.98 | 20.7  | 22.32 |      |
| 3111620 | R0.75 × 20 × 4 | 60  |      | 24.9 | 6    |      | 2.98°      | 20.75 | 21.45 | 22.19 | 23    | -     |      |
| 3121620 | R0.75 × 20 × 6 | 60  |      | 28.6 | 6    |      | 4.63°      | 20.75 | 21.45 | 22.19 | 23    | 24.81 |      |
| 3111622 | R0.75 × 22 × 4 | 55  |      | 26.9 |      |      | 2.75°      | 22.82 | 23.59 | 24.41 | 25.3  | -     |      |
| 3111630 | R0.75 × 30 × 4 | 65  |      | 34.9 |      |      | 2.1°       | 31.09 | 32.14 | 33.28 | 34.5  | -     |      |
| 3111640 | R0.8 × 4 × 4   | 45  | 1.3  | 8.7  | 4    | 1.15 | 8.7°       | 4.18  | 4.33  | 4.46  | 4.59  | 4.91  |      |
| 3111680 | R0.8 × 8 × 4   |     |      | 12.7 |      |      | 5.8°       | 8.34  | 8.61  | 8.89  | 9.19  | 9.88  |      |
| 3111712 | R0.8 × 12 × 4  | 50  |      | 16.7 |      |      | 4.34°      | 12.48 | 12.89 | 13.32 | 13.79 | 14.85 |      |
| 3111716 | R0.8 × 16 × 4  | 55  |      | 20.7 |      |      | 3.47°      | 16.61 | 17.16 | 17.76 | 18.39 | 19.82 |      |
| 3111720 | R0.8 × 20 × 4  | 55  | 1.4  | 24.7 |      |      | 2.89°      | 20.75 | 21.44 | 22.19 | 22.99 | -     |      |
| 3111880 | R0.9 × 8 × 4   | 45  |      | 12.6 |      |      | 5.38°      | 8.48  | 8.88  | 9.23  | 9.56  | 10.27 |      |
| 3111912 | R0.9 × 12 × 4  | 50  |      | 16.6 |      |      | 4.02°      | 12.69 | 13.22 | 13.68 | 14.16 | 15.24 |      |
| 3111916 | R0.9 × 16 × 4  | 55  |      | 20.6 |      |      | 3.2°       | 16.88 | 17.51 | 18.11 | 18.76 | 20.21 |      |
| 3111920 | R0.9 × 20 × 4  | 45  | 1.6  | 24.6 |      | 1.35 | 2.66°      | 21.05 | 21.79 | 22.55 | 23.36 | -     |      |
| 3112030 | R1 × 3 × 4     | 50  |      | 7.3  |      |      | 9.1°       | 3.16  | 3.31  | 3.47  | 3.64  | 3.96  |      |
| 3112040 | R1 × 4 × 4     | 50  |      | 8.3  |      |      | 7.87°      | 4.23  | 4.44  | 4.66  | 4.86  | 5.26  |      |
| 3122040 | R1 × 4 × 6     | 45  |      | 12   |      |      | 10.32°     | 4.23  | 4.44  | 4.66  | 4.86  | 5.26  |      |
| 3112060 | R1 × 6 × 4     | 50  |      | 10.3 |      | 1.45 | 6.19°      | 6.36  | 6.67  | 6.96  | 7.23  | 7.76  |      |
| 3122060 | R1 × 6 × 6     | 45  |      | 14   |      |      | 8.77°      | 6.36  | 6.67  | 6.96  | 7.23  | 7.76  |      |
| 3112080 | R1 × 8 × 4     | 50  |      | 12.3 |      |      | 5.1°       | 8.48  | 8.87  | 9.22  | 9.55  | 10.24 |      |
| 3122080 | R1 × 8 × 6     | 50  |      | 16   |      |      | 7.61°      | 8.48  | 8.87  | 9.22  | 9.55  | 10.24 |      |
| 3112100 | R1 × 10 × 4    | 50  |      | 14.3 |      |      | 4.33°      | 10.59 | 11.05 | 11.45 | 11.85 | 12.73 |      |
| 3122100 | R1 × 10 × 6    | 45  |      | 18   |      |      | 6.73°      | 10.59 | 11.05 | 11.45 | 11.85 | 12.73 |      |
| 3112112 | R1 × 12 × 4    | 50  |      | 16.3 |      |      | 3.77°      | 12.69 | 13.21 | 13.67 | 14.15 | 15.22 |      |
| 3122112 | R1 × 12 × 6    | 50  |      | 20   |      |      | 6.03°      | 12.69 | 13.21 | 13.67 | 14.15 | 15.22 |      |
| 3112114 | R1 × 14 × 4    | 60  |      | 18.3 |      |      | 3.33°      | 14.78 | 15.36 | 15.89 | 16.45 | 17.7  |      |
| 3112116 | R1 × 16 × 4    | 60  |      | 20.3 |      |      | 2.98°      | 16.88 | 17.51 | 18.1  | 18.75 | -     |      |
| 3122116 | R1 × 16 × 6    | 55  | 2    | 24   |      |      | 4.98°      | 16.88 | 17.51 | 18.1  | 18.75 | 20.19 |      |
| 3112118 | R1 × 18 × 4    | 65  |      | 22.3 |      |      | 2.7°       | 18.96 | 19.65 | 20.32 | 21.04 | -     |      |
| 3112120 | R1 × 20 × 4    | 65  |      | 24.3 |      |      | 2.47°      | 21.05 | 21.78 | 22.54 | 23.34 | -     |      |
| 3122120 | R1 × 20 × 6    | 60  |      | 28   |      |      | 4.25°      | 21.05 | 21.78 | 22.54 | 23.34 | 25.16 |      |
| 3112122 | R1 × 22 × 4    | 65  |      | 26.3 |      |      | 2.27°      | 23.13 | 23.92 | 24.75 | 25.64 | -     |      |
| 3112125 | R1 × 25 × 4    | 70  |      | 29.3 |      |      | 2.03°      | 26.24 | 27.13 | 28.08 | 29.09 | -     |      |
| 3122125 | R1 × 25 × 6    | 75  |      | 33   |      |      | 3.58°      | 26.24 | 27.13 | 28.08 | 29.09 | 31.38 |      |
| 3112130 | R1 × 30 × 4    | 80  |      | 34.3 |      |      | 1.73°      | 31.42 | 32.48 | 33.62 | -     | -     |      |
| 3122130 | R1 × 30 × 6    | 80  |      | 38   |      |      | 3.1°       | 31.42 | 32.48 | 33.62 | 34.84 | 37.59 |      |
| 3112135 | R1 × 35 × 4    | 85  | 2.4  | 39.3 |      | 2.85 | 1.5°       | 36.59 | 37.83 | 39.16 | -     | -     |      |
| 3122135 | R1 × 35 × 6    | 85  |      | 43   |      |      | 2.73°      | 36.59 | 37.83 | 39.16 | 40.59 | -     |      |
| 3112140 | R1 × 40 × 4    | 90  |      | 44.3 |      |      | 1.33°      | 41.76 | 43.18 | -     | -     | -     |      |
| 3112560 | R1.25 × 6 × 4  | 45  |      | 9.1  |      |      | 5.46°      | 6.26  | 6.51  | 6.75  | 6.99  | 7.46  |      |
| 3112600 | R1.25 × 10 × 4 | 50  |      | 13.1 |      |      | 3.63°      | 10.46 | 10.85 | 11.21 | 11.59 | 12.43 |      |
| 3112615 | R1.25 × 15 × 4 | 55  |      | 18.1 |      |      | 2.55°      | 15.67 | 16.21 | 16.75 | 17.34 | -     |      |
| 3112620 | R1.25 × 20 × 4 | 60  |      | 23.1 |      |      | 1.97°      | 20.87 | 21.56 | 22.3  | -     | -     |      |
| 3112625 | R1.25 × 25 × 4 | 65  |      | 28.1 |      |      | 1.6°       | 26.04 | 26.91 | 27.84 | -     | -     |      |
| 3112630 | R1.25 × 30 × 4 | 70  |      | 33.1 |      |      | 1.35°      | 31.21 | 32.26 | -     | -     | -     |      |
| 3112635 | R1.25 × 35 × 4 | 75  |      | 38.1 |      |      | 1.17°      | 36.38 | 37.61 | -     | -     | -     |      |
| 3123059 | R1.5 × 6 × 3   | 45  | 2.4  | -    | 3    | 2.85 | -          | -     | -     | -     | -     | -     | 2    |
| 3113060 | R1.5 × 6 × 4   | 50  |      | 8.2  | 4    |      | 4.29°      | 6.25  | 6.49  | 6.72  | 6.95  | 7.4   | 1    |
| 3123060 | R1.5 × 6 × 6   | 55  |      | 11.9 |      |      | 8.17°      | 6.25  | 6.49  | 6.72  | 6.95  | 7.4   |      |
| 3123080 | R1.5 × 8 × 6   | 60  |      | 13.9 |      |      | 6.88°      | 8.35  | 8.67  | 8.97  | 9.25  | 9.88  |      |
| 3123100 | R1.5 × 10 × 6  | 65  |      | 15.9 |      |      | 5.94°      | 10.44 | 10.83 | 11.19 | 11.55 | 12.37 |      |
| 3123112 | R1.5 × 12 × 6  | 70  |      | 17.9 |      |      | 5.22°      | 12.53 | 12.98 | 13.4  | 13.85 | 14.86 |      |
| 3123114 | R1.5 × 14 × 6  | 75  |      | 19.9 |      |      | 4.66°      | 14.62 | 15.13 | 15.62 | 16.15 | 17.34 |      |
| 3123115 | R1.5 × 15 × 6  | 80  |      | 20.9 | 6    |      | 4.42°      | 15.66 | 16.2  | 16.73 | 17.3  | 18.59 |      |
| 3123116 | R1.5 × 16 × 6  | 85  |      | 21.9 |      |      | 4.21°      | 16.7  | 17.26 | 17.84 | 18.45 | 19.83 |      |
| 3123120 | R1.5 × 20 × 6  | 90  |      | 25.9 |      |      | 3.52°      | 20.86 | 21.54 | 22.27 | 23.05 | 24.8  |      |
| 3123125 | R1.5 × 25 × 6  | 95  | 2.8  | 30.9 |      |      | 2.92°      | 26.04 | 26.89 | 27.81 | 28.8  | -     |      |
| 3123130 | R1.5 × 30 × 6  | 100 |      | 35.9 |      |      | 2.5°       | 31.2  | 32.24 | 33.35 | 34.55 | -     |      |
| 3123135 | R1.5 × 35 × 6  | 105 |      | 40.9 |      |      | 2.18°      | 36.37 | 37.59 | 38.89 | 40.3  | -     |      |
| 3123140 | R1.5 × 40 × 6  | 110 |      | 45.9 |      |      | 1.94°      | 41.54 | 42.94 | 44.43 | -     | -     |      |



# WXL COATED 2 FLUTES BALL NOSE ENDMILL

| EDP No. | RE X LU X DCON | LF  | APMX | LH   | DCON | DN   | $\theta_k$ | Le    |       |       |       |       | Type |
|---------|----------------|-----|------|------|------|------|------------|-------|-------|-------|-------|-------|------|
|         |                |     |      |      |      |      |            | 0.5°  | 1°    | 1.5°  | 2°    | 3°    |      |
| 3123600 | R1.75 × 10 × 6 | 60  | 2.8  | 15   | 6    | 3.35 | 5.4°       | 10.43 | 10.81 | 11.16 | 11.51 | 12.31 | 1    |
| 3123615 | R1.75 × 15 × 6 |     |      | 20   |      |      | 3.93°      | 15.65 | 16.18 | 16.7  | 17.26 | 18.53 |      |
| 3123620 | R1.75 × 20 × 6 | 65  |      | 25   |      |      | 3.08°      | 20.85 | 21.53 | 22.24 | 23.01 | 24.74 |      |
| 3123625 | R1.75 × 25 × 6 |     |      | 30   |      |      | 2.54°      | 26.03 | 26.87 | 27.78 | 28.76 | -     |      |
| 3123630 | R1.75 × 30 × 6 | 70  |      | 35   |      |      | 2.16°      | 31.2  | 32.22 | 33.32 | 34.51 | -     |      |
| 3123635 | R1.75 × 35 × 6 | 80  |      | 40   |      |      | 1.88°      | 36.36 | 37.57 | 38.87 | -     | -     |      |
| 3123640 | R1.75 × 40 × 6 | 90  |      | 45   |      |      | 1.66°      | 41.53 | 42.92 | 44.41 | -     | -     |      |
| 3123645 | R1.75 × 45 × 6 |     |      | 50   |      |      | 1.49°      | 46.7  | 48.27 | -     | -     | -     |      |
| 3114080 | R2 × 8 × 4     | 55  | 3.2  | -    | 4    | 3.85 | -          | -     | -     | -     | -     | -     | 2    |
| 3124080 | R2 × 8 × 6     | 60  |      | 12.1 | 6    |      | 5.67°      | 8.33  | 8.63  | 8.91  | 9.18  | 9.77  | 1    |
| 3124100 | R2 × 10 × 6    |     |      | 14.1 |      |      | 4.74°      | 10.42 | 10.79 | 11.13 | 11.48 | 12.25 |      |
| 3124112 | R2 × 12 × 6    |     |      | 16.1 |      |      | 4.07°      | 12.51 | 12.95 | 13.35 | 13.78 | 14.74 |      |
| 3124114 | R2 × 14 × 6    |     |      | 18.1 |      |      | 3.57°      | 14.6  | 15.09 | 15.57 | 16.08 | 17.22 |      |
| 3124115 | R2 × 15 × 6    |     |      | 19.1 |      |      | 3.36°      | 15.64 | 16.16 | 16.67 | 17.23 | 18.47 |      |
| 3124116 | R2 × 16 × 6    |     |      | 20.1 |      |      | 3.18°      | 16.68 | 17.23 | 17.78 | 18.38 | 19.71 |      |
| 3124120 | R2 × 20 × 6    | 65  |      | 24.1 |      |      | 2.6°       | 20.84 | 21.51 | 22.22 | 22.98 | -     |      |
| 3124125 | R2 × 25 × 6    | 70  |      | 29.1 |      |      | 2.12°      | 26.02 | 26.86 | 27.76 | 28.72 | -     |      |
| 3124130 | R2 × 30 × 6    | 80  |      | 34.1 |      |      | 1.79°      | 31.19 | 32.21 | 33.3  | -     | -     |      |
| 3124135 | R2 × 35 × 6    |     |      | 39.1 |      |      | 1.55°      | 36.36 | 37.55 | 38.84 | -     | -     |      |
| 3124140 | R2 × 40 × 6    | 90  |      | 44.1 |      |      | 1.36°      | 41.52 | 42.9  | -     | -     | -     |      |
| 3124145 | R2 × 45 × 6    |     |      | 49.1 |      |      | 1.22°      | 46.69 | 48.25 | -     | -     | -     |      |
| 3124150 | R2 × 50 × 6    | 100 |      | 54.1 |      |      | 1.1°       | 51.86 | 53.6  | -     | -     | -     |      |
| 3125100 | R2.5 × 10      | 65  | 5    | 12.2 | 6    | 4.85 | 2.96°      | 10.4  | 10.75 | 11.08 | 11.4  | -     | 1    |
| 3125115 | R2.5 × 15      | 70  |      | 17.2 |      |      | 1.96°      | 15.62 | 16.13 | 16.62 | -     | -     |      |
| 3125120 | R2.5 × 20      |     |      | 22.2 |      |      | 1.46°      | 20.82 | 21.47 | -     | -     | -     |      |
| 3125125 | R2.5 × 25      | 80  |      | 27.2 |      |      | 1.16°      | 26    | 26.82 | -     | -     | -     |      |
| 3125130 | R2.5 × 30      |     |      | 32.2 |      |      | 0.97°      | 31.17 | -     | -     | -     | -     |      |
| 3125135 | R2.5 × 35      | 90  |      | 37.2 |      |      | 0.83°      | 36.34 | -     | -     | -     | -     |      |
| 3125140 | R2.5 × 40      |     |      | 42.2 |      |      | 0.72°      | 41.51 | -     | -     | -     | -     |      |
| 3125145 | R2.5 × 45      | 100 |      | 47.2 |      |      | 0.64°      | 46.68 | -     | -     | -     | -     |      |
| 3125150 | R2.5 × 50      |     |      | 52.2 |      |      | 0.58°      | 51.84 | -     | -     | -     | -     |      |
| 3126100 | R3 × 10        | 60  | 6    | -    | 5.85 | 5.85 | -          | -     | -     | -     | -     | -     | 2    |
| 3126120 | R3 × 20        | 70  |      | -    |      |      | -          | -     | -     | -     | -     |       |      |
| 3126125 | R3 × 25        | 80  |      | -    |      |      | -          | -     | -     | -     | -     |       |      |
| 3126130 | R3 × 30        |     |      | -    |      |      | -          | -     | -     | -     | -     |       |      |
| 3126135 | R3 × 35        | 90  |      | -    |      |      | -          | -     | -     | -     | -     |       |      |
| 3126140 | R3 × 40        |     |      | -    |      |      | -          | -     | -     | -     | -     |       |      |
| 3126145 | R3 × 45        | 100 |      | -    |      |      | -          | -     | -     | -     | -     |       |      |
| 3126150 | R3 × 50        | 120 |      | -    |      |      | -          | -     | -     | -     | -     |       |      |





# END MILL FOR HARDENED STEEL UP TO 70 HRC

## Series 450 HPE Rocket Mill

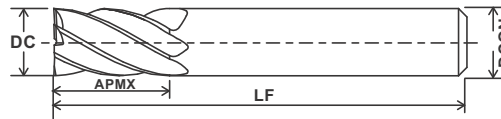
Metric Sizes, Multiple Flute



**Tolerance for cutter Diameter**  
 Smaller than Dia 3mm +0.000/-0.025  
 Dia 3mm and Larger +0.000/-0.038



450



| EDP Number | Mill Diameter | OAL | Length of Cut |      | Shank Diameter | No. of Flutes |
|------------|---------------|-----|---------------|------|----------------|---------------|
|            | DC            |     | APMX          | DCON |                |               |
| 450-118111 | 3             | 57  | 8             | 6    | 4              | 4             |
| 450-157511 | 4             | 57  | 11            | 6    | 4              | 4             |
| 450-196911 | 5             | 57  | 13            | 6    | 4              | 4             |
| 450-236211 | 6             | 57  | 13            | 6    | 6              | 6             |
| 450-315011 | 8             | 63  | 19            | 8    | 6              | 6             |
| 450-393711 | 10            | 72  | 22            | 10   | 6              | 6             |

| EDP Number | Mill Diameter | OAL | Length of Cut |      | Shank Diameter | No. of Flutes |
|------------|---------------|-----|---------------|------|----------------|---------------|
|            | DC            |     | APMX          | DCON |                |               |
| 450-472411 | 12            | 83  | 26            | 12   | 6              | 6             |
| 450-551211 | 14            | 83  | 26            | 14   | 6              | 6             |
| 450-629911 | 16            | 92  | 32            | 16   | 6              | 6             |
| 450-708711 | 18            | 92  | 32            | 18   | 6              | 6             |
| 450-787411 | 20            | 104 | 38            | 20   | 6              | 6             |
| 450-984311 | 25            | 121 | 50            | 25   | 6              | 6             |

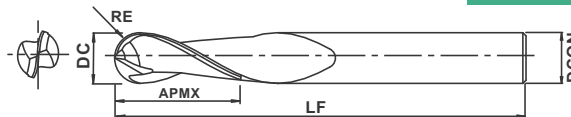
## Series 4512 HPE MOON BALL

Metric Size, 2 Flute  
 For Hard Material Die



**Tolerance for cutter Radius**

$R < 3$  ± 0.005  
 $3 \leq R \leq 6$  ± 0.007  
 $6 < R$  ± 0.01



| EDP Number | Mill Diameter | OAL | Length of Cut |     | Shank Diameter | No. of Flute |
|------------|---------------|-----|---------------|-----|----------------|--------------|
|            | RE x DC       |     | APMX          | LN  | DCON           |              |
| 451201017  | R0.5x1        | 39  | 1.5           | 2.5 | 4              | 2            |
| 451202017  | R1x2          | 39  | 3             | 5   | 4              | 2            |
| 451203017  | R1.5x3        | 39  | 4.5           | -   | 4              | 2            |
| 451204017  | R2x4          | 51  | 6             | -   | 4              | 2            |
| 451205017  | R2.5x5        | 51  | 7.5           | -   | 5              | 2            |
| 451206017  | R3x6          | 64  | 9             | -   | 6              | 2            |
| 451208017  | R4x8          | 64  | 12            | -   | 8              | 2            |
| 451210017  | R5x10         | 70  | 15            | -   | 10             | 2            |
| 451212017  | R6x12         | 100 | 18            | -   | 12             | 2            |
| 451216017  | R8x16         | 89  | 24            | -   | 16             | 2            |
| 451220017  | R10x20        | 102 | 30            | -   | 20             | 2            |

| Work Matrial |            |          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                  |     |        |                                                                                     |                                                                                      |                                                                                       |
|--------------|------------|----------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------|-----|--------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Serial No.   | Aluminum   |          | Cast Iron                                                                           | Low Carbon Steel                                                                    | Med. Carbon Steel                                                                   | High Carbon Steel                                                                   | Alloy Steel                                                                         | Die Steels                                                                          | Titanium                                                                            | High Nickel Alloy                                                                   | Stainless Steels |     |        | Die Steels                                                                          |                                                                                      |                                                                                       |
|              | 6061, 7075 | Castings |                                                                                     | 1010, 1018                                                                          | 1035, 1045                                                                          | 1065                                                                                | 4140, 4340                                                                          | 20 Hrc                                                                              | 6AL4V (30Hrc)                                                                       | 20 Hrc                                                                              | 300              | 400 | 17-4PH | 45 Hrc                                                                              | 55 Hrc                                                                               | 65 Hrc                                                                                |
| 450<br>4512  |            |          |  |  |  |  |  |  |  |  |                  |     |        |  |  |  |

○ Excellent ○ Fair

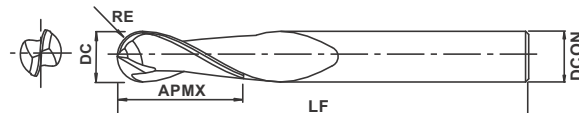
# END MILL FOR HARDENED STEEL UP TO 70 HRC



| Tolerance for cutter Radius |             |
|-----------------------------|-------------|
| $R < 3$                     | $\pm 0.005$ |
| $3 \leq R \leq 6$           | $\pm 0.007$ |
| $6 < R$                     | $\pm 0.01$  |

## Series 4522 HPE MOON BALL Long Length

MetricSize,2Flute  
ForHardMaterialDie



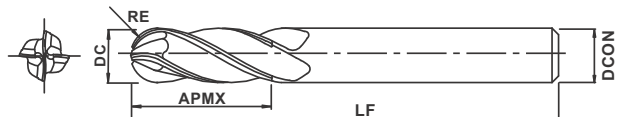
| EDP Number | Mill Diameter | OAL | Length of Cut | Neck Length | Shank Diameter | No. of Flute |
|------------|---------------|-----|---------------|-------------|----------------|--------------|
|            | RE x DC       | LF  | APMX          | LN          | DCON           | Z            |
| 452201017  | R0.5x1        | 75  | 2.5           | 3.5         | 3              | 2            |
| 452202017  | R1x2          | 75  | 4             | 6           | 3              | 2            |
| 452203017  | R1.5x3        | 75  | 4.5           | -           | 3              | 2            |
| 452204017  | R2x4          | 75  | 6             | -           | 4              | 2            |
| 452205017  | R2.5x5        | 75  | 7.5           | -           | 5              | 2            |
| 452206017  | R3x6          | 100 | 9             | -           | 6              | 2            |
| 452208017  | R4x8          | 100 | 12            | -           | 8              | 2            |
| 452210017  | R5x10         | 100 | 15            | -           | 10             | 2            |
| 452212017  | R6x12         | 150 | 18            | -           | 12             | 2            |



| Tolerance for cutter Radius |             |
|-----------------------------|-------------|
| $R < 3$                     | $\pm 0.005$ |
| $3 \leq R \leq 6$           | $\pm 0.007$ |
| $6 < R$                     | $\pm 0.01$  |

## Series 4514 HPE MOON BALL

MetricSize,4Flute  
ForHardMaterialDie



| EDP Number | Mill Diameter | OAL | Length of Cut | Shank Diameter | No. of Flute |
|------------|---------------|-----|---------------|----------------|--------------|
|            | RE x DC       | LF  | APMX          | DCON           |              |
| 451403017  | R1.5x3        | 39  | 4.5           | 3              | 4            |
| 451404017  | R2x4          | 51  | 6             | 4              | 4            |
| 451406017  | R3X6          | 64  | 9             | 6              | 4            |
| 451408017  | R4X8          | 64  | 12            | 8              | 4            |
| 451410017  | R5X10         | 70  | 15            | 10             | 4            |
| 451412017  | R6X12         | 76  | 18            | 12             | 4            |

| Work Matrial |            |          |           |                  |                   |                   |             |            |               |                   |                  |     |        |            |        |        |
|--------------|------------|----------|-----------|------------------|-------------------|-------------------|-------------|------------|---------------|-------------------|------------------|-----|--------|------------|--------|--------|
| Serial No.   | Aluminum   |          | Cast Iron | Low Carbon Steel | Med. Carbon Steel | High Carbon Steel | Alloy Steel | Die Steels | Titanium      | High Nickel Alloy | Stainless Steels |     |        | Die Steels |        |        |
|              | 6061, 7075 | Castings |           | 1010, 1018       | 1035, 1045        | 1065              | 4140, 4340  | 20 Hrc     | 6AL4V (30Hrc) | 20 Hrc            | 300              | 400 | 17-4PH | 45 Hrc     | 55 Hrc | 65 Hrc |
| 450<br>4512  |            |          | ○         | ○                | ○                 | ○                 | ○           | ○          | ○             | ○                 |                  |     |        | ○          | ⊗      | ⊗      |

# GENERAL PURPOSE END MILL

## Series 404 Short Flute

Metric Size 4 Flute



404



Tolerance for cutter Diameter  
Smaller than Dia 3mm +0.000/-0.025  
Dia 3mm and Larger +0.000/-0.038

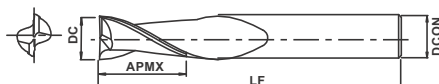
| EDP Number | Mill Diameter | OAL | Length of Cut | Shank Diameter | No. of Flute |
|------------|---------------|-----|---------------|----------------|--------------|
|            | DC            | LF  | AMPX          | DCON           | Z            |
| 404103011  | 3             | 39  | 4             | 3              | 4            |
| 404104011  | 4             | 51  | 6             | 4              | 4            |
| 404105011  | 5             | 51  | 8             | 5              | 4            |
| 404106011  | 6             | 64  | 8             | 6              | 4            |
| 404108011  | 8             | 64  | 12            | 8              | 4            |
| 404110011  | 10            | 70  | 14            | 10             | 4            |
| 404112011  | 12            | 76  | 16            | 12             | 4            |
| 404116011  | 16            | 89  | 22            | 16             | 4            |
| 404120011  | 20            | 102 | 26            | 20             | 4            |

## Series 402, 404 Regular Length

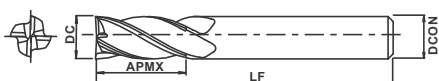
Metric Size, 2, or 4 Flute



402



404



Tolerance for cutter Diameter  
Smaller than Dia 3mm +0.000/-0.025  
Dia 3mm and Larger +0.000/-0.038

| EDP Number |            | Mill Diameter | OAL | Length of Cut | Shank Diameter |
|------------|------------|---------------|-----|---------------|----------------|
| 402        | 404        | DC            | LF  | AMPX          | DCON           |
| 2 Flute    | 4 Flute    |               |     |               |                |
| 402-019711 | —          | 0.5           | 39  | 1.5           | 3              |
| 402-039411 | 404-039411 | 1             | 39  | 3             | 3              |
| 402-059111 | 404-059111 | 1.5           | 39  | 5             | 3              |
| 402-078711 | 404-078711 | 2             | 39  | 7             | 3              |
| 402-098411 | 404-098411 | 2.5           | 39  | 8             | 3              |
| 402-118111 | 404-118111 | 3             | 39  | 10            | 3              |
| 402-137811 | 404-137811 | 3.5           | 51  | 12            | 4              |
| 402-157511 | 404-157511 | 4             | 51  | 14            | 4              |
| 402-177211 | 404-177211 | 4.5           | 51  | 14            | 5              |
| 402-196811 | 404-196811 | 5             | 51  | 16            | 5              |
| 402-236211 | 404-236211 | 6             | 64  | 19            | 6              |
| 402-275611 | 404-275611 | 7             | 64  | 19            | 8              |
| 402-315011 | 404-315011 | 8             | 64  | 21            | 8              |
| 402-354311 | 404-354311 | 9             | 70  | 22            | 10             |
| 402-393711 | 404-393711 | 10            | 70  | 25            | 10             |
| 402-433111 | 404-433111 | 11            | 70  | 25            | 12             |
| 402-472411 | 404-472411 | 12            | 76  | 25            | 12             |
| 402-551211 | 404-551211 | 14            | 89  | 30            | 14             |
| 402-629911 | 404-629911 | 16            | 89  | 32            | 16             |
| 402-708711 | 404-708711 | 18            | 102 | 35            | 18             |
| 402-787411 | 404-787411 | 20            | 102 | 38            | 20             |
| 402-866111 | 404-866111 | 22            | 102 | 38            | 22             |
| 402-984311 | 404-984311 | 25            | 102 | 38            | 25             |

| Work Material                                     |            |          |           |                  |                   |                   |             |            |               |                   |                  |     |        |            |           |           |
|---------------------------------------------------|------------|----------|-----------|------------------|-------------------|-------------------|-------------|------------|---------------|-------------------|------------------|-----|--------|------------|-----------|-----------|
| Chart applies to all series numbers on this page. | Aluminum   |          | Cast Iron | Low Carbon Steel | Med. Carbon Steel | High Carbon Steel | Alloy Steel | Die Steels | Titanium      | High Nickel Alloy | Stainless Steels |     |        | Die Steels |           |           |
|                                                   | 6061, 7075 | Castings |           | 1010, 1018       | 1035, 1045        | 1065              | 4140, 4340  | 20 Hrc     | 6AL4V (30Hrc) | 20 Hrc            | 300              | 400 | 17-4PH | -35 Hrc    | 35-45 Hrc | 45-50 Hrc |
|                                                   | ○          | ○        |           | ○                | ○                 | ○                 | ○           | ○          |               |                   | ○                | ○   | ○      | ○          | ○         |           |

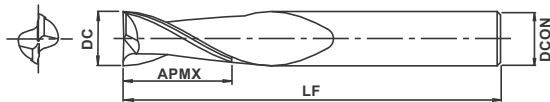
# GENERAL PURPOSE END MILL

## Series 462, 464 Long Length

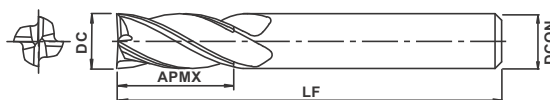
Long Length, Metric Sizes, 2 or 4 Flute



462



464



**Tolerance for cutter Diameter**  
 Smaller than Dia 3mm +0.000/-0.025  
 Dia 3mm and Larger +0.000/-0.038

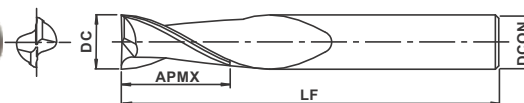
| EDP Number |            | Mill Diameter | OAL | Length of Cut | Shank Diameter |
|------------|------------|---------------|-----|---------------|----------------|
| 462        | 464        |               |     |               |                |
| 2 Flute    | 4 Flute    | DC            | LF  | APMX          | DCON           |
| 462-118111 | 464-118111 | 3             | 57  | 19            | 3              |
| 462-157511 | 464-157511 | 4             | 57  | 19            | 4              |
| 462-196811 | 464-196811 | 5             | 64  | 25            | 5              |
| 462-236211 | 464-236211 | 6             | 76  | 28            | 6              |
| 462-315011 | 464-315011 | 8             | 76  | 29            | 8              |
| 462-393711 | 464-393711 | 10            | 76  | 32            | 10             |
| 462-472411 | 464-472411 | 12            | 102 | 51            | 12             |
| 462-551211 | 464-551211 | 14            | 127 | 57            | 14             |
| 462-629911 | 464-629911 | 16            | 127 | 57            | 16             |
| 462-708711 | 464-708711 | 18            | 127 | 57            | 18             |
| 462-787411 | 464-787411 | 20            | 127 | 57            | 20             |
| 462-984311 | 464-984311 | 25            | 127 | 57            | 25             |

## Series 482, 484 Extra Long Length

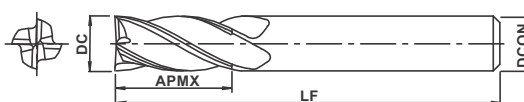
Extra Long Length, Metric Sizes, 2 or 4 Flute



482



484



**Tolerance for cutter Diameter**  
 Smaller than Dia 3mm +0.000/-0.025  
 Dia 3mm and Larger +0.000/-0.038

| EDP Number |            | Mill Diameter | OAL | Length of Cut | Shank Diameter |
|------------|------------|---------------|-----|---------------|----------------|
| 482        | 484        |               |     |               |                |
| 2 Flute    | 4 Flute    | DC            | LF  | APMX          | DCON           |
| 482-118111 | 484-118111 | 3             | 76  | 25            | 3              |
| 482-157511 | 484-157511 | 4             | 76  | 28            | 4              |
| 482-196811 | 484-196811 | 5             | 76  | 29            | 5              |
| 482-236211 | 484-236211 | 6             | 102 | 38            | 6              |
| 482-315011 | 484-315011 | 8             | 102 | 42            | 8              |
| 482-393711 | 484-393711 | 10            | 102 | 45            | 10             |
| 482-472411 | 484-472411 | 12            | 153 | 76            | 12             |
| 482-551211 | 484-551211 | 14            | 153 | 76            | 14             |
| 482-629911 | 484-629911 | 16            | 153 | 76            | 16             |
| 482-708711 | 484-708711 | 18            | 153 | 76            | 18             |
| 482-787411 | 484-787411 | 20            | 153 | 76            | 20             |
| 482-984311 | 484-984311 | 25            | 153 | 76            | 25             |

| Work Material                                     |            |          |           |                  |                   |                   |             |            |               |                   |                  |     |        |            |           |           |
|---------------------------------------------------|------------|----------|-----------|------------------|-------------------|-------------------|-------------|------------|---------------|-------------------|------------------|-----|--------|------------|-----------|-----------|
| Chart applies to all series numbers on this page. | Aluminum   |          | Cast Iron | Low Carbon Steel | Med. Carbon Steel | High Carbon Steel | Alloy Steel | Die Steels | Titanium      | High Nickel Alloy | Stainless Steels |     |        | Die Steels |           |           |
|                                                   | 6061, 7075 | Castings |           | 1010, 1018       | 1035, 1045        | 1065              | 4140, 4340  | 20 Hrc     | 6AL4V (30Hrc) | 20 Hrc            | 300              | 400 | 17-4PH | -35 Hrc    | 35-45 Hrc | 45-50 Hrc |
|                                                   | ○          | ○        | ○         | ○                | ○                 | ○                 | ○           | ○          |               |                   | ○                | ○   | ○      | ○          | ○         |           |

# END MILL FOR EXOTICS AND ROUGHING

## Series 452/4527 Unequal Helix for SUS, Ti & Ni

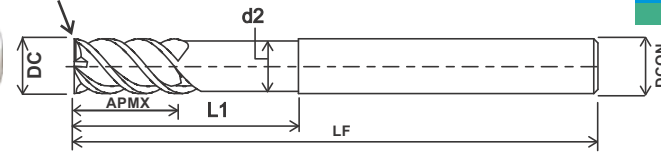


Super Tough Mills, Metric Sizes

Tolerance for cutter Diameter  
All sizes h10



C/R (Chamfer / Radius)



| EDP Number | Mill Dia. | OAL | Length of Cut | Neck Dia. | Neck Length | Shank Dia. |
|------------|-----------|-----|---------------|-----------|-------------|------------|
|            | DC        | LF  | APMX          | d2        | L1          | DCON       |
| 452-039411 | 1xc0.1    | 57  | 2.5           | 3.7       | 21          | 6          |
| 452-078711 | 2xc0.1    | 57  | 6             | 4.7       | 21          | 6          |
| 452-118111 | 3xc0.1    | 57  | 8             | 5.7       | 21          | 6          |
| 452-157511 | 4xc0.1    | 57  | 11            | 3.7       | 21          | 6          |
| 452-196911 | 5xc0.1    | 57  | 13            | 4.7       | 21          | 6          |
| 452-236211 | 6xc0.2    | 57  | 13            | 5.7       | 21          | 6          |
| 452-315011 | 8xc0.2    | 63  | 19            | 7.7       | 27          | 8          |
| 452-393711 | 10xc0.3   | 72  | 22            | 9.5       | 32          | 10         |

| EDP Number | Mill Dia. | OAL | Length of Cut | Neck Dia. | Neck Length | Shank Dia. |
|------------|-----------|-----|---------------|-----------|-------------|------------|
|            | DC        | LF  | APMX          | d2        | L1          | DCON       |
| 452-472411 | 12xc0.3   | 83  | 26            | 11.5      | 38          | 12         |
| 452-551211 | 14xc0.3   | 83  | 26            | 13.5      | 42          | 14         |
| 452-629911 | 16xc0.4   | 92  | 32            | 15.5      | 44          | 16         |
| 452-787411 | 20xc0.5   | 104 | 38            | 19.5      | 54          | 20         |
| 452-984311 | 25xc0.5   | 121 | 50            | 24.5      | 60          | 25         |

| EDP Number | Mill Dia. | OAL | Length of Cut | Neck Dia. | Neck Length | Shank Dia. |
|------------|-----------|-----|---------------|-----------|-------------|------------|
|            | DC        | LF  | APMX          | d2        | L1          | DCON       |
| 4527030501 | 3xR0.5    | 57  | 8             | 5.7       | 21          | 6          |
| 4527040501 | 4xR0.5    | 57  | 11            | 3.7       | 21          | 6          |
| 4527050501 | 5xR0.5    | 57  | 13            | 4.7       | 21          | 6          |
| 4527051001 | 5xR1.0    | 57  | 13            | 4.7       | 21          | 6          |
| 4527060501 | 6xR0.5    | 57  | 13            | 5.7       | 21          | 6          |
| 4527061001 | 6xR1.0    | 57  | 13            | 5.7       | 21          | 6          |
| 4527080501 | 8xR0.5    | 63  | 19            | 7.7       | 27          | 8          |
| 4527081001 | 8xR1.0    | 63  | 19            | 7.7       | 27          | 8          |

| EDP Number | Mill Dia. | OAL | Length of Cut | Neck Dia. | Neck Length | Shank Dia. |
|------------|-----------|-----|---------------|-----------|-------------|------------|
|            | DC        | LF  | APMX          | d2        | L1          | DCON       |
| 4527100501 | 10xR0.5   | 72  | 22            | 9.5       | 32          | 10         |
| 4527101001 | 10xR1.0   | 72  | 22            | 9.5       | 32          | 10         |
| 4527120501 | 12xR0.5   | 83  | 26            | 11.5      | 38          | 12         |
| 4527121001 | 12xR1.0   | 83  | 26            | 11.5      | 38          | 12         |
| 4527140501 | 14xR0.5   | 83  | 26            | 13.5      | 42          | 14         |
| 4527141001 | 14xR1.0   | 83  | 26            | 13.5      | 42          | 14         |
| 4527160501 | 16xR0.5   | 92  | 32            | 15.5      | 44          | 16         |
| 4527161001 | 16xR1.0   | 92  | 32            | 15.5      | 44          | 16         |

## Series 483 Roughing

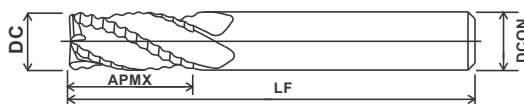


Roughing Mills, Metric Sizes

Tolerance for cutter Diameter  
All sizes h10



483



| EDP Number | Mill Diameter | OAL | Length of Cut | Shank Diameter | No. of Flutes |
|------------|---------------|-----|---------------|----------------|---------------|
|            | DC            | LF  | APMX          | DCON           |               |
| 483-118111 | 3             | 57  | 7             | 6              | 3             |
| 483-157511 | 4             | 57  | 14            | 6              | 3             |
| 483-196811 | 5             | 57  | 14            | 6              | 3             |
| 483-236211 | 6             | 64  | 19            | 6              | 4             |
| 483-315011 | 8             | 64  | 21            | 8              | 4             |

| EDP Number | Mill Diameter | OAL | Length of Cut | Shank Diameter | No. of Flutes |
|------------|---------------|-----|---------------|----------------|---------------|
|            | DC            | LF  | APMX          | DCON           |               |
| 483-393711 | 10            | 70  | 22            | 10             | 4             |
| 483-472411 | 12            | 76  | 25            | 12             | 4             |
| 483-551211 | 14            | 89  | 30            | 14             | 4             |
| 483-629911 | 16            | 89  | 32            | 16             | 5             |
| 483-787411 | 20            | 102 | 38            | 20             | 6             |
| 483-984311 | 25            | 102 | 38            | 25             | 6             |

| Work Material |            |          |           |                  |                   |                   |             |            |               |                   |                  |     |        |            |           |
|---------------|------------|----------|-----------|------------------|-------------------|-------------------|-------------|------------|---------------|-------------------|------------------|-----|--------|------------|-----------|
| Serial No.    | Aluminum   |          | Cast Iron | Low Carbon Steel | Med. Carbon Steel | High Carbon Steel | Alloy Steel | Die Steels | Titanium      | High Nickel Alloy | Stainless Steels |     |        | Die Steels |           |
|               | 6061, 7075 | Castings |           | 1010, 1018       | 1035, 1045        | 1065              | 4140, 4340  | 20 HRC     | 6AL4V (30HRC) | 20 HRC            | 300              | 400 | 17-4PH | -35 Hrc    | 35-45 Hrc |
| 452           |            |          | ⊙         | ⊙                | ⊙                 | ⊙                 | ⊙           | ⊙          | ⊙             | ⊙                 | ⊙                | ⊙   | ⊙      | ⊙          | ⊙         |
| 483           |            |          | ⊙         | ⊙                | ⊙                 | ⊙                 | ⊙           | ⊙          | ⊙             | ⊙                 | ⊙                | ⊙   | ⊙      | ⊙          | ⊙         |

# GENERAL BALL NOSE END MILL

## Series 402BN, 404BN Regular

Ball Nose, Metric Sizes, 2 or 4 Flute

SPEED  
FEED  
P.147

CARBIDE

HPL

30°

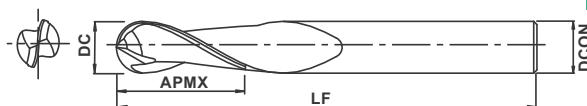
30°

30°

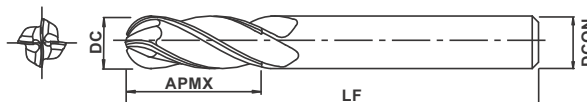
Tolerance for cutter Diameter  
Smaller than Dia 3mm +0.000/-0.025  
Dia 3mm and Larger +0.000/-0.038



402BN



404BN



| 402BN         | 404BN         | Mill Diameter | OAL | Length of Cut | Shank Diameter |
|---------------|---------------|---------------|-----|---------------|----------------|
| 2 Flute       | 4 Flute       | DC            | LF  | APMX          | DCON           |
| 402-0197-BN11 | -----         | 0.5           | 39  | 1.5           | 3              |
| 402-0394-BN11 | 404-0394-BN11 | 1             | 39  | 3             | 3              |
| 402-0591-BN11 | 404-0591-BN11 | 1.5           | 39  | 5             | 3              |
| 402-0787-BN11 | 404-0787-BN11 | 2             | 39  | 7             | 3              |
| 402-0984-BN11 | 404-0984-BN11 | 2.5           | 39  | 8             | 3              |
| 402-1181-BN11 | 404-1181-BN11 | 3             | 39  | 10            | 3              |
| 402-1378-BN11 | 404-1378-BN11 | 3.5           | 51  | 12            | 4              |
| 402-1575-BN11 | 404-1575-BN11 | 4             | 51  | 14            | 4              |
| 402-1772-BN11 | 404-1772-BN11 | 4.5           | 51  | 14            | 5              |
| 402-1968-BN11 | 404-1968-BN11 | 5             | 51  | 16            | 5              |
| 402-2362-BN11 | 404-2362-BN11 | 6             | 64  | 19            | 6              |
| 402-2756-BN11 | 404-2756-BN11 | 7             | 64  | 19            | 8              |
| 402-3150-BN11 | 404-3150-BN11 | 8             | 64  | 21            | 8              |
| 402-3543-BN11 | 404-3543-BN11 | 9             | 70  | 22            | 10             |
| 402-3937-BN11 | 404-3937-BN11 | 10            | 70  | 25            | 10             |
| 402-4332-BN11 | 404-4332-BN11 | 11            | 70  | 25            | 12             |
| 402-4724-BN11 | 404-4724-BN11 | 12            | 76  | 25            | 12             |
| 402-5512-BN11 | 404-5512-BN11 | 14            | 89  | 30            | 14             |
| 402-6299-BN11 | 404-6299-BN11 | 16            | 89  | 32            | 16             |
| 402-7087-BN11 | 404-7087-BN11 | 18            | 102 | 35            | 18             |
| 402-7874-BN11 | 404-7874-BN11 | 20            | 102 | 38            | 20             |
| 402-8661-BN11 | 404-8661-BN11 | 22            | 102 | 38            | 22             |
| 402-9843-BN11 | 404-9843-BN11 | 25            | 102 | 38            | 25             |





# GENERAL BALL NOSE END MILL

## Series 462BN, 464BN Long Length

Ball Nose, Metric Sizes, Long Length, 2 or 4 Flute



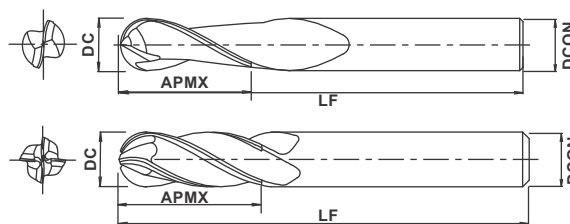
**Tolerance for cutter Diameter**  
 Smaller than Dia 3mm +0.000/-0.025  
 Dia 3mm and Larger +0.000/-0.038



462BN



464BN



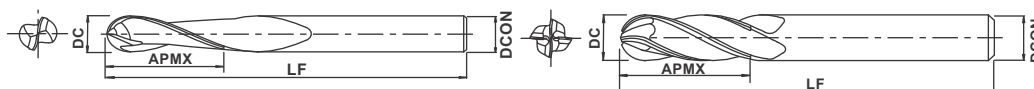
| EDP Number    |               | Mill<br>Diameter | OAL | Length<br>of Cut | Shank<br>Diameter |
|---------------|---------------|------------------|-----|------------------|-------------------|
| 462BN         | 464BN         |                  |     |                  |                   |
| 2 Flute       | 4 Flute       | DC               | LF  | APMX             | DCON              |
| 462-1181-BN11 | 464-1181-BN11 | 3                | 57  | 19               | 3                 |
| 462-1575-BN11 | 464-1575-BN11 | 4                | 57  | 19               | 4                 |
| 462-1968-BN11 | 464-1968-BN11 | 5                | 64  | 25               | 5                 |
| 462-2362-BN11 | 464-2362-BN11 | 6                | 76  | 28               | 6                 |
| 462-3150-BN11 | 464-3150-BN11 | 8                | 76  | 29               | 8                 |
| 462-3937-BN11 | 464-3937-BN11 | 10               | 76  | 32               | 10                |
| 462-4724-BN11 | 464-4724-BN11 | 12               | 102 | 51               | 12                |
| 462-5512-BN11 | 464-5512-BN11 | 14               | 127 | 57               | 14                |
| 462-6299-BN11 | 464-6299-BN11 | 16               | 127 | 57               | 16                |
| 462-7087-BN11 | 464-7087-BN11 | 18               | 127 | 57               | 18                |
| 462-7874-BN11 | 464-7874-BN11 | 20               | 127 | 57               | 20                |
| 462-9843-BN11 | 464-9843-BN11 | 25               | 127 | 57               | 25                |

## Series 482BN, 484BN Extra Long Length

Ball Nose, Metric Sizes, Extra Long Length, 2 or 4 Flute



**Tolerance for cutter Diameter**  
 Smaller than Dia 3mm +0.000/-0.025  
 Dia 3mm and Larger +0.000/-0.038



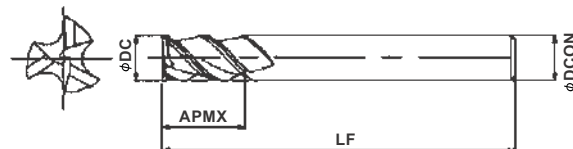
| EDP Number    |               | Mill<br>Diameter | OAL | Length<br>of Cut | Shank<br>Diameter |
|---------------|---------------|------------------|-----|------------------|-------------------|
| 482BN         | 484BN         |                  |     |                  |                   |
| 2 Flute       | 4 Flute       | DC               | LF  | APMX             | DCON              |
| 482-1181-BN11 | 484-1181-BN11 | 3                | 76  | 25               | 3                 |
| 482-1575-BN11 | 484-1575-BN11 | 4                | 76  | 28               | 4                 |
| 482-1968-BN11 | 484-1968-BN11 | 5                | 76  | 32               | 5                 |
| 482-2362-BN11 | 484-2362-BN11 | 6                | 102 | 38               | 6                 |
| 482-3150-BN11 | 484-3150-BN11 | 8                | 102 | 42               | 8                 |
| 482-3937-BN11 | 484-3937-BN11 | 10               | 102 | 45               | 10                |
| 482-4724-BN11 | 484-4724-BN11 | 12               | 153 | 76               | 12                |
| 482-5512-BN11 | 484-5512-BN11 | 14               | 153 | 76               | 14                |
| 482-6299-BN11 | 484-6299-BN11 | 16               | 153 | 76               | 16                |
| 482-7087-BN11 | 484-7087-BN11 | 18               | 153 | 76               | 18                |
| 482-7874-BN11 | 484-7874-BN11 | 20               | 153 | 76               | 20                |
| 482-9843-BN11 | 484-9843-BN11 | 25               | 153 | 76               | 25                |

| Work Material |            |          |           |                  |                   |                   |             |            |               |                   |                  |     |        |            |           |
|---------------|------------|----------|-----------|------------------|-------------------|-------------------|-------------|------------|---------------|-------------------|------------------|-----|--------|------------|-----------|
| Serial No.    | Aluminum   |          | Cast Iron | Low Carbon Steel | Med. Carbon Steel | High Carbon Steel | Alloy Steel | Die Steels | Titanium      | High Nickel Alloy | Stainless Steels |     |        | Die Steels |           |
|               | 6061, 7075 | Castings |           | 1010, 1018       | 1035, 1045        | 1065              | 4140, 4340  | 20 Hrc     | 6AL4V (30Hrc) | 20 Hrc            | 300              | 400 | 17-4PH | -35 Hrc    | 35-45 Hrc |
| 462BN         | ○          | ○        | ○         | ○                | ○                 | ○                 | ○           | ○          |               |                   | ○                | ○   |        | ○          | ○         |
| 464BN         | ○          | ○        | ○         | ○                | ○                 | ○                 | ○           | ○          |               |                   | ○                | ○   |        | ○          | ○         |
| 482BN         | ○          | ○        | ○         | ○                | ○                 | ○                 | ○           | ○          |               |                   | ○                | ○   |        | ○          | ○         |
| 484BN         | ○          | ○        | ○         | ○                | ○                 | ○                 | ○           | ○          |               |                   | ○                | ○   |        | ○          | ○         |

## END MILL FOR NON - FERROUS ALLOYS

### Series SCA - ETS for Copper & Aluminum Alloys

SCA-ETS



**SPEED  
FEED**  
P-148

**CARBIDE**



0~0.02

**SHRINK  
FIT**

**40°**

(Unit:mm)

| EDP NO. | DC   | LF | AMPX | DCON |
|---------|------|----|------|------|
| S530030 | 3.0  | 45 | 8    | 6    |
| S530040 | 4.0  | 45 | 11   | 6    |
| S530050 | 5.0  | 50 | 13   | 6    |
| S530060 | 6.0  | 50 | 13   | 6    |
| S530080 | 8.0  | 60 | 19   | 8    |
| S530100 | 10.0 | 70 | 22   | 10   |
| S530120 | 12.0 | 75 | 26   | 12   |

| WORK<br>MATERIAL | CARBON STEELS               | PREHARDENED STEELS |        |        |        |        | STAINLESS<br>STEELS | CAST IRON | COPPER<br>ALLOYS | ALUMINUM<br>ALLOYS | GRAPHITE | TITANIUM<br>ALLOYS | HEAT<br>RESISTANT<br>ALLOYS | PLASTIC |
|------------------|-----------------------------|--------------------|--------|--------|--------|--------|---------------------|-----------|------------------|--------------------|----------|--------------------|-----------------------------|---------|
|                  | PREHARDENED STEELS          | HARDENED STEELS    |        |        |        |        | ~35HRC              | ~350HB    |                  |                    |          |                    |                             |         |
|                  | ALLOY STEELS<br>TOOL STEELS | ~40HRC             | ~45HRC | ~55HRC | ~60HRC | ~65HRC |                     |           |                  |                    |          |                    |                             |         |
| Abbreviation     |                             |                    |        |        |        |        |                     |           |                  |                    |          |                    |                             |         |
| <b>SCA-ETS</b>   |                             |                    |        |        |        |        |                     |           | ◎                | ◎                  |          |                    |                             | ○       |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## AE-VMS

## SIDE MILLING

| Work Material            | Mild Steel · Carbon Steel · Cast Iron<br>SS400・S55C・FC250<br>( ~ 750N/mm <sup>2</sup> ) |                    | Alloy Steel · Tool Steel<br>SCM・SKS・SKD<br>( ~ 30HRC ) |                    | Prehardened Steel · Hardened Steel<br>PX5・NAK80<br>( 30 ~ 45HRC ) |                    | Stainless Steel<br>( ≧200HB )  |                    |
|--------------------------|-----------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------|--------------------|-------------------------------------------------------------------|--------------------|--------------------------------|--------------------|
| Cutting Speed<br>(m/min) | 130 ( 100-150 )                                                                         |                    | 120 ( 100-150 )                                        |                    | 100 ( 80-120 )                                                    |                    | 80 ( 60-100 )                  |                    |
| Mill Dia.<br>(mm)        | Speed<br>( min <sup>-1</sup> )                                                          | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> )                         | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> )                                    | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> ) | Feed<br>( mm/min ) |
| 3                        | 13,800                                                                                  | 1,660              | 12,700                                                 | 1,070              | 10,600                                                            | 760                | 8,000                          | 480                |
| 4                        | 10,400                                                                                  | 1,830              | 9,600                                                  | 1,150              | 8,000                                                             | 800                | 6,000                          | 530                |
| 5                        | 8,300                                                                                   | 1,990              | 7,600                                                  | 1,220              | 6,400                                                             | 900                | 4,800                          | 560                |
| 6                        | 6,900                                                                                   | 2,070              | 6,400                                                  | 1,540              | 5,300                                                             | 1,060              | 4,200                          | 640                |
| 8                        | 5,200                                                                                   | 1,770              | 4,800                                                  | 1,540              | 4,000                                                             | 1,040              | 3,200                          | 610                |
| 10                       | 4,100                                                                                   | 1,640              | 3,800                                                  | 1,370              | 3,200                                                             | 900                | 2,500                          | 580                |
| 12                       | 3,500                                                                                   | 1,400              | 3,200                                                  | 1,280              | 2,700                                                             | 760                | 2,100                          | 530                |
| Depth of Cut             |                                                                                         |                    |                                                        |                    |                                                                   |                    |                                |                    |
|                          | <div>ap</div>                                                                           |                    |                                                        |                    | <div>ae</div>                                                     |                    |                                |                    |
|                          | 1.5D                                                                                    |                    |                                                        |                    | 0.2D                                                              |                    |                                |                    |

## AE-VMS

## SLOTING

| Work Material            | Mild Steel · Carbon Steel · Cast Iron<br>SS400・S55C・FC250<br>( ~ 750N/mm² ) |                    | Alloy Steel · Tool Steel<br>SCM・SKS・SKD<br>( ~ 30HRC ) |                    | Prehardened Steel · Hardened Steel<br>PX5・NAK80<br>( 30 ~ 45HRC ) |                    | Stainless Steel<br>( ≧200HB )  |                    |
|--------------------------|-----------------------------------------------------------------------------|--------------------|--------------------------------------------------------|--------------------|-------------------------------------------------------------------|--------------------|--------------------------------|--------------------|
| Cutting Speed<br>(m/min) | 100 ( 80-120 )                                                              |                    | 90 ( 70-110 )                                          |                    | 80 ( 60-100 )                                                     |                    | 70 ( 50-80 )                   |                    |
| Mill Dia.<br>(mm)        | Speed<br>( min <sup>-1</sup> )                                              | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> )                         | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> )                                    | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> ) | Feed<br>( mm/min ) |
| 3                        | 10,600                                                                      | 930                | 9,600                                                  | 690                | 8,500                                                             | 510                | 7,400                          | 470                |
| 4                        | 8,000                                                                       | 960                | 7,200                                                  | 720                | 6,400                                                             | 510                | 5,600                          | 490                |
| 5                        | 6,400                                                                       | 1,020              | 5,700                                                  | 800                | 5,100                                                             | 610                | 4,500                          | 560                |
| 6                        | 5,300                                                                       | 1,060              | 4,800                                                  | 900                | 4,200                                                             | 670                | 3,700                          | 370                |
| 8                        | 4,000                                                                       | 910                | 3,600                                                  | 720                | 3,200                                                             | 640                | 2,800                          | 370                |
| 10                       | 3,200                                                                       | 840                | 2,900                                                  | 700                | 2,500                                                             | 550                | 2,200                          | 350                |
| 12                       | 2,700                                                                       | 810                | 2,400                                                  | 670                | 2,100                                                             | 550                | 1,900                          | 330                |
| Depth of Cut             | <div>ap</div> <div>1D</div>                                                 |                    |                                                        |                    |                                                                   |                    | Dc                             | ap                 |
|                          |                                                                             |                    |                                                        |                    |                                                                   |                    | Dc < 6                         | 0.5D               |
|                          |                                                                             |                    |                                                        |                    |                                                                   |                    | Dc ≧ 6                         | 1D                 |

1. The above milling condition is a guideline for the overhang length is  $3 \times D$ .
2. Use a rigid and precise machine and holder.
3. The rotational speed is calculated by the median of the recommended cutting speed.  
Adjustment may be necessary depending on the rigidity of the workpiece fixture and machine.
4. Please use a suitable fluid with high smoke retardant properties.
5. During dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.
6. Please use water-soluble oil when machining stainless steel.
7. Reduce speed and feed as well as depth of cut when high precision is required.
8. Adjust the speed and feed accordingly when the overhang length is longer than specified.

## ( $D_c \geq \phi 6$ ) AE-VMS

## FIX RATE FOR CUTTING CONDITION

|              | Work Material | Mild Steel · Carbon Steel · Cast Iron<br><b>SS400 · S55C · FC250</b><br>( ~ 750N/mm <sup>2</sup> ) |                    | Alloy Steel · Tool Steel<br><b>SCM · SKS · SKD</b><br>( ~ 30HRC ) |                    | Prehardened Steel · Hardened Steel<br><b>PX5 · NAK80</b><br>( 30 ~ 45HRC ) |                    | Stainless Steel<br>( ≥200HB )  |                    |
|--------------|---------------|----------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------|--------------------|--------------------------------|--------------------|
|              | L/D           | Speed<br>( min <sup>-1</sup> )                                                                     | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> )                                    | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> )                                             | Feed<br>( mm/min ) | Speed<br>( min <sup>-1</sup> ) | Feed<br>( mm/min ) |
| Side Milling | 4             | 90%                                                                                                |                    | 90%                                                               |                    | 80%                                                                        |                    | 70%                            |                    |
|              | 5             | 80%                                                                                                |                    | 80%                                                               |                    | 70%                                                                        |                    | 70%                            |                    |
| Slotting     | 4             | 80%                                                                                                |                    | 70%                                                               |                    | 70%                                                                        |                    | 60%                            |                    |
|              | 5             | 70%                                                                                                |                    | 60%                                                               |                    | 60%                                                                        |                    |                                |                    |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## AE-VMSS

## SLOTTING

| Work Material         | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |               | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |               | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |               | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |               |
|-----------------------|-------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------|---------------|-------------------------------------------------------------------|---------------|------------------------------------------------|---------------|
| Cutting Speed (m/min) | 100 (80-120)                                                                              |               | 90 (70-110)                                             |               | 80 (60-100)                                                       |               | 70 (50-80)                                     |               |
| Mill Dia. (mm)        | Speed (min <sup>-1</sup> )                                                                | Feed (mm/min) | Speed (min <sup>-1</sup> )                              | Feed (mm/min) | Speed (min <sup>-1</sup> )                                        | Feed (mm/min) | Speed (min <sup>-1</sup> )                     | Feed (mm/min) |
| 1                     | 28,700                                                                                    | 570           | 25,500                                                  | 460           | 22,300                                                            | 360           | 19,100                                         | 340           |
| 1.5                   | 19,100                                                                                    | 610           | 17,000                                                  | 480           | 14,900                                                            | 420           | 12,700                                         | 360           |
| 2                     | 14,300                                                                                    | 630           | 12,700                                                  | 510           | 11,100                                                            | 440           | 9,600                                          | 380           |
| 2.5                   | 11,500                                                                                    | 780           | 10,200                                                  | 570           | 8,900                                                             | 460           | 7,600                                          | 430           |
| 3                     | 10,600                                                                                    | 930           | 9,600                                                   | 690           | 8,500                                                             | 510           | 7,400                                          | 470           |
| 4                     | 8,000                                                                                     | 960           | 7,200                                                   | 720           | 6,400                                                             | 510           | 5,600                                          | 490           |
| 5                     | 6,400                                                                                     | 1,020         | 5,700                                                   | 800           | 5,100                                                             | 610           | 4,500                                          | 560           |
| 6                     | 5,300                                                                                     | 1,060         | 4,800                                                   | 900           | 4,200                                                             | 670           | 3,700                                          | 370           |
| 8                     | 4,000                                                                                     | 910           | 3,600                                                   | 720           | 3,200                                                             | 640           | 2,800                                          | 370           |
| 10                    | 3,200                                                                                     | 840           | 2,900                                                   | 700           | 2,500                                                             | 550           | 2,200                                          | 350           |
| 12                    | 2,700                                                                                     | 810           | 2,400                                                   | 670           | 2,100                                                             | 550           | 1,900                                          | 330           |
| Depth of Cut          | $a_p$                                                                                     |               |                                                         |               |                                                                   |               | DC                                             | $a_p$         |
|                       |                                                                                           |               |                                                         |               |                                                                   |               | DC ≤ 6                                         | 0.5D          |
|                       |                                                                                           |               |                                                         |               |                                                                   |               | DC > 6                                         | 1D            |

## SIDE MILLING

| Work Material         | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |               | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |               | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |               | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |               |
|-----------------------|-------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------|---------------|-------------------------------------------------------------------|---------------|------------------------------------------------|---------------|
| Cutting Speed (m/min) | 100 (80-120)                                                                              |               | 90 (70-110)                                             |               | 80 (60-100)                                                       |               | 70 (50-80)                                     |               |
| Mill Dia. (mm)        | Speed (min <sup>-1</sup> )                                                                | Feed (mm/min) | Speed (min <sup>-1</sup> )                              | Feed (mm/min) | Speed (min <sup>-1</sup> )                                        | Feed (mm/min) | Speed (min <sup>-1</sup> )                     | Feed (mm/min) |
| 1                     | 38,200                                                                                    | 840           | 28,700                                                  | 690           | 25,500                                                            | 510           | 22,300                                         | 450           |
| 1.5                   | 25,500                                                                                    | 920           | 21,200                                                  | 760           | 17,000                                                            | 540           | 14,900                                         | 460           |
| 2                     | 19,900                                                                                    | 1,430         | 17,500                                                  | 840           | 14,300                                                            | 630           | 11,100                                         | 470           |
| 2.5                   | 15,900                                                                                    | 1,590         | 14,000                                                  | 900           | 11,500                                                            | 690           | 8,900                                          | 480           |
| 3                     | 13,800                                                                                    | 1,660         | 12,700                                                  | 1,070         | 10,600                                                            | 760           | 8,000                                          | 480           |
| 4                     | 10,400                                                                                    | 1,830         | 9,600                                                   | 1,150         | 8,000                                                             | 800           | 6,000                                          | 530           |
| 5                     | 8,300                                                                                     | 1,990         | 7,600                                                   | 1,220         | 6,400                                                             | 900           | 4,800                                          | 560           |
| 6                     | 6,900                                                                                     | 2,070         | 6,400                                                   | 1,540         | 5,300                                                             | 1,060         | 4,200                                          | 640           |
| 8                     | 5,200                                                                                     | 1,770         | 4,800                                                   | 1,540         | 4,000                                                             | 1,040         | 3,200                                          | 610           |
| 10                    | 4,100                                                                                     | 1,640         | 3,800                                                   | 1,370         | 3,200                                                             | 900           | 2,500                                          | 580           |
| 12                    | 3,500                                                                                     | 1,400         | 3,200                                                   | 1,280         | 2,700                                                             | 760           | 2,100                                          | 530           |
| Depth of Cut          | $a_p$                                                                                     |               |                                                         |               | $a_e$                                                             |               |                                                |               |
|                       | 1.5D                                                                                      |               |                                                         |               | 0.2D                                                              |               |                                                |               |

## LONG NECK TYPE

## SIDE MILLING

| Work Material         | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |               | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |               | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |               | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |               |
|-----------------------|-------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------|---------------|-------------------------------------------------------------------|---------------|------------------------------------------------|---------------|
| Cutting Speed (m/min) | 100 (80-120)                                                                              |               | 90 (70-110)                                             |               | 80 (60-100)                                                       |               | 70 (50-80)                                     |               |
| Mill Dia. (mm)        | Speed (min <sup>-1</sup> )                                                                | Feed (mm/min) | Speed (min <sup>-1</sup> )                              | Feed (mm/min) | Speed (min <sup>-1</sup> )                                        | Feed (mm/min) | Speed (min <sup>-1</sup> )                     | Feed (mm/min) |
| 6                     | 5,520                                                                                     | 1,660         | 5,120                                                   | 1,230         | 3,710                                                             | 740           | 2,940                                          | 450           |
| 8                     | 4,160                                                                                     | 1,420         | 3,840                                                   | 1,230         | 2,800                                                             | 730           | 2,240                                          | 430           |
| 10                    | 3,280                                                                                     | 1,310         | 3,040                                                   | 1,100         | 2,240                                                             | 630           | 1,750                                          | 410           |
| 12                    | 2,800                                                                                     | 1,120         | 2,560                                                   | 1,020         | 1,890                                                             | 530           | 1,470                                          | 370           |
| Depth of Cut          | $a_p$                                                                                     |               |                                                         |               | $a_e$                                                             |               |                                                |               |
|                       | 1.5D                                                                                      |               |                                                         |               | 0.02D                                                             |               |                                                |               |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## STANDARD SIDE MILLING 3D DEPTH OF CUT

### AE-VML

| Work Material         | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |               | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |               | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |               | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |               |
|-----------------------|-------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------|---------------|-------------------------------------------------------------------|---------------|------------------------------------------------|---------------|
| Cutting Speed (m/min) | 160 (140-180)                                                                             |               | 150 (130-170)                                           |               | 140 (120-160)                                                     |               | 125 (100-140)                                  |               |
| Mill Dia. (mm)        | Speed (min <sup>-1</sup> )                                                                | Feed (mm/min) | Speed (min <sup>-1</sup> )                              | Feed (mm/min) | Speed (min <sup>-1</sup> )                                        | Feed (mm/min) | Speed (min <sup>-1</sup> )                     | Feed (mm/min) |
| 6                     | 8,500                                                                                     | 2,480         | 8,000                                                   | 2,180         | 7,400                                                             | 2,010         | 6,600                                          | 1,660         |
| 8                     | 6,400                                                                                     | 1,870         | 6,000                                                   | 1,630         | 5,600                                                             | 1,520         | 5,000                                          | 1,260         |
| 10                    | 5,100                                                                                     | 1,730         | 4,800                                                   | 1,440         | 4,500                                                             | 1,350         | 4,000                                          | 1,120         |
| 12                    | 4,200                                                                                     | 1,430         | 4,000                                                   | 1,200         | 3,700                                                             | 1,110         | 3,300                                          | 920           |
| Depth of Cut          | $a_p$                                                                                     |               |                                                         |               | $a_e$                                                             |               |                                                |               |
|                       | 3D                                                                                        |               |                                                         |               | <0.05D                                                            |               |                                                |               |

## HIGH EFFICIENCY SIDE MILLING 3D DEPTH OF CUT

### AE-VML

| Work Material         | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |               | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |               | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |               | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |               |
|-----------------------|-------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------|---------------|-------------------------------------------------------------------|---------------|------------------------------------------------|---------------|
| Cutting Speed (m/min) | 220 (200-240)                                                                             |               | 170 (150-190)                                           |               | 135 (110-150)                                                     |               | 130 (110-150)                                  |               |
| Mill Dia. (mm)        | Speed (min <sup>-1</sup> )                                                                | Feed (mm/min) | Speed (min <sup>-1</sup> )                              | Feed (mm/min) | Speed (min <sup>-1</sup> )                                        | Feed (mm/min) | Speed (min <sup>-1</sup> )                     | Feed (mm/min) |
| 6                     | 11,700                                                                                    | 3,180         | 9,000                                                   | 2,270         | 7,200                                                             | 1,810         | 6,900                                          | 1,600         |
| 8                     | 8,800                                                                                     | 2,390         | 6,800                                                   | 1,710         | 5,400                                                             | 1,360         | 5,200                                          | 1,210         |
| 10                    | 7,000                                                                                     | 2,240         | 5,400                                                   | 1,510         | 4,300                                                             | 1,200         | 4,100                                          | 1,070         |
| 12                    | 5,800                                                                                     | 1,860         | 4,500                                                   | 1,260         | 3,600                                                             | 1,010         | 3,500                                          | 910           |
| Depth of Cut          | $a_p$                                                                                     |               |                                                         |               | $a_e$                                                             |               |                                                |               |
|                       | 3D                                                                                        |               |                                                         |               | 0.1D                                                              |               |                                                |               |

### AE-VML

## DEPTH OF CUT

| Work Material         | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |               | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |               | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |               | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |               |
|-----------------------|-------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------|---------------|-------------------------------------------------------------------|---------------|------------------------------------------------|---------------|
| Cutting Speed (m/min) | 140 (120-160)                                                                             |               | 100 (80-120)                                            |               | 90 (70-110)                                                       |               | 85 (60-100)                                    |               |
| Mill Dia. (mm)        | Speed (min <sup>-1</sup> )                                                                | Feed (mm/min) | Speed (min <sup>-1</sup> )                              | Feed (mm/min) | Speed (min <sup>-1</sup> )                                        | Feed (mm/min) | Speed (min <sup>-1</sup> )                     | Feed (mm/min) |
| 6                     | 7,400                                                                                     | 1,860         | 5,600                                                   | 1,300         | 4,800                                                             | 1,110         | 4,500                                          | 950           |
| 8                     | 5,600                                                                                     | 1,410         | 4,200                                                   | 970           | 3,600                                                             | 840           | 3,400                                          | 720           |
| 10                    | 4,500                                                                                     | 1,350         | 3,300                                                   | 860           | 2,900                                                             | 750           | 2,700                                          | 650           |
| 12                    | 3,700                                                                                     | 1,110         | 2,800                                                   | 730           | 2,400                                                             | 620           | 2,300                                          | 550           |
| Depth of Cut          | $a_p$                                                                                     |               |                                                         |               | $a_e$                                                             |               |                                                |               |
|                       | 3D                                                                                        |               |                                                         |               | 0.15D                                                             |               |                                                |               |

### AE-VML

## DEPTH OF CUT

| Work Material         | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |               | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |               | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |               | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |               |
|-----------------------|-------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------|---------------|-------------------------------------------------------------------|---------------|------------------------------------------------|---------------|
| Cutting Speed (m/min) | 100 (80-120)                                                                              |               | 80 (60-100)                                             |               | 70 (50-90)                                                        |               | 65 (40-80)                                     |               |
| Mill Dia. (mm)        | Speed (min <sup>-1</sup> )                                                                | Feed (mm/min) | Speed (min <sup>-1</sup> )                              | Feed (mm/min) | Speed (min <sup>-1</sup> )                                        | Feed (mm/min) | Speed (min <sup>-1</sup> )                     | Feed (mm/min) |
| 6                     | 5,300                                                                                     | 1,230         | 4,200                                                   | 890           | 3,700                                                             | 780           | 3,500                                          | 670           |
| 8                     | 4,000                                                                                     | 930           | 3,200                                                   | 680           | 2,800                                                             | 590           | 2,600                                          | 500           |
| 10                    | 3,200                                                                                     | 900           | 2,500                                                   | 600           | 2,200                                                             | 530           | 2,100                                          | 460           |
| 12                    | 2,700                                                                                     | 760           | 2,100                                                   | 500           | 1,900                                                             | 460           | 1,700                                          | 370           |
| Depth of Cut          | $a_p$                                                                                     |               |                                                         |               | $a_e$                                                             |               |                                                |               |
|                       | 3D                                                                                        |               |                                                         |               | ≤0.2D                                                             |               |                                                |               |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## ANTI-VIBRATION LONG CARBIDE END MILL STANDARD SIDE MILLING 4D DEPTH OF CUT

### AE-VML

| Work Material            | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |                  | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |                  | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |                  | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |                  |
|--------------------------|-------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------|------------------|-------------------------------------------------------------------|------------------|------------------------------------------------|------------------|
| Cutting Speed<br>(m/min) | 140(120-160)                                                                              |                  | 130(110-150)                                            |                  | 120(100-140)                                                      |                  | 115(90-130)                                    |                  |
| Mill Dia.<br>(mm)        | Speed<br>(min <sup>-1</sup> )                                                             | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                           | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                     | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                  | Feed<br>(mm/min) |
| 6                        | 7,400                                                                                     | 2,010            | 6,900                                                   | 1,740            | 6,400                                                             | 1,610            | 6,100                                          | 1,420            |
| 8                        | 5,600                                                                                     | 1,520            | 5,200                                                   | 1,310            | 4,800                                                             | 1,210            | 4,600                                          | 1,070            |
| 10                       | 4,500                                                                                     | 1,440            | 4,100                                                   | 1,230            | 3,800                                                             | 1,140            | 3,700                                          | 960              |
| 12                       | 3,700                                                                                     | 1,180            | 3,500                                                   | 1,050            | 3,200                                                             | 960              | 3,100                                          | 810              |
| Depth of Cut             |                                                                                           |                  |                                                         |                  |                                                                   |                  |                                                |                  |
|                          | $a_p$                                                                                     |                  |                                                         |                  | $a_e$                                                             |                  |                                                |                  |
|                          | 4D                                                                                        |                  |                                                         |                  | <0.05D                                                            |                  |                                                |                  |

## HIGH EFFICIENCY SIDE MILLING 4D DEPTH OF CUT

### AE-VML

| Work Material            | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |                  | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |                  | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |                  | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |                  |
|--------------------------|-------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------|------------------|-------------------------------------------------------------------|------------------|------------------------------------------------|------------------|
| Cutting Speed<br>(m/min) | 200(180-220)                                                                              |                  | 160(140-180)                                            |                  | 130(110-150)                                                      |                  | 125(100-140)                                   |                  |
| Mill Dia.<br>(mm)        | Speed<br>(min <sup>-1</sup> )                                                             | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                           | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                     | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                  | Feed<br>(mm/min) |
| 6                        | 10,600                                                                                    | 2,670            | 8,500                                                   | 1,970            | 6,900                                                             | 1,600            | 6,600                                          | 1,400            |
| 8                        | 8,000                                                                                     | 2,020            | 6,400                                                   | 1,480            | 5,200                                                             | 1,210            | 5,000                                          | 1,060            |
| 10                       | 6,400                                                                                     | 1,920            | 5,100                                                   | 1,330            | 4,100                                                             | 1,070            | 4,000                                          | 960              |
| 12                       | 5,300                                                                                     | 1,590            | 4,200                                                   | 1,090            | 3,500                                                             | 910              | 3,300                                          | 790              |
| Depth of Cut             |                                                                                           |                  |                                                         |                  |                                                                   |                  |                                                |                  |
|                          | $a_p$                                                                                     |                  |                                                         |                  | $a_e$                                                             |                  |                                                |                  |
|                          | 4D                                                                                        |                  |                                                         |                  | 0.1D                                                              |                  |                                                |                  |

### AE-VML

## DEPTH OF CUT

| Work Material            | Mild Steel • Carbon Steel • Cast Iron<br>SS400 • S55C • FC250<br>(~750N/mm <sup>2</sup> ) |                  | Alloy Steel • Tool Steel<br>SCM • SKS • SKD<br>(~30HRC) |                  | Prehardened Steel • Hardened Steel<br>PX5 • NAK80<br>(30 ~ 45HRC) |                  | Stainless Steel<br>SUS304 • SUS420<br>(≤200HB) |                  |
|--------------------------|-------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------|------------------|-------------------------------------------------------------------|------------------|------------------------------------------------|------------------|
| Cutting Speed<br>(m/min) | 135(110-150)                                                                              |                  | 115(100-140)                                            |                  | 85(60-100)                                                        |                  | 75(50-90)                                      |                  |
| Mill Dia.<br>(mm)        | Speed<br>(min <sup>-1</sup> )                                                             | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                           | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                     | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                  | Feed<br>(mm/min) |
| 6                        | 7,200                                                                                     | 1,670            | 6,100                                                   | 1,290            | 4,500                                                             | 950              | 4,000                                          | 770              |
| 8                        | 5,400                                                                                     | 1,250            | 4,600                                                   | 980              | 3,400                                                             | 720              | 3,000                                          | 580              |
| 10                       | 4,300                                                                                     | 1,200            | 3,700                                                   | 890              | 2,700                                                             | 650              | 2,400                                          | 530              |
| 12                       | 3,600                                                                                     | 1,010            | 3,100                                                   | 740              | 2,300                                                             | 550              | 2,000                                          | 440              |
| Depth of Cut             |                                                                                           |                  |                                                         |                  |                                                                   |                  |                                                |                  |
|                          | $a_p$                                                                                     |                  |                                                         |                  | $a_e$                                                             |                  |                                                |                  |
|                          | 4D                                                                                        |                  |                                                         |                  | ≤0.15D                                                            |                  |                                                |                  |

1. Use a rigid and precise machine and holder.
2. The rotational speed is calculated by the median of the recommended cutting speed.  
Adjustment may be necessary depending on the rigidity of the workpiece fixture and machine.
3. Please use a suitable fluid with high smoke retardant properties.
4. During dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.
5. Please use water-soluble coolant when machining stainless steel.





# CUTTING CONDITIONS FOR CARBIDE END MILLS

## AE-BM-H

The machining path is on condition of contouring line operation.

Roughing

| Work Material | Tool Steel · Hardened Steel<br>Prehardened Steel<br>SKD11 · SKD61 · NAK80<br>(~45HRC) |                  | Hardened Steel                |                  |                               |                  |                               |                  |                               |                  |
|---------------|---------------------------------------------------------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|
|               |                                                                                       |                  | ~55HRC                        |                  | ~62HRC                        |                  | ~66HRC                        |                  | ~70HRC                        |                  |
| RE            | Speed<br>(min <sup>-1</sup> )                                                         | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |
| R1            | 20,700                                                                                | 3,310            | 18,300                        | 1,830            | 15,900                        | 1,590            | 14,300                        | 1,140            | 9,600                         | 770              |
| R1.5          | 13,800                                                                                | 2,760            | 12,200                        | 1,710            | 10,600                        | 1,480            | 9,600                         | 1,150            | 6,400                         | 770              |
| R2            | 10,400                                                                                | 2,500            | 9,200                         | 1,660            | 8,000                         | 1,440            | 7,200                         | 1,150            | 4,800                         | 770              |
| R2.5          | 8,300                                                                                 | 2,660            | 7,300                         | 1,900            | 6,400                         | 1,660            | 5,700                         | 1,370            | 3,800                         | 910              |
| R3            | 6,900                                                                                 | 2,760            | 6,100                         | 1,950            | 5,300                         | 1,700            | 4,800                         | 1,340            | 3,200                         | 900              |
| R4            | 5,200                                                                                 | 2,500            | 4,600                         | 1,840            | 4,000                         | 1,600            | 3,600                         | 1,300            | 2,400                         | 860              |
| R5            | 4,500                                                                                 | 2,340            | 4,000                         | 1,760            | 3,500                         | 1,540            | 3,200                         | 1,280            | 2,200                         | 850              |
| R6            | 4,000                                                                                 | 2,240            | 3,600                         | 1,730            | 3,200                         | 1,540            | 2,900                         | 1,160            | 2,100                         | 840              |
| Depth of Cut  |                                                                                       |                  |                               |                  |                               |                  |                               |                  |                               |                  |
|               |                                                                                       |                  |                               |                  |                               |                  |                               |                  |                               |                  |

| Work Material        | Tool Steel · Hardened Steel<br>Prehardened Steel<br>SKD11 · SKD61 · NAK80<br>(~45HRC) |                  | Hardened Steel                |                  |                               |                  |                               |                  |                               |                  |
|----------------------|---------------------------------------------------------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|
|                      |                                                                                       |                  | ~55HRC                        |                  | ~62HRC                        |                  | ~66HRC                        |                  | ~70HRC                        |                  |
| RE                   | Speed<br>(min <sup>-1</sup> )                                                         | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |
| R1                   | 27,100                                                                                | 4,340            | 24,700                        | 2,470            | 22,300                        | 1,780            | 18,300                        | 1,460            | 13,500                        | 1,080            |
| R1.5                 | 18,000                                                                                | 3,600            | 16,500                        | 2,310            | 14,900                        | 1,780            | 12,200                        | 1,460            | 9,000                         | 1,080            |
| R2                   | 13,500                                                                                | 3,240            | 12,300                        | 2,210            | 11,100                        | 1,780            | 9,200                         | 1,470            | 6,800                         | 1,090            |
| R2.5                 | 10,800                                                                                | 3,460            | 9,900                         | 2,570            | 8,900                         | 2,140            | 7,300                         | 1,750            | 5,400                         | 1,300            |
| R3                   | 9,000                                                                                 | 3,600            | 8,200                         | 2,620            | 7,400                         | 2,070            | 6,100                         | 1,710            | 4,500                         | 1,260            |
| R4                   | 6,800                                                                                 | 3,260            | 6,200                         | 2,480            | 5,600                         | 1,790            | 4,600                         | 1,470            | 3,400                         | 1,090            |
| R5                   | 5,700                                                                                 | 2,960            | 5,300                         | 2,330            | 4,800                         | 1,730            | 4,000                         | 1,440            | 3,000                         | 1,080            |
| R6                   | 5,000                                                                                 | 2,800            | 4,600                         | 2,210            | 4,200                         | 1,680            | 3,500                         | 1,400            | 2,800                         | 1,120            |
| 切込深さ<br>Depth of Cut |                                                                                       |                  |                               |                  |                               |                  |                               |                  |                               |                  |
|                      |                                                                                       |                  |                               |                  |                               |                  |                               |                  |                               |                  |

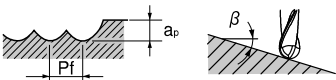
| Work Material        | Tool Steel · Hardened Steel<br>Prehardened Steel<br>SKD11 · SKD61 · NAK80<br>(~45HRC) |                  | Hardened Steel                |                  |                               |                  |                               |                  |                               |                  |
|----------------------|---------------------------------------------------------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|
|                      |                                                                                       |                  | ~55HRC                        |                  | ~62HRC                        |                  | ~66HRC                        |                  | ~70HRC                        |                  |
| RE                   | Speed<br>(min <sup>-1</sup> )                                                         | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |
| R1                   | 37,300                                                                                | 5,970            | 33,000                        | 3,300            | 28,700                        | 2,870            | 25,800                        | 2,060            | 17,200                        | 1,380            |
| R1.5                 | 24,800                                                                                | 4,960            | 22,000                        | 3,080            | 19,100                        | 2,670            | 17,200                        | 2,060            | 11,500                        | 1,380            |
| R2                   | 20,700                                                                                | 4,970            | 18,300                        | 3,290            | 15,900                        | 2,860            | 14,300                        | 2,290            | 9,600                         | 1,540            |
| R2.5                 | 16,600                                                                                | 5,310            | 14,600                        | 3,800            | 12,700                        | 3,300            | 11,500                        | 2,760            | 7,600                         | 1,820            |
| R3                   | 13,800                                                                                | 5,520            | 12,200                        | 3,900            | 10,600                        | 3,390            | 9,600                         | 2,690            | 6,400                         | 1,790            |
| R4                   | 10,400                                                                                | 4,990            | 9,200                         | 3,680            | 8,000                         | 3,200            | 7,200                         | 2,590            | 4,800                         | 1,730            |
| R5                   | 8,900                                                                                 | 4,630            | 8,000                         | 3,520            | 7,000                         | 3,080            | 6,400                         | 2,560            | 4,500                         | 1,800            |
| R6                   | 8,000                                                                                 | 4,480            | 7,200                         | 3,460            | 6,400                         | 3,070            | 5,800                         | 2,320            | 4,200                         | 1,680            |
| 切込深さ<br>Depth of Cut |                                                                                       |                  |                               |                  |                               |                  |                               |                  |                               |                  |
|                      |                                                                                       |                  |                               |                  |                               |                  |                               |                  |                               |                  |



# CUTTING CONDITIONS FOR CARBIDE END MILLS

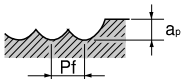
## AE-BM-H

High-Speed Finishing

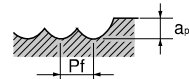
| Work Material | Tool Steel · Hardened Steel<br>Prehardened Steel<br>SKD11 · SKD61 · NAK80<br>(~45HRC)                                                                                                                 |                  | Hardened Steel                |                  |                               |                  |                               |                  |                               |                  |    |    |       |       |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|----|----|-------|-------|
|               |                                                                                                                                                                                                       |                  | ~55HRC                        |                  | ~62HRC                        |                  | ~66HRC                        |                  | ~70HRC                        |                  |    |    |       |       |
| RE            | Speed<br>(min <sup>-1</sup> )                                                                                                                                                                         | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |    |    |       |       |
| R1            | 40,610                                                                                                                                                                                                | 6,500            | 37,020                        | 3,700            | 33,440                        | 2,680            | 27,470                        | 2,200            | 20,300                        | 1,620            |    |    |       |       |
| R1.5          | 27,070                                                                                                                                                                                                | 5,410            | 24,680                        | 3,460            | 22,290                        | 2,670            | 18,310                        | 2,200            | 13,540                        | 1,620            |    |    |       |       |
| R2            | 24,360                                                                                                                                                                                                | 5,850            | 22,210                        | 4,000            | 20,060                        | 3,210            | 16,480                        | 2,640            | 12,180                        | 1,950            |    |    |       |       |
| R2.5          | 19,490                                                                                                                                                                                                | 6,240            | 17,770                        | 4,620            | 16,050                        | 3,850            | 13,180                        | 3,160            | 9,750                         | 2,340            |    |    |       |       |
| R3            | 16,240                                                                                                                                                                                                | 6,500            | 14,810                        | 4,740            | 13,380                        | 3,750            | 10,990                        | 3,080            | 8,120                         | 2,270            |    |    |       |       |
| R4            | 12,180                                                                                                                                                                                                | 5,850            | 11,110                        | 4,440            | 10,030                        | 3,210            | 8,240                         | 2,640            | 6,090                         | 1,950            |    |    |       |       |
| R5            | 10,320                                                                                                                                                                                                | 5,370            | 9,460                         | 4,160            | 8,600                         | 3,100            | 7,170                         | 2,580            | 5,450                         | 1,960            |    |    |       |       |
| R6            | 9,080                                                                                                                                                                                                 | 5,080            | 8,360                         | 4,010            | 7,640                         | 3,060            | 6,210                         | 2,480            | 5,020                         | 2,010            |    |    |       |       |
| Depth of Cut  | <div><div></div><div><table><tr><th>ap</th><th>Pf</th></tr><tr><td>0.02D</td><td>0.05D</td></tr></table></div></div> |                  |                               |                  |                               |                  |                               |                  |                               |                  | ap | Pf | 0.02D | 0.05D |
| ap            | Pf                                                                                                                                                                                                    |                  |                               |                  |                               |                  |                               |                  |                               |                  |    |    |       |       |
| 0.02D         | 0.05D                                                                                                                                                                                                 |                  |                               |                  |                               |                  |                               |                  |                               |                  |    |    |       |       |

## AE-BD-H

Finishing

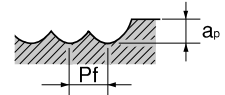
| Work Material | Tool Steel · Hardened Steel<br>Prehardened Steel<br>SKD11 · SKD61 · NAK80<br>(~45HRC) |                  | Hardened Steel                |                  |                               |                  |                               |                  |                               |                  |      |  |
|---------------|---------------------------------------------------------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|------|--|
|               |                                                                                       |                  | ~55HRC                        |                  | ~62HRC                        |                  | ~66HRC                        |                  | ~70HRC                        |                  |      |  |
| RE            | Speed<br>(min <sup>-1</sup> )                                                         | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |      |  |
| R0.5          | 38,400                                                                                | 2,350            | 38,400                        | 2,350            | 38,400                        | 2,000            | 38,400                        | 1,600            | 38,400                        | 1,450            |      |  |
| R0.75         | 38,400                                                                                | 3,050            | 38,400                        | 3,050            | 38,400                        | 2,500            | 31,800                        | 1,900            | 25,200                        | 1,450            |      |  |
| R1            | 38,400                                                                                | 3,600            | 38,400                        | 3,550            | 28,800                        | 2,200            | 24,000                        | 1,750            | 19,200                        | 1,250            |      |  |
| R1.5          | 31,800                                                                                | 4,000            | 25,200                        | 3,200            | 19,200                        | 2,000            | 16,200                        | 1,600            | 12,600                        | 1,200            |      |  |
| R2            | 24,000                                                                                | 3,650            | 19,200                        | 2,950            | 14,400                        | 1,900            | 11,900                        | 1,500            | 9,500                         | 1,150            |      |  |
| R2.5          | 19,200                                                                                | 3,500            | 15,000                        | 2,650            | 11,500                        | 1,700            | 9,500                         | 1,350            | 7,600                         | 1,000            |      |  |
| R3            | 16,200                                                                                | 3,350            | 12,600                        | 2,300            | 9,500                         | 1,550            | 8,000                         | 1,250            | 6,400                         | 955              |      |  |
| R4            | 11,900                                                                                | 2,850            | 9,500                         | 2,050            | 7,100                         | 1,350            | 5,900                         | 1,050            | 4,800                         | 830              |      |  |
| R5            | 9,500                                                                                 | 2,550            | 7,600                         | 1,800            | 5,800                         | 1,150            | 4,800                         | 875              | 3,800                         | 700              |      |  |
| R6            | 8,000                                                                                 | 2,400            | 6,400                         | 1,650            | 4,800                         | 955              | 4,000                         | 795              | 3,200                         | 635              |      |  |
| Depth of Cut  |    |                  | ap                            |                  | Pf                            |                  | ap                            |                  | Pf                            |                  |      |  |
|               |                                                                                       |                  | 0.05D                         |                  | 0.1D                          |                  |                               |                  | 0.03D                         |                  | 0.1D |  |
|               |                                                                                       |                  |                               |                  |                               |                  |                               |                  | ap                            |                  | Pf   |  |
|               |                                                                                       |                  |                               |                  |                               |                  |                               |                  | 0.02D                         |                  | 0.5D |  |

High-Speed Finishing

| Work Material | Tool Steel · Hardened Steel<br>Prehardened Steel<br>SKD11 · SKD61 · NAK80<br>(~45HRC) |                  | Hardened Steel                |                  |                               |                                                                                                                                                                         |                               |                  |                               |                  |    |    |       |       |    |    |       |       |
|---------------|---------------------------------------------------------------------------------------|------------------|-------------------------------|------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------|-------------------------------|------------------|----|----|-------|-------|----|----|-------|-------|
|               |                                                                                       |                  | ~55HRC                        |                  | ~62HRC                        |                                                                                                                                                                         | ~66HRC                        |                  | ~70HRC                        |                  |    |    |       |       |    |    |       |       |
| RE            | Speed<br>(min <sup>-1</sup> )                                                         | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min)                                                                                                                                                        | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |    |    |       |       |    |    |       |       |
| R0.5          | 50,000                                                                                | 3,700            | 50,000                        | 3,700            | 50,000                        | 3,100                                                                                                                                                                   | 50,000                        | 2,600            | 50,000                        | 2,400            |    |    |       |       |    |    |       |       |
| R0.75         | 50,000                                                                                | 4,800            | 50,000                        | 4,800            | 50,000                        | 3,900                                                                                                                                                                   | 50,000                        | 3,050            | 38,400                        | 2,300            |    |    |       |       |    |    |       |       |
| R1            | 50,000                                                                                | 5,600            | 50,000                        | 5,350            | 48,000                        | 3,650                                                                                                                                                                   | 38,400                        | 2,800            | 28,800                        | 2,100            |    |    |       |       |    |    |       |       |
| R1.5          | 49,800                                                                                | 6,200            | 38,400                        | 4,800            | 31,800                        | 3,350                                                                                                                                                                   | 25,200                        | 2,550            | 19,200                        | 1,900            |    |    |       |       |    |    |       |       |
| R2            | 37,200                                                                                | 5,700            | 28,800                        | 4,400            | 24,000                        | 3,200                                                                                                                                                                   | 19,200                        | 2,400            | 14,400                        | 1,800            |    |    |       |       |    |    |       |       |
| R2.5          | 30,000                                                                                | 5,450            | 22,800                        | 4,000            | 19,200                        | 2,850                                                                                                                                                                   | 15,600                        | 2,150            | 11,500                        | 1,600            |    |    |       |       |    |    |       |       |
| R3            | 24,600                                                                                | 5,200            | 19,200                        | 3,450            | 16,200                        | 2,550                                                                                                                                                                   | 12,600                        | 2,050            | 9,500                         | 1,550            |    |    |       |       |    |    |       |       |
| R4            | 18,600                                                                                | 4,450            | 14,400                        | 3,050            | 11,900                        | 2,250                                                                                                                                                                   | 9,500                         | 1,800            | 7,100                         | 1,350            |    |    |       |       |    |    |       |       |
| R5            | 15,000                                                                                | 3,950            | 11,500                        | 2,650            | 9,500                         | 1,900                                                                                                                                                                   | 7,600                         | 1,550            | 5,800                         | 1,150            |    |    |       |       |    |    |       |       |
| R6            | 12,600                                                                                | 3,700            | 9,500                         | 2,500            | 8,000                         | 1,600                                                                                                                                                                   | 6,400                         | 1,350            | 4,800                         | 995              |    |    |       |       |    |    |       |       |
| Depth of Cut  |    |                  |                               |                  |                               | <table><tr><td>ap</td><td>Pf</td></tr><tr><td>0.02D</td><td>0.05D</td></tr></table> <table><tr><td>ap</td><td>Pf</td></tr><tr><td>0.01D</td><td>0.05D</td></tr></table> |                               |                  |                               |                  | ap | Pf | 0.02D | 0.05D | ap | Pf | 0.01D | 0.05D |
| ap            | Pf                                                                                    |                  |                               |                  |                               |                                                                                                                                                                         |                               |                  |                               |                  |    |    |       |       |    |    |       |       |
| 0.02D         | 0.05D                                                                                 |                  |                               |                  |                               |                                                                                                                                                                         |                               |                  |                               |                  |    |    |       |       |    |    |       |       |
| ap            | Pf                                                                                    |                  |                               |                  |                               |                                                                                                                                                                         |                               |                  |                               |                  |    |    |       |       |    |    |       |       |
| 0.01D         | 0.05D                                                                                 |                  |                               |                  |                               |                                                                                                                                                                         |                               |                  |                               |                  |    |    |       |       |    |    |       |       |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## AE-LNBD-H



| Work Material |         | Tool Steel · Hardened Steel<br>Prehardened Steel<br>SKD11·SKD61·NAK80<br>(~45HRC) |               |       |       | Hardened Steel             |               |       |       |                            |               |       |       |                            |               |       |       |                            |               |       |       |
|---------------|---------|-----------------------------------------------------------------------------------|---------------|-------|-------|----------------------------|---------------|-------|-------|----------------------------|---------------|-------|-------|----------------------------|---------------|-------|-------|----------------------------|---------------|-------|-------|
|               |         |                                                                                   |               |       |       | ~55HRC                     |               |       |       | ~62HRC                     |               |       |       | ~66HRC                     |               |       |       | ~70HRC                     |               |       |       |
| RE            | LU (mm) | Speed (min <sup>-1</sup> )                                                        | Feed (mm/min) | ap    | Pf    | Speed (min <sup>-1</sup> ) | Feed (mm/min) | ap    | Pf    | Speed (min <sup>-1</sup> ) | Feed (mm/min) | ap    | Pf    | Speed (min <sup>-1</sup> ) | Feed (mm/min) | ap    | Pf    | Speed (min <sup>-1</sup> ) | Feed (mm/min) | ap    | Pf    |
| 0.05          | 0.2     | 50,000                                                                            | 80            | 0.003 | 0.003 | 50,000                     | 70            | 0.003 | 0.003 | 50,000                     | 70            | 0.003 | 0.003 | 50,000                     | 60            | 0.003 | 0.003 | 50,000                     | 50            | 0.003 | 0.003 |
|               | 0.3     | 50,000                                                                            | 70            | 0.003 | 0.003 | 50,000                     | 60            | 0.003 | 0.003 | 50,000                     | 60            | 0.003 | 0.003 | 50,000                     | 50            | 0.003 | 0.003 | 50,000                     | 40            | 0.003 | 0.003 |
|               | 0.5     | 50,000                                                                            | 50            | 0.003 | 0.003 | 50,000                     | 40            | 0.003 | 0.003 | 50,000                     | 40            | 0.003 | 0.003 | 50,000                     | 30            | 0.003 | 0.003 | 50,000                     | 20            | 0.003 | 0.003 |
| 0.1           | 0.3     | 50,000                                                                            | 400           | 0.005 | 0.005 | 50,000                     | 280           | 0.005 | 0.005 | 50,000                     | 220           | 0.004 | 0.005 | 50,000                     | 190           | 0.004 | 0.005 | 50,000                     | 140           | 0.004 | 0.005 |
|               | 0.5     | 50,000                                                                            | 380           | 0.005 | 0.005 | 50,000                     | 260           | 0.005 | 0.005 | 50,000                     | 200           | 0.004 | 0.005 | 50,000                     | 170           | 0.004 | 0.005 | 50,000                     | 130           | 0.004 | 0.005 |
|               | 0.75    | 50,000                                                                            | 340           | 0.005 | 0.005 | 50,000                     | 230           | 0.005 | 0.005 | 50,000                     | 180           | 0.004 | 0.005 | 50,000                     | 150           | 0.004 | 0.005 | 50,000                     | 110           | 0.004 | 0.005 |
|               | 1       | 50,000                                                                            | 340           | 0.005 | 0.005 | 50,000                     | 230           | 0.005 | 0.005 | 50,000                     | 180           | 0.004 | 0.005 | 50,000                     | 150           | 0.004 | 0.005 | 45,000                     | 110           | 0.004 | 0.005 |
|               | 1.25    | 50,000                                                                            | 300           | 0.005 | 0.005 | 50,000                     | 210           | 0.005 | 0.005 | 50,000                     | 150           | 0.004 | 0.005 | 46,500                     | 130           | 0.004 | 0.005 | 37,200                     | 100           | 0.004 | 0.005 |
|               | 1.5     | 50,000                                                                            | 280           | 0.005 | 0.005 | 50,000                     | 190           | 0.005 | 0.005 | 49,200                     | 130           | 0.004 | 0.005 | 44,300                     | 110           | 0.004 | 0.005 | 35,500                     | 80            | 0.004 | 0.005 |
|               | 1.75    | 50,000                                                                            | 240           | 0.005 | 0.005 | 50,000                     | 170           | 0.005 | 0.005 | 45,600                     | 120           | 0.004 | 0.005 | 41,100                     | 100           | 0.004 | 0.005 | 32,900                     | 80            | 0.004 | 0.005 |
|               | 2       | 45,600                                                                            | 210           | 0.005 | 0.005 | 44,500                     | 140           | 0.005 | 0.005 | 39,600                     | 100           | 0.004 | 0.005 | 35,700                     | 90            | 0.004 | 0.005 | 28,600                     | 70            | 0.004 | 0.005 |
|               | 2.5     | 38,400                                                                            | 160           | 0.004 | 0.005 | 37,200                     | 100           | 0.004 | 0.005 | 37,200                     | 80            | 0.004 | 0.005 | 33,500                     | 70            | 0.004 | 0.005 | 26,800                     | 50            | 0.004 | 0.005 |
| 0.15          | 3       | 38,400                                                                            | 140           | 0.004 | 0.005 | 37,200                     | 90            | 0.004 | 0.005 | 37,200                     | 70            | 0.004 | 0.005 | 33,500                     | 60            | 0.004 | 0.005 | 26,800                     | 50            | 0.004 | 0.005 |
|               | 0.5     | 50,000                                                                            | 600           | 0.005 | 0.1   | 50,000                     | 400           | 0.005 | 0.01  | 50,000                     | 300           | 0.005 | 0.01  | 50,000                     | 260           | 0.005 | 0.01  | 50,000                     | 200           | 0.01  | 0.01  |
|               | 0.6     | 50,000                                                                            | 570           | 0.005 | 0.1   | 50,000                     | 390           | 0.005 | 0.01  | 50,000                     | 300           | 0.005 | 0.01  | 50,000                     | 260           | 0.005 | 0.01  | 50,000                     | 200           | 0.01  | 0.01  |
|               | 0.75    | 50,000                                                                            | 570           | 0.005 | 0.1   | 50,000                     | 390           | 0.05  | 0.01  | 50,000                     | 300           | 0.005 | 0.01  | 50,000                     | 260           | 0.005 | 0.01  | 50,000                     | 200           | 0.01  | 0.01  |
|               | 1       | 50,000                                                                            | 570           | 0.005 | 0.01  | 50,000                     | 390           | 0.005 | 0.01  | 50,000                     | 300           | 0.005 | 0.01  | 50,000                     | 260           | 0.005 | 0.01  | 50,000                     | 200           | 0.01  | 0.01  |
|               | 1.25    | 50,000                                                                            | 570           | 0.005 | 0.01  | 50,000                     | 380           | 0.005 | 0.01  | 50,000                     | 300           | 0.005 | 0.01  | 50,000                     | 260           | 0.005 | 0.01  | 50,000                     | 200           | 0.01  | 0.01  |
|               | 1.5     | 50,000                                                                            | 570           | 0.005 | 0.01  | 50,000                     | 370           | 0.005 | 0.01  | 50,000                     | 290           | 0.005 | 0.01  | 50,000                     | 250           | 0.005 | 0.01  | 46,500                     | 190           | 0.01  | 0.01  |
|               | 1.75    | 50,000                                                                            | 480           | 0.005 | 0.01  | 50,000                     | 310           | 0.005 | 0.01  | 50,000                     | 220           | 0.005 | 0.01  | 46,500                     | 190           | 0.005 | 0.01  | 37,200                     | 140           | 0.01  | 0.01  |
|               | 2       | 50,000                                                                            | 450           | 0.005 | 0.005 | 50,000                     | 290           | 0.005 | 0.005 | 49,200                     | 210           | 0.004 | 0.005 | 44,300                     | 180           | 0.004 | 0.005 | 35,500                     | 140           | 0.004 | 0.005 |
|               | 2.25    | 50,000                                                                            | 380           | 0.005 | 0.005 | 50,000                     | 250           | 0.005 | 0.005 | 49,200                     | 180           | 0.004 | 0.005 | 44,300                     | 150           | 0.004 | 0.005 | 35,500                     | 110           | 0.004 | 0.005 |
|               | 2.5     | 48,000                                                                            | 280           | 0.005 | 0.005 | 48,000                     | 190           | 0.005 | 0.005 | 43,200                     | 130           | 0.004 | 0.005 | 38,900                     | 110           | 0.004 | 0.005 | 31,200                     | 80            | 0.004 | 0.005 |
|               | 3       | 45,600                                                                            | 230           | 0.005 | 0.005 | 44,400                     | 150           | 0.005 | 0.005 | 39,600                     | 100           | 0.004 | 0.005 | 35,700                     | 90            | 0.004 | 0.005 | 28,600                     | 70            | 0.004 | 0.005 |
|               | 3.5     | 40,800                                                                            | 190           | 0.004 | 0.005 | 39,600                     | 120           | 0.004 | 0.005 | 39,600                     | 95            | 0.004 | 0.005 | 35,700                     | 80            | 0.004 | 0.005 | 28,600                     | 60            | 0.004 | 0.005 |
|               | 4       | 38,400                                                                            | 140           | 0.004 | 0.005 | 37,200                     | 90            | 0.004 | 0.005 | 37,200                     | 70            | 0.004 | 0.005 | 33,500                     | 60            | 0.004 | 0.005 | 26,800                     | 50            | 0.004 | 0.005 |
|               | 4.5     | 38,400                                                                            | 120           | 0.004 | 0.005 | 37,200                     | 80            | 0.004 | 0.005 | 37,200                     | 60            | 0.004 | 0.005 | 33,500                     | 50            | 0.004 | 0.005 | 26,800                     | 40            | 0.004 | 0.005 |
|               | 5       | 34,800                                                                            | 95            | 0.004 | 0.005 | 33,600                     | 60            | 0.004 | 0.005 | 33,600                     | 50            | 0.004 | 0.005 | 30,300                     | 40            | 0.004 | 0.005 | 24,200                     | 30            | 0.004 | 0.005 |
| 0.2           | 0.5     | 50,000                                                                            | 900           | 0.01  | 0.02  | 50,000                     | 630           | 0.01  | 0.02  | 50,000                     | 500           | 0.008 | 0.015 | 50,000                     | 430           | 0.008 | 0.015 | 50,000                     | 320           | 0.008 | 0.015 |
|               | 0.75    | 50,000                                                                            | 850           | 0.01  | 0.02  | 50,000                     | 590           | 0.01  | 0.02  | 50,000                     | 470           | 0.008 | 0.015 | 50,000                     | 400           | 0.008 | 0.015 | 50,000                     | 300           | 0.008 | 0.015 |
|               | 0.8     | 50,000                                                                            | 850           | 0.01  | 0.02  | 50,000                     | 590           | 0.01  | 0.02  | 50,000                     | 470           | 0.008 | 0.015 | 50,000                     | 400           | 0.008 | 0.015 | 50,000                     | 300           | 0.008 | 0.015 |
|               | 1       | 50,000                                                                            | 850           | 0.01  | 0.02  | 50,000                     | 550           | 0.01  | 0.02  | 50,000                     | 440           | 0.008 | 0.015 | 50,000                     | 370           | 0.008 | 0.015 | 50,000                     | 280           | 0.008 | 0.015 |
|               | 1.5     | 50,000                                                                            | 760           | 0.01  | 0.02  | 50,000                     | 520           | 0.01  | 0.02  | 50,000                     | 410           | 0.008 | 0.015 | 50,000                     | 350           | 0.008 | 0.015 | 46,500                     | 260           | 0.008 | 0.015 |
|               | 2       | 50,000                                                                            | 660           | 0.01  | 0.02  | 50,000                     | 460           | 0.01  | 0.02  | 50,000                     | 330           | 0.008 | 0.015 | 48,600                     | 280           | 0.008 | 0.015 | 38,900                     | 210           | 0.008 | 0.015 |
|               | 2.5     | 50,000                                                                            | 520           | 0.008 | 0.015 | 50,000                     | 360           | 0.008 | 0.015 | 49,200                     | 260           | 0.008 | 0.015 | 44,300                     | 220           | 0.008 | 0.015 | 35,500                     | 170           | 0.008 | 0.015 |
|               | 3       | 50,000                                                                            | 470           | 0.005 | 0.01  | 50,000                     | 320           | 0.005 | 0.01  | 45,600                     | 220           | 0.005 | 0.01  | 41,100                     | 190           | 0.005 | 0.01  | 32,900                     | 140           | 0.005 | 0.01  |
|               | 3.5     | 48,000                                                                            | 400           | 0.005 | 0.01  | 48,000                     | 280           | 0.005 | 0.01  | 43,200                     | 200           | 0.005 | 0.01  | 38,900                     | 170           | 0.005 | 0.01  | 31,200                     | 130           | 0.005 | 0.01  |
|               | 4       | 43,200                                                                            | 350           | 0.005 | 0.005 | 42,000                     | 230           | 0.005 | 0.005 | 37,200                     | 160           | 0.005 | 0.005 | 33,500                     | 140           | 0.005 | 0.005 | 26,800                     | 110           | 0.005 | 0.005 |
|               | 4.5     | 38,400                                                                            | 270           | 0.004 | 0.005 | 37,200                     | 180           | 0.004 | 0.005 | 33,600                     | 130           | 0.004 | 0.005 | 30,300                     | 110           | 0.004 | 0.005 | 24,200                     | 80            | 0.004 | 0.005 |
|               | 5       | 38,400                                                                            | 260           | 0.004 | 0.005 | 37,200                     | 170           | 0.004 | 0.005 | 33,600                     | 120           | 0.004 | 0.005 | 30,300                     | 100           | 0.004 | 0.005 | 24,200                     | 80            | 0.004 | 0.005 |
|               | 5.5     | 36,000                                                                            | 210           | 0.004 | 0.005 | 34,800                     | 140           | 0.004 | 0.005 | 31,200                     | 100           | 0.004 | 0.005 | 28,100                     | 90            | 0.004 | 0.005 | 22,500                     | 70            | 0.004 | 0.005 |
|               | 6       | 36,000                                                                            | 190           | 0.004 | 0.005 | 34,800                     | 120           | 0.004 | 0.005 | 31,200                     | 100           | 0.004 | 0.005 | 28,100                     | 90            | 0.004 | 0.005 | 22,500                     | 70            | 0.004 | 0.005 |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## AE-LNBD-H

| Work Material |            | Tool Steel · Hardened Steel<br>Prehardened Steel<br>SKD11 · SKD61 · NAK80<br>(~45HRC) |                  |       |       | Hardened Steel                |                  |       |       |                               |                  |       |       |                               |                  |       |       |                               |                  |       |       |
|---------------|------------|---------------------------------------------------------------------------------------|------------------|-------|-------|-------------------------------|------------------|-------|-------|-------------------------------|------------------|-------|-------|-------------------------------|------------------|-------|-------|-------------------------------|------------------|-------|-------|
|               |            | ~55HRC                                                                                |                  |       |       | ~62HRC                        |                  |       |       | ~66HRC                        |                  |       |       | ~70HRC                        |                  |       |       |                               |                  |       |       |
| RE            | LU<br>(mm) | Speed<br>(min <sup>-1</sup> )                                                         | Feed<br>(mm/min) | ap    | Pf    | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | ap    | Pf    | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | ap    | Pf    | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | ap    | Pf    | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | ap    | Pf    |
| 0.25          | 0.75       | 50,000                                                                                | 1,100            | 0.015 | 0.03  | 50,000                        | 750              | 0.015 | 0.03  | 50,000                        | 590              | 0.01  | 0.02  | 50,000                        | 500              | 0.01  | 0.02  | 50,000                        | 380              | 0.01  | 0.02  |
|               | 1          | 50,000                                                                                | 1,050            | 0.015 | 0.03  | 50,000                        | 730              | 0.015 | 0.03  | 50,000                        | 580              | 0.01  | 0.02  | 50,000                        | 490              | 0.01  | 0.02  | 50,000                        | 370              | 0.01  | 0.02  |
|               | 1.5        | 50,000                                                                                | 1,050            | 0.015 | 0.03  | 50,000                        | 700              | 0.015 | 0.03  | 50,000                        | 560              | 0.01  | 0.02  | 50,000                        | 480              | 0.01  | 0.02  | 48,000                        | 360              | 0.01  | 0.02  |
|               | 2          | 50,000                                                                                | 950              | 0.015 | 0.03  | 50,000                        | 650              | 0.015 | 0.03  | 50,000                        | 520              | 0.01  | 0.02  | 48,600                        | 440              | 0.01  | 0.02  | 38,900                        | 330              | 0.01  | 0.02  |
|               | 2.5        | 50,000                                                                                | 950              | 0.015 | 0.03  | 50,000                        | 600              | 0.015 | 0.03  | 50,000                        | 430              | 0.01  | 0.02  | 46,500                        | 370              | 0.01  | 0.02  | 37,200                        | 280              | 0.01  | 0.02  |
|               | 3          | 50,000                                                                                | 850              | 0.01  | 0.02  | 50,000                        | 550              | 0.01  | 0.02  | 48,000                        | 390              | 0.01  | 0.02  | 43,200                        | 330              | 0.01  | 0.02  | 34,600                        | 250              | 0.01  | 0.02  |
|               | 3.5        | 50,000                                                                                | 650              | 0.01  | 0.02  | 50,000                        | 450              | 0.01  | 0.02  | 45,600                        | 320              | 0.01  | 0.02  | 41,100                        | 270              | 0.01  | 0.02  | 32,900                        | 200              | 0.01  | 0.02  |
|               | 4          | 50,000                                                                                | 570              | 0.01  | 0.01  | 50,000                        | 390              | 0.01  | 0.01  | 40,800                        | 270              | 0.01  | 0.01  | 36,800                        | 230              | 0.01  | 0.01  | 29,400                        | 170              | 0.01  | 0.01  |
|               | 4.5        | 45,600                                                                                | 470              | 0.01  | 0.01  | 45,600                        | 320              | 0.01  | 0.01  | 31,200                        | 220              | 0.01  | 0.01  | 28,100                        | 190              | 0.01  | 0.01  | 22,500                        | 140              | 0.01  | 0.01  |
|               | 5          | 36,000                                                                                | 380              | 0.005 | 0.01  | 34,800                        | 250              | 0.005 | 0.01  | 28,800                        | 170              | 0.005 | 0.01  | 26,000                        | 140              | 0.005 | 0.01  | 20,800                        | 110              | 0.005 | 0.01  |
|               | 5.5        | 33,600                                                                                | 280              | 0.004 | 0.005 | 32,400                        | 180              | 0.004 | 0.005 | 26,400                        | 120              | 0.004 | 0.005 | 23,800                        | 100              | 0.004 | 0.005 | 19,100                        | 80               | 0.004 | 0.005 |
|               | 6          | 31,200                                                                                | 230              | 0.004 | 0.005 | 30,000                        | 150              | 0.004 | 0.005 | 24,000                        | 100              | 0.004 | 0.005 | 21,600                        | 90               | 0.004 | 0.005 | 17,300                        | 70               | 0.004 | 0.005 |
|               | 7          | 28,800                                                                                | 190              | 0.004 | 0.005 | 27,600                        | 130              | 0.004 | 0.005 | 24,000                        | 100              | 0.004 | 0.005 | 21,600                        | 90               | 0.004 | 0.005 | 17,300                        | 70               | 0.004 | 0.005 |
|               | 8          | 26,400                                                                                | 150              | 0.004 | 0.005 | 25,200                        | 110              | 0.004 | 0.005 | 24,000                        | 100              | 0.004 | 0.005 | 21,600                        | 90               | 0.004 | 0.005 | 17,300                        | 70               | 0.004 | 0.005 |
|               | 9          | 24,000                                                                                | 110              | 0.004 | 0.005 | 25,200                        | 100              | 0.004 | 0.005 | 24,000                        | 90               | 0.004 | 0.005 | 21,600                        | 80               | 0.004 | 0.005 | 17,300                        | 60               | 0.004 | 0.005 |
|               | 10         | 24,000                                                                                | 95               | 0.004 | 0.005 | 25,200                        | 100              | 0.004 | 0.005 | 24,000                        | 90               | 0.004 | 0.005 | 21,600                        | 80               | 0.004 | 0.005 | 17,300                        | 60               | 0.004 | 0.005 |
| 0.3           | 0.75       | 50,000                                                                                | 1,250            | 0.03  | 0.05  | 50,000                        | 880              | 0.03  | 0.05  | 50,000                        | 700              | 0.01  | 0.02  | 50,000                        | 600              | 0.01  | 0.02  | 50,000                        | 450              | 0.01  | 0.02  |
|               | 1          | 50,000                                                                                | 1,200            | 0.03  | 0.05  | 50,000                        | 840              | 0.03  | 0.05  | 50,000                        | 670              | 0.01  | 0.02  | 50,000                        | 570              | 0.01  | 0.02  | 50,000                        | 430              | 0.01  | 0.02  |
|               | 1.2        | 50,000                                                                                | 1,200            | 0.03  | 0.05  | 50,000                        | 840              | 0.03  | 0.05  | 50,000                        | 670              | 0.01  | 0.02  | 50,000                        | 570              | 0.01  | 0.02  | 50,000                        | 430              | 0.01  | 0.02  |
|               | 1.5        | 50,000                                                                                | 1,200            | 0.03  | 0.05  | 50,000                        | 830              | 0.03  | 0.05  | 50,000                        | 660              | 0.01  | 0.02  | 50,000                        | 560              | 0.01  | 0.02  | 50,000                        | 420              | 0.01  | 0.02  |
|               | 2          | 50,000                                                                                | 1,200            | 0.03  | 0.05  | 50,000                        | 820              | 0.03  | 0.05  | 50,000                        | 650              | 0.01  | 0.02  | 50,000                        | 550              | 0.01  | 0.02  | 50,000                        | 410              | 0.01  | 0.02  |
|               | 2.5        | 50,000                                                                                | 1,100            | 0.03  | 0.05  | 50,000                        | 770              | 0.03  | 0.05  | 50,000                        | 610              | 0.01  | 0.02  | 50,000                        | 520              | 0.01  | 0.02  | 48,000                        | 390              | 0.01  | 0.02  |
|               | 3          | 50,000                                                                                | 1,100            | 0.02  | 0.03  | 50,000                        | 750              | 0.02  | 0.03  | 50,000                        | 540              | 0.01  | 0.02  | 48,600                        | 460              | 0.01  | 0.02  | 38,900                        | 350              | 0.01  | 0.02  |
|               | 3.5        | 50,000                                                                                | 950              | 0.02  | 0.03  | 50,000                        | 660              | 0.02  | 0.03  | 49,200                        | 480              | 0.01  | 0.02  | 44,300                        | 410              | 0.01  | 0.02  | 35,500                        | 310              | 0.01  | 0.02  |
|               | 4          | 48,000                                                                                | 850              | 0.01  | 0.02  | 48,000                        | 590              | 0.01  | 0.02  | 43,200                        | 420              | 0.01  | 0.02  | 38,900                        | 360              | 0.01  | 0.02  | 31,200                        | 270              | 0.01  | 0.02  |
|               | 4.5        | 40,800                                                                                | 740              | 0.01  | 0.02  | 40,800                        | 510              | 0.01  | 0.02  | 37,200                        | 370              | 0.01  | 0.02  | 33,500                        | 310              | 0.01  | 0.02  | 26,800                        | 230              | 0.01  | 0.02  |
|               | 5          | 36,000                                                                                | 640              | 0.01  | 0.02  | 36,000                        | 440              | 0.01  | 0.02  | 32,400                        | 310              | 0.01  | 0.02  | 29,200                        | 260              | 0.01  | 0.02  | 23,400                        | 200              | 0.01  | 0.02  |
|               | 5.5        | 33,600                                                                                | 610              | 0.01  | 0.02  | 33,600                        | 420              | 0.01  | 0.02  | 30,000                        | 300              | 0.01  | 0.02  | 27,000                        | 260              | 0.01  | 0.02  | 21,600                        | 200              | 0.01  | 0.02  |
|               | 6          | 31,200                                                                                | 570              | 0.01  | 0.02  | 30,000                        | 380              | 0.01  | 0.02  | 26,400                        | 260              | 0.01  | 0.02  | 23,800                        | 220              | 0.01  | 0.02  | 19,100                        | 170              | 0.01  | 0.02  |
|               | 6.5        | 28,800                                                                                | 520              | 0.01  | 0.01  | 27,600                        | 340              | 0.01  | 0.01  | 24,000                        | 230              | 0.01  | 0.01  | 21,600                        | 200              | 0.01  | 0.01  | 17,300                        | 150              | 0.01  | 0.01  |
|               | 7          | 27,600                                                                                | 420              | 0.01  | 0.01  | 26,400                        | 280              | 0.01  | 0.01  | 22,800                        | 190              | 0.01  | 0.01  | 20,600                        | 160              | 0.01  | 0.01  | 16,500                        | 120              | 0.01  | 0.01  |
|               | 7.5        | 27,600                                                                                | 380              | 0.01  | 0.01  | 26,400                        | 250              | 0.01  | 0.01  | 22,800                        | 170              | 0.01  | 0.01  | 20,600                        | 140              | 0.01  | 0.01  | 16,500                        | 110              | 0.01  | 0.01  |
|               | 8          | 24,000                                                                                | 300              | 0.005 | 0.01  | 22,800                        | 200              | 0.005 | 0.01  | 20,400                        | 140              | 0.005 | 0.01  | 18,400                        | 120              | 0.005 | 0.01  | 14,700                        | 90               | 0.005 | 0.01  |
|               | 8.5        | 24,000                                                                                | 280              | 0.005 | 0.01  | 22,800                        | 180              | 0.005 | 0.01  | 20,400                        | 130              | 0.005 | 0.01  | 18,400                        | 110              | 0.005 | 0.01  | 14,700                        | 80               | 0.005 | 0.01  |
|               | 9          | 24,000                                                                                | 260              | 0.005 | 0.01  | 22,800                        | 170              | 0.005 | 0.01  | 20,400                        | 120              | 0.005 | 0.01  | 18,400                        | 100              | 0.005 | 0.01  | 14,700                        | 80               | 0.005 | 0.01  |
|               | 9.5        | 24,000                                                                                | 220              | 0.005 | 0.008 | 22,800                        | 140              | 0.005 | 0.008 | 20,400                        | 110              | 0.005 | 0.008 | 18,400                        | 90               | 0.005 | 0.008 | 14,700                        | 70               | 0.005 | 0.008 |
|               | 10         | 24,000                                                                                | 190              | 0.005 | 0.008 | 22,800                        | 120              | 0.005 | 0.008 | 20,400                        | 100              | 0.005 | 0.008 | 18,400                        | 90               | 0.005 | 0.008 | 14,700                        | 70               | 0.005 | 0.008 |
|               | 11         | 21,600                                                                                | 140              | 0.005 | 0.008 | 20,400                        | 90               | 0.005 | 0.008 | 20,400                        | 80               | 0.005 | 0.008 | 18,400                        | 70               | 0.005 | 0.008 | 14,700                        | 50               | 0.005 | 0.008 |
|               | 12         | 21,600                                                                                | 110              | 0.005 | 0.005 | 20,400                        | 80               | 0.005 | 0.005 | 20,400                        | 70               | 0.004 | 0.005 | 18,400                        | 60               | 0.004 | 0.005 | 14,700                        | 50               | 0.004 | 0.005 |



# CUTTING CONDITIONS FOR CARBIDE END MILLS

## AM-EBT

Ball Type

| Work Material | Hardened Steel-<br>Prehardened Steel |                  | Hardened Steel                |                  | Stainless Steel               |                  | Cobalt-Chromium Based Alloy<br>(Stellite) |                  | Titanium Alloy                |                  | Ni-Based Alloy<br>(Inconel 718) |                  |
|---------------|--------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------------------|------------------|-------------------------------|------------------|---------------------------------|------------------|
|               | ~45HRC                               |                  | ~65HRC                        |                  | ≤200HB                        |                  |                                           |                  |                               |                  |                                 |                  |
| Cutting Speed | 50~70m/min                           |                  | 40~60m/min                    |                  | 60~80m/min                    |                  | 50~70m/min                                |                  | 40~60m/min                    |                  | 20~40m/min                      |                  |
| R             | Speed<br>(min <sup>-1</sup> )        | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )             | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )   | Feed<br>(mm/min) |
| R3            | 3,200                                | 960              | 2,700                         | 800              | 3,700                         | 1,120            | 3,200                                     | 960              | 2,700                         | 800              | 1,600                           | 480              |
| R4            | 2,400                                | 860              | 2,000                         | 720              | 2,800                         | 1,000            | 2,400                                     | 860              | 2,000                         | 720              | 1,200                           | 430              |
| R5            | 1,900                                | 860              | 1,600                         | 720              | 2,200                         | 1,000            | 1,900                                     | 860              | 1,600                         | 720              | 960                             | 430              |
| R6            | 1,600                                | 960              | 1,300                         | 800              | 1,900                         | 1,120            | 1,600                                     | 960              | 1,300                         | 800              | 800                             | 480              |
| R8            | 1,200                                | 790              | 1,000                         | 660              | 1,400                         | 920              | 1,200                                     | 790              | 1,000                         | 660              | 600                             | 390              |
| R10           | 1,000                                | 720              | 800                           | 600              | 1,100                         | 840              | 1,000                                     | 720              | 800                           | 600              | 480                             | 360              |
| Depth of Cut  |                                      |                  |                               |                  |                               |                  | ap                                        |                  | Pf                            |                  |                                 |                  |
|               |                                      |                  |                               |                  |                               |                  | R≤6                                       | Max:0.15D        | 0.05D                         |                  |                                 |                  |
|               |                                      |                  |                               |                  |                               |                  | 8≤R                                       | Max:3mm          |                               |                  |                                 |                  |
|               |                                      |                  |                               |                  |                               |                  |                                           |                  |                               |                  |                                 |                  |

## AM-CRE

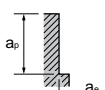
Radius Type

| Work Material | Hardened Steel-<br>Prehardened Steel |                  | Hardened Steel                |                  | Stainless Steel               |                  | Cobalt-Chromium Based Alloy<br>(Stellite) |                  | Titanium Alloy                |                  | Ni-Based Alloy<br>(Inconel 718) |                  |
|---------------|--------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------------------|------------------|-------------------------------|------------------|---------------------------------|------------------|
|               | ~45HRC                               |                  | ~65HRC                        |                  | ≤200HB                        |                  |                                           |                  |                               |                  |                                 |                  |
| Cutting Speed | 50~70m/min                           |                  | 40~60m/min                    |                  | 60~80m/min                    |                  | 50~70m/min                                |                  | 40~60m/min                    |                  | 20~40m/min                      |                  |
| R             | Speed<br>(min <sup>-1</sup> )        | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )             | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )   | Feed<br>(mm/min) |
| 6×R1.5        | 3,200                                | 960              | 2,700                         | 800              | 3,700                         | 1,120            | 3,200                                     | 960              | 2,700                         | 800              | 1,600                           | 480              |
| 8×R2          | 2,400                                | 720              | 2,000                         | 600              | 2,800                         | 840              | 2,400                                     | 720              | 2,000                         | 600              | 1,200                           | 360              |
| 10×R2         | 1,900                                | 920              | 1,600                         | 760              | 2,200                         | 1,070            | 1,900                                     | 920              | 1,600                         | 760              | 960                             | 460              |
| 12×R2         | 1,600                                | 1,270            | 1,300                         | 1,060            | 1,900                         | 1,490            | 1,600                                     | 1,270            | 1,300                         | 1,060            | 800                             | 640              |
| 16×R3         | 1,200                                | 1,430            | 1,000                         | 1,190            | 1,400                         | 1,670            | 1,200                                     | 1,430            | 1,000                         | 1,190            | 600                             | 720              |
| 20×R3         | 1,000                                | 1,530            | 800                           | 1,270            | 1,100                         | 1,780            | 1,000                                     | 1,530            | 800                           | 1,270            | 480                             | 760              |
| Depth of Cut  |                                      |                  |                               |                  |                               |                  | ap                                        | Max:0.5mm        |                               |                  |                                 |                  |
|               |                                      |                  |                               |                  |                               |                  | ae                                        | Max:0.5mm        |                               |                  |                                 |                  |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## WXL-EMS

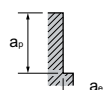
## WXL 4 FLUTES SHORT SIDE MILLING

| Work Material       | Copper · Copper Alloy                                                                                                                                                                                         |                  | Mild Steel · Carbon Steel<br>Fc250 · Ss400 · S55C · NAK55<br>~32HRC |                  | Hardened Steel · Prehardened Steel · Stainless Steel<br>SKT · SKD61 · NAK80 · HPM1 · DH * · SUS304 |                  |                               |                     |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------|------------------|-------------------------------|---------------------|------|-------|---------------------|------|------|------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------|--|----------------|----------------|----|-------|
|                     |                                                                                                                                                                                                               |                  |                                                                     |                  | 33~41HRC                                                                                           |                  | 42~50HRC                      |                     |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| Mill Dia.<br>(mm)   | Speed<br>(min <sup>-1</sup> )                                                                                                                                                                                 | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                                                      | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min)    |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 1                   | 50,000                                                                                                                                                                                                        | 440              | 24,000                                                              | 210              | 14,000                                                                                             | 78               | 12,500                        | 70                  |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 1.5                 | 50,000                                                                                                                                                                                                        | 975              | 16,000                                                              | 310              | 9,250                                                                                              | 115              | 8,400                         | 105                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 2                   | 47,500                                                                                                                                                                                                        | 1,100            | 12,000                                                              | 295              | 7,000                                                                                              | 110              | 6,350                         | 100                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 2.5                 | 38,000                                                                                                                                                                                                        | 1,900            | 9,600                                                               | 480              | 6,200                                                                                              | 140              | 5,550                         | 125                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 3                   | 32,000                                                                                                                                                                                                        | 1,600            | 8,150                                                               | 430              | 5,300                                                                                              | 125              | 4,750                         | 110                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 4                   | 24,000                                                                                                                                                                                                        | 1,700            | 6,050                                                               | 450              | 4,250                                                                                              | 135              | 3,700                         | 115                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 5                   | 19,000                                                                                                                                                                                                        | 2,000            | 4,900                                                               | 520              | 3,550                                                                                              | 140              | 3,150                         | 125                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 6                   | 16,000                                                                                                                                                                                                        | 2,000            | 4,100                                                               | 520              | 2,950                                                                                              | 145              | 2,650                         | 130                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 8                   | 12,000                                                                                                                                                                                                        | 1,900            | 3,050                                                               | 505              | 2,200                                                                                              | 145              | 1,950                         | 130                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 10                  | 9,500                                                                                                                                                                                                         | 1,900            | 2,450                                                               | 505              | 1,750                                                                                              | 145              | 1,550                         | 130                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 12                  | 7,900                                                                                                                                                                                                         | 1,900            | 2,050                                                               | 505              | 1,450                                                                                              | 145              | 1,300                         | 130                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 14                  | 6,800                                                                                                                                                                                                         | 1,900            | 1,750                                                               | 495              | 1,250                                                                                              | 145              | 1,100                         | 125                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 15                  | 6,300                                                                                                                                                                                                         | 1,900            | 1,600                                                               | 490              | 1,150                                                                                              | 135              | 1,050                         | 120                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 16                  | 5,900                                                                                                                                                                                                         | 1,800            | 1,500                                                               | 480              | 1,100                                                                                              | 130              | 995                           | 115                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 18                  | 5,300                                                                                                                                                                                                         | 1,800            | 1,350                                                               | 470              | 990                                                                                                | 115              | 880                           | 105                 |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 20                  | 4,700                                                                                                                                                                                                         | 1,700            | 1,200                                                               | 445              | 890                                                                                                | 105              | 795                           | 95                  |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 25                  | 3,800                                                                                                                                                                                                         | 1,400            | 970                                                                 | 360              | 710                                                                                                | 85               | 635                           | 75                  |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 30                  | 3,100                                                                                                                                                                                                         | 1,100            | 815                                                                 | 300              | 590                                                                                                | 70               | 530                           | 60                  |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| Depth of Cut        | <table><tr><td></td><td>a<sub>p</sub></td><td>a<sub>e</sub></td></tr><tr><td>D<sub>c</sub> &lt; φ3</td><td>1.5D</td><td>0.05D</td></tr><tr><td>φ3 ≤ D<sub>c</sub></td><td>1.5D</td><td>0.1D</td></tr></table> |                  |                                                                     |                  |                                                                                                    | a <sub>p</sub>   | a <sub>e</sub>                | D <sub>c</sub> < φ3 | 1.5D | 0.05D | φ3 ≤ D <sub>c</sub> | 1.5D | 0.1D |  |  | <table><tr><td>a<sub>p</sub></td><td>a<sub>e</sub></td></tr><tr><td>1D</td><td>0.02D</td></tr></table> |  | a <sub>p</sub> | a <sub>e</sub> | 1D | 0.02D |
|                     |                                                                                                                                                                                                               | a <sub>p</sub>   | a <sub>e</sub>                                                      |                  |                                                                                                    |                  |                               |                     |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
|                     | D <sub>c</sub> < φ3                                                                                                                                                                                           | 1.5D             | 0.05D                                                               |                  |                                                                                                    |                  |                               |                     |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| φ3 ≤ D <sub>c</sub> | 1.5D                                                                                                                                                                                                          | 0.1D             |                                                                     |                  |                                                                                                    |                  |                               |                     |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| a <sub>p</sub>      | a <sub>e</sub>                                                                                                                                                                                                |                  |                                                                     |                  |                                                                                                    |                  |                               |                     |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
| 1D                  | 0.02D                                                                                                                                                                                                         |                  |                                                                     |                  |                                                                                                    |                  |                               |                     |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |
|                     |                                                                                                                                                                                                               |                  |                                                                     |                  |                                                                                                    |                  |                               |                     |      |       |                     |      |      |                                                                                    |  |                                                                                                        |  |                |                |    |       |

1. Use a rigid and precise machine and holder.
2. When chattering occurs, reduce the speed and feed at the same ratio.
3. Use an air blow or a suitable cutting fluid with high smoke retardant properties.
4. Refer to the table above to set the milling conditions in accordance with the actual situation.

## WXL 4 FLUTES SHORT HIGH-SPEED SIDE MILLING

Caution: Sparks generated during operation or heat caused by tool breakage can cause fire. Be sure to use all proper fire-prevention measures.

| Work Material                                                                                                                                                  | Copper · Copper Alloy                                                               |                  | Mild Steel · Carbon Steel<br>FC250 · S5400 · S55C<br>~ 32HRC |                  | Hardened Steel · Prehardened Steel<br>SKT · SKD61 · NAK55 · NAK80 · HPM1 · DH**                                                                                |                  |                               |                  |       |         |    |         |    |       |         |    |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------|------------------|-------|---------|----|---------|----|-------|---------|----|-------|
|                                                                                                                                                                |                                                                                     |                  |                                                              |                  | 33~41HRC                                                                                                                                                       |                  | 42 ~ 50HRC                    |                  |       |         |    |         |    |       |         |    |       |
| Mill Dia.<br>(mm)                                                                                                                                              | Speed<br>(min <sup>-1</sup> )                                                       | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                                                                                                                  | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |       |         |    |         |    |       |         |    |       |
| 6                                                                                                                                                              | 26,000                                                                              | 2,900            | 20,000                                                       | 2,300            | 13,000                                                                                                                                                         | 1,500            | 7,950                         | 795              |       |         |    |         |    |       |         |    |       |
| 8                                                                                                                                                              | 19,500                                                                              | 3,000            | 14,500                                                       | 2,300            | 9,900                                                                                                                                                          | 1,450            | 5,950                         | 795              |       |         |    |         |    |       |         |    |       |
| 10                                                                                                                                                             | 15,500                                                                              | 2,900            | 12,000                                                       | 2,300            | 7,950                                                                                                                                                          | 1,450            | 4,750                         | 795              |       |         |    |         |    |       |         |    |       |
| 12                                                                                                                                                             | 13,000                                                                              | 3,000            | 9,900                                                        | 2,300            | 6,600                                                                                                                                                          | 1,450            | 3,950                         | 790              |       |         |    |         |    |       |         |    |       |
| 14                                                                                                                                                             | 11,100                                                                              | 2,800            | 8,500                                                        | 2,200            | 5,650                                                                                                                                                          | 1,350            | 3,400                         | 740              |       |         |    |         |    |       |         |    |       |
| 15                                                                                                                                                             | 10,500                                                                              | 2,800            | 7,950                                                        | 2,150            | 5,250                                                                                                                                                          | 1,350            | 3,150                         | 730              |       |         |    |         |    |       |         |    |       |
| 16                                                                                                                                                             | 9,700                                                                               | 2,700            | 7,450                                                        | 2,100            | 4,950                                                                                                                                                          | 1,350            | 2,950                         | 715              |       |         |    |         |    |       |         |    |       |
| 18                                                                                                                                                             | 8,600                                                                               | 2,700            | 6,600                                                        | 2,100            | 4,400                                                                                                                                                          | 1,300            | 2,650                         | 705              |       |         |    |         |    |       |         |    |       |
| 20                                                                                                                                                             | 7,800                                                                               | 2,600            | 5,950                                                        | 2,000            | 3,950                                                                                                                                                          | 1,300            | 2,350                         | 665              |       |         |    |         |    |       |         |    |       |
| 25                                                                                                                                                             | 6,200                                                                               | 2,000            | 4,750                                                        | 1,600            | 3,150                                                                                                                                                          | 1,050            | 1,900                         | 560              |       |         |    |         |    |       |         |    |       |
| 30                                                                                                                                                             | 5,200                                                                               | 1,700            | 3,950                                                        | 1,350            | 2,650                                                                                                                                                          | 890              | 1,550                         | 455              |       |         |    |         |    |       |         |    |       |
| Depth of Cut                                                                                                                                                   |  |                  |                                                              |                  | <table><tr><td></td><td>ap</td><td>ae</td></tr><tr><td>Dc &lt; φ8</td><td>1D</td><td>0.01D</td></tr><tr><td>φ8 ≤ Dc</td><td>1D</td><td>0.02D</td></tr></table> |                  |                               |                  |       | ap      | ae | Dc < φ8 | 1D | 0.01D | φ8 ≤ Dc | 1D | 0.02D |
|                                                                                                                                                                |                                                                                     |                  |                                                              |                  |                                                                                                                                                                | ap               | ae                            |                  |       |         |    |         |    |       |         |    |       |
|                                                                                                                                                                |                                                                                     |                  |                                                              |                  | Dc < φ8                                                                                                                                                        | 1D               | 0.01D                         |                  |       |         |    |         |    |       |         |    |       |
|                                                                                                                                                                |                                                                                     |                  |                                                              |                  | φ8 ≤ Dc                                                                                                                                                        | 1D               | 0.02D                         |                  |       |         |    |         |    |       |         |    |       |
| <table><tr><td></td><td>ap</td><td>ae</td></tr><tr><td>Dc &lt; φ8</td><td>1D</td><td>0.01D</td></tr><tr><td>φ8 ≤ Dc</td><td>1D</td><td>0.02D</td></tr></table> |                                                                                     |                  |                                                              |                  | ap                                                                                                                                                             | ae               | Dc < φ8                       | 1D               | 0.01D | φ8 ≤ Dc | 1D | 0.02D   |    |       |         |    |       |
|                                                                                                                                                                | ap                                                                                  | ae               |                                                              |                  |                                                                                                                                                                |                  |                               |                  |       |         |    |         |    |       |         |    |       |
| Dc < φ8                                                                                                                                                        | 1D                                                                                  | 0.01D            |                                                              |                  |                                                                                                                                                                |                  |                               |                  |       |         |    |         |    |       |         |    |       |
| φ8 ≤ Dc                                                                                                                                                        | 1D                                                                                  | 0.02D            |                                                              |                  |                                                                                                                                                                |                  |                               |                  |       |         |    |         |    |       |         |    |       |
|                                                                                                                                                                |                                                                                     |                  |                                                              |                  |                                                                                                                                                                |                  |                               |                  |       |         |    |         |    |       |         |    |       |

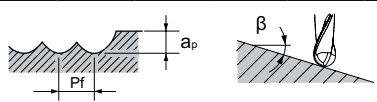
1. The indicated speeds and feeds are for high speed light milling with high speed/high precision machining centers.
2. Tools can cause sparks. Do not use flammable fluids.
3. Use an air blow or a suitable cutting fluid with high smoke retardant properties.
4. Refer to the table above to set the milling conditions in accordance with the actual situation.





# CUTTING CONDITIONS FOR CARBIDE END MILLS

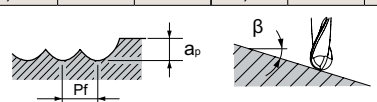
## WXL 2 FLUTES BALL-END REGULAR MILLING

| Work Material | Copper · Copper Alloy                                                              |                               |                  |                                        | Mild Steel · Carbon Steel ·<br>FC250 · S5400 · S55C<br>~ 32HRC |                  |                                        |                               | Hardened Steel · Prehardened Steel · Stainless Steel<br>SKT · SKD61 · NAK80 · HPM1 · DH** · SUS304 |                                        |                               |                  |                                        |                               |                  |                                        |
|---------------|------------------------------------------------------------------------------------|-------------------------------|------------------|----------------------------------------|----------------------------------------------------------------|------------------|----------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------|------------------|----------------------------------------|-------------------------------|------------------|----------------------------------------|
|               |                                                                                    |                               |                  |                                        |                                                                |                  |                                        |                               | 33~41HRC                                                                                           |                                        |                               |                  | 42~50HRC                               |                               |                  |                                        |
|               | R                                                                                  | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm)<br>a <sub>p</sub> Pf | Speed<br>(min <sup>-1</sup> )                                  | Feed<br>(mm/min) | Depth of Cut (mm)<br>a <sub>p</sub> Pf | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min)                                                                                   | Depth of Cut (mm)<br>a <sub>p</sub> Pf | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm)<br>a <sub>p</sub> Pf | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm)<br>a <sub>p</sub> Pf |
| 0.05          | 40,000                                                                             | 150                           | 0.003            | 0.005                                  | 32,000                                                         | 75               | 0.005                                  | 0.005                         | 32,000                                                                                             | 50                                     | 0.005                         | 0.005            | 32,000                                 | 35                            | 0.005            | 0.005                                  |
| 0.1           | 40,000                                                                             | 300                           | 0.01             | 0.02                                   | 32,000                                                         | 200              | 0.01                                   | 0.01                          | 32,000                                                                                             | 200                                    | 0.01                          | 0.01             | 32,000                                 | 200                           | 0.005            | 0.005                                  |
| 0.2           | 40,000                                                                             | 490                           | 0.02             | 0.08                                   | 32,000                                                         | 410              | 0.02                                   | 0.08                          | 32,000                                                                                             | 330                                    | 0.02                          | 0.08             | 32,000                                 | 205                           | 0.02             | 0.04                                   |
| 0.3           | 40,000                                                                             | 580                           | 0.03             | 0.12                                   | 32,000                                                         | 490              | 0.03                                   | 0.12                          | 32,000                                                                                             | 420                                    | 0.03                          | 0.12             | 32,000                                 | 265                           | 0.03             | 0.06                                   |
| 0.4           | 40,000                                                                             | 660                           | 0.04             | 0.16                                   | 32,000                                                         | 550              | 0.04                                   | 0.16                          | 31,500                                                                                             | 420                                    | 0.04                          | 0.16             | 27,500                                 | 290                           | 0.04             | 0.08                                   |
| 0.5           | 32,000                                                                             | 750                           | 0.05             | 0.2                                    | 31,500                                                         | 620              | 0.05                                   | 0.2                           | 25,000                                                                                             | 400                                    | 0.05                          | 0.2              | 22,000                                 | 285                           | 0.05             | 0.1                                    |
| 1             | 19,000                                                                             | 750                           | 0.2              | 0.4                                    | 15,500                                                         | 620              | 0.2                                    | 0.4                           | 12,500                                                                                             | 400                                    | 0.2                           | 0.4              | 11,000                                 | 290                           | 0.1              | 0.2                                    |
| 1.5           | 12,500                                                                             | 760                           | 0.3              | 0.6                                    | 10,500                                                         | 630              | 0.3                                    | 0.6                           | 8,450                                                                                              | 405                                    | 0.3                           | 0.6              | 7,400                                  | 290                           | 0.15             | 0.3                                    |
| 2             | 9,500                                                                              | 760                           | 0.4              | 0.8                                    | 7,950                                                          | 630              | 0.4                                    | 0.8                           | 6,350                                                                                              | 445                                    | 0.4                           | 0.8              | 5,550                                  | 370                           | 0.2              | 0.4                                    |
| 3             | 6,300                                                                              | 800                           | 0.6              | 1.2                                    | 5,300                                                          | 670              | 0.6                                    | 1.2                           | 4,200                                                                                              | 465                                    | 0.6                           | 1.2              | 3,700                                  | 390                           | 0.3              | 0.6                                    |
| 4             | 4,750                                                                              | 950                           | 0.8              | 1.6                                    | 3,950                                                          | 790              | 0.8                                    | 1.6                           | 3,150                                                                                              | 555                                    | 0.8                           | 1.6              | 2,750                                  | 455                           | 0.4              | 0.8                                    |
| 5             | 3,800                                                                              | 890                           | 1                | 2                                      | 3,150                                                          | 745              | 1                                      | 2                             | 2,500                                                                                              | 525                                    | 1                             | 2                | 2,200                                  | 430                           | 0.5              | 1                                      |
| 6             | 3,170                                                                              | 840                           | 1.2              | 2.4                                    | 2,650                                                          | 700              | 1.2                                    | 2.4                           | 2,100                                                                                              | 490                                    | 1.2                           | 2.4              | 1,850                                  | 430                           | 0.6              | 1.2                                    |
| 8             | 2,400                                                                              | 630                           | 1.6              | 3.2                                    | 1,990                                                          | 525              | 1.6                                    | 3.2                           | 1,580                                                                                              | 370                                    | 1.6                           | 3.2              | 1,390                                  | 325                           | 0.8              | 1.6                                    |
| 10            | 1,900                                                                              | 500                           | 2                | 4                                      | 1,590                                                          | 420              | 2                                      | 4                             | 1,260                                                                                              | 290                                    | 2                             | 4                | 1,110                                  | 260                           | 1                | 2                                      |
| Depth of Cut  |  |                               |                  |                                        |                                                                |                  |                                        |                               |                                                                                                    |                                        |                               |                  |                                        |                               |                  |                                        |

1. Use a rigid and precise machine and holder.
  2. Use an air blow or a suitable cutting fluid with high smoke retardant properties.
  3. Refer to the table above to set the milling conditions in accordance with the actual situation.
- ※ When the length of tool extension from the machine is long, reduce the speed and feed.
- ※ ※ When  $\beta$  is less than  $15^\circ$ , speed and feed in the above table can be increased 1.5 ~2 times.

## WXL 2 FLUTES BALL-END HIGH-SPEED LIGHT MILLING

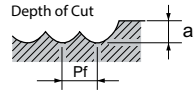
Caution: Sparks generated during operation or heat caused by tool breakage can cause fire. Be sure to use all proper fire-prevention measures.

| Work Material | Copper · Copper Alloy                                                                |                               |                  |                                        | Mild Steel · Carbon Steel ·<br>FC250 · S5400 · S55C<br>~ 32HRC |                  |                                        |                               | Hardened Steel · Prehardened Steel<br>SKT · SKD61 · NAK55 · NAK80 · HPM1 · DH** |                                        |                               |                  |                                        |                               |                  |                                        |
|---------------|--------------------------------------------------------------------------------------|-------------------------------|------------------|----------------------------------------|----------------------------------------------------------------|------------------|----------------------------------------|-------------------------------|---------------------------------------------------------------------------------|----------------------------------------|-------------------------------|------------------|----------------------------------------|-------------------------------|------------------|----------------------------------------|
|               |                                                                                      |                               |                  |                                        |                                                                |                  |                                        |                               | 33~41HRC                                                                        |                                        |                               |                  | 42~50HRC                               |                               |                  |                                        |
|               | R                                                                                    | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm)<br>a <sub>p</sub> Pf | Speed<br>(min <sup>-1</sup> )                                  | Feed<br>(mm/min) | Depth of Cut (mm)<br>a <sub>p</sub> Pf | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min)                                                                | Depth of Cut (mm)<br>a <sub>p</sub> Pf | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm)<br>a <sub>p</sub> Pf | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm)<br>a <sub>p</sub> Pf |
| 0.5           | 50,000                                                                               | 3,350                         | 0.02             | 0.05                                   | 50,000                                                         | 2,800            | 0.02                                   | 0.05                          | 50,000                                                                          | 2,500                                  | 0.02                          | 0.05             | 47,500                                 | 2,250                         | 0.02             | 0.05                                   |
| 1             | 31,500                                                                               | 3,350                         | 0.04             | 0.1                                    | 25,000                                                         | 2,800            | 0.04                                   | 0.1                           | 24,500                                                                          | 2,500                                  | 0.04                          | 0.1              | 23,500                                 | 2,250                         | 0.04             | 0.1                                    |
| 1.5           | 21,000                                                                               | 3,350                         | 0.06             | 0.15                                   | 16,500                                                         | 2,800            | 0.06                                   | 0.15                          | 16,000                                                                          | 2,500                                  | 0.06                          | 0.15             | 15,500                                 | 2,250                         | 0.06             | 0.15                                   |
| 2             | 15,500                                                                               | 4,080                         | 0.08             | 0.2                                    | 15,500                                                         | 3,400            | 0.08                                   | 0.2                           | 15,000                                                                          | 2,750                                  | 0.08                          | 0.2              | 13,500                                 | 2,450                         | 0.08             | 0.2                                    |
| 3             | 10,500                                                                               | 5,160                         | 0.12             | 0.3                                    | 13,500                                                         | 4,300            | 0.3                                    | 0.6                           | 11,500                                                                          | 2,750                                  | 0.3                           | 0.6              | 9,500                                  | 2,250                         | 0.12             | 0.3                                    |
| 4             | 7,900                                                                                | 3,840                         | 0.16             | 0.4                                    | 10,000                                                         | 3,200            | 0.4                                    | 0.8                           | 8,950                                                                           | 2,100                                  | 0.4                           | 0.8              | 7,150                                  | 1,700                         | 0.16             | 0.4                                    |
| 5             | 6,300                                                                                | 3,120                         | 0.2              | 0.5                                    | 8,250                                                          | 2,600            | 0.5                                    | 1                             | 7,150                                                                           | 1,700                                  | 0.5                           | 1                | 5,700                                  | 1,350                         | 0.2              | 0.5                                    |
| 6             | 5,250                                                                                | 2,580                         | 0.24             | 0.6                                    | 6,850                                                          | 2,150            | 0.5                                    | 2.4                           | 5,950                                                                           | 1,400                                  | 0.5                           | 2.4              | 4,750                                  | 1,100                         | 0.24             | 0.6                                    |
| 8             | 4,950                                                                                | 1,550                         | 0.32             | 0.8                                    | 4,110                                                          | 1,290            | 0.5                                    | 3.2                           | 4,460                                                                           | 1,050                                  | 0.5                           | 3.2              | 3,560                                  | 820                           | 0.32             | 0.8                                    |
| 10            | 3,950                                                                                | 1,240                         | 0.4              | 1                                      | 3,290                                                          | 1,030            | 0.5                                    | 4                             | 3,570                                                                           | 840                                    | 0.5                           | 4                | 2,850                                  | 660                           | 0.32             | 1                                      |
| Depth of Cut  |  |                               |                  |                                        |                                                                |                  |                                        |                               |                                                                                 |                                        |                               |                  |                                        |                               |                  |                                        |

1. The indicated speeds and feeds are for high speed light milling with high speed/high precision machining centers.
  2. Because tools can cause sparks, do not use flammable fluids.
  3. Use an air blow or a suitable cutting fluid with high smoke retardant properties.
  4. Refer to the table above to set the milling conditions in accordance with the actual situation.
- ※ When  $\beta$  is less than  $15^\circ$ , speed and feed in the above table can be increased 1.2~1.5 times.

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## WXL-LN-EBD



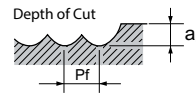
## WXL 2 FLUTES BALL-ENDLONG NECK REGULAR MILLING

| Work Material |            | Copper·Copper Alloy           |                  |                   |       | Mild Steel·Carbon Steel<br>FC250·S5400·S55C<br>~32HRC |                  |                   |       | Hardened Steel·Prehardened Steel<br>SKT·SKD61·NAK55·NAK80·HPM1·DH** |                  |                   |                |                               |                  |                   |                |
|---------------|------------|-------------------------------|------------------|-------------------|-------|-------------------------------------------------------|------------------|-------------------|-------|---------------------------------------------------------------------|------------------|-------------------|----------------|-------------------------------|------------------|-------------------|----------------|
|               |            |                               |                  |                   |       |                                                       |                  |                   |       | 33~41HRC                                                            |                  |                   |                | 42~50HRC                      |                  |                   |                |
|               |            |                               |                  |                   |       |                                                       |                  |                   |       | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/min) | Depth of Cut (mm) |                | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |                |
| R             | φ2<br>(mm) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> )                         | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/min) | a <sub>p</sub>    | P <sub>f</sub> | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | a <sub>p</sub>    | P <sub>f</sub> |
| 0.05          | 0.3        | 32,000                        | 150              | 0.005             | 0.005 | 32,000                                                | 75               | 0.005             | 0.005 | 32,000                                                              | 50               | 0.005             | 0.005          | 32,000                        | 35               | 0.005             | 0.005          |
|               | 0.5        | 32,000                        | 120              | 0.005             | 0.005 | 32,000                                                | 60               | 0.005             | 0.005 | 32,000                                                              | 40               | 0.005             | 0.005          | 32,000                        | 25               | 0.005             | 0.005          |
| 0.1           | 0.3        | 32,000                        | 300              | 0.02              | 0.02  | 32,000                                                | 200              | 0.01              | 0.01  | 32,000                                                              | 200              | 0.01              | 0.01           | 32,000                        | 200              | 0.005             | 0.005          |
|               | 0.5        | 32,000                        | 300              | 0.02              | 0.02  | 32,000                                                | 200              | 0.01              | 0.01  | 32,000                                                              | 200              | 0.01              | 0.01           | 32,000                        | 200              | 0.005             | 0.005          |
|               | 0.75       | 32,000                        | 300              | 0.02              | 0.02  | 32,000                                                | 200              | 0.01              | 0.01  | 32,000                                                              | 200              | 0.01              | 0.01           | 32,000                        | 100              | 0.005             | 0.005          |
|               | 1          | 32,000                        | 150              | 0.02              | 0.02  | 32,000                                                | 100              | 0.01              | 0.01  | 32,000                                                              | 100              | 0.01              | 0.01           | 32,000                        | 80               | 0.005             | 0.005          |
|               | 1.25       | 32,000                        | 150              | 0.02              | 0.02  | 32,000                                                | 100              | 0.01              | 0.01  | 32,000                                                              | 100              | 0.01              | 0.01           | 32,000                        | 80               | 0.005             | 0.005          |
|               | 1.5        | 32,000                        | 150              | 0.02              | 0.02  | 32,000                                                | 100              | 0.01              | 0.01  | 32,000                                                              | 100              | 0.01              | 0.01           | 32,000                        | 80               | 0.005             | 0.005          |
|               | 1.75       | 32,000                        | 150              | 0.02              | 0.02  | 32,000                                                | 100              | 0.01              | 0.01  | 32,000                                                              | 100              | 0.01              | 0.01           | 32,000                        | 80               | 0.005             | 0.005          |
|               | 2          | 32,000                        | 150              | 0.01              | 0.01  | 32,000                                                | 100              | 0.005             | 0.005 | 32,000                                                              | 100              | 0.005             | 0.005          | 32,000                        | 80               | 0.005             | 0.005          |
|               | 2.5        | 32,000                        | 75               | 0.01              | 0.01  | 32,000                                                | 50               | 0.005             | 0.005 | 32,000                                                              | 50               | 0.005             | 0.005          | 32,000                        | 40               | 0.003             | 0.005          |
|               | 3          | 32,000                        | 75               | 0.01              | 0.01  | 32,000                                                | 50               | 0.005             | 0.005 | 32,000                                                              | 50               | 0.005             | 0.005          | 32,000                        | 40               | 0.003             | 0.005          |
| 0.15          | 0.5        | 32,000                        | 600              | 0.02              | 0.03  | 32,000                                                | 400              | 0.01              | 0.015 | 32,000                                                              | 300              | 0.01              | 0.015          | 32,000                        | 300              | 0.005             | 0.005          |
|               | 0.6        | 32,000                        | 600              | 0.02              | 0.03  | 32,000                                                | 400              | 0.01              | 0.015 | 32,000                                                              | 300              | 0.01              | 0.015          | 32,000                        | 300              | 0.005             | 0.005          |
|               | 0.75       | 32,000                        | 600              | 0.02              | 0.03  | 32,000                                                | 400              | 0.01              | 0.015 | 32,000                                                              | 300              | 0.01              | 0.015          | 32,000                        | 300              | 0.005             | 0.005          |
|               | 1          | 32,000                        | 450              | 0.02              | 0.03  | 32,000                                                | 300              | 0.01              | 0.015 | 32,000                                                              | 200              | 0.01              | 0.015          | 32,000                        | 200              | 0.005             | 0.005          |
|               | 1.25       | 32,000                        | 450              | 0.02              | 0.03  | 32,000                                                | 300              | 0.01              | 0.015 | 32,000                                                              | 200              | 0.01              | 0.015          | 32,000                        | 200              | 0.005             | 0.005          |
|               | 1.5        | 32,000                        | 450              | 0.02              | 0.03  | 32,000                                                | 300              | 0.01              | 0.015 | 32,000                                                              | 200              | 0.01              | 0.015          | 32,000                        | 200              | 0.005             | 0.005          |
|               | 1.75       | 32,000                        | 450              | 0.02              | 0.03  | 32,000                                                | 300              | 0.01              | 0.015 | 32,000                                                              | 200              | 0.01              | 0.015          | 32,000                        | 200              | 0.005             | 0.005          |
|               | 2          | 32,000                        | 450              | 0.02              | 0.03  | 32,000                                                | 300              | 0.01              | 0.015 | 32,000                                                              | 200              | 0.01              | 0.015          | 32,000                        | 200              | 0.005             | 0.005          |
|               | 2.25       | 32,000                        | 450              | 0.02              | 0.02  | 32,000                                                | 300              | 0.01              | 0.01  | 32,000                                                              | 200              | 0.01              | 0.01           | 32,000                        | 200              | 0.01              | 0.01           |
|               | 2.5        | 32,000                        | 450              | 0.02              | 0.02  | 32,000                                                | 300              | 0.01              | 0.01  | 32,000                                                              | 200              | 0.01              | 0.01           | 32,000                        | 200              | 0.01              | 0.01           |
|               | 2.75       | 32,000                        | 450              | 0.02              | 0.02  | 32,000                                                | 300              | 0.01              | 0.01  | 32,000                                                              | 200              | 0.01              | 0.01           | 32,000                        | 200              | 0.01              | 0.01           |
|               | 3          | 32,000                        | 450              | 0.02              | 0.02  | 32,000                                                | 300              | 0.01              | 0.01  | 32,000                                                              | 200              | 0.01              | 0.01           | 32,000                        | 200              | 0.005             | 0.01           |
| 0.2           | 3.5        | 32,000                        | 270              | 0.02              | 0.02  | 32,000                                                | 180              | 0.01              | 0.01  | 32,000                                                              | 120              | 0.01              | 0.01           | 32,000                        | 120              | 0.005             | 0.01           |
|               | 4          | 32,000                        | 270              | 0.02              | 0.02  | 32,000                                                | 180              | 0.01              | 0.01  | 32,000                                                              | 120              | 0.01              | 0.01           | 32,000                        | 120              | 0.005             | 0.005          |
|               | 4.5        | 32,000                        | 270              | 0.02              | 0.02  | 32,000                                                | 180              | 0.01              | 0.01  | 32,000                                                              | 120              | 0.01              | 0.01           | 32,000                        | 120              | 0.003             | 0.005          |
|               | 5          | 32,000                        | 150              | 0.01              | 0.02  | 32,000                                                | 100              | 0.005             | 0.01  | 32,000                                                              | 70               | 0.005             | 0.01           | 32,000                        | 70               | 0.003             | 0.005          |
|               | 0.5        | 32,000                        | 750              | 0.025             | 0.05  | 32,000                                                | 500              | 0.015             | 0.025 | 32,000                                                              | 400              | 0.015             | 0.02           | 32,000                        | 400              | 0.01              | 0.01           |
|               | 0.75       | 32,000                        | 750              | 0.025             | 0.05  | 32,000                                                | 500              | 0.015             | 0.025 | 32,000                                                              | 400              | 0.015             | 0.02           | 32,000                        | 400              | 0.01              | 0.01           |
|               | 1          | 32,000                        | 600              | 0.025             | 0.05  | 32,000                                                | 400              | 0.015             | 0.025 | 32,000                                                              | 300              | 0.015             | 0.02           | 32,000                        | 300              | 0.01              | 0.01           |
|               | 1.5        | 32,000                        | 600              | 0.025             | 0.05  | 32,000                                                | 400              | 0.015             | 0.025 | 32,000                                                              | 300              | 0.015             | 0.02           | 32,000                        | 300              | 0.01              | 0.01           |
|               | 2          | 27,000                        | 450              | 0.025             | 0.05  | 27,000                                                | 300              | 0.015             | 0.025 | 27,000                                                              | 200              | 0.015             | 0.02           | 27,000                        | 200              | 0.01              | 0.01           |
|               | 2.5        | 27,000                        | 450              | 0.025             | 0.05  | 27,000                                                | 300              | 0.015             | 0.025 | 27,000                                                              | 200              | 0.015             | 0.02           | 27,000                        | 200              | 0.01              | 0.01           |
| 0.25          | 3          | 27,000                        | 450              | 0.025             | 0.05  | 27,000                                                | 300              | 0.015             | 0.025 | 27,000                                                              | 200              | 0.015             | 0.02           | 27,000                        | 200              | 0.01              | 0.01           |
|               | 3.5        | 27,000                        | 450              | 0.025             | 0.05  | 27,000                                                | 300              | 0.015             | 0.025 | 27,000                                                              | 200              | 0.015             | 0.02           | 27,000                        | 200              | 0.01              | 0.01           |
|               | 4          | 27,000                        | 450              | 0.01              | 0.03  | 27,000                                                | 300              | 0.005             | 0.015 | 27,000                                                              | 200              | 0.005             | 0.012          | 27,000                        | 200              | 0.005             | 0.01           |
|               | 4.5        | 24,000                        | 300              | 0.01              | 0.03  | 27,000                                                | 200              | 0.005             | 0.015 | 27,000                                                              | 100              | 0.005             | 0.012          | 27,000                        | 100              | 0.005             | 0.01           |
|               | 5          | 24,000                        | 300              | 0.01              | 0.03  | 27,000                                                | 200              | 0.005             | 0.015 | 27,000                                                              | 100              | 0.005             | 0.012          | 27,000                        | 100              | 0.005             | 0.01           |
|               | 5.5        | 21,000                        | 300              | 0.01              | 0.02  | 27,000                                                | 200              | 0.005             | 0.01  | 27,000                                                              | 100              | 0.005             | 0.008          | 27,000                        | 100              | 0.005             | 0.005          |
|               | 6          | 21,000                        | 150              | 0.01              | 0.015 | 27,000                                                | 100              | 0.005             | 0.008 | 27,000                                                              | 80               | 0.005             | 0.006          | 27,000                        | 80               | 0.003             | 0.005          |
|               | 1          | 32,000                        | 750              | 0.04              | 0.05  | 32,000                                                | 500              | 0.02              | 0.025 | 32,000                                                              | 400              | 0.02              | 0.02           | 32,000                        | 400              | 0.01              | 0.01           |
|               | 1.5        | 32,000                        | 750              | 0.04              | 0.05  | 32,000                                                | 500              | 0.02              | 0.025 | 32,000                                                              | 400              | 0.02              | 0.02           | 32,000                        | 400              | 0.01              | 0.01           |
|               | 2          | 32,000                        | 600              | 0.04              | 0.05  | 32,000                                                | 400              | 0.02              | 0.025 | 32,000                                                              | 300              | 0.02              | 0.02           | 32,000                        | 300              | 0.01              | 0.01           |
|               | 2.5        | 27,000                        | 450              | 0.04              | 0.05  | 27,000                                                | 300              | 0.02              | 0.025 | 27,000                                                              | 200              | 0.02              | 0.02           | 27,000                        | 200              | 0.01              | 0.01           |
|               | 3          | 27,000                        | 450              | 0.04              | 0.05  | 27,000                                                | 300              | 0.02              | 0.025 | 27,000                                                              | 200              | 0.02              | 0.02           | 27,000                        | 200              | 0.01              | 0.01           |
|               | 3.5        | 27,000                        | 450              | 0.04              | 0.05  | 27,000                                                | 300              | 0.02              | 0.025 | 27,000                                                              | 200              | 0.02              | 0.02           | 27,000                        | 200              | 0.01              | 0.01           |
|               | 4          | 27,000                        | 450              | 0.04              | 0.05  | 27,000                                                | 300              | 0.02              | 0.025 | 27,000                                                              | 200              | 0.02              | 0.02           | 27,000                        | 200              | 0.01              | 0.01           |
|               | 4.5        | 21,000                        | 300              | 0.04              | 0.05  | 20,000                                                | 200              | 0.02              | 0.025 | 20,000                                                              | 200              | 0.02              | 0.02           | 20,000                        | 200              | 0.01              | 0.01           |
| 0.25          | 5          | 21,000                        | 300              | 0.04              | 0.05  | 20,000                                                | 200              | 0.02              | 0.025 | 20,000                                                              | 150              | 0.02              | 0.02           | 20,000                        | 150              | 0.01              | 0.01           |
|               | 5.5        | 21,000                        | 300              | 0.02              | 0.03  | 20,000                                                | 200              | 0.01              | 0.015 | 20,000                                                              | 150              | 0.01              | 0.01           | 20,000                        | 150              | 0.01              | 0.01           |
|               | 6          | 21,000                        | 300              | 0.02              | 0.03  | 20,000                                                | 200              | 0.01              | 0.015 | 20,000                                                              | 150              | 0.01              | 0.01           | 20,000                        | 150              | 0.01              | 0.01           |
|               | 7          | 21,000                        | 300              | 0.02              | 0.03  | 20,000                                                | 200              | 0.01              | 0.015 | 20,000                                                              | 150              | 0.01              | 0.01           | 20,000                        | 150              | 0.01              | 0.01           |
|               | 8          | 21,000                        | 300              | 0.02              | 0.03  | 15,000                                                | 200              | 0.01              | 0.015 | 15,000                                                              | 150              | 0.01              | 0.01           | 15,000                        | 150              | 0.005             | 0.01           |
|               | 9          | 18,000                        | 150              | 0.02              | 0.02  | 15,000                                                | 100              | 0.01              | 0.01  | 15,000                                                              | 80               | 0.005             | 0.01           | 15,000                        | 80               | 0.005             | 0.005          |
|               | 10         | 18,000                        | 150              | 0.01              | 0.01  | 15,000                                                | 100              | 0.005             | 0.005 | 15,000                                                              | 80               | 0.005             | 0.005          | 15,000                        | 80               | 0.003             | 0.005          |



# CUTTING CONDITIONS FOR CARBIDE END MILLS

## WXL-LN-EBD

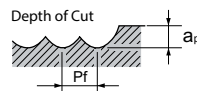


## WXL 2 FLUTES BALL-ENDLONG NECK REGULAR MILLING

| Work Material |            | Copper·Copper Alloy           |                  |                   |        | Mild Steel·Carbon Steel<br>FC250· S5400· S55C<br>～32HRC |                  |                   |        | Hardened Steel·Prehardened Steel<br>SKT·SKD61·NAK55·NAK80·HPM1·DH** |                  |                   |        |                               |                  |                   |       |
|---------------|------------|-------------------------------|------------------|-------------------|--------|---------------------------------------------------------|------------------|-------------------|--------|---------------------------------------------------------------------|------------------|-------------------|--------|-------------------------------|------------------|-------------------|-------|
|               |            |                               |                  |                   |        |                                                         |                  |                   |        | 33～41HRC                                                            |                  |                   |        | 42～50HRC                      |                  |                   |       |
| R             | φ2<br>(mm) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |        | Speed<br>(min <sup>-1</sup> )                           | Feed<br>(mm/min) | Depth of Cut (mm) |        | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/min) | Depth of Cut (mm) |        | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |       |
|               |            |                               |                  | ap                | Pf     |                                                         |                  | ap                | Pf     |                                                                     |                  | ap                | Pf     |                               |                  | ap                | Pf    |
| 0.3           | 1          | 32,000                        | 900              | 0.045             | 0.12   | 32,000                                                  | 600              | 0.03              | 0.06   | 32,000                                                              | 500              | 0.03              | 0.05   | 32,000                        | 500              | 0.03              | 0.03  |
|               | 1.5        | 32,000                        | 900              | 0.045             | 0.12   | 32,000                                                  | 600              | 0.03              | 0.06   | 32,000                                                              | 500              | 0.03              | 0.05   | 32,000                        | 500              | 0.03              | 0.03  |
|               | 2          | 32,000                        | 675              | 0.045             | 0.12   | 32,000                                                  | 450              | 0.03              | 0.06   | 32,000                                                              | 300              | 0.03              | 0.05   | 32,000                        | 300              | 0.03              | 0.03  |
|               | 2.5        | 30,000                        | 675              | 0.045             | 0.12   | 32,000                                                  | 450              | 0.03              | 0.06   | 32,000                                                              | 300              | 0.03              | 0.05   | 32,000                        | 300              | 0.03              | 0.03  |
|               | 3          | 30,000                        | 375              | 0.045             | 0.12   | 25,000                                                  | 250              | 0.03              | 0.06   | 24,000                                                              | 200              | 0.03              | 0.05   | 24,000                        | 200              | 0.03              | 0.03  |
|               | 3.5        | 30,000                        | 375              | 0.045             | 0.12   | 25,000                                                  | 250              | 0.03              | 0.06   | 24,000                                                              | 200              | 0.03              | 0.04   | 24,000                        | 200              | 0.03              | 0.03  |
|               | 4          | 30,000                        | 375              | 0.045             | 0.12   | 25,000                                                  | 250              | 0.03              | 0.06   | 24,000                                                              | 200              | 0.03              | 0.04   | 24,000                        | 200              | 0.03              | 0.03  |
|               | 4.5        | 30,000                        | 375              | 0.045             | 0.12   | 25,000                                                  | 250              | 0.03              | 0.06   | 24,000                                                              | 200              | 0.03              | 0.04   | 24,000                        | 200              | 0.03              | 0.03  |
|               | 5          | 30,000                        | 375              | 0.045             | 0.12   | 25,000                                                  | 250              | 0.03              | 0.06   | 24,000                                                              | 200              | 0.03              | 0.04   | 24,000                        | 200              | 0.02              | 0.02  |
|               | 5.5        | 25,000                        | 300              | 0.045             | 0.12   | 20,000                                                  | 200              | 0.03              | 0.06   | 20,000                                                              | 200              | 0.03              | 0.04   | 20,000                        | 200              | 0.02              | 0.02  |
|               | 6          | 25,000                        | 225              | 0.045             | 0.12   | 20,000                                                  | 150              | 0.03              | 0.06   | 20,000                                                              | 150              | 0.03              | 0.04   | 20,000                        | 150              | 0.02              | 0.02  |
|               | 6.5        | 25,000                        | 225              | 0.045             | 0.12   | 20,000                                                  | 150              | 0.03              | 0.06   | 20,000                                                              | 150              | 0.03              | 0.04   | 20,000                        | 150              | 0.02              | 0.02  |
|               | 7          | 25,000                        | 225              | 0.045             | 0.12   | 20,000                                                  | 150              | 0.03              | 0.06   | 20,000                                                              | 150              | 0.03              | 0.04   | 20,000                        | 150              | 0.02              | 0.02  |
|               | 7.5        | 25,000                        | 225              | 0.045             | 0.12   | 20,000                                                  | 150              | 0.03              | 0.06   | 20,000                                                              | 150              | 0.03              | 0.04   | 20,000                        | 150              | 0.02              | 0.02  |
|               | 8          | 25,000                        | 225              | 0.045             | 0.12   | 20,000                                                  | 150              | 0.03              | 0.06   | 20,000                                                              | 150              | 0.03              | 0.04   | 20,000                        | 150              | 0.02              | 0.02  |
|               | 8.5        | 22,000                        | 225              | 0.045             | 0.12   | 20,000                                                  | 150              | 0.03              | 0.06   | 20,000                                                              | 150              | 0.02              | 0.04   | 20,000                        | 150              | 0.01              | 0.01  |
| 9             | 22,000     | 225                           | 0.03             | 0.1               | 20,000 | 150                                                     | 0.02             | 0.05              | 20,000 | 150                                                                 | 0.02             | 0.04              | 20,000 | 150                           | 0.01             | 0.01              |       |
| 9.5           | 22,000     | 225                           | 0.03             | 0.1               | 17,000 | 150                                                     | 0.02             | 0.05              | 17,000 | 150                                                                 | 0.02             | 0.04              | 17,000 | 150                           | 0.01             | 0.01              |       |
| 10            | 20,000     | 150                           | 0.025            | 0.05              | 17,000 | 100                                                     | 0.015            | 0.025             | 17,000 | 100                                                                 | 0.015            | 0.02              | 17,000 | 100                           | 0.005            | 0.005             |       |
| 11            | 20,000     | 150                           | 0.025            | 0.05              | 17,000 | 100                                                     | 0.015            | 0.025             | 17,000 | 100                                                                 | 0.01             | 0.02              | 17,000 | 100                           | 0.005            | 0.005             |       |
| 12            | 20,000     | 120                           | 0.025            | 0.05              | 17,000 | 80                                                      | 0.015            | 0.025             | 17,000 | 80                                                                  | 0.01             | 0.012             | 17,000 | 80                            | 0.005            | 0.005             |       |
| 0.4           | 2          | 27,000                        | 675              | 0.06              | 0.16   | 23,000                                                  | 450              | 0.04              | 0.08   | 21,000                                                              | 300              | 0.04              | 0.06   | 21,000                        | 300              | 0.04              | 0.04  |
|               | 3          | 27,000                        | 675              | 0.06              | 0.16   | 23,000                                                  | 450              | 0.04              | 0.08   | 21,000                                                              | 300              | 0.04              | 0.06   | 21,000                        | 300              | 0.04              | 0.04  |
|               | 4          | 27,000                        | 675              | 0.06              | 0.16   | 23,000                                                  | 450              | 0.04              | 0.08   | 21,000                                                              | 300              | 0.04              | 0.06   | 21,000                        | 300              | 0.04              | 0.04  |
|               | 5          | 24,000                        | 375              | 0.06              | 0.12   | 21,000                                                  | 250              | 0.04              | 0.06   | 19,000                                                              | 200              | 0.04              | 0.05   | 19,000                        | 200              | 0.02              | 0.025 |
|               | 6          | 24,000                        | 375              | 0.06              | 0.12   | 21,000                                                  | 250              | 0.04              | 0.06   | 19,000                                                              | 200              | 0.04              | 0.05   | 19,000                        | 200              | 0.02              | 0.025 |
|               | 7          | 24,000                        | 375              | 0.06              | 0.12   | 21,000                                                  | 250              | 0.04              | 0.06   | 19,000                                                              | 200              | 0.04              | 0.05   | 19,000                        | 200              | 0.02              | 0.025 |
|               | 8          | 22,000                        | 225              | 0.06              | 0.12   | 19,000                                                  | 150              | 0.04              | 0.06   | 17,000                                                              | 150              | 0.04              | 0.05   | 17,000                        | 150              | 0.02              | 0.025 |
|               | 9          | 22,000                        | 225              | 0.06              | 0.12   | 19,000                                                  | 150              | 0.04              | 0.06   | 17,000                                                              | 150              | 0.04              | 0.05   | 17,000                        | 150              | 0.02              | 0.025 |
| 10            | 22,000     | 225                           | 0.06             | 0.12              | 19,000 | 150                                                     | 0.04             | 0.06              | 17,000 | 150                                                                 | 0.04             | 0.05              | 17,000 | 150                           | 0.02             | 0.025             |       |
| 12            | 20,000     | 225                           | 0.06             | 0.12              | 19,000 | 150                                                     | 0.04             | 0.06              | 17,000 | 150                                                                 | 0.04             | 0.05              | 17,000 | 150                           | 0.02             | 0.025             |       |
| 0.5           | 2.5        | 28,000                        | 900              | 0.075             | 0.2    | 25,000                                                  | 600              | 0.05              | 0.1    | 21,000                                                              | 400              | 0.05              | 0.08   | 21,000                        | 400              | 0.05              | 0.05  |
|               | 3          | 28,000                        | 750              | 0.075             | 0.2    | 25,000                                                  | 500              | 0.05              | 0.1    | 21,000                                                              | 300              | 0.05              | 0.08   | 21,000                        | 300              | 0.05              | 0.05  |
|               | 4          | 28,000                        | 750              | 0.075             | 0.2    | 25,000                                                  | 500              | 0.05              | 0.1    | 21,000                                                              | 300              | 0.05              | 0.08   | 21,000                        | 300              | 0.05              | 0.05  |
|               | 5          | 21,000                        | 450              | 0.075             | 0.2    | 19,000                                                  | 300              | 0.05              | 0.1    | 16,000                                                              | 200              | 0.05              | 0.08   | 16,000                        | 200              | 0.05              | 0.05  |
|               | 6          | 21,000                        | 450              | 0.075             | 0.2    | 19,000                                                  | 300              | 0.05              | 0.1    | 16,000                                                              | 200              | 0.05              | 0.08   | 16,000                        | 200              | 0.05              | 0.05  |
|               | 7          | 21,000                        | 450              | 0.075             | 0.15   | 19,000                                                  | 300              | 0.05              | 0.075  | 16,000                                                              | 200              | 0.05              | 0.06   | 16,000                        | 200              | 0.03              | 0.03  |
|               | 8          | 21,000                        | 450              | 0.075             | 0.15   | 19,000                                                  | 300              | 0.05              | 0.075  | 16,000                                                              | 200              | 0.05              | 0.06   | 16,000                        | 200              | 0.03              | 0.03  |
|               | 9          | 21,000                        | 450              | 0.075             | 0.15   | 19,000                                                  | 300              | 0.05              | 0.075  | 16,000                                                              | 200              | 0.05              | 0.06   | 16,000                        | 200              | 0.03              | 0.03  |
|               | 10         | 18,000                        | 300              | 0.06              | 0.12   | 17,000                                                  | 200              | 0.03              | 0.05   | 14,000                                                              | 150              | 0.03              | 0.04   | 14,000                        | 150              | 0.01              | 0.015 |
|               | 12         | 18,000                        | 300              | 0.06              | 0.12   | 17,000                                                  | 200              | 0.03              | 0.05   | 14,000                                                              | 150              | 0.03              | 0.04   | 14,000                        | 150              | 0.01              | 0.015 |
|               | 14         | 18,000                        | 300              | 0.06              | 0.12   | 17,000                                                  | 200              | 0.03              | 0.05   | 14,000                                                              | 150              | 0.03              | 0.04   | 14,000                        | 150              | 0.01              | 0.015 |
|               | 16         | 16,000                        | 300              | 0.06              | 0.12   | 13,000                                                  | 200              | 0.03              | 0.05   | 10,000                                                              | 150              | 0.03              | 0.04   | 10,000                        | 150              | 0.01              | 0.015 |
| 18            | 16,000     | 300                           | 0.06             | 0.12              | 13,000 | 200                                                     | 0.03             | 0.05              | 10,000 | 150                                                                 | 0.03             | 0.04              | 10,000 | 150                           | 0.01             | 0.015             |       |
| 20            | 16,000     | 300                           | 0.06             | 0.12              | 13,000 | 200                                                     | 0.03             | 0.05              | 10,000 | 150                                                                 | 0.03             | 0.04              | 10,000 | 150                           | 0.01             | 0.015             |       |
| 22            | 16,000     | 225                           | 0.05             | 0.05              | 13,000 | 150                                                     | 0.02             | 0.025             | 10,000 | 100                                                                 | 0.02             | 0.02              | 10,000 | 100                           | 0.005            | 0.005             |       |
| 0.6           | 4          | 20,000                        | 750              | 0.09              | 0.24   | 17,000                                                  | 500              | 0.06              | 0.12   | 14,000                                                              | 300              | 0.06              | 0.1    | 14,000                        | 300              | 0.06              | 0.06  |
|               | 6          | 20,000                        | 450              | 0.09              | 0.24   | 17,000                                                  | 300              | 0.06              | 0.12   | 14,000                                                              | 200              | 0.06              | 0.1    | 14,000                        | 200              | 0.06              | 0.06  |
|               | 8          | 20,000                        | 450              | 0.09              | 0.24   | 17,000                                                  | 300              | 0.06              | 0.12   | 14,000                                                              | 200              | 0.06              | 0.1    | 14,000                        | 200              | 0.06              | 0.06  |
|               | 10         | 20,000                        | 450              | 0.09              | 0.18   | 17,000                                                  | 300              | 0.06              | 0.09   | 14,000                                                              | 200              | 0.06              | 0.07   | 14,000                        | 200              | 0.03              | 0.03  |
|               | 12         | 16,000                        | 300              | 0.09              | 0.18   | 14,000                                                  | 200              | 0.06              | 0.09   | 11,000                                                              | 150              | 0.06              | 0.07   | 11,000                        | 150              | 0.03              | 0.03  |
|               | 14         | 16,000                        | 300              | 0.09              | 0.18   | 14,000                                                  | 200              | 0.06              | 0.09   | 11,000                                                              | 150              | 0.06              | 0.07   | 11,000                        | 150              | 0.01              | 0.03  |
|               | 16         | 16,000                        | 300              | 0.09              | 0.18   | 14,000                                                  | 200              | 0.06              | 0.09   | 11,000                                                              | 150              | 0.06              | 0.07   | 11,000                        | 150              | 0.01              | 0.03  |
|               | 18         | 16,000                        | 300              | 0.09              | 0.18   | 14,000                                                  | 200              | 0.06              | 0.09   | 11,000                                                              | 150              | 0.06              | 0.07   | 11,000                        | 150              | 0.01              | 0.03  |
| 20            | 16,000     | 300                           | 0.09             | 0.18              | 14,000 | 200                                                     | 0.06             | 0.09              | 11,000 | 150                                                                 | 0.06             | 0.07              | 11,000 | 150                           | 0.01             | 0.03              |       |
| 24            | 16,000     | 300                           | 0.09             | 0.18              | 14,000 | 200                                                     | 0.06             | 0.09              | 11,000 | 150                                                                 | 0.06             | 0.07              | 11,000 | 150                           | 0.01             | 0.03              |       |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## WXL-LN-EBD



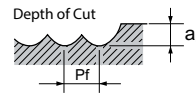
## WXL 2 FLUTES BALL-ENDLONG NECK REGULAR MILLING

| Work Material |            | Copper·Copper Alloy           |                  |                   |                | Mild Steel·Carbon Steel<br>FC250·S5400·S55C<br>~32HRC |                  |                   |                | Hardened Steel·Prehardened Steel<br>SKT·SKD61·NAK55·NAK80·HPM1·DH** |                  |                   |                |                               |                  |                   |                |
|---------------|------------|-------------------------------|------------------|-------------------|----------------|-------------------------------------------------------|------------------|-------------------|----------------|---------------------------------------------------------------------|------------------|-------------------|----------------|-------------------------------|------------------|-------------------|----------------|
|               |            |                               |                  |                   |                |                                                       |                  |                   |                | 33~41HRC                                                            |                  |                   |                | 42~50HRC                      |                  |                   |                |
| R             | φ2<br>(mm) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |                | Speed<br>(min <sup>-1</sup> )                         | Feed<br>(mm/min) | Depth of Cut (mm) |                | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/min) | Depth of Cut (mm) |                | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |                |
|               |            |                               |                  | a <sub>p</sub>    | P <sub>f</sub> |                                                       |                  | a <sub>p</sub>    | P <sub>f</sub> |                                                                     |                  | a <sub>p</sub>    | P <sub>f</sub> |                               |                  | a <sub>p</sub>    | P <sub>f</sub> |
| 0.7           | 8          | 18,000                        | 450              | 0.1               | 0.28           | 15,500                                                | 300              | 0.07              | 0.14           | 12,000                                                              | 250              | 0.07              | 0.1            | 12,000                        | 250              | 0.07              | 0.07           |
|               | 12         | 18,000                        | 450              | 0.1               | 0.2            | 15,500                                                | 300              | 0.07              | 0.1            | 12,000                                                              | 250              | 0.07              | 0.08           | 12,000                        | 250              | 0.07              | 0.07           |
|               | 16         | 13,000                        | 300              | 0.09              | 0.18           | 12,000                                                | 200              | 0.06              | 0.09           | 9,000                                                               | 150              | 0.04              | 0.07           | 9,000                         | 150              | 0.01              | 0.03           |
| 0.75          | 3          | 20,000                        | 900              | 0.12              | 0.3            | 15,000                                                | 600              | 0.08              | 0.15           | 12,000                                                              | 500              | 0.08              | 0.12           | 12,000                        | 300              | 0.08              | 0.1            |
|               | 4          | 20,000                        | 900              | 0.12              | 0.3            | 15,000                                                | 600              | 0.08              | 0.15           | 12,000                                                              | 500              | 0.08              | 0.12           | 12,000                        | 300              | 0.08              | 0.1            |
|               | 6          | 18,000                        | 750              | 0.12              | 0.3            | 15,000                                                | 500              | 0.08              | 0.15           | 12,000                                                              | 350              | 0.08              | 0.12           | 12,000                        | 300              | 0.08              | 0.1            |
|               | 8          | 17,000                        | 450              | 0.12              | 0.3            | 15,000                                                | 300              | 0.08              | 0.15           | 12,000                                                              | 250              | 0.08              | 0.12           | 12,000                        | 250              | 0.08              | 0.1            |
|               | 10         | 17,000                        | 450              | 0.12              | 0.3            | 15,000                                                | 300              | 0.08              | 0.15           | 12,000                                                              | 250              | 0.08              | 0.12           | 12,000                        | 250              | 0.08              | 0.1            |
|               | 12         | 17,000                        | 450              | 0.12              | 0.24           | 15,000                                                | 300              | 0.08              | 0.12           | 12,000                                                              | 250              | 0.08              | 0.09           | 12,000                        | 250              | 0.05              | 0.06           |
|               | 14         | 17,000                        | 450              | 0.12              | 0.24           | 15,000                                                | 300              | 0.08              | 0.12           | 12,000                                                              | 250              | 0.08              | 0.09           | 12,000                        | 250              | 0.05              | 0.06           |
|               | 16         | 13,000                        | 300              | 0.09              | 0.18           | 12,000                                                | 200              | 0.06              | 0.1            | 9,500                                                               | 150              | 0.06              | 0.07           | 9,500                         | 150              | 0.01              | 0.03           |
|               | 18         | 13,000                        | 300              | 0.09              | 0.18           | 12,000                                                | 200              | 0.06              | 0.1            | 9,500                                                               | 150              | 0.06              | 0.07           | 9,500                         | 150              | 0.01              | 0.03           |
|               | 20         | 13,000                        | 300              | 0.09              | 0.18           | 12,000                                                | 200              | 0.06              | 0.1            | 9,500                                                               | 150              | 0.06              | 0.07           | 9,500                         | 150              | 0.01              | 0.03           |
|               | 22         | 13,000                        | 300              | 0.09              | 0.18           | 12,000                                                | 200              | 0.06              | 0.1            | 9,500                                                               | 150              | 0.06              | 0.07           | 9,500                         | 150              | 0.01              | 0.03           |
|               | 30         | 13,000                        | 300              | 0.09              | 0.18           | 12,000                                                | 200              | 0.06              | 0.1            | 9,500                                                               | 150              | 0.06              | 0.07           | 9,500                         | 150              | 0.01              | 0.03           |
| 0.8           | 4          | 20,000                        | 900              | 0.12              | 0.32           | 14,000                                                | 600              | 0.08              | 0.16           | 11,000                                                              | 500              | 0.08              | 0.13           | 11,000                        | 350              | 0.08              | 0.1            |
|               | 8          | 16,500                        | 450              | 0.12              | 0.32           | 14,000                                                | 300              | 0.08              | 0.16           | 11,000                                                              | 250              | 0.08              | 0.13           | 11,000                        | 250              | 0.08              | 0.1            |
|               | 12         | 16,500                        | 450              | 0.12              | 0.24           | 14,000                                                | 300              | 0.08              | 0.12           | 11,000                                                              | 250              | 0.08              | 0.08           | 11,000                        | 250              | 0.05              | 0.05           |
|               | 16         | 11,500                        | 300              | 0.12              | 0.24           | 11,000                                                | 200              | 0.08              | 0.12           | 9,000                                                               | 150              | 0.08              | 0.08           | 9,000                         | 150              | 0.05              | 0.05           |
|               | 20         | 11,500                        | 300              | 0.09              | 0.2            | 11,000                                                | 200              | 0.06              | 0.12           | 9,000                                                               | 150              | 0.06              | 0.075          | 9,000                         | 150              | 0.015             | 0.03           |
| 0.9           | 8          | 16,500                        | 600              | 0.13              | 0.36           | 14,000                                                | 400              | 0.09              | 0.18           | 11,000                                                              | 300              | 0.09              | 0.16           | 11,000                        | 300              | 0.09              | 0.12           |
|               | 12         | 16,500                        | 600              | 0.13              | 0.36           | 14,000                                                | 400              | 0.09              | 0.18           | 11,000                                                              | 300              | 0.09              | 0.16           | 11,000                        | 300              | 0.09              | 0.12           |
|               | 16         | 16,500                        | 600              | 0.13              | 0.27           | 14,000                                                | 400              | 0.09              | 0.14           | 11,000                                                              | 300              | 0.09              | 0.12           | 11,000                        | 300              | 0.05              | 0.06           |
|               | 20         | 11,000                        | 300              | 0.1               | 0.22           | 11,000                                                | 200              | 0.06              | 0.13           | 8,000                                                               | 200              | 0.06              | 0.08           | 8,000                         | 200              | 0.02              | 0.03           |
| 1             | 3          | 16,500                        | 1,350            | 0.15              | 0.56           | 16,500                                                | 900              | 0.1               | 0.28           | 13,500                                                              | 800              | 0.1               | 0.28           | 13,500                        | 700              | 0.1               | 0.2            |
|               | 4          | 16,500                        | 1,050            | 0.15              | 0.56           | 16,500                                                | 700              | 0.1               | 0.28           | 13,500                                                              | 500              | 0.1               | 0.28           | 13,500                        | 500              | 0.1               | 0.2            |
|               | 6          | 16,500                        | 1,050            | 0.15              | 0.56           | 16,500                                                | 700              | 0.1               | 0.28           | 13,500                                                              | 500              | 0.1               | 0.28           | 13,500                        | 500              | 0.1               | 0.2            |
|               | 8          | 16,500                        | 1,050            | 0.15              | 0.56           | 16,500                                                | 700              | 0.1               | 0.28           | 13,500                                                              | 500              | 0.1               | 0.28           | 13,500                        | 500              | 0.1               | 0.2            |
|               | 10         | 14,000                        | 750              | 0.15              | 0.56           | 13,000                                                | 500              | 0.1               | 0.28           | 10,000                                                              | 300              | 0.1               | 0.28           | 10,000                        | 300              | 0.1               | 0.2            |
|               | 12         | 14,000                        | 750              | 0.15              | 0.56           | 13,000                                                | 500              | 0.1               | 0.28           | 10,000                                                              | 300              | 0.1               | 0.28           | 10,000                        | 300              | 0.1               | 0.2            |
|               | 14         | 14,000                        | 750              | 0.15              | 0.56           | 13,000                                                | 500              | 0.1               | 0.28           | 10,000                                                              | 300              | 0.1               | 0.28           | 10,000                        | 300              | 0.1               | 0.2            |
|               | 16         | 14,000                        | 750              | 0.15              | 0.42           | 13,000                                                | 500              | 0.1               | 0.21           | 10,000                                                              | 300              | 0.1               | 0.18           | 10,000                        | 300              | 0.06              | 0.1            |
|               | 18         | 14,000                        | 750              | 0.15              | 0.42           | 13,000                                                | 500              | 0.1               | 0.21           | 10,000                                                              | 300              | 0.1               | 0.18           | 10,000                        | 300              | 0.06              | 0.1            |
|               | 20         | 11,000                        | 375              | 0.15              | 0.42           | 10,000                                                | 250              | 0.1               | 0.21           | 8,000                                                               | 200              | 0.1               | 0.18           | 8,000                         | 200              | 0.06              | 0.1            |
|               | 22         | 11,000                        | 375              | 0.15              | 0.42           | 10,000                                                | 250              | 0.1               | 0.21           | 8,000                                                               | 200              | 0.1               | 0.18           | 8,000                         | 200              | 0.06              | 0.1            |
|               | 25         | 11,000                        | 375              | 0.15              | 0.42           | 10,000                                                | 250              | 0.1               | 0.21           | 8,000                                                               | 200              | 0.1               | 0.18           | 8,000                         | 200              | 0.06              | 0.1            |
|               | 30         | 11,000                        | 375              | 0.15              | 0.42           | 10,000                                                | 250              | 0.1               | 0.21           | 8,000                                                               | 200              | 0.1               | 0.18           | 8,000                         | 200              | 0.06              | 0.1            |
|               | 35         | 10,000                        | 375              | 0.15              | 0.42           | 10,000                                                | 250              | 0.1               | 0.21           | 8,000                                                               | 200              | 0.1               | 0.18           | 8,000                         | 200              | 0.06              | 0.1            |
|               | 40         | 10,000                        | 300              | 0.15              | 0.42           | 10,000                                                | 200              | 0.1               | 0.21           | 8,000                                                               | 160              | 0.1               | 0.18           | 8,000                         | 160              | 0.06              | 0.1            |
| 1.25          | 6          | 16,000                        | 1,050            | 0.18              | 0.7            | 12,000                                                | 700              | 0.12              | 0.35           | 10,000                                                              | 600              | 0.12              | 0.3            | 10,000                        | 600              | 0.1               | 0.25           |
|               | 10         | 14,000                        | 1,050            | 0.18              | 0.7            | 12,000                                                | 700              | 0.12              | 0.35           | 10,000                                                              | 600              | 0.12              | 0.3            | 10,000                        | 600              | 0.1               | 0.25           |
|               | 15         | 14,000                        | 600              | 0.18              | 0.7            | 10,000                                                | 400              | 0.12              | 0.35           | 8,500                                                               | 300              | 0.12              | 0.3            | 8,500                         | 300              | 0.1               | 0.25           |
|               | 20         | 12,000                        | 600              | 0.18              | 0.56           | 10,000                                                | 400              | 0.12              | 0.28           | 8,500                                                               | 300              | 0.12              | 0.2            | 8,500                         | 300              | 0.08              | 0.15           |
|               | 25         | 12,000                        | 450              | 0.18              | 0.56           | 8,000                                                 | 300              | 0.12              | 0.28           | 6,500                                                               | 250              | 0.12              | 0.2            | 6,500                         | 250              | 0.08              | 0.15           |
|               | 30         | 12,000                        | 375              | 0.18              | 0.56           | 8,000                                                 | 250              | 0.12              | 0.28           | 6,500                                                               | 200              | 0.12              | 0.2            | 6,500                         | 200              | 0.08              | 0.15           |
|               | 35         | 12,000                        | 375              | 0.18              | 0.56           | 8,000                                                 | 250              | 0.12              | 0.28           | 6,500                                                               | 200              | 0.12              | 0.2            | 6,500                         | 200              | 0.08              | 0.15           |
| 1.5           | 6          | 15,000                        | 1,200            | 0.2               | 0.84           | 9,500                                                 | 800              | 0.15              | 0.42           | 7,500                                                               | 600              | 0.15              | 0.42           | 7,500                         | 600              | 0.15              | 0.3            |
|               | 8          | 12,000                        | 900              | 0.2               | 0.84           | 9,500                                                 | 600              | 0.15              | 0.42           | 7,500                                                               | 400              | 0.15              | 0.36           | 7,500                         | 400              | 0.15              | 0.3            |
|               | 10         | 12,000                        | 900              | 0.2               | 0.84           | 9,500                                                 | 600              | 0.15              | 0.42           | 7,500                                                               | 400              | 0.15              | 0.36           | 7,500                         | 400              | 0.15              | 0.3            |
|               | 12         | 10,000                        | 900              | 0.2               | 0.84           | 9,500                                                 | 600              | 0.15              | 0.42           | 7,500                                                               | 400              | 0.15              | 0.36           | 7,500                         | 400              | 0.15              | 0.3            |
|               | 14         | 10,000                        | 900              | 0.2               | 0.84           | 9,500                                                 | 600              | 0.15              | 0.42           | 7,500                                                               | 400              | 0.15              | 0.36           | 7,500                         | 400              | 0.15              | 0.3            |
|               | 15         | 10,000                        | 600              | 0.2               | 0.84           | 8,500                                                 | 400              | 0.15              | 0.42           | 6,500                                                               | 250              | 0.15              | 0.36           | 6,500                         | 250              | 0.15              | 0.3            |
|               | 16         | 10,000                        | 450              | 0.2               | 0.84           | 8,500                                                 | 300              | 0.15              | 0.42           | 6,500                                                               | 250              | 0.15              | 0.36           | 6,500                         | 250              | 0.15              | 0.3            |
|               | 20         | 10,000                        | 450              | 0.2               | 0.84           | 8,500                                                 | 300              | 0.15              | 0.42           | 6,500                                                               | 250              | 0.15              | 0.36           | 6,500                         | 250              | 0.15              | 0.3            |
|               | 25         | 10,000                        | 450              | 0.2               | 0.84           | 8,500                                                 | 300              | 0.15              | 0.42           | 6,500                                                               | 250              | 0.15              | 0.3            | 6,500                         | 250              | 0.09              | 0.15           |
|               | 30         | 9,000                         | 375              | 0.2               | 0.84           | 7,500                                                 | 250              | 0.15              | 0.42           | 6,000                                                               | 200              | 0.15              | 0.3            | 6,000                         | 200              | 0.09              | 0.15           |



# CUTTING CONDITIONS FOR CARBIDE END MILLS

## WXL-LN-EBD

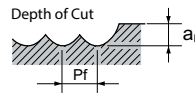


## WXL 2 FLUTES BALL-ENDLONG NECK REGULAR MILLING

| Work Material |            | Copper·Copper Alloy           |                  |                   |       | Mild Steel·Carbon Steel<br>FC250· S5400· S55C<br>～32HRC |                  |                   |       | Hardened Steel·Prehardened Steel<br>SKT·SKD61·NAK55·NAK80·HPM1·DH** |                  |                   |       |                               |                  |                   |       |
|---------------|------------|-------------------------------|------------------|-------------------|-------|---------------------------------------------------------|------------------|-------------------|-------|---------------------------------------------------------------------|------------------|-------------------|-------|-------------------------------|------------------|-------------------|-------|
|               |            |                               |                  |                   |       |                                                         |                  |                   |       | 33～41HRC                                                            |                  |                   |       | 42～50HRC                      |                  |                   |       |
| R             | φ2<br>(mm) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> )                           | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |       |
|               |            |                               |                  | ap                | Pf    |                                                         |                  | ap                | Pf    |                                                                     |                  | ap                | Pf    |                               |                  | ap                | Pf    |
| 1.5           | 35         | 9,000                         | 375              | 0.2               | 0.84  | 7,500                                                   | 250              | 0.15              | 0.42  | 6,000                                                               | 200              | 0.15              | 0.3   | 6,000                         | 200              | 0.09              | 0.15  |
|               | 40         | 9,000                         | 375              | 0.2               | 0.84  | 7,500                                                   | 250              | 0.15              | 0.42  | 6,000                                                               | 200              | 0.15              | 0.3   | 6,000                         | 200              | 0.09              | 0.15  |
| 1.75          | 10         | 10,000                        | 1,050            | 0.4               | 0.98  | 8,500                                                   | 700              | 0.15              | 0.49  | 6,500                                                               | 500              | 0.15              | 0.42  | 6,500                         | 500              | 0.15              | 0.35  |
|               | 15         | 10,000                        | 900              | 0.4               | 0.98  | 8,500                                                   | 600              | 0.15              | 0.49  | 6,500                                                               | 400              | 0.15              | 0.42  | 6,500                         | 400              | 0.15              | 0.35  |
|               | 20         | 8,000                         | 750              | 0.4               | 0.98  | 7,500                                                   | 500              | 0.15              | 0.49  | 5,500                                                               | 300              | 0.15              | 0.42  | 5,500                         | 300              | 0.15              | 0.35  |
|               | 25         | 8,000                         | 600              | 0.4               | 0.98  | 7,500                                                   | 400              | 0.15              | 0.49  | 5,500                                                               | 275              | 0.15              | 0.42  | 5,500                         | 275              | 0.15              | 0.35  |
|               | 30         | 8,000                         | 450              | 0.4               | 0.98  | 7,500                                                   | 300              | 0.15              | 0.49  | 5,500                                                               | 250              | 0.15              | 0.35  | 5,500                         | 250              | 0.1               | 0.2   |
|               | 35         | 8,000                         | 375              | 0.4               | 0.98  | 6,000                                                   | 250              | 0.15              | 0.49  | 5,000                                                               | 200              | 0.15              | 0.35  | 5,000                         | 200              | 0.1               | 0.2   |
|               | 40         | 6,000                         | 375              | 0.3               | 0.98  | 6,000                                                   | 250              | 0.15              | 0.49  | 5,000                                                               | 200              | 0.15              | 0.35  | 5,000                         | 200              | 0.1               | 0.2   |
|               | 45         | 6,000                         | 375              | 0.3               | 0.98  | 6,000                                                   | 250              | 0.15              | 0.49  | 5,000                                                               | 200              | 0.15              | 0.35  | 5,000                         | 200              | 0.1               | 0.2   |
| 2             | 8          | 11,000                        | 1,200            | 0.5               | 1.28  | 7,500                                                   | 800              | 0.2               | 0.64  | 6,000                                                               | 700              | 0.2               | 0.6   | 6,000                         | 700              | 0.2               | 0.4   |
|               | 10         | 9,000                         | 900              | 0.5               | 1.28  | 7,500                                                   | 600              | 0.2               | 0.64  | 6,000                                                               | 400              | 0.2               | 0.6   | 6,000                         | 400              | 0.2               | 0.4   |
|               | 12         | 9,000                         | 900              | 0.5               | 1.28  | 7,500                                                   | 600              | 0.2               | 0.64  | 6,000                                                               | 400              | 0.2               | 0.6   | 6,000                         | 400              | 0.2               | 0.4   |
|               | 14         | 9,000                         | 900              | 0.5               | 1.28  | 7,500                                                   | 600              | 0.2               | 0.64  | 6,000                                                               | 400              | 0.2               | 0.6   | 6,000                         | 400              | 0.2               | 0.4   |
|               | 15         | 9,000                         | 900              | 0.5               | 1.28  | 7,500                                                   | 600              | 0.2               | 0.64  | 6,000                                                               | 400              | 0.2               | 0.6   | 6,000                         | 400              | 0.2               | 0.4   |
|               | 16         | 9,000                         | 900              | 0.5               | 1.28  | 7,500                                                   | 600              | 0.2               | 0.64  | 6,000                                                               | 400              | 0.2               | 0.6   | 6,000                         | 400              | 0.2               | 0.4   |
|               | 20         | 7,000                         | 600              | 0.5               | 1.28  | 6,000                                                   | 400              | 0.2               | 0.64  | 5,000                                                               | 250              | 0.2               | 0.6   | 5,000                         | 250              | 0.2               | 0.4   |
|               | 25         | 7,000                         | 600              | 0.5               | 1.28  | 6,000                                                   | 400              | 0.2               | 0.64  | 5,000                                                               | 250              | 0.2               | 0.6   | 5,000                         | 250              | 0.2               | 0.4   |
|               | 30         | 7,000                         | 600              | 0.4               | 1.28  | 6,000                                                   | 400              | 0.2               | 0.64  | 5,000                                                               | 250              | 0.2               | 0.56  | 5,000                         | 250              | 0.12              | 0.2   |
|               | 35         | 7,000                         | 600              | 0.4               | 1.28  | 6,000                                                   | 400              | 0.2               | 0.64  | 5,000                                                               | 250              | 0.2               | 0.56  | 5,000                         | 250              | 0.12              | 0.2   |
|               | 40         | 5,000                         | 375              | 0.35              | 1.28  | 5,000                                                   | 250              | 0.2               | 0.64  | 4,000                                                               | 200              | 0.2               | 0.56  | 4,000                         | 200              | 0.12              | 0.2   |
|               | 45         | 5,000                         | 375              | 0.35              | 1.28  | 5,000                                                   | 250              | 0.2               | 0.64  | 4,000                                                               | 200              | 0.2               | 0.56  | 4,000                         | 200              | 0.12              | 0.2   |
| 50            | 5,000      | 375                           | 0.35             | 1.28              | 5,000 | 250                                                     | 0.2              | 0.64              | 4,000 | 200                                                                 | 0.2              | 0.56              | 4,000 | 200                           | 0.12             | 0.2               |       |
| 2.5           | 10         | 9,000                         | 1,350            | 0.6               | 1.8   | 6,500                                                   | 900              | 0.25              | 0.9   | 5,000                                                               | 750              | 0.25              | 0.7   | 5,000                         | 750              | 0.25              | 0.5   |
|               | 15         | 9,000                         | 1,350            | 0.6               | 1.8   | 6,500                                                   | 900              | 0.25              | 0.9   | 5,000                                                               | 750              | 0.25              | 0.7   | 5,000                         | 750              | 0.25              | 0.5   |
|               | 20         | 7,000                         | 750              | 0.6               | 1.8   | 6,500                                                   | 500              | 0.25              | 0.9   | 5,000                                                               | 400              | 0.25              | 0.7   | 5,000                         | 400              | 0.25              | 0.5   |
|               | 25         | 6,000                         | 750              | 0.6               | 1.8   | 5,000                                                   | 500              | 0.25              | 0.9   | 4,000                                                               | 250              | 0.25              | 0.7   | 4,000                         | 250              | 0.25              | 0.5   |
|               | 30         | 6,000                         | 750              | 0.6               | 1.8   | 5,000                                                   | 500              | 0.25              | 0.9   | 4,000                                                               | 250              | 0.25              | 0.7   | 4,000                         | 250              | 0.25              | 0.5   |
|               | 35         | 6,000                         | 750              | 0.6               | 1.8   | 5,000                                                   | 500              | 0.25              | 0.9   | 4,000                                                               | 250              | 0.25              | 0.7   | 4,000                         | 250              | 0.25              | 0.5   |
|               | 40         | 5,000                         | 600              | 0.4               | 1.8   | 4,000                                                   | 400              | 0.25              | 0.9   | 4,000                                                               | 200              | 0.25              | 0.6   | 4,000                         | 200              | 0.2               | 0.25  |
|               | 45         | 5,000                         | 600              | 0.4               | 1.8   | 4,000                                                   | 400              | 0.25              | 0.9   | 4,000                                                               | 200              | 0.25              | 0.6   | 4,000                         | 200              | 0.2               | 0.25  |
| 3             | 50         | 5,000                         | 450              | 0.4               | 1.8   | 4,000                                                   | 300              | 0.25              | 0.9   | 4,000                                                               | 200              | 0.25              | 0.6   | 4,000                         | 200              | 0.2               | 0.25  |
|               | 10         | 7,000                         | 1,500            | 0.75              | 2.4   | 5,500                                                   | 1,000            | 0.3               | 1.2   | 4,500                                                               | 800              | 0.3               | 0.96  | 4,500                         | 800              | 0.3               | 0.6   |
|               | 20         | 7,000                         | 1,200            | 0.75              | 2.4   | 5,500                                                   | 800              | 0.3               | 1.2   | 4,500                                                               | 600              | 0.3               | 0.96  | 4,500                         | 600              | 0.3               | 0.6   |
|               | 25         | 6,000                         | 900              | 0.75              | 2.4   | 5,500                                                   | 600              | 0.3               | 1.2   | 4,500                                                               | 400              | 0.3               | 0.96  | 4,500                         | 400              | 0.3               | 0.6   |
|               | 30         | 5,000                         | 600              | 0.75              | 2.4   | 4,000                                                   | 400              | 0.3               | 1.2   | 4,000                                                               | 300              | 0.3               | 0.96  | 4,000                         | 300              | 0.3               | 0.6   |
|               | 35         | 5,000                         | 600              | 0.75              | 2.4   | 4,000                                                   | 400              | 0.3               | 1.2   | 4,000                                                               | 300              | 0.3               | 0.96  | 4,000                         | 300              | 0.3               | 0.6   |
|               | 40         | 5,000                         | 600              | 0.6               | 2.4   | 4,000                                                   | 400              | 0.3               | 1.2   | 4,000                                                               | 300              | 0.3               | 0.96  | 4,000                         | 300              | 0.3               | 0.6   |
| 0.05          | 45         | 5,000                         | 600              | 0.6               | 2.4   | 4,000                                                   | 400              | 0.3               | 1.2   | 4,000                                                               | 300              | 0.3               | 0.96  | 4,000                         | 300              | 0.3               | 0.6   |
|               | 50         | 5,000                         | 600              | 0.6               | 2.4   | 4,000                                                   | 400              | 0.3               | 1.2   | 4,000                                                               | 300              | 0.3               | 0.96  | 4,000                         | 300              | 0.3               | 0.3   |
| 0.1           | 0.3        | 50,000                        | 280              | 0.003             | 0.005 | 50,000                                                  | 150              | 0.003             | 0.003 | 50,000                                                              | 100              | 0.003             | 0.003 | 50,000                        | 70               | 0.003             | 0.003 |
|               | 0.5        | 50,000                        | 220              | 0.003             | 0.005 | 50,000                                                  | 120              | 0.003             | 0.003 | 50,000                                                              | 80               | 0.003             | 0.003 | 50,000                        | 50               | 0.003             | 0.003 |
|               | 0.3        | 50,000                        | 490              | 0.0075            | 0.01  | 50,000                                                  | 400              | 0.005             | 0.005 | 50,000                                                              | 380              | 0.005             | 0.005 | 50,000                        | 380              | 0.005             | 0.005 |
|               | 0.5        | 50,000                        | 490              | 0.0075            | 0.01  | 50,000                                                  | 400              | 0.005             | 0.005 | 50,000                                                              | 380              | 0.005             | 0.005 | 50,000                        | 380              | 0.005             | 0.005 |
|               | 0.75       | 50,000                        | 440              | 0.0075            | 0.01  | 50,000                                                  | 360              | 0.005             | 0.005 | 50,000                                                              | 340              | 0.005             | 0.005 | 50,000                        | 340              | 0.005             | 0.005 |
|               | 1          | 50,000                        | 440              | 0.0075            | 0.01  | 50,000                                                  | 360              | 0.005             | 0.005 | 50,000                                                              | 340              | 0.005             | 0.005 | 50,000                        | 340              | 0.005             | 0.005 |
|               | 1.25       | 50,000                        | 390              | 0.0075            | 0.01  | 47,000                                                  | 320              | 0.005             | 0.005 | 47,000                                                              | 300              | 0.005             | 0.005 | 47,000                        | 300              | 0.005             | 0.005 |
|               | 1.5        | 50,000                        | 360              | 0.0075            | 0.01  | 45,000                                                  | 300              | 0.005             | 0.005 | 45,000                                                              | 280              | 0.005             | 0.005 | 45,000                        | 280              | 0.005             | 0.005 |
|               | 1.75       | 50,000                        | 350              | 0.0075            | 0.01  | 42,000                                                  | 260              | 0.005             | 0.005 | 42,000                                                              | 240              | 0.005             | 0.005 | 42,000                        | 240              | 0.005             | 0.005 |
|               | 2          | 50,000                        | 320              | 0.0075            | 0.01  | 38,000                                                  | 230              | 0.005             | 0.005 | 38,000                                                              | 210              | 0.005             | 0.005 | 37,000                        | 200              | 0.005             | 0.005 |
| 0.15          | 2.5        | —                             | —                | —                 | —     | —                                                       | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 3          | —                             | —                | —                 | —     | —                                                       | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 0.5        | 50,000                        | 750              | 0.0075            | 0.02  | 50,000                                                  | 620              | 0.005             | 0.01  | 50,000                                                              | 600              | 0.005             | 0.01  | 50,000                        | 600              | 0.005             | 0.01  |
| 0.15          | 0.6        | 50,000                        | 730              | 0.0075            | 0.02  | 50,000                                                  | 600              | 0.005             | 0.01  | 50,000                                                              | 570              | 0.005             | 0.01  | 50,000                        | 570              | 0.005             | 0.01  |
|               | 0.75       | 50,000                        | 730              | 0.0075            | 0.02  | 50,000                                                  | 600              | 0.005             | 0.01  | 50,000                                                              | 570              | 0.005             | 0.01  | 50,000                        | 570              | 0.005             | 0.01  |
|               | 1          | 50,000                        | 730              | 0.0075            | 0.02  | 50,000                                                  | 600              | 0.005             | 0.01  | 50,000                                                              | 570              | 0.005             | 0.01  | 50,000                        | 570              | 0.005             | 0.01  |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## WXL-LN-EBD



## WXL 2 FLUTES BALL-ENDLONG NECK REGULAR MILLING

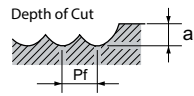
| Work Material |            | Copper・Copper Alloy           |                  |                   |       | Mild Steel・Carbon Steel<br>FC250・S5400・S55C<br>～32HRC |                  |                   |       | Hardened Steel・Prehardened Steel<br>SKT・SKD61・NAK55・NAK80・HPM1・DH＊＊ |                  |                   |       |                               |                  |                   |       |
|---------------|------------|-------------------------------|------------------|-------------------|-------|-------------------------------------------------------|------------------|-------------------|-------|---------------------------------------------------------------------|------------------|-------------------|-------|-------------------------------|------------------|-------------------|-------|
|               |            |                               |                  |                   |       |                                                       |                  |                   |       | 33～41HRC                                                            |                  |                   |       | 42～50HRC                      |                  |                   |       |
| R             | φ2<br>(mm) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> )                         | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |       |
|               |            |                               |                  | ap                | Pf    |                                                       |                  | ap                | Pf    |                                                                     |                  | ap                | Pf    |                               |                  | ap                | Pf    |
| 0.15          | 1.25       | 50,000                        | 730              | 0.0075            | 0.02  | 50,000                                                | 600              | 0.005             | 0.01  | 50,000                                                              | 570              | 0.005             | 0.01  | 50,000                        | 570              | 0.005             | 0.01  |
|               | 1.5        | 50,000                        | 730              | 0.0075            | 0.02  | 50,000                                                | 600              | 0.005             | 0.01  | 50,000                                                              | 570              | 0.005             | 0.01  | 50,000                        | 570              | 0.005             | 0.01  |
|               | 1.75       | 50,000                        | 610              | 0.0075            | 0.02  | 47,000                                                | 510              | 0.005             | 0.01  | 47,000                                                              | 480              | 0.005             | 0.01  | 47,000                        | 480              | 0.005             | 0.01  |
|               | 2          | 50,000                        | 580              | 0.0075            | 0.01  | 45,000                                                | 480              | 0.005             | 0.005 | 45,000                                                              | 450              | 0.005             | 0.005 | 45,000                        | 450              | 0.005             | 0.005 |
|               | 2.25       | 50,000                        | 490              | 0.0075            | 0.01  | 45,000                                                | 400              | 0.005             | 0.005 | 45,000                                                              | 380              | 0.005             | 0.005 | 45,000                        | 380              | 0.005             | 0.005 |
|               | 2.5        | 50,000                        | 360              | 0.0075            | 0.01  | 40,000                                                | 300              | 0.005             | 0.005 | 40,000                                                              | 280              | 0.005             | 0.005 | 40,000                        | 280              | 0.005             | 0.005 |
|               | 2.75       | 50,000                        | 320              | 0.0075            | 0.01  | 38,000                                                | 250              | 0.005             | 0.005 | 38,000                                                              | 230              | 0.005             | 0.005 | 38,000                        | 230              | 0.005             | 0.005 |
|               | 3          | 50,000                        | 290              | 0.0075            | 0.01  | 38,000                                                | 250              | 0.005             | 0.005 | 38,000                                                              | 230              | 0.005             | 0.005 | 37,000                        | 230              | 0.005             | 0.005 |
|               | 3.5        | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 4          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 4.5        | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 5          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 5          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
| 0.2           | 0.5        | 50,000                        | 1,100            | 0.015             | 0.04  | 50,000                                                | 920              | 0.01              | 0.02  | 50,000                                                              | 870              | 0.01              | 0.02  | 50,000                        | 870              | 0.01              | 0.02  |
|               | 0.75       | 50,000                        | 1,090            | 0.015             | 0.04  | 50,000                                                | 900              | 0.01              | 0.02  | 50,000                                                              | 850              | 0.01              | 0.02  | 50,000                        | 850              | 0.01              | 0.02  |
|               | 1          | 50,000                        | 1,090            | 0.015             | 0.04  | 50,000                                                | 900              | 0.01              | 0.02  | 50,000                                                              | 850              | 0.01              | 0.02  | 50,000                        | 850              | 0.01              | 0.02  |
|               | 1.5        | 50,000                        | 970              | 0.015             | 0.04  | 50,000                                                | 800              | 0.01              | 0.02  | 50,000                                                              | 760              | 0.01              | 0.02  | 50,000                        | 760              | 0.01              | 0.02  |
|               | 2          | 50,000                        | 850              | 0.015             | 0.04  | 50,000                                                | 700              | 0.01              | 0.02  | 50,000                                                              | 660              | 0.01              | 0.02  | 50,000                        | 660              | 0.01              | 0.02  |
|               | 2.5        | 50,000                        | 670              | 0.012             | 0.03  | 45,000                                                | 550              | 0.008             | 0.015 | 45,000                                                              | 520              | 0.008             | 0.015 | 45,000                        | 520              | 0.008             | 0.015 |
|               | 3          | 48,000                        | 540              | 0.0075            | 0.02  | 43,000                                                | 500              | 0.005             | 0.01  | 43,000                                                              | 470              | 0.005             | 0.01  | 43,000                        | 470              | 0.005             | 0.01  |
|               | 3.5        | 45,000                        | 460              | 0.0075            | 0.02  | 40,000                                                | 420              | 0.005             | 0.01  | 40,000                                                              | 400              | 0.005             | 0.01  | 40,000                        | 400              | 0.005             | 0.01  |
|               | 4          | 40,000                        | 400              | 0.0075            | 0.01  | 36,000                                                | 370              | 0.005             | 0.005 | 36,000                                                              | 350              | 0.005             | 0.005 | 35,000                        | 340              | 0.005             | 0.005 |
|               | 4.5        | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 5          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 5.5        | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
| 6             | —          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 |       |
| 0.25          | 1          | 50,000                        | 1,420            | 0.0225            | 0.045 | 50,000                                                | 1,100            | 0.015             | 0.03  | 50,000                                                              | 1,050            | 0.015             | 0.03  | 50,000                        | 1,050            | 0.015             | 0.03  |
|               | 1.5        | 50,000                        | 1,420            | 0.0225            | 0.045 | 50,000                                                | 1,100            | 0.015             | 0.03  | 50,000                                                              | 1,050            | 0.015             | 0.03  | 50,000                        | 1,050            | 0.015             | 0.03  |
|               | 2          | 50,000                        | 1,400            | 0.0225            | 0.045 | 50,000                                                | 1,000            | 0.015             | 0.03  | 50,000                                                              | 950              | 0.015             | 0.03  | 50,000                        | 950              | 0.015             | 0.03  |
|               | 2.5        | 50,000                        | 1,380            | 0.0225            | 0.045 | 50,000                                                | 1,000            | 0.015             | 0.03  | 50,000                                                              | 950              | 0.015             | 0.03  | 50,000                        | 950              | 0.015             | 0.03  |
|               | 3          | 50,000                        | 1,190            | 0.015             | 0.04  | 48,000                                                | 900              | 0.01              | 0.02  | 48,000                                                              | 850              | 0.01              | 0.02  | 48,000                        | 850              | 0.01              | 0.02  |
|               | 3.5        | 50,000                        | 1,140            | 0.015             | 0.04  | 45,000                                                | 700              | 0.01              | 0.02  | 45,000                                                              | 650              | 0.01              | 0.02  | 45,000                        | 650              | 0.01              | 0.02  |
|               | 4          | 45,000                        | 1,000            | 0.015             | 0.02  | 43,000                                                | 600              | 0.01              | 0.01  | 43,000                                                              | 570              | 0.01              | 0.01  | 43,000                        | 570              | 0.01              | 0.01  |
|               | 4.5        | 38,000                        | 940              | 0.015             | 0.02  | 38,000                                                | 500              | 0.01              | 0.01  | 38,000                                                              | 470              | 0.01              | 0.01  | 38,000                        | 470              | 0.01              | 0.01  |
|               | 5          | 30,000                        | 760              | 0.0075            | 0.02  | 30,000                                                | 400              | 0.005             | 0.01  | 30,000                                                              | 380              | 0.005             | 0.01  | 29,000                        | 360              | 0.005             | 0.01  |
|               | 5.5        | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 6          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
|               | 7          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
| 0.3           | 1          | 50,000                        | 1,660            | 0.045             | 0.1   | 50,000                                                | 1,400            | 0.03              | 0.05  | 50,000                                                              | 1,300            | 0.03              | 0.05  | 50,000                        | 1,300            | 0.03              | 0.05  |
|               | 1.5        | 50,000                        | 1,600            | 0.045             | 0.1   | 50,000                                                | 1,300            | 0.03              | 0.05  | 50,000                                                              | 1,200            | 0.03              | 0.05  | 50,000                        | 1,200            | 0.03              | 0.05  |
|               | 2          | 50,000                        | 1,600            | 0.045             | 0.1   | 50,000                                                | 1,300            | 0.03              | 0.05  | 50,000                                                              | 1,200            | 0.03              | 0.05  | 50,000                        | 1,200            | 0.03              | 0.05  |
|               | 2.5        | 50,000                        | 1,550            | 0.045             | 0.1   | 50,000                                                | 1,200            | 0.03              | 0.05  | 50,000                                                              | 1,100            | 0.03              | 0.05  | 50,000                        | 1,100            | 0.03              | 0.05  |
|               | 3          | 50,000                        | 1,550            | 0.03              | 0.06  | 50,000                                                | 1,200            | 0.02              | 0.03  | 50,000                                                              | 1,100            | 0.02              | 0.03  | 50,000                        | 1,100            | 0.02              | 0.03  |
|               | 3.5        | 50,000                        | 1,340            | 0.03              | 0.06  | 45,000                                                | 1,000            | 0.02              | 0.03  | 45,000                                                              | 950              | 0.02              | 0.03  | 45,000                        | 950              | 0.02              | 0.03  |
|               | 4          | 50,000                        | 1,200            | 0.015             | 0.04  | 40,000                                                | 900              | 0.01              | 0.02  | 40,000                                                              | 850              | 0.01              | 0.02  | 40,000                        | 850              | 0.01              | 0.02  |
|               | 4.5        | 45,000                        | 1,040            | 0.015             | 0.04  | 34,000                                                | 780              | 0.01              | 0.02  | 34,000                                                              | 740              | 0.01              | 0.02  | 34,000                        | 740              | 0.01              | 0.02  |
|               | 5          | 30,000                        | 960              | 0.015             | 0.04  | 30,000                                                | 680              | 0.01              | 0.02  | 30,000                                                              | 640              | 0.01              | 0.02  | 30,000                        | 640              | 0.01              | 0.02  |
|               | 5.5        | 30,000                        | 820              | 0.015             | 0.04  | 28,000                                                | 650              | 0.01              | 0.02  | 28,000                                                              | 610              | 0.01              | 0.02  | 28,000                        | 610              | 0.01              | 0.02  |
|               | 6          | 30,000                        | 720              | 0.015             | 0.04  | 26,000                                                | 600              | 0.01              | 0.02  | 26,000                                                              | 570              | 0.01              | 0.02  | 25,000                        | 540              | 0.01              | 0.02  |
|               | 6.5        | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 | —     |
| 7             | —          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 |       |
| 7.5           | —          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 |       |
| 8             | —          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 |       |
| 8.5           | —          | —                             | —                | —                 | —     | —                                                     | —                | —                 | —     | —                                                                   | —                | —                 | —     | —                             | —                | —                 |       |





# CUTTING CONDITIONS FOR CARBIDE END MILLS

## WXL-LN-EBD

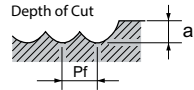


## WXL 2 FLUTES BALL-ENDLONG NECK REGULAR MILLING

| Work Material |         | Copper·Copper Alloy        |               |                   |                | Mild Steel·Carbon Steel<br>FC250·S5400·S55C<br>~32HRC |               |                   |                | Hardened Steel·Prehardened Steel<br>SKT·SKD61·NAK55·NAK80·HPM1·DH** |               |                   |                |                            |               |                   |                |
|---------------|---------|----------------------------|---------------|-------------------|----------------|-------------------------------------------------------|---------------|-------------------|----------------|---------------------------------------------------------------------|---------------|-------------------|----------------|----------------------------|---------------|-------------------|----------------|
|               |         |                            |               | Depth of Cut (mm) |                |                                                       |               | Depth of Cut (mm) |                | 33~41HRC                                                            |               |                   |                | 42~50HRC                   |               |                   |                |
| R             | φ2 (mm) | Speed (min <sup>-1</sup> ) | Feed (mm/min) | Depth of Cut (mm) |                | Speed (min <sup>-1</sup> )                            | Feed (mm/min) | Depth of Cut (mm) |                | Speed (min <sup>-1</sup> )                                          | Feed (mm/min) | Depth of Cut (mm) |                | Speed (min <sup>-1</sup> ) | Feed (mm/min) | Depth of Cut (mm) |                |
|               |         |                            |               | a <sub>p</sub>    | P <sub>f</sub> |                                                       |               | a <sub>p</sub>    | P <sub>f</sub> |                                                                     |               | a <sub>p</sub>    | P <sub>f</sub> |                            |               | a <sub>p</sub>    | P <sub>f</sub> |
| 0.3           | 9       | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 9.5     | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 10      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 11      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
| 0.4           | 12      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 2       | 50,000                     | 2,200         | 0.06              | 0.16           | 50,000                                                | 2,000         | 0.04              | 0.08           | 50,000                                                              | 1,900         | 0.04              | 0.08           | 50,000                     | 1,900         | 0.04              | 0.08           |
|               | 3       | 50,000                     | 1,740         | 0.06              | 0.16           | 48,000                                                | 1,600         | 0.04              | 0.08           | 48,000                                                              | 1,500         | 0.04              | 0.08           | 48,000                     | 1,500         | 0.04              | 0.08           |
|               | 4       | 50,000                     | 1,680         | 0.06              | 0.16           | 40,000                                                | 1,200         | 0.04              | 0.08           | 40,000                                                              | 1,100         | 0.04              | 0.08           | 40,000                     | 1,100         | 0.04              | 0.08           |
|               | 5       | 43,000                     | 1,600         | 0.045             | 0.1            | 34,000                                                | 950           | 0.03              | 0.05           | 34,000                                                              | 900           | 0.03              | 0.05           | 34,000                     | 900           | 0.03              | 0.05           |
|               | 6       | 32,000                     | 1,260         | 0.045             | 0.1            | 30,000                                                | 800           | 0.03              | 0.05           | 30,000                                                              | 760           | 0.03              | 0.05           | 30,000                     | 760           | 0.03              | 0.05           |
|               | 7       | 30,000                     | 1,000         | 0.02              | 0.08           | 25,000                                                | 600           | 0.01              | 0.02           | 25,000                                                              | 570           | 0.01              | 0.02           | 25,000                     | 570           | 0.01              | 0.02           |
|               | 8       | 24,000                     | 720           | 0.01              | 0.04           | 23,000                                                | 450           | 0.005             | 0.01           | 23,000                                                              | 420           | 0.005             | 0.01           | 23,000                     | 420           | 0.005             | 0.01           |
|               | 9       | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 10      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
| 0.5           | 12      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 2.5     | 50,000                     | 3,270         | 0.075             | 0.2            | 50,000                                                | 3,400         | 0.05              | 0.1            | 50,000                                                              | 3,200         | 0.05              | 0.1            | 50,000                     | 3,200         | 0.05              | 0.1            |
| 0.5           | 3       | 50,000                     | 3,060         | 0.075             | 0.2            | 45,000                                                | 3,200         | 0.05              | 0.1            | 45,000                                                              | 3,000         | 0.05              | 0.1            | 45,000                     | 3,000         | 0.05              | 0.1            |
|               | 4       | 50,000                     | 3,000         | 0.075             | 0.2            | 40,000                                                | 3,000         | 0.05              | 0.1            | 40,000                                                              | 2,850         | 0.05              | 0.1            | 40,000                     | 2,850         | 0.05              | 0.1            |
|               | 5       | 47,000                     | 2,870         | 0.075             | 0.2            | 36,000                                                | 2,300         | 0.05              | 0.1            | 36,000                                                              | 2,100         | 0.05              | 0.1            | 36,000                     | 2,100         | 0.05              | 0.1            |
|               | 6       | 43,000                     | 2,600         | 0.075             | 0.2            | 30,000                                                | 2,000         | 0.05              | 0.1            | 30,000                                                              | 1,900         | 0.05              | 0.1            | 30,000                     | 1,900         | 0.05              | 0.1            |
|               | 7       | 30,000                     | 2,350         | 0.075             | 0.15           | 27,000                                                | 1,700         | 0.05              | 0.1            | 27,000                                                              | 1,600         | 0.05              | 0.1            | 27,000                     | 1,600         | 0.05              | 0.1            |
|               | 8       | 27,000                     | 2,000         | 0.075             | 0.15           | 26,000                                                | 1,600         | 0.05              | 0.1            | 26,000                                                              | 1,500         | 0.05              | 0.1            | 26,000                     | 1,500         | 0.05              | 0.1            |
|               | 9       | 26,000                     | 1,540         | 0.045             | 0.075          | 24,000                                                | 1,200         | 0.03              | 0.05           | 24,000                                                              | 1,100         | 0.03              | 0.05           | 24,000                     | 1,100         | 0.03              | 0.05           |
|               | 10      | 24,000                     | 1,400         | 0.015             | 0.04           | 22,000                                                | 1,100         | 0.01              | 0.02           | 22,000                                                              | 1,000         | 0.01              | 0.02           | 21,000                     | 950           | 0.01              | 0.02           |
|               | 12      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 14      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
| 0.6           | 16      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 18      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 20      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 22      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 4       | 40,000                     | 3,000         | 0.12              | 0.21           | 40,000                                                | 3,000         | 0.06              | 0.12           | 40,000                                                              | 2,850         | 0.06              | 0.12           | 40,000                     | 2,850         | 0.06              | 0.12           |
|               | 6       | 35,000                     | 2,600         | 0.09              | 0.21           | 32,000                                                | 2,100         | 0.06              | 0.12           | 32,000                                                              | 2,000         | 0.06              | 0.12           | 32,000                     | 2,000         | 0.06              | 0.12           |
|               | 8       | 30,000                     | 2,000         | 0.09              | 0.21           | 25,000                                                | 1,700         | 0.06              | 0.12           | 25,000                                                              | 1,600         | 0.06              | 0.12           | 25,000                     | 1,600         | 0.06              | 0.12           |
|               | 10      | 21,000                     | 1,400         | 0.075             | 0.12           | 20,000                                                | 1,200         | 0.05              | 0.1            | 20,000                                                              | 1,100         | 0.05              | 0.1            | 18,000                     | 990           | 0.05              | 0.1            |
|               | 12      | 20,000                     | 1,000         | 0.045             | 0.1            | 19,000                                                | 900           | 0.03              | 0.05           | 17,000                                                              | 850           | 0.03              | 0.05           | 16,000                     | 800           | 0.03              | 0.05           |
|               | 14      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
| 0.7           | 16      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 18      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 20      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 24      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 8       | 30,000                     | 2,100         | 0.14              | 0.245          | 25,000                                                | 1,700         | 0.07              | 0.14           | 25,000                                                              | 1,600         | 0.07              | 0.14           | 25,000                     | 1,600         | 0.07              | 0.14           |
|               | 12      | 22,000                     | 1,210         | 0.06              | 0.14           | 19,000                                                | 1,000         | 0.03              | 0.07           | 19,000                                                              | 950           | 0.03              | 0.07           | 19,000                     | 950           | 0.03              | 0.07           |
|               | 16      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 3       | 50,000                     | 5,330         | 0.15              | 0.3            | 50,000                                                | 4,800         | 0.075             | 0.15           | 50,000                                                              | 4,800         | 0.075             | 0.15           | 50,000                     | 4,800         | 0.075             | 0.15           |
|               | 4       | 42,000                     | 4,110         | 0.15              | 0.3            | 40,000                                                | 3,900         | 0.075             | 0.15           | 40,000                                                              | 3,700         | 0.075             | 0.15           | 40,000                     | 3,700         | 0.075             | 0.15           |
|               | 6       | 32,000                     | 3,000         | 0.15              | 0.3            | 30,000                                                | 2,900         | 0.075             | 0.15           | 30,000                                                              | 2,700         | 0.075             | 0.15           | 30,000                     | 2,700         | 0.075             | 0.15           |
| 0.75          | 8       | 30,000                     | 2,650         | 0.15              | 0.3            | 24,000                                                | 2,300         | 0.075             | 0.15           | 24,000                                                              | 2,100         | 0.075             | 0.15           | 24,000                     | 2,100         | 0.075             | 0.15           |
|               | 10      | 30,000                     | 2,400         | 0.15              | 0.3            | 24,000                                                | 2,000         | 0.075             | 0.15           | 24,000                                                              | 1,900         | 0.075             | 0.15           | 24,000                     | 1,900         | 0.075             | 0.15           |
|               | 12      | 24,000                     | 1,400         | 0.15              | 0.2            | 21,000                                                | 1,400         | 0.075             | 0.1            | 21,000                                                              | 1,300         | 0.075             | 0.1            | 21,000                     | 1,300         | 0.075             | 0.1            |
|               | 14      | 22,000                     | 1,400         | 0.1               | 0.2            | 18,000                                                | 1,200         | 0.05              | 0.1            | 18,000                                                              | 1,100         | 0.05              | 0.1            | 17,000                     | 1,100         | 0.05              | 0.1            |
|               | 16      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 18      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 20      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 22      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |
|               | 30      | —                          | —             | —                 | —              | —                                                     | —             | —                 | —              | —                                                                   | —             | —                 | —              | —                          | —             | —                 | —              |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## WXL-LN-EBD



## WXL 2 FLUTES BALL-ENDLONG NECK REGULAR MILLING

| Work Material |                        | Copper·Copper Alloy           |                  |                   |       | Mild Steel·Carbon Steel<br>FC250· S5400· S55C<br>～32HRC |       |      |       | Hardened Steel·Prehardened Steel<br>SKT·SKD61·NAK55·NAK80·HPM1·DH** |                  |                   |       |                               |                  |                   |     |
|---------------|------------------------|-------------------------------|------------------|-------------------|-------|---------------------------------------------------------|-------|------|-------|---------------------------------------------------------------------|------------------|-------------------|-------|-------------------------------|------------------|-------------------|-----|
|               |                        |                               |                  |                   |       |                                                         |       |      |       | 33～41HRC                                                            |                  |                   |       | 42～50HRC                      |                  |                   |     |
| R             | ℓ <sub>2</sub><br>(mm) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |       |                                                         |       |      |       | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/min) | Depth of Cut (mm) |       | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Depth of Cut (mm) |     |
|               |                        |                               |                  | ap                | Pf    | ap                                                      | Pf    | ap   | Pf    |                                                                     |                  | ap                | Pf    |                               |                  |                   |     |
| 2             | 15                     | 20,000                        | 4,000            | 0.4               | 1     | 20,000                                                  | 3,600 | 0.2  | 0.5   | 20,000                                                              | 3,400            | 0.2               | 0.5   | 16,000                        | 2,700            | 0.2               | 0.5 |
|               | 16                     | 20,000                        | 3,460            | 0.4               | 0.6   | 18,000                                                  | 3,200 | 0.2  | 0.5   | 18,000                                                              | 3,000            | 0.2               | 0.5   | 14,000                        | 2,300            | 0.2               | 0.5 |
|               | 20                     | 18,000                        | 3,000            | 0.4               | 0.5   | 16,000                                                  | 2,800 | 0.2  | 0.4   | 16,000                                                              | 2,600            | 0.2               | 0.4   | 12,000                        | 1,900            | 0.2               | 0.4 |
|               | 25                     | 18,000                        | 3,000            | 0.25              | 0.6   | 16,000                                                  | 2,800 | 0.1  | 0.3   | 16,000                                                              | 2,600            | 0.1               | 0.3   | 12,000                        | 1,900            | 0.1               | 0.3 |
|               | 30                     | 16,000                        | 2,850            | 0.25              | 0.4   | 14,000                                                  | 2,400 | 0.1  | 0.2   | 14,000                                                              | 2,200            | 0.1               | 0.2   | 11,000                        | 1,700            | 0.1               | 0.2 |
|               | 35                     | 14,000                        | 2,200            | 0.25              | 0.4   | 12,000                                                  | 1,800 | 0.1  | 0.2   | 12,000                                                              | 1,700            | 0.1               | 0.2   | 9,000                         | 1,700            | 0.1               | 0.2 |
|               | 40                     | 12,000                        | 1,600            | 0.125             | 0.2   | 10,000                                                  | 1,300 | 0.05 | 0.1   | 10,000                                                              | 1,200            | 0.05              | 0.1   | 7,000                         | 840              | 0.05              | 0.1 |
|               | 45                     | -                             | -                | -                 | -     | -                                                       | -     | -    | -     | -                                                                   | -                | -                 | -     | -                             | -                | -                 | -   |
| 50            | -                      | -                             | -                | -                 | -     | -                                                       | -     | -    | -     | -                                                                   | -                | -                 | -     | -                             | -                | -                 |     |
| 2.5           | 10                     | 25,000                        | 5,600            | 0.5               | 1.25  | 25,000                                                  | 5,400 | 0.25 | 0.5   | 25,000                                                              | 5,400            | 0.25              | 0.5   | 19,000                        | 4,000            | 0.25              | 0.5 |
|               | 15                     | 20,000                        | 4,400            | 0.5               | 1.25  | 20,000                                                  | 4,200 | 0.25 | 0.5   | 20,000                                                              | 3,900            | 0.25              | 0.5   | 16,000                        | 3,100            | 0.25              | 0.5 |
|               | 20                     | 18,000                        | 3,800            | 0.5               | 1.25  | 16,000                                                  | 3,500 | 0.25 | 0.5   | 16,000                                                              | 3,300            | 0.25              | 0.5   | 12,000                        | 2,400            | 0.25              | 0.5 |
|               | 25                     | 20,000                        | 3,400            | 0.4               | 0.75  | 15,000                                                  | 3,200 | 0.2  | 0.3   | 15,000                                                              | 3,000            | 0.2               | 0.3   | 12,000                        | 2,400            | 0.2               | 0.3 |
|               | 30                     | 16,000                        | 2,900            | 0.25              | 0.75  | 14,000                                                  | 2,500 | 0.1  | 0.3   | 14,000                                                              | 2,300            | 0.1               | 0.3   | 11,000                        | 1,800            | 0.1               | 0.3 |
|               | 35                     | 14,000                        | 2,200            | 0.25              | 0.75  | 12,000                                                  | 1,600 | 0.1  | 0.3   | 12,000                                                              | 1,500            | 0.1               | 0.3   | 9,000                         | 1,100            | 0.1               | 0.3 |
|               | 40                     | 12,000                        | 1,800            | 0.25              | 0.5   | 10,000                                                  | 1,200 | 0.1  | 0.2   | 10,000                                                              | 1,100            | 0.1               | 0.2   | 8,000                         | 880              | 0.1               | 0.2 |
|               | 45                     | 9,000                         | 1,200            | 0.2               | 0.25  | 9,000                                                   | 900   | 0.1  | 0.1   | 9,000                                                               | 850              | 0.1               | 0.1   | 7,000                         | 660              | 0.1               | 0.1 |
| 50            | 8,000                  | 1,100                         | 0.2              | 0.25              | 8,000 | 800                                                     | 0.1   | 0.1  | 8,000 | 760                                                                 | 0.1              | 0.1               | 6,000 | 570                           | 0.1              | 0.1               |     |
| 3             | 10                     | 22,000                        | 5,900            | 0.75              | 1.25  | 20,000                                                  | 5,400 | 0.3  | 0.5   | 20,000                                                              | 5,000            | 0.3               | 0.5   | 15,000                        | 3,750            | 0.3               | 0.5 |
|               | 20                     | 18,000                        | 4,400            | 0.75              | 1.25  | 16,000                                                  | 4,200 | 0.3  | 0.5   | 16,000                                                              | 3,900            | 0.3               | 0.5   | 12,000                        | 2,900            | 0.3               | 0.5 |
|               | 25                     | 14,000                        | 4,000            | 0.6               | 1.25  | 12,000                                                  | 3,200 | 0.3  | 0.5   | 12,000                                                              | 3,000            | 0.3               | 0.5   | 9,000                         | 2,250            | 0.3               | 0.5 |
|               | 30                     | 10,000                        | 3,200            | 0.6               | 1.25  | 10,000                                                  | 2,600 | 0.3  | 0.5   | 10,000                                                              | 2,400            | 0.3               | 0.5   | 8,000                         | 1,900            | 0.3               | 0.5 |
|               | 35                     | 9,000                         | 3,000            | 0.4               | 1     | 9,000                                                   | 2,300 | 0.2  | 0.4   | 9,000                                                               | 2,100            | 0.2               | 0.4   | 7,000                         | 1,600            | 0.2               | 0.4 |
|               | 40                     | 9,000                         | 2,800            | 0.4               | 0.75  | 9,000                                                   | 2,000 | 0.2  | 0.3   | 9,000                                                               | 1,900            | 0.2               | 0.3   | 7,000                         | 1,400            | 0.2               | 0.3 |
|               | 45                     | 8,000                         | 2,500            | 0.4               | 0.75  | 8,000                                                   | 1,800 | 0.2  | 0.3   | 8,000                                                               | 1,700            | 0.2               | 0.3   | 6,500                         | 1,300            | 0.2               | 0.3 |
| 50            | 7,000                  | 2,300                         | 0.4              | 0.75              | 7,000 | 1,600                                                   | 0.2   | 0.3  | 7,000 | 1,500                                                               | 0.2              | 0.3               | 5,500 | 1,100                         | 0.2              | 0.3               |     |

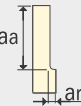
1. Use a rigid and precise machine and holder.
2. When machining carbon steels or hardened steels, using MQL (Minimum Quantity Lubrication / oil mist coolant) or air blow is recommended.
3. Use an air blow or a suitable cutting fluid with high smoke retardant properties.
4. The above cutting conditions are for contouring operation with low-load and stable condition. Refer to the table above to set the milling conditions in accordance with the actual situation.
5. Please adjust conditions based on machining accuracy, machining shape and machining path.
6. When using a tool with a diameter of φ 0.5 (R0.25) or less, or L/D (aspect ratio) is greater than 10, high loads can cause tool breakage. Therefore, adjust the cutting conditions based on the machining situation.
7. When RPM are insufficient, please reduce the RPM and feed rates at the same ratio as listed above.



# CUTTING CONDITIONS FOR CARBIDE END MILLS

## Series 402, 404

Side Milling (Metric)

| Hardness      |                                                                                                                                        |                |                            |                |                                   |                | Up to 30 HRC                             |                | 30 to 40 HRC                             |                | 40 to 50 HRC               |                |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------|----------------|-----------------------------------|----------------|------------------------------------------|----------------|------------------------------------------|----------------|----------------------------|----------------|
| Work Material | Aluminum                                                                                                                               |                | Cast Iron                  |                | Mild Carbon Steels<br>Mild Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Hardened Steels            |                |
| Cutting Speed | 100-120 m/min                                                                                                                          |                | 30-45 m/min                |                | 30-45 m/min                       |                | 25-35 m/min                              |                | 25-35 m/min                              |                | 15 m/min                   |                |
| Depth of Cut  | <div><div>aa=1.5D<br/>ar=0.1D</div><div></div></div> |                |                            |                |                                   |                |                                          |                |                                          |                |                            |                |
| Mill Dia.     | Speed<br>min <sup>-1</sup>                                                                                                             | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup>        | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |
| 0.5           | 62,000                                                                                                                                 | 450            | 22,400                     | 125            | 22,000                            | 60             | 16,000                                   | 35             | 16,000                                   | 18             | 9,500                      | 10             |
| 0.8           | 40,000                                                                                                                                 | 450            | 16,000                     | 125            | 14,000                            | 60             | 10,000                                   | 35             | 10,000                                   | 18             | 6,000                      | 10             |
| 1.0           | 31,500                                                                                                                                 | 450            | 14,000                     | 175            | 11,000                            | 85             | 8,000                                    | 60             | 8,000                                    | 35             | 4,800                      | 14             |
| 1.5           | 21,200                                                                                                                                 | 450            | 9,500                      | 175            | 7,500                             | 85             | 5,300                                    | 60             | 5,400                                    | 35             | 3,200                      | 14             |
| 2.0           | 16,000                                                                                                                                 | 450            | 7,100                      | 250            | 5,500                             | 85             | 4,000                                    | 60             | 4,000                                    | 35             | 2,400                      | 14             |
| 3.0           | 12,500                                                                                                                                 | 450            | 4,750                      | 300            | 4,500                             | 150            | 3,550                                    | 120            | 3,150                                    | 45             | 1,600                      | 25             |
| 4.0           | 9,500                                                                                                                                  | 475            | 3,550                      | 300            | 3,550                             | 175            | 2,650                                    | 120            | 2,360                                    | 45             | 1,200                      | 25             |
| 5.0           | 7,500                                                                                                                                  | 475            | 2,800                      | 300            | 2,800                             | 200            | 2,120                                    | 125            | 1,900                                    | 45             | 950                        | 25             |
| 6.0           | 6,300                                                                                                                                  | 475            | 2,360                      | 300            | 2,360                             | 200            | 1,700                                    | 125            | 1,600                                    | 45             | 800                        | 25             |
| 8.0           | 4,750                                                                                                                                  | 500            | 1,800                      | 300            | 1,800                             | 200            | 1,320                                    | 125            | 1,180                                    | 45             | 600                        | 25             |
| 10            | 3,750                                                                                                                                  | 500            | 1,400                      | 315            | 1,400                             | 225            | 1,060                                    | 125            | 950                                      | 45             | 480                        | 25             |
| 12            | 3,150                                                                                                                                  | 560            | 1,180                      | 315            | 1,180                             | 225            | 850                                      | 125            | 800                                      | 45             | 400                        | 25             |
| 16            | 2,360                                                                                                                                  | 560            | 900                        | 375            | 900                               | 250            | 670                                      | 140            | 600                                      | 45             | 300                        | 25             |
| 20            | 1,900                                                                                                                                  | 560            | 710                        | 375            | 710                               | 250            | 530                                      | 150            | 475                                      | 45             | 240                        | 25             |
| 25            | 1,500                                                                                                                                  | 500            | 560                        | 375            | 560                               | 250            | 425                                      | 140            | 375                                      | 35             | 190                        | 20             |

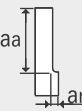
## Slotting (Metric)

| Hardness       |                                                                                                                                                                                                                                                                                                                                                                |                |                            |                |                                 |                | Up to 30 HRC                             |                | 30 to 40 HRC                             |                | 40 to 50 HRC               |                |  |       |            |        |                |       |            |     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------|----------------|---------------------------------|----------------|------------------------------------------|----------------|------------------------------------------|----------------|----------------------------|----------------|--|-------|------------|--------|----------------|-------|------------|-----|
| Work Material  | Aluminum                                                                                                                                                                                                                                                                                                                                                       |                | Cast Iron                  |                | Mid Carbon Steels<br>Mid Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Hardened Steels            |                |  |       |            |        |                |       |            |     |
| Cutting Speed  | 100 - 120 m/min                                                                                                                                                                                                                                                                                                                                                |                | 30 - 45 m/min              |                | 30 - 45 m/min                   |                | 25 - 35 m/min                            |                | 25 - 35 m/min                            |                | 15 m/min                   |                |  |       |            |        |                |       |            |     |
| Depth of Cut   | <table><tr><td></td><td><math>a_a</math></td></tr><tr><td><math>D &lt; 0.70</math></td><td><math>.25D</math></td></tr><tr><td><math>0.8 &lt; D &lt; 20</math></td><td><math>.5D</math></td></tr><tr><td><math>2.5 &lt; D1</math></td><td><math>D</math></td></tr></table>  |                |                            |                |                                 |                |                                          |                |                                          |                |                            |                |  | $a_a$ | $D < 0.70$ | $.25D$ | $0.8 < D < 20$ | $.5D$ | $2.5 < D1$ | $D$ |
|                | $a_a$                                                                                                                                                                                                                                                                                                                                                          |                |                            |                |                                 |                |                                          |                |                                          |                |                            |                |  |       |            |        |                |       |            |     |
| $D < 0.70$     | $.25D$                                                                                                                                                                                                                                                                                                                                                         |                |                            |                |                                 |                |                                          |                |                                          |                |                            |                |  |       |            |        |                |       |            |     |
| $0.8 < D < 20$ | $.5D$                                                                                                                                                                                                                                                                                                                                                          |                |                            |                |                                 |                |                                          |                |                                          |                |                            |                |  |       |            |        |                |       |            |     |
| $2.5 < D1$     | $D$                                                                                                                                                                                                                                                                                                                                                            |                |                            |                |                                 |                |                                          |                |                                          |                |                            |                |  |       |            |        |                |       |            |     |
| Mill Dia.      | Speed<br>min <sup>-1</sup>                                                                                                                                                                                                                                                                                                                                     | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup>      | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |  |       |            |        |                |       |            |     |
| 0.3            | 100,000                                                                                                                                                                                                                                                                                                                                                        | 180            | 31,500                     | 100            | 30,000                          | 35             | 22,400                                   | 18             | 21,200                                   | 13             | 16,000                     | 7              |  |       |            |        |                |       |            |     |
| 0.5            | 62,000                                                                                                                                                                                                                                                                                                                                                         | 200            | 22,400                     | 125            | 19,000                          | 40             | 13,000                                   | 20             | 12,000                                   | 15             | 9,500                      | 8              |  |       |            |        |                |       |            |     |
| 0.8            | 40,000                                                                                                                                                                                                                                                                                                                                                         | 200            | 16,000                     | 125            | 14,000                          | 63             | 8,000                                    | 25             | 8,000                                    | 15             | 6,000                      | 8              |  |       |            |        |                |       |            |     |
| 1.0            | 31,500                                                                                                                                                                                                                                                                                                                                                         | 200            | 14,000                     | 140            | 12,500                          | 75             | 7,500                                    | 30             | 7,000                                    | 15             | 4,800                      | 8              |  |       |            |        |                |       |            |     |
| 1.5            | 21,200                                                                                                                                                                                                                                                                                                                                                         | 200            | 9,500                      | 140            | 8,500                           | 90             | 6,500                                    | 35             | 5,000                                    | 20             | 3,200                      | 11             |  |       |            |        |                |       |            |     |
| 2.0            | 16,000                                                                                                                                                                                                                                                                                                                                                         | 300            | 7,100                      | 150            | 6,300                           | 100            | 5,000                                    | 60             | 4,000                                    | 30             | 2,400                      | 16             |  |       |            |        |                |       |            |     |
| 3.0            | 11,200                                                                                                                                                                                                                                                                                                                                                         | 300            | 4,750                      | 160            | 4,250                           | 100            | 3,200                                    | 80             | 2,600                                    | 30             | 1,600                      | 16             |  |       |            |        |                |       |            |     |
| 4.0            | 8,000                                                                                                                                                                                                                                                                                                                                                          | 300            | 3,550                      | 160            | 3,150                           | 100            | 2,400                                    | 80             | 2,000                                    | 30             | 1,200                      | 16             |  |       |            |        |                |       |            |     |
| 5.0            | 6,300                                                                                                                                                                                                                                                                                                                                                          | 300            | 2,800                      | 160            | 2,500                           | 100            | 2,000                                    | 80             | 1,600                                    | 30             | 950                        | 16             |  |       |            |        |                |       |            |     |
| 6.0            | 5,300                                                                                                                                                                                                                                                                                                                                                          | 300            | 2,360                      | 200            | 2,120                           | 100            | 1,600                                    | 80             | 1,300                                    | 30             | 800                        | 16             |  |       |            |        |                |       |            |     |
| 8.0            | 4,000                                                                                                                                                                                                                                                                                                                                                          | 300            | 1,800                      | 236            | 1,600                           | 100            | 1,200                                    | 80             | 1,000                                    | 30             | 600                        | 16             |  |       |            |        |                |       |            |     |
| 10             | 3,150                                                                                                                                                                                                                                                                                                                                                          | 300            | 1,400                      | 236            | 1,250                           | 100            | 1,000                                    | 80             | 800                                      | 30             | 480                        | 16             |  |       |            |        |                |       |            |     |
| 12             | 2,650                                                                                                                                                                                                                                                                                                                                                          | 300            | 1,180                      | 236            | 1,060                           | 100            | 820                                      | 80             | 700                                      | 30             | 400                        | 16             |  |       |            |        |                |       |            |     |
| 16             | 2,000                                                                                                                                                                                                                                                                                                                                                          | 300            | 900                        | 236            | 800                             | 100            | 640                                      | 85             | 500                                      | 37             | 300                        | 12             |  |       |            |        |                |       |            |     |
| 20             | 1,600                                                                                                                                                                                                                                                                                                                                                          | 300            | 710                        | 236            | 630                             | 100            | 500                                      | 85             | 400                                      | 37             | 240                        | 10             |  |       |            |        |                |       |            |     |
| 25             | 1,250                                                                                                                                                                                                                                                                                                                                                          | 300            | 560                        | 236            | 500                             | 100            | 400                                      | 85             | 320                                      | 37             | 190                        | 8              |  |       |            |        |                |       |            |     |

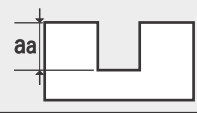
# CUTTING CONDITIONS FOR CARBIDE END MILLS

## Series 462, 482

Side Milling (Metric)

| Hardness      |                                                                                                                              |                |                            |                |                                 |                | Up to 30 HRC                             |                | 30 to 40 HRC                             |                | 40 to 50 HRC               |                |
|---------------|------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------|----------------|---------------------------------|----------------|------------------------------------------|----------------|------------------------------------------|----------------|----------------------------|----------------|
| Work Material | Aluminum                                                                                                                     |                | Cast Iron                  |                | Mid Carbon Steels<br>Mid Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Hardened Steels            |                |
| Cutting Speed | 100-120 m/min                                                                                                                |                | 30-45 m/min                |                | 30-45 m/min                     |                | 25-35 m/min                              |                | 25-35 m/min                              |                | 15 m/min                   |                |
| Depth of Cut  | <div>aa=1.5D<br/>ar=0.1D</div> <div></div> |                |                            |                |                                 |                |                                          |                |                                          |                |                            |                |
| Mill Dia.     | Speed<br>min <sup>-1</sup>                                                                                                   | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup>      | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |
| 0.3           | 100,000                                                                                                                      | 400            | 31,500                     | 100            | 30,000                          | 50             | 25,000                                   | 30             | 25,000                                   | 15             | 16,000                     | 8              |
| 0.5           | 62,000                                                                                                                       | 450            | 22,400                     | 125            | 22,000                          | 60             | 16,000                                   | 35             | 16,000                                   | 18             | 9,500                      | 10             |
| 0.8           | 40,000                                                                                                                       | 450            | 16,000                     | 125            | 14,000                          | 60             | 10,000                                   | 35             | 10,000                                   | 18             | 6,000                      | 10             |
| 1.0           | 31,500                                                                                                                       | 450            | 14,000                     | 175            | 11,000                          | 85             | 8,000                                    | 60             | 8,000                                    | 35             | 4,800                      | 14             |
| 1.5           | 21,200                                                                                                                       | 450            | 9,500                      | 175            | 7,500                           | 85             | 5,300                                    | 60             | 5,400                                    | 35             | 3,200                      | 14             |
| 2.0           | 16,000                                                                                                                       | 450            | 7,100                      | 250            | 5,500                           | 85             | 4,000                                    | 60             | 4,000                                    | 35             | 2,400                      | 14             |
| 3.0           | 12,500                                                                                                                       | 450            | 4,750                      | 300            | 4,500                           | 150            | 3,550                                    | 120            | 3,150                                    | 45             | 1,600                      | 25             |
| 4.0           | 9,500                                                                                                                        | 475            | 3,550                      | 300            | 3,550                           | 175            | 2,650                                    | 120            | 2,360                                    | 45             | 1,200                      | 25             |
| 5.0           | 7,500                                                                                                                        | 475            | 2,800                      | 300            | 2,800                           | 200            | 2,120                                    | 125            | 1,900                                    | 45             | 950                        | 25             |
| 6.0           | 6,300                                                                                                                        | 475            | 2,360                      | 300            | 2,360                           | 200            | 1,700                                    | 125            | 1,600                                    | 45             | 800                        | 25             |
| 8.0           | 4,750                                                                                                                        | 500            | 1,800                      | 300            | 1,800                           | 200            | 1,320                                    | 125            | 1,180                                    | 45             | 600                        | 25             |
| 10            | 3,750                                                                                                                        | 500            | 1,400                      | 315            | 1,400                           | 225            | 1,060                                    | 125            | 950                                      | 45             | 480                        | 25             |
| 12            | 3,150                                                                                                                        | 560            | 1,180                      | 315            | 1,180                           | 225            | 850                                      | 125            | 800                                      | 45             | 400                        | 25             |
| 16            | 2,360                                                                                                                        | 560            | 900                        | 375            | 900                             | 250            | 670                                      | 140            | 600                                      | 45             | 300                        | 25             |
| 20            | 1,900                                                                                                                        | 560            | 710                        | 375            | 710                             | 250            | 530                                      | 150            | 475                                      | 45             | 240                        | 25             |
| 25            | 1,500                                                                                                                        | 500            | 560                        | 375            | 560                             | 250            | 425                                      | 140            | 375                                      | 35             | 190                        | 20             |

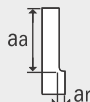
### Slotting (Metric)

| Hardness      |                                                                                                                                                                                                                                                                       |                |                                 |                                          | Up to 30 HRC                             | 30 to 40 HRC    | 40 to 50 HRC               |                |                            |                |                            |                |  |                |        |      |          |     |       |    |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------|------------------------------------------|------------------------------------------|-----------------|----------------------------|----------------|----------------------------|----------------|----------------------------|----------------|--|----------------|--------|------|----------|-----|-------|----|
| Work Material | Aluminum                                                                                                                                                                                                                                                              | Cast Iron      | Mid Carbon Steels<br>Mid Steels | Prehardened Steels<br>Die & Alloy Steels | Prehardened Steels<br>Die & Alloy Steels | Hardened Steels |                            |                |                            |                |                            |                |  |                |        |      |          |     |       |    |
| Cutting Speed | 100 m/min                                                                                                                                                                                                                                                             | 30-45 m/min    | 30-40 m/min                     | 20-30 m/min                              | 20-25 m/min                              | 15 m/min        |                            |                |                            |                |                            |                |  |                |        |      |          |     |       |    |
| Depth of Cut  | <table><tr><td></td><td>a<sub>a</sub></td></tr><tr><td>D&lt;0.70</td><td>.25D</td></tr><tr><td>0.8&lt;D&lt;20</td><td>.5D</td></tr><tr><td>2.5&lt;D</td><td>1D</td></tr></table>  |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |  | a <sub>a</sub> | D<0.70 | .25D | 0.8<D<20 | .5D | 2.5<D | 1D |
|               | a <sub>a</sub>                                                                                                                                                                                                                                                        |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |  |                |        |      |          |     |       |    |
| D<0.70        | .25D                                                                                                                                                                                                                                                                  |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |  |                |        |      |          |     |       |    |
| 0.8<D<20      | .5D                                                                                                                                                                                                                                                                   |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |  |                |        |      |          |     |       |    |
| 2.5<D         | 1D                                                                                                                                                                                                                                                                    |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |  |                |        |      |          |     |       |    |
| Mill Dia.     | Speed<br>min <sup>-1</sup>                                                                                                                                                                                                                                            | Feed<br>mm/min | Speed<br>min <sup>-1</sup>      | Feed<br>mm/min                           | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min  | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |  |                |        |      |          |     |       |    |
| 0.3           | 100,000                                                                                                                                                                                                                                                               | 180            | 31,500                          | 100                                      | 30,000                                   | 35              | 22,400                     | 18             | 21,200                     | 13             | 16,000                     | 7              |  |                |        |      |          |     |       |    |
| 0.5           | 62,000                                                                                                                                                                                                                                                                | 200            | 22,400                          | 125                                      | 19,000                                   | 40              | 13,000                     | 20             | 12,000                     | 15             | 9,500                      | 8              |  |                |        |      |          |     |       |    |
| 0.8           | 40,000                                                                                                                                                                                                                                                                | 200            | 16,000                          | 125                                      | 14,000                                   | 63              | 8,000                      | 25             | 8,000                      | 15             | 6,000                      | 8              |  |                |        |      |          |     |       |    |
| 1.0           | 31,500                                                                                                                                                                                                                                                                | 200            | 14,000                          | 140                                      | 12,500                                   | 75              | 7,500                      | 30             | 7,000                      | 15             | 4,800                      | 8              |  |                |        |      |          |     |       |    |
| 1.5           | 21,200                                                                                                                                                                                                                                                                | 200            | 9,500                           | 140                                      | 8,500                                    | 90              | 6,500                      | 35             | 5,000                      | 20             | 3,200                      | 11             |  |                |        |      |          |     |       |    |
| 2.0           | 16,000                                                                                                                                                                                                                                                                | 300            | 7,100                           | 150                                      | 6,300                                    | 100             | 5,000                      | 60             | 4,000                      | 30             | 2,400                      | 16             |  |                |        |      |          |     |       |    |
| 3.0           | 11,200                                                                                                                                                                                                                                                                | 300            | 4,750                           | 160                                      | 4,250                                    | 100             | 3,200                      | 80             | 2,600                      | 30             | 1,600                      | 16             |  |                |        |      |          |     |       |    |
| 4.0           | 8,000                                                                                                                                                                                                                                                                 | 300            | 3,550                           | 160                                      | 3,150                                    | 100             | 2,400                      | 80             | 2,000                      | 30             | 1,200                      | 16             |  |                |        |      |          |     |       |    |
| 5.0           | 6,300                                                                                                                                                                                                                                                                 | 300            | 2,800                           | 160                                      | 2,500                                    | 100             | 2,000                      | 80             | 1,600                      | 30             | 950                        | 16             |  |                |        |      |          |     |       |    |
| 6.0           | 5,300                                                                                                                                                                                                                                                                 | 300            | 2,360                           | 200                                      | 2,120                                    | 100             | 1,600                      | 80             | 1,300                      | 30             | 800                        | 16             |  |                |        |      |          |     |       |    |
| 8.0           | 4,000                                                                                                                                                                                                                                                                 | 300            | 1,800                           | 236                                      | 1,600                                    | 100             | 1,200                      | 80             | 1,000                      | 30             | 600                        | 16             |  |                |        |      |          |     |       |    |
| 10            | 3,150                                                                                                                                                                                                                                                                 | 300            | 1,400                           | 236                                      | 1,250                                    | 100             | 1,000                      | 80             | 800                        | 30             | 480                        | 16             |  |                |        |      |          |     |       |    |
| 12            | 2,650                                                                                                                                                                                                                                                                 | 300            | 1,180                           | 236                                      | 1,060                                    | 100             | 820                        | 80             | 700                        | 30             | 400                        | 16             |  |                |        |      |          |     |       |    |
| 16            | 2,000                                                                                                                                                                                                                                                                 | 300            | 900                             | 236                                      | 800                                      | 100             | 640                        | 85             | 500                        | 37             | 300                        | 12             |  |                |        |      |          |     |       |    |
| 20            | 1,600                                                                                                                                                                                                                                                                 | 300            | 710                             | 236                                      | 630                                      | 100             | 500                        | 85             | 400                        | 37             | 240                        | 10             |  |                |        |      |          |     |       |    |
| 25            | 1,250                                                                                                                                                                                                                                                                 | 300            | 560                             | 236                                      | 500                                      | 100             | 400                        | 85             | 320                        | 37             | 190                        | 8              |  |                |        |      |          |     |       |    |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## Series 464, 484

Side Milling (Metric)

| Hardness      |                                                                                                                                                                               |                |                            |                |                                 |                | Up to 30 HRC                             |                | 30 to 40 HRC                             |                | 40 to 50 HRC               |                |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------|----------------|---------------------------------|----------------|------------------------------------------|----------------|------------------------------------------|----------------|----------------------------|----------------|
| Work Material | Aluminum                                                                                                                                                                      |                | Cast Iron                  |                | Mid Carbon Steels<br>Mid Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Hardened Steels            |                |
| Cutting Speed | 100-120 m/min                                                                                                                                                                 |                | 30-45 m/min                |                | 30-45 m/min                     |                | 25-35 m/min                              |                | 25-35 m/min                              |                | 15 m/min                   |                |
| Depth of Cut  | <div><div><div><math>a_a=1.5D</math><br/><math>a_r=0.1D</math></div><div></div></div></div> |                |                            |                |                                 |                |                                          |                |                                          |                |                            |                |
| Mill Dia.     | Speed<br>min <sup>-1</sup>                                                                                                                                                    | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup>      | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |
| 0.8           | 40,000                                                                                                                                                                        | 630            | 16,000                     | 175            | 14,000                          | 85             | 10,000                                   | 50             | 10,000                                   | 25             | 6,000                      | 14             |
| 1.0           | 31,500                                                                                                                                                                        | 630            | 14,000                     | 245            | 11,000                          | 120            | 8,000                                    | 85             | 8,000                                    | 50             | 4,800                      | 20             |
| 1.5           | 21,200                                                                                                                                                                        | 630            | 9,500                      | 245            | 7,500                           | 120            | 5,300                                    | 85             | 5,400                                    | 50             | 3,200                      | 20             |
| 2.0           | 16,000                                                                                                                                                                        | 630            | 7,100                      | 350            | 5,500                           | 120            | 4,000                                    | 85             | 4,000                                    | 50             | 2,400                      | 20             |
| 3.0           | 12,500                                                                                                                                                                        | 630            | 4,750                      | 420            | 4,500                           | 210            | 3,550                                    | 170            | 3,150                                    | 63             | 1,600                      | 35             |
| 4.0           | 9,500                                                                                                                                                                         | 665            | 3,550                      | 420            | 3,550                           | 245            | 2,650                                    | 170            | 2,360                                    | 63             | 1,200                      | 35             |
| 5.0           | 7,500                                                                                                                                                                         | 665            | 2,800                      | 420            | 2,800                           | 280            | 2,120                                    | 170            | 1,900                                    | 63             | 950                        | 35             |
| 6.0           | 6,300                                                                                                                                                                         | 665            | 2,360                      | 420            | 2,360                           | 280            | 1,700                                    | 170            | 1,600                                    | 63             | 800                        | 35             |
| 8.0           | 4,750                                                                                                                                                                         | 700            | 1,800                      | 420            | 1,800                           | 280            | 1,320                                    | 170            | 1,180                                    | 63             | 600                        | 35             |
| 10            | 3,750                                                                                                                                                                         | 700            | 1,400                      | 440            | 1,400                           | 310            | 1,060                                    | 170            | 950                                      | 63             | 480                        | 35             |
| 12            | 3,150                                                                                                                                                                         | 780            | 1,180                      | 440            | 1,180                           | 310            | 850                                      | 170            | 800                                      | 63             | 400                        | 35             |
| 16            | 2,360                                                                                                                                                                         | 780            | 900                        | 525            | 900                             | 350            | 670                                      | 200            | 600                                      | 63             | 300                        | 35             |
| 20            | 1,900                                                                                                                                                                         | 780            | 710                        | 525            | 710                             | 350            | 530                                      | 210            | 475                                      | 63             | 240                        | 35             |
| 25            | 1,500                                                                                                                                                                         | 700            | 560                        | 525            | 560                             | 350            | 425                                      | 200            | 375                                      | 50             | 190                        | 28             |

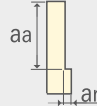
## Slotting (Metric)

| Hardness      |                                                                                                                                                                                                                                                                        |                |                                 |                                          | Up to 30 HRC                             |                 | 30 to 40 HRC               |                | 40 to 50 HRC               |                |                            |                |       |    |  |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------|------------------------------------------|------------------------------------------|-----------------|----------------------------|----------------|----------------------------|----------------|----------------------------|----------------|-------|----|--|
| Work Material | Aluminum                                                                                                                                                                                                                                                               | Cast Iron      | Mid Carbon Steels<br>Mid Steels | Prehardened Steels<br>Die & Alloy Steels | Prehardened Steels<br>Die & Alloy Steels | Hardened Steels |                            |                |                            |                |                            |                |       |    |  |
| Cutting Speed | 100 m/min                                                                                                                                                                                                                                                              | 30-45 m/min    | 30-40 m/min                     | 20-30 m/min                              | 20-25 m/min                              | 15 m/min        |                            |                |                            |                |                            |                |       |    |  |
| Depth of Cut  | <table><tr><td></td><td>a<sub>a</sub></td></tr><tr><td>D&lt;0.70</td><td>.25D</td></tr><tr><td>0.8&lt;D&lt;20</td><td>.5 D</td></tr><tr><td>2.5&lt;D</td><td>1D</td></tr></table>  |                |                                 |                                          |                                          |                 |                            | a <sub>a</sub> | D<0.70                     | .25D           | 0.8<D<20                   | .5 D           | 2.5<D | 1D |  |
|               | a <sub>a</sub>                                                                                                                                                                                                                                                         |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |       |    |  |
| D<0.70        | .25D                                                                                                                                                                                                                                                                   |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |       |    |  |
| 0.8<D<20      | .5 D                                                                                                                                                                                                                                                                   |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |       |    |  |
| 2.5<D         | 1D                                                                                                                                                                                                                                                                     |                |                                 |                                          |                                          |                 |                            |                |                            |                |                            |                |       |    |  |
| Mill Dia.     | Speed<br>min <sup>-1</sup>                                                                                                                                                                                                                                             | Feed<br>mm/min | Speed<br>min <sup>-1</sup>      | Feed<br>mm/min                           | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min  | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |       |    |  |
| 0.8           | 40,000                                                                                                                                                                                                                                                                 | 280            | 16,000                          | 175                                      | 14,000                                   | 88              | 8,000                      | 35             | 8,000                      | 20             | 6,000                      | 10             |       |    |  |
| 1.0           | 31,500                                                                                                                                                                                                                                                                 | 280            | 14,000                          | 200                                      | 12,500                                   | 105             | 7,500                      | 42             | 7,000                      | 20             | 4,800                      | 10             |       |    |  |
| 1.5           | 21,200                                                                                                                                                                                                                                                                 | 280            | 9,500                           | 200                                      | 8,500                                    | 125             | 6,500                      | 50             | 5,000                      | 28             | 3,200                      | 15             |       |    |  |
| 2.0           | 16,000                                                                                                                                                                                                                                                                 | 420            | 7,100                           | 210                                      | 6,300                                    | 140             | 5,000                      | 85             | 4,000                      | 42             | 2,400                      | 22             |       |    |  |
| 3.0           | 11,200                                                                                                                                                                                                                                                                 | 420            | 4,750                           | 225                                      | 4,250                                    | 140             | 3,200                      | 110            | 2,600                      | 42             | 1,600                      | 22             |       |    |  |
| 4.0           | 8,000                                                                                                                                                                                                                                                                  | 420            | 3,550                           | 225                                      | 3,150                                    | 140             | 2,400                      | 110            | 2,000                      | 42             | 1,200                      | 22             |       |    |  |
| 5.0           | 6,300                                                                                                                                                                                                                                                                  | 420            | 2,800                           | 225                                      | 2,500                                    | 140             | 2,000                      | 110            | 1,600                      | 42             | 950                        | 22             |       |    |  |
| 6.0           | 5,300                                                                                                                                                                                                                                                                  | 420            | 2,360                           | 280                                      | 2,120                                    | 140             | 1,600                      | 110            | 1,300                      | 42             | 800                        | 22             |       |    |  |
| 8.0           | 4,000                                                                                                                                                                                                                                                                  | 420            | 1,800                           | 330                                      | 1,600                                    | 140             | 1,200                      | 110            | 1,000                      | 42             | 600                        | 22             |       |    |  |
| 10            | 3,150                                                                                                                                                                                                                                                                  | 420            | 1,400                           | 330                                      | 1,250                                    | 140             | 1,000                      | 110            | 800                        | 42             | 480                        | 22             |       |    |  |
| 12            | 2,650                                                                                                                                                                                                                                                                  | 420            | 1,180                           | 330                                      | 1,060                                    | 140             | 820                        | 110            | 700                        | 42             | 400                        | 22             |       |    |  |
| 16            | 2,000                                                                                                                                                                                                                                                                  | 420            | 900                             | 330                                      | 800                                      | 140             | 640                        | 120            | 500                        | 50             | 300                        | 17             |       |    |  |
| 20            | 1,600                                                                                                                                                                                                                                                                  | 420            | 710                             | 330                                      | 630                                      | 140             | 500                        | 120            | 400                        | 50             | 240                        | 14             |       |    |  |
| 25            | 1,250                                                                                                                                                                                                                                                                  | 420            | 560                             | 330                                      | 500                                      | 140             | 400                        | 120            | 320                        | 50             | 190                        | 11             |       |    |  |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

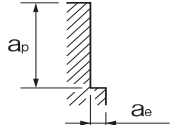
## Series 450 & 452

Side Milling (Metric)

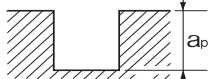
| Hardness      |                                                                                                                    |                | Tensile Strength:<br>Up to 750N/mm2 |                | Up to 30 HRC                                        |                | 30 to 38 HRC                                                                   |                | 38 to 45 HRC                                                                            |                |                            |                |
|---------------|--------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------|----------------|-----------------------------------------------------|----------------|--------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------|----------------|----------------------------|----------------|
| Work Material | Cast Iron                                                                                                          |                | Mild Steels<br>Carbon Steels        |                | Alloy Steels<br>Tool Steels<br>Ti Alloys (Annealed) |                | Hardened Steels<br>Prehardened Steels<br>Ti Alloys (Solution Treated and Aged) |                | Hardened Steels<br>Prehardened Steels<br>Stainless Steels<br>Inconel<br>Ni Based Alloys |                | Aluminum Alloy             |                |
| Cutting Speed | 102 m/min                                                                                                          |                | 120 m/min                           |                | 96 m/min                                            |                | 72 m/min                                                                       |                | 48 m/min                                                                                |                | 132 m/min                  |                |
| Depth of Cut  | <div>aa=1.5D<br/>ar=0.1D</div>  |                |                                     |                |                                                     |                |                                                                                |                |                                                                                         |                |                            |                |
| Mill Dia.     | Speed<br>min <sup>-1</sup>                                                                                         | Feed<br>mm/min | Speed<br>min <sup>-1</sup>          | Feed<br>mm/min | Speed<br>min <sup>-1</sup>                          | Feed<br>mm/min | Speed<br>min <sup>-1</sup>                                                     | Feed<br>mm/min | Speed<br>min <sup>-1</sup>                                                              | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |
| 4             | 8,160                                                                                                              | 840            | 9,600                               | 1,800          | 7,680                                               | 1,560          | 5,760                                                                          | 480            | 3,840                                                                                   | 288            | 10,560                     | 1,320          |
| 6             | 5,400                                                                                                              | 960            | 6,360                               | 2,040          | 5,040                                               | 1,800          | 3,840                                                                          | 480            | 2,520                                                                                   | 312            | 6,960                      | 1,560          |
| 8             | 4,080                                                                                                              | 840            | 4,800                               | 1,920          | 3,840                                               | 1,680          | 2,880                                                                          | 744            | 1,920                                                                                   | 492            | 5,280                      | 1,440          |
| 10            | 3,240                                                                                                              | 816            | 3,840                               | 1,680          | 3,000                                               | 1,560          | 2,280                                                                          | 720            | 1,560                                                                                   | 492            | 4,200                      | 1,320          |
| 12            | 2,760                                                                                                              | 792            | 3,240                               | 1,680          | 2,520                                               | 1,440          | 1,920                                                                          | 612            | 1,260                                                                                   | 420            | 3,480                      | 1,200          |
| 16            | 2,040                                                                                                              | 660            | 2,400                               | 1,320          | 1,920                                               | 1,140          | 1,440                                                                          | 468            | 960                                                                                     | 396            | 2,640                      | 1,080          |
| 20            | 1,620                                                                                                              | 540            | 2,160                               | 1,080          | 1,500                                               | 900            | 1,140                                                                          | 384            | 780                                                                                     | 312            | 2,100                      | 960            |

## Series 483

SIDE MILLING

| Work Material     | Cast Iron<br>FC, FCD                                                                                             |                  | Mild Steel · Carbon Steel<br>SS400, S55C<br>(~750N/mm <sup>2</sup> ) |                  | Alloy Steel · Tool Steel<br>SCM, SKT, SKS, SKD<br>(~30HRC) |                  | Hardened Steel · Prehardened Steel<br>(Free-Cutting)<br>SKT, SKD, NAK55, HPM1 |                              | (38~45HRC)<br>Hardened Steel<br>SKD |                  | Stainless Steel<br>SUS304     |                  | Titanium Alloy<br>Steel       |                  |
|-------------------|------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------|------------------|------------------------------------------------------------|------------------|-------------------------------------------------------------------------------|------------------------------|-------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|
| Cutting Speed     | 100~140m/min                                                                                                     |                  | 80~120m/min                                                          |                  | 70~100m/min                                                |                  | 50~80m/min                                                                    |                              | 35~65m/min                          |                  | 35~65m/min                    |                  | 30~50m/min                    |                  |
| Mill Dia.<br>(mm) | Speed<br>(min <sup>-1</sup> )                                                                                    | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                        | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                              | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                                 | Feed<br>(mm/min)             | Speed<br>(min <sup>-1</sup> )       | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |
| 6                 | 6,350                                                                                                            | 760              | 5,300                                                                | 640              | 4,500                                                      | 360              | 3,450                                                                         | 280                          | 2,650                               | 210              | 2,650                         | 210              | 1,800                         | 120              |
| 8                 | 4,750                                                                                                            | 760              | 4,000                                                                | 640              | 3,400                                                      | 410              | 2,600                                                                         | 310                          | 2,000                               | 240              | 2,000                         | 240              | 1,350                         | 160              |
| 10                | 3,800                                                                                                            | 760              | 3,200                                                                | 640              | 2,700                                                      | 430              | 2,050                                                                         | 330                          | 1,600                               | 260              | 1,600                         | 260              | 1,100                         | 170              |
| 12                | 3,200                                                                                                            | 770              | 2,650                                                                | 640              | 2,250                                                      | 450              | 1,700                                                                         | 340                          | 1,350                               | 270              | 1,350                         | 270              | 920                           | 180              |
| 14                | 2,750                                                                                                            | 770              | 2,250                                                                | 650              | 1,950                                                      | 470              | 1,500                                                                         | 360                          | 1,150                               | 280              | 1,150                         | 280              | 800                           | 190              |
| 16                | 2,400                                                                                                            | 770              | 2,000                                                                | 640              | 1,700                                                      | 480              | 1,300                                                                         | 360                          | 1,000                               | 280              | 1,000                         | 280              | 700                           | 190              |
| 18                | 2,100                                                                                                            | 760              | 1,750                                                                | 630              | 1,500                                                      | 480              | 1,150                                                                         | 350                          | 900                                 | 270              | 900                           | 270              | 620                           | 190              |
| 20                | 1,900                                                                                                            | 760              | 1,600                                                                | 610              | 1,350                                                      | 470              | 1,050                                                                         | 350                          | 800                                 | 260              | 800                           | 260              | 560                           | 180              |
| 22                | 1,750                                                                                                            | 770              | 1,450                                                                | 580              | 1,250                                                      | 470              | 950                                                                           | 340                          | 750                                 | 260              | 750                           | 260              | 510                           | 170              |
| 25                | 1,550                                                                                                            | 740              | 1,300                                                                | 550              | 1,100                                                      | 440              | 850                                                                           | 330                          | 650                                 | 240              | 650                           | 240              | 450                           | 160              |
| Depth of Cut      | $a_p = 1.5D$<br>$a_e = 0.4D$  |                  |                                                                      |                  |                                                            |                  |                                                                               | $a_p = 1.5D$<br>$a_e = 0.3D$ |                                     |                  |                               |                  |                               |                  |

SLOTTING

| Work Material        | Cast Iron<br>FC, FCD                                                                                                                 |                  | Mild Steel · Carbon Steel<br>SS400, S55C<br>(~750N/mm <sup>2</sup> ) |                  | Alloy Steel · Tool Steel<br>SCM, SKT, SKS, SKD<br>(~30HRC) |                  | Hardened Steel · Prehardened Steel<br>(Free-Cutting)<br>SKT, SKD, NAK55, HPM1 |                  | (38~45HRC)<br>Hardened Steel<br>SKD |                  | Stainless Steel<br>SUS304     |                  | Titanium Alloy<br>Steel       |                  |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------|------------------|------------------------------------------------------------|------------------|-------------------------------------------------------------------------------|------------------|-------------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|
| Cutting Speed        | 100~140m/min                                                                                                                         |                  | 80~120m/min                                                          |                  | 70~100m/min                                                |                  | 50~80m/min                                                                    |                  | 35~65m/min                          |                  | 35~65m/min                    |                  | 30~50m/min                    |                  |
| Mill Dia.<br>(mm)    | Speed<br>(min <sup>-1</sup> )                                                                                                        | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                        | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                              | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )                                                 | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> )       | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) | Speed<br>(min <sup>-1</sup> ) | Feed<br>(mm/min) |
| 6                    | 5,300                                                                                                                                | 640              | 4,500                                                                | 540              | 3,700                                                      | 300              | 2,900                                                                         | 230              | 2,400                               | 190              | 2,400                         | 190              | 1,500                         | 100              |
| 8                    | 4,000                                                                                                                                | 640              | 3,400                                                                | 540              | 2,800                                                      | 340              | 2,200                                                                         | 260              | 1,800                               | 220              | 1,800                         | 220              | 1,150                         | 130              |
| 10                   | 3,200                                                                                                                                | 640              | 2,700                                                                | 540              | 2,250                                                      | 360              | 1,750                                                                         | 280              | 1,450                               | 230              | 1,450                         | 230              | 950                           | 150              |
| 12                   | 2,650                                                                                                                                | 640              | 2,250                                                                | 540              | 1,850                                                      | 370              | 1,450                                                                         | 290              | 1,200                               | 240              | 1,200                         | 240              | 800                           | 160              |
| 14                   | 2,250                                                                                                                                | 630              | 1,950                                                                | 570              | 1,600                                                      | 380              | 1,250                                                                         | 300              | 1,000                               | 240              | 1,000                         | 240              | 700                           | 170              |
| 16                   | 2,000                                                                                                                                | 640              | 1,700                                                                | 540              | 1,400                                                      | 390              | 1,100                                                                         | 310              | 900                                 | 250              | 900                           | 250              | 600                           | 170              |
| 18                   | 1,750                                                                                                                                | 630              | 1,500                                                                | 540              | 1,250                                                      | 400              | 950                                                                           | 290              | 800                                 | 240              | 800                           | 240              | 540                           | 160              |
| 20                   | 1,600                                                                                                                                | 640              | 1,350                                                                | 510              | 1,100                                                      | 390              | 900                                                                           | 300              | 700                                 | 230              | 700                           | 230              | 480                           | 150              |
| 22                   | 1,450                                                                                                                                | 640              | 1,250                                                                | 500              | 1,000                                                      | 380              | 800                                                                           | 290              | 650                                 | 220              | 650                           | 220              | 440                           | 150              |
| 25                   | 1,300                                                                                                                                | 620              | 1,100                                                                | 470              | 900                                                        | 360              | 700                                                                           | 270              | 600                                 | 220              | 600                           | 220              | 390                           | 140              |
| 切込深さ<br>Depth of Cut | $a_p = 0.75D$<br>$a_p \text{ Max} = 15\text{mm}$  |                  |                                                                      |                  |                                                            |                  |                                                                               | $a_p = 0.5D$     |                                     |                  |                               |                  |                               |                  |

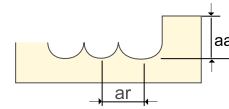




# CUTTING CONDITIONS FOR CARBIDE END MILLS

## Series 4512

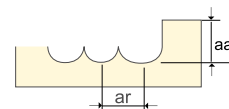
Profile Milling (Metric)



| Hardness      | Up to 50 HRC            |             | Up to 55 HRC            |             | Up to 65 HRC            |             | Up to 70 HRC            |             |
|---------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|
| Material      | Die Steel               |             | Die Steel               |             | Die Steel               |             | Die Steel               |             |
| Cutting Speed | 100 (m/min)             |             | 80 (m/min)              |             | 60 (m/min)              |             | 50 (m/min)              |             |
| Depth of Cut  | Aa0.05D Ar0.1D          |             | Aa0.03D Ar0.1D          |             | Aa0.02D Ar0.05D         |             |                         |             |
| Mill Dia.     | Speed min <sup>-1</sup> | Feed mm/min | Speed min <sup>-1</sup> | Feed mm/min | Speed min <sup>-1</sup> | Feed mm/min | Speed min <sup>-1</sup> | Feed mm/min |
| 1             | 31847                   | 1911        | 25478                   | 1376        | 19108                   | 917         | 15924                   | 717         |
| 2             | 15924                   | 1592        | 12739                   | 1146        | 9554                    | 764         | 7962                    | 597         |
| 3             | 10616                   | 1486        | 8493                    | 1070        | 6369                    | 713         | 5308                    | 557         |
| 4             | 7962                    | 1433        | 6369                    | 1032        | 4777                    | 688         | 3981                    | 537         |
| 5             | 6369                    | 1274        | 5096                    | 917         | 3822                    | 611         | 3185                    | 478         |
| 6             | 5308                    | 1168        | 4246                    | 841         | 3185                    | 561         | 2654                    | 438         |
| 8             | 3981                    | 955         | 3185                    | 688         | 2389                    | 459         | 1990                    | 358         |
| 10            | 3185                    | 892         | 2548                    | 642         | 1911                    | 428         | 1592                    | 334         |
| 12            | 2654                    | 796         | 2123                    | 573         | 1592                    | 382         | 1327                    | 299         |
| 16            | 1990                    | 597         | 1592                    | 430         | 1194                    | 287         | 995                     | 224         |
| 20            | 1592                    | 478         | 1274                    | 344         | 955                     | 229         | 796                     | 179         |

## Series 4514

Profile Milling (Metric)

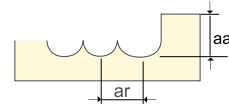


| Hardness      | Up to 50 HRC               |                | Up to 55 HRC               |                | Up to 65 HRC               |                | Up to 70 HRC               |                |
|---------------|----------------------------|----------------|----------------------------|----------------|----------------------------|----------------|----------------------------|----------------|
| Material      | Die Steel                  |                | Die Steel                  |                | Die Steel                  |                | Die Steel                  |                |
| Cutting Speed | 100 (m/min)                |                | 80 (m/min)                 |                | 60 (m/min)                 |                | 50 (m/min)                 |                |
| Depth of Cut  | Aa0.04D Ar0.09D            |                | Aa0.02D Ar0.09D            |                | Aa0.015D Ar0.04D           |                |                            |                |
| Mill Dia.     | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |
| 1             | 31847                      | 2866           | 25478                      | 2064           | 19108                      | 1376           | 15924                      | 1075           |
| 2             | 15924                      | 2389           | 12739                      | 1720           | 9554                       | 1146           | 7962                       | 896            |
| 3             | 10616                      | 2229           | 8493                       | 1605           | 6369                       | 1070           | 5308                       | 836            |
| 4             | 7962                       | 2150           | 6369                       | 1548           | 4777                       | 1032           | 3981                       | 806            |
| 5             | 6369                       | 1911           | 5096                       | 1376           | 3822                       | 917            | 3185                       | 717            |
| 6             | 5308                       | 1752           | 4246                       | 1261           | 3185                       | 841            | 2654                       | 657            |
| 8             | 3981                       | 1433           | 3185                       | 1032           | 2389                       | 688            | 1990                       | 537            |
| 10            | 3185                       | 1338           | 2548                       | 963            | 1911                       | 642            | 1592                       | 502            |
| 12            | 2654                       | 1194           | 2123                       | 860            | 1592                       | 573            | 1327                       | 448            |
| 16            | 1990                       | 896            | 1592                       | 645            | 1194                       | 430            | 995                        | 336            |
| 20            | 1592                       | 717            | 1274                       | 516            | 955                        | 344            | 796                        | 269            |

# CUTTING CONDITIONS FOR CARBIDE END MILLS

## Series 4522

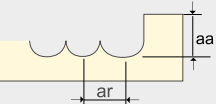
Profile Milling (Metric)



| Hardness      | Up to 50 HRC               |                | Up to 55 HRC               |                | Up to 65 HRC               |                | Up to 70 HRC               |                |
|---------------|----------------------------|----------------|----------------------------|----------------|----------------------------|----------------|----------------------------|----------------|
| Material      | Die Steel                  |                | Die Steel                  |                | Die Steel                  |                | Die Steel                  |                |
| Cutting Speed | 70 (m/min)                 |                | 60 (m/min)                 |                | 45 (m/min)                 |                | 40 (m/min)                 |                |
| Depth of Cut  | Aa0.04D   Ar0.09D          |                | Aa0.02D   Ar0.09D          |                | Aa0.015D   Ar0.04D         |                |                            |                |
| Mill Dia.     | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |
| 1             | 22293                      | 1338           | 19108                      | 1032           | 14331                      | 688            | 12739                      | 573            |
| 2             | 11146                      | 1115           | 9554                       | 860            | 7166                       | 573            | 6369                       | 478            |
| 3             | 7431                       | 1040           | 6369                       | 803            | 4777                       | 535            | 4246                       | 446            |
| 4             | 5573                       | 1003           | 4777                       | 774            | 3583                       | 516            | 3185                       | 430            |
| 5             | 4459                       | 892            | 3822                       | 688            | 2866                       | 459            | 2548                       | 382            |
| 6             | 3715                       | 817            | 3185                       | 631            | 2389                       | 420            | 2123                       | 350            |
| 8             | 2787                       | 669            | 2389                       | 516            | 1791                       | 344            | 1592                       | 287            |
| 10            | 2229                       | 624            | 1911                       | 482            | 1433                       | 321            | 1274                       | 268            |
| 12            | 1858                       | 557            | 1592                       | 430            | 1194                       | 287            | 1062                       | 239            |
| 16            | 1393                       | 418            | 1194                       | 322            | 896                        | 215            | 796                        | 179            |
| 20            | 1115                       | 334            | 955                        | 258            | 717                        | 172            | 637                        | 143            |

## Series 402BN, 404BN, 462BN, 464BN, 482BN, 484BN

Profile Milling (Metric)

| Hardness      |                                                                                                                               |                |                            |                |                                   |                | Up to 30 HRC                             |                | 30 to 40 HRC                             |                | 40 to 50 HRC               |                |
|---------------|-------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------|----------------|-----------------------------------|----------------|------------------------------------------|----------------|------------------------------------------|----------------|----------------------------|----------------|
| Work Material | Aluminum                                                                                                                      |                | Cast Iron                  |                | Mild Carbon Steels<br>Mild Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Prehardened Steels<br>Die & Alloy Steels |                | Hardened Steels            |                |
| Cutting Speed | 100 m/min                                                                                                                     |                | 30-45 m/min                |                | 30-40 m/min                       |                | 20-30 m/min                              |                | 20-25 m/min                              |                | 15 m/min                   |                |
| Depth of Cut  | <div><div>aa=0.3D<br/>ar=0.7D</div></div> |                |                            |                |                                   |                |                                          |                |                                          |                |                            |                |
| Mill Dia.     | Speed<br>min <sup>-1</sup>                                                                                                    | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min | Speed<br>min <sup>-1</sup>        | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup>               | Feed<br>mm/min | Speed<br>min <sup>-1</sup> | Feed<br>mm/min |
| 1             | 32,000                                                                                                                        | 226            | 11,000                     | 126            | 11,000                            | 112            | 8,000                                    | 63             | 6,400                                    | 33.6           | 8,000                      | 63             |
| 2             | 16,000                                                                                                                        | 226            | 5,600                      | 126            | 5,600                             | 112            | 4,000                                    | 63             | 3,200                                    | 33.6           | 4,000                      | 63             |
| 3             | 10,000                                                                                                                        | 226            | 3,700                      | 140            | 3,700                             | 126            | 2,600                                    | 70             | 2,100                                    | 42             | 2,600                      | 77             |
| 4             | 8,000                                                                                                                         | 226            | 2,800                      | 140            | 2,800                             | 126            | 2,000                                    | 70             | 1,600                                    | 42             | 2,000                      | 77             |
| 5             | 6,400                                                                                                                         | 226            | 2,200                      | 140            | 2,200                             | 126            | 1,600                                    | 70             | 1,300                                    | 42             | 1,600                      | 77             |
| 6             | 5,300                                                                                                                         | 226            | 1,900                      | 140            | 1,900                             | 126            | 1,320                                    | 70             | 1,000                                    | 42             | 1,320                      | 77             |
| 8             | 4,000                                                                                                                         | 308            | 1,400                      | 140            | 1,400                             | 126            | 1,000                                    | 70             | 800                                      | 42             | 1,000                      | 77             |
| 10            | 3,200                                                                                                                         | 308            | 1,100                      | 140            | 1,100                             | 126            | 800                                      | 70             | 640                                      | 42             | 800                        | 77             |
| 12            | 2,600                                                                                                                         | 308            | 930                        | 140            | 930                               | 126            | 660                                      | 70             | 530                                      | 42             | 660                        | 77             |
| 16            | 2,000                                                                                                                         | 308            | 700                        | 140            | 700                               | 126            | 500                                      | 70             | 400                                      | 42             | 500                        | 77             |
| 20            | 1,600                                                                                                                         | 308            | 560                        | 140            | 560                               | 126            | 400                                      | 70             | 320                                      | 42             | 400                        | 77             |
| 25            | 1,200                                                                                                                         | 308            | 450                        | 140            | 450                               | 126            | 320                                      | 70             | 250                                      | 42             | 320                        | 77             |



shaping your dreams

## CUTTING CONDITIONS FOR CARBIDE END MILLS

### SCA -ETS

#### Side Milling (ap : 1.0XD/ ae : 0.1XD)

| Work Material | Aluminium Alloy Expanding Material<br>A7075 |               | Aluminium Alloy Casting<br><Si 13% |               | Copper Alloy<br>C1100 |               |
|---------------|---------------------------------------------|---------------|------------------------------------|---------------|-----------------------|---------------|
| Mill Dia (mm) | Speed (min-1)                               | Feed (mm/min) | Speed (min-1)                      | Feed (mm/min) | Speed (min-1)         | Feed (mm/min) |
| 3             | 21000                                       | 950           | 21000                              | 950           | 7950                  | 320           |
| 4             | 15500                                       | 1100          | 15500                              | 1100          | 5950                  | 350           |
| 5             | 12500                                       | 1100          | 12500                              | 1100          | 4750                  | 380           |
| 6             | 10500                                       | 1200          | 10500                              | 1200          | 3950                  | 400           |
| 8             | 7950                                        | 1300          | 7950                               | 1300          | 2950                  | 450           |
| 10            | 6350                                        | 1500          | 6350                               | 1500          | 2350                  | 480           |
| 12            | 5300                                        | 1550          | 5300                               | 1550          | 1950                  | 510           |

### SCA -ETS

#### Slotting (ap : 0.25XD)

| Work Material | Aluminium Alloy Expanding Material<br>A7075 |               | Aluminium Alloy Casting<br><Si 13% |               | Copper Alloy<br>C1100 |               |
|---------------|---------------------------------------------|---------------|------------------------------------|---------------|-----------------------|---------------|
| Mill Dia (mm) | Speed (min-1)                               | Feed (mm/min) | Speed (min-1)                      | Feed (mm/min) | Speed (min-1)         | Feed (mm/min) |
| 3             | 21000                                       | 670           | 21000                              | 670           | 7950                  | 325           |
| 4             | 15500                                       | 700           | 15500                              | 700           | 5950                  | 365           |
| 5             | 12500                                       | 745           | 12500                              | 745           | 4750                  | 385           |
| 6             | 10500                                       | 820           | 10500                              | 820           | 3950                  | 405           |
| 8             | 7950                                        | 865           | 7950                               | 865           | 2950                  | 455           |
| 10            | 6350                                        | 970           | 6350                               | 970           | 2350                  | 475           |
| 12            | 5300                                        | 1050          | 5300                               | 1050          | 1950                  | 510           |

1. Use a water soluble cutting fluid
2. Please adjust the speed and feed when the cutting depth is large or when machines with low rigidity are used

# CARBIDE DRILLS CUTTING CONDITIONS

## Series 3103 & 3105

HPD 3D, 5D

| WORK MATERIAL           | CARBON STEELS, MILD STEEL<br>1010,1050, 12L14 |             | ALLOY STEEL<br>4140,130 |             | SPECIAL ALLOY STEEL , HARDENED STEELS |             |           |             |           |             |           |             |
|-------------------------|-----------------------------------------------|-------------|-------------------------|-------------|---------------------------------------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|
|                         |                                               |             |                         |             | 26-30 HRC                             |             | 30-34 HRC |             | 34-43 HRC |             | 43-56 HRC |             |
| DRILLING SPEED<br>m/min | 73 - 107                                      |             | 70 - 99                 |             | 49 - 73                               |             | 34 - 56   |             | 30 - 46   |             | 23 - 30   |             |
| DRILL DIA(mm)           | SPEED RPM                                     | FEED mm/rev | SPEED RPM               | FEED mm/rev | SPEED RPM                             | FEED mm/rev | SPEED RPM | FEED mm/rev | SPEED RPM | FEED mm/rev | SPEED RPM | FEED mm/rev |
| 3                       | 9,541                                         | 0.05 - 0.13 | 8,959                   | 0.05 - 0.13 | 6,469                                 | 0.05 - 0.13 | 4,754     | 0.05 - 0.08 | 4,043     | 0.05 - 0.08 | 2,814     | 0.03 - 0.05 |
| 4                       | 7,156                                         | 0.08 - 0.15 | 6,719                   | 0.08 - 0.15 | 4,851                                 | 0.08 - 0.15 | 3,566     | 0.08 - 0.10 | 3,032     | 0.08 - 0.10 | 2,110     | 0.05 - 0.08 |
| 5                       | 5,725                                         | 0.10 - 0.20 | 5,375                   | 0.10 - 0.20 | 3,881                                 | 0.10 - 0.20 | 2,853     | 0.10 - 0.13 | 2,426     | 0.10 - 0.13 | 1,688     | 0.05 - 0.08 |
| 6                       | 4,771                                         | 0.13 - 0.23 | 4,479                   | 0.13 - 0.23 | 3,234                                 | 0.13 - 0.23 | 2,377     | 0.13 - 0.15 | 2,021     | 0.13 - 0.15 | 1,407     | 0.05 - 0.10 |
| 7                       | 4,089                                         | 0.15 - 0.25 | 3,840                   | 0.15 - 0.25 | 2,772                                 | 0.15 - 0.25 | 2,038     | 0.15 - 0.18 | 1,733     | 0.15 - 0.18 | 1,206     | 0.08 - 0.13 |
| 8                       | 3,578                                         | 0.15 - 0.28 | 3,360                   | 0.15 - 0.28 | 2,426                                 | 0.15 - 0.28 | 1,783     | 0.15 - 0.20 | 1,516     | 0.15 - 0.20 | 1,055     | 0.08 - 0.13 |
| 9                       | 3,180                                         | 0.18 - 0.30 | 2,986                   | 0.18 - 0.30 | 2,156                                 | 0.18 - 0.30 | 1,585     | 0.18 - 0.23 | 1,348     | 0.18 - 0.23 | 938       | 0.10 - 0.15 |
| 10                      | 2,862                                         | 0.20 - 0.30 | 2,688                   | 0.20 - 0.30 | 1,941                                 | 0.20 - 0.30 | 1,426     | 0.20 - 0.25 | 1,213     | 0.20 - 0.25 | 844       | 0.10 - 0.15 |
| 11                      | 2,602                                         | 0.20 - 0.30 | 2,443                   | 0.20 - 0.30 | 1,764                                 | 0.20 - 0.30 | 1,297     | 0.23 - 0.28 | 1,103     | 0.23 - 0.28 | 767       | 0.10 - 0.15 |
| 12                      | 2,385                                         | 0.20 - 0.30 | 2,240                   | 0.20 - 0.30 | 1,617                                 | 0.20 - 0.30 | 1,189     | 0.23 - 0.30 | 1,011     | 0.23 - 0.30 | 703       | 0.13 - 0.18 |
| 13                      | 2,202                                         | 0.20 - 0.30 | 2,067                   | 0.20 - 0.30 | 1,493                                 | 0.20 - 0.30 | 1,097     | 0.25 - 0.33 | 933       | 0.25 - 0.33 | 649       | 0.13 - 0.18 |
| 14                      | 2,045                                         | 0.23 - 0.36 | 1,920                   | 0.23 - 0.36 | 1,386                                 | 0.23 - 0.36 | 1,019     | 0.28 - 0.36 | 866       | 0.28 - 0.36 | 603       | 0.15 - 0.20 |
| 16                      | 1,789                                         | 0.25 - 0.36 | 1,680                   | 0.25 - 0.36 | 1,213                                 | 0.25 - 0.36 | 891       | 0.33 - 0.41 | 758       | 0.33 - 0.41 | 528       | 0.15 - 0.20 |
| 18                      | 1,590                                         | 0.28 - 0.38 | 1,493                   | 0.28 - 0.38 | 1,078                                 | 0.28 - 0.38 | 792       | 0.36 - 0.46 | 674       | 0.38 - 0.46 | 469       | 0.18 - 0.23 |
| 20                      | 1,431                                         | 0.30 - 0.41 | 1,344                   | 0.30 - 0.41 | 970                                   | 0.30 - 0.41 | 713       | 0.41 - 5.08 | 606       | 0.41 - 0.51 | 422       | 0.20 - 0.28 |

# CARBIDE DRILLS CUTTING CONDITIONS

## Series 3103 & 3105

HPD 3D, 5D

| WORK MATERIAL        | CAST IRON |             | DUCTILE CAST IRON |             | STAINLESS STEELS 400SS, 17-4PH |             | COPPER    |             |
|----------------------|-----------|-------------|-------------------|-------------|--------------------------------|-------------|-----------|-------------|
| DRILLING SPEED m/min | 73 - 117  |             | 53 - 91           |             | 25 - 40                        |             | 79 - 195  |             |
| DRILL DIA(mm)        | SPEED RPM | FEED mm/rev | SPEED RPM         | FEED mm/rev | SPEED RPM                      | FEED mm/rev | SPEED RPM | FEED mm/rev |
| 3                    | 10,091    | 0.05 - 0.13 | 7,698             | 0.05 - 0.13 | 3,400                          | 0.05 - 0.10 | 14,554    | 0.10 - 0.15 |
| 4                    | 7,568     | 0.08 - 0.15 | 5,773             | 0.08 - 0.15 | 2,550                          | 0.08 - 0.13 | 10,916    | 0.13 - 0.18 |
| 5                    | 6,055     | 0.10 - 0.20 | 4,619             | 0.10 - 0.20 | 2,040                          | 0.10 - 0.15 | 8,733     | 0.18 - 0.23 |
| 6                    | 5,045     | 0.13 - 0.23 | 3,849             | 0.13 - 0.23 | 1,700                          | 0.13 - 0.18 | 7,277     | 0.20 - 0.25 |
| 7                    | 4,325     | 0.15 - 0.25 | 3,299             | 0.15 - 0.25 | 1,456                          | 0.15 - 0.20 | 6,238     | 0.25 - 0.30 |
| 8                    | 3,784     | 0.15 - 0.28 | 2,887             | 0.15 - 0.28 | 1,274                          | 0.15 - 0.23 | 5,458     | 0.30 - 0.36 |
| 9                    | 3,364     | 0.18 - 0.30 | 2,566             | 0.18 - 0.30 | 1,130                          | 0.18 - 0.25 | 4,851     | 0.33 - 0.38 |
| 10                   | 3,027     | 0.20 - 0.30 | 2,309             | 0.20 - 0.30 | 1,020                          | 0.20 - 0.25 | 4,366     | 0.38 - 0.43 |
| 11                   | 2,752     | 0.20 - 0.30 | 2,099             | 0.20 - 0.30 | 930                            | 0.20 - 0.25 | 3,969     | 0.41 - 0.46 |
| 12                   | 2,523     | 0.20 - 0.30 | 1,924             | 0.20 - 0.30 | 850                            | 0.20 - 0.25 | 3,639     | 0.46 - 0.51 |
| 13                   | 2,329     | 0.20 - 0.30 | 1,776             | 0.20 - 0.30 | 785                            | 0.20 - 0.25 | 3,359     | 0.48 - 0.53 |
| 14                   | 2,162     | 0.23 - 0.36 | 1,649             | 0.23 - 0.36 | 730                            | 0.23 - 0.28 | 3,119     | 0.53 - 0.58 |
| 16                   | 1,892     | 0.25 - 0.36 | 1,443             | 0.25 - 0.36 | 640                            | 0.25 - 0.30 | 2,729     | 0.61 - 0.66 |
| 18                   | 1,682     | 0.28 - 0.38 | 1,283             | 0.28 - 0.38 | 565                            | 0.28 - 0.33 | 2,426     | 0.66 - 0.76 |
| 20                   | 1,514     | 0.30 - 0.41 | 1,155             | 0.30 - 0.41 | 510                            | 0.30 - 0.36 | 2,183     | 0.71 - 0.81 |

# CARBIDE DRILLS CUTTING CONDITIONS

## Series 3113, 3115, 3118 & SC-HO-HPD-3D

HO-HPD 3D, 5D, 8D

| WORK MATERIAL           | CARBON STEELS, MILD STEEL<br>1010,1050, 12L14 |             | ALLOY STEEL<br>4140,130 |             | SPECIAL ALLOY STEEL , HARDENED STEELS |             |           |             |           |             |           |             |
|-------------------------|-----------------------------------------------|-------------|-------------------------|-------------|---------------------------------------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|
|                         |                                               |             |                         |             | 26-30 HRC                             |             | 30-34 HRC |             | 34-43 HRC |             | 43-56 HRC |             |
| DRILLING SPEED<br>m/min | 95 - 139                                      |             | 81 - 116                |             | 56 - 90                               |             | 40 - 64   |             | 37 - 55   |             | 24 - 34   |             |
| DRILL DIA(mm)           | SPEED RPM                                     | FEED mm/rev | SPEED RPM               | FEED mm/rev | SPEED RPM                             | FEED mm/rev | SPEED RPM | FEED mm/rev | SPEED RPM | FEED mm/rev | SPEED RPM | FEED mm/rev |
| 3                       | 11,449                                        | 0.05 - 0.13 | 10,751                  | 0.05 - 0.13 | 7,762                                 | 0.05 - 0.13 | 5,705     | 0.05 - 0.08 | 4,851     | 0.05 - 0.08 | 3,095     | 0.03 - 0.05 |
| 4                       | 8,587                                         | 0.08 - 0.15 | 8,063                   | 0.08 - 0.15 | 5,822                                 | 0.08 - 0.15 | 4,279     | 0.08 - 0.10 | 3,639     | 0.08 - 0.10 | 2,321     | 0.05 - 0.08 |
| 5                       | 6,870                                         | 0.10 - 0.20 | 6,450                   | 0.10 - 0.20 | 4,657                                 | 0.10 - 0.20 | 3,423     | 0.10 - 0.13 | 2,911     | 0.10 - 0.13 | 1,857     | 0.05 - 0.08 |
| 6                       | 5,725                                         | 0.13 - 0.23 | 5,375                   | 0.13 - 0.23 | 3,881                                 | 0.13 - 0.23 | 2,853     | 0.13 - 0.15 | 2,426     | 0.13 - 0.15 | 1,548     | 0.05 - 0.10 |
| 7                       | 4,907                                         | 0.15 - 0.25 | 4,607                   | 0.15 - 0.25 | 3,327                                 | 0.15 - 0.25 | 2,445     | 0.15 - 0.18 | 2,079     | 0.15 - 0.18 | 1,327     | 0.08 - 0.13 |
| 8                       | 4,293                                         | 0.15 - 0.28 | 4,032                   | 0.15 - 0.28 | 2,911                                 | 0.15 - 0.28 | 2,139     | 0.15 - 0.20 | 1,819     | 0.15 - 0.20 | 1,161     | 0.08 - 0.13 |
| 9                       | 3,816                                         | 0.18 - 0.30 | 3,584                   | 0.18 - 0.30 | 2,587                                 | 0.18 - 0.30 | 1,902     | 0.18 - 0.23 | 1,617     | 0.18 - 0.23 | 1,032     | 0.10 - 0.15 |
| 10                      | 3,435                                         | 0.20 - 0.30 | 3,225                   | 0.20 - 0.30 | 2,329                                 | 0.20 - 0.30 | 1,712     | 0.20 - 0.25 | 1,376     | 0.15 - 0.23 | 878       | 0.10 - 0.15 |
| 11                      | 3,123                                         | 0.20 - 0.30 | 2,932                   | 0.20 - 0.30 | 2,117                                 | 0.20 - 0.30 | 1,556     | 0.23 - 0.28 | 1,145     | 0.15 - 0.25 | 731       | 0.10 - 0.15 |
| 12                      | 2,862                                         | 0.20 - 0.30 | 2,688                   | 0.20 - 0.30 | 1,941                                 | 0.20 - 0.30 | 1,426     | 0.23 - 0.30 | 914       | 0.18 - 0.25 | 583       | 0.13 - 0.18 |
| 13                      | 2,642                                         | 0.20 - 0.30 | 2,481                   | 0.20 - 0.30 | 1,791                                 | 0.20 - 0.30 | 1,317     | 0.25 - 0.33 | 683       | 0.15 - 0.28 | 436       | 0.13 - 0.18 |
| 14                      | 2,453                                         | 0.23 - 0.36 | 2,304                   | 0.23 - 0.36 | 1,663                                 | 0.23 - 0.36 | 1,223     | 0.28 - 0.36 | 452       | 0.15 - 0.30 | 289       | 0.15 - 0.20 |
| 16                      | 2,147                                         | 0.25 - 0.36 | 2,016                   | 0.25 - 0.36 | 1,455                                 | 0.25 - 0.36 | 1,070     | 0.33 - 0.41 | 221       | 0.18 - 0.28 | 141       | 0.15 - 0.20 |
| 18                      | 1,908                                         | 0.28 - 0.38 | 1,792                   | 0.28 - 0.38 | 1,294                                 | 0.28 - 0.38 | 951       | 0.36 - 0.46 | 809       | 0.38 - 0.46 | 516       | 0.18 - 0.23 |
| 20                      | 1,717                                         | 0.30 - 0.41 | 1,613                   | 0.30 - 0.41 | 1,164                                 | 0.30 - 0.41 | 856       | 0.41 - 5.08 | 728       | 0.41 - 0.51 | 464       | 0.20 - 0.28 |

# CARBIDE DRILLS CUTTING CONDITIONS

## Series 3113, 3115, & 3118

HO-HPD 3D, 5D, 8D

| WORK MATERIAL        | CAST IRON |             | DUCTILE CAST IRON |             | STAINLESS STEELS 300SS, 400SS, 17-4PH |             | COPPER    |             | ALLUMINIUM ALLOY |             | CAST ALLUMINIUM |             |
|----------------------|-----------|-------------|-------------------|-------------|---------------------------------------|-------------|-----------|-------------|------------------|-------------|-----------------|-------------|
| DRILLING SPEED m/min | 87 - 128  |             | 66 - 107          |             | 44 - 67                               |             | 70 - 116  |             | 79 - 137         |             | 99 - 213        |             |
| DRILL DIA(mm)        | SPEED RPM | FEED mm/rev | SPEED RPM         | FEED mm/rev | SPEED RPM                             | FEED mm/rev | SPEED RPM | FEED mm/rev | SPEED RPM        | FEED mm/rev | SPEED RPM       | FEED mm/rev |
| 3                    | 12,614    | 0.05 - 0.13 | 9,622             | 0.05 - 0.13 | 6,137                                 | 0.05 - 0.10 | 10,722    | 0.08 - 0.13 | 13,099           | 0.08 - 0.13 | 19,648          | 0.10 - 0.15 |
| 4                    | 9,460     | 0.08 - 0.15 | 7,216             | 0.08 - 0.15 | 4,603                                 | 0.08 - 0.13 | 7,113     | 0.10 - 0.15 | 9,824            | 0.10 - 0.15 | 14,736          | 0.13 - 0.18 |
| 5                    | 7,568     | 0.10 - 0.20 | 5,773             | 0.10 - 0.20 | 3,682                                 | 0.10 - 0.15 | 5,691     | 0.13 - 0.18 | 7,859            | 0.13 - 0.18 | 11,789          | 0.18 - 0.23 |
| 6                    | 6,307     | 0.13 - 0.23 | 4,811             | 0.13 - 0.23 | 3,069                                 | 0.13 - 0.18 | 4,742     | 0.15 - 0.20 | 6,549            | 0.15 - 0.20 | 9,824           | 0.20 - 0.25 |
| 7                    | 5,406     | 0.15 - 0.25 | 4,124             | 0.15 - 0.25 | 2,630                                 | 0.15 - 0.20 | 4,065     | 0.18 - 0.23 | 5,614            | 0.18 - 0.23 | 8,421           | 0.25 - 0.30 |
| 8                    | 4,730     | 0.15 - 0.28 | 3,608             | 0.15 - 0.28 | 2,301                                 | 0.15 - 0.23 | 3,557     | 0.20 - 0.25 | 4,912            | 0.20 - 0.25 | 7,368           | 0.30 - 0.36 |
| 9                    | 4,205     | 0.18 - 0.30 | 3,207             | 0.18 - 0.30 | 2,046                                 | 0.18 - 0.25 | 3,161     | 0.25 - 0.30 | 4,366            | 0.25 - 0.30 | 6,549           | 0.33 - 0.38 |
| 10                   | 3,784     | 0.20 - 0.30 | 2,887             | 0.20 - 0.30 | 1,841                                 | 0.20 - 0.25 | 2,845     | 0.28 - 0.33 | 3,930            | 0.28 - 0.33 | 5,894           | 0.38 - 0.43 |
| 11                   | 3,440     | 0.20 - 0.30 | 2,624             | 0.20 - 0.30 | 1,674                                 | 0.20 - 0.25 | 2,587     | 0.30 - 0.36 | 3,572            | 0.30 - 0.36 | 5,359           | 0.41 - 0.46 |
| 12                   | 3,153     | 0.20 - 0.30 | 2,405             | 0.20 - 0.30 | 1,534                                 | 0.20 - 0.25 | 2,371     | 0.33 - 0.38 | 3,275            | 0.33 - 0.38 | 4,912           | 0.46 - 0.51 |
| 13                   | 2,911     | 0.20 - 0.30 | 2,220             | 0.20 - 0.30 | 1,416                                 | 0.20 - 0.25 | 2,189     | 0.36 - 0.41 | 3,023            | 0.36 - 0.41 | 4,534           | 0.48 - 0.53 |
| 14                   | 2,703     | 0.23 - 0.36 | 2,062             | 0.23 - 0.36 | 1,315                                 | 0.23 - 0.28 | 2,032     | 0.41 - 0.46 | 2,807            | 0.41 - 0.46 | 4,210           | 0.53 - 0.58 |
| 16                   | 2,365     | 0.25 - 0.36 | 1,804             | 0.25 - 0.36 | 1,151                                 | 0.25 - 0.30 | 1,778     | 0.46 - 0.51 | 2,456            | 0.46 - 0.51 | 3,684           | 0.61 - 0.66 |
| 18                   | 2,102     | 0.28 - 0.38 | 1,604             | 0.28 - 0.38 | 1,023                                 | 0.28 - 0.33 | 1,581     | 0.51 - 0.56 | 2,183            | 0.51 - 0.56 | 3,275           | 0.66 - 0.76 |
| 20                   | 1,892     | 0.30 - 0.41 | 1,443             | 0.30 - 0.41 | 921                                   | 0.30 - 0.36 | 1,423     | 0.56 - 0.61 | 1,965            | 0.56 - 0.61 | 2,947           | 0.71 - 0.81 |

1. The indicated speeds and feeds are for drilling with water soluble oil.
2. Suitable cutting fluid is water-emulsifiable high density oil (less than 20 times dilution).
3. When using non-water soluble oil or water-emulsifiable (over 20 times dilution), reduce drilling speed by 30%.
4. These conditions are for drilling depths under 3 times the drill diameter.
5. When attaching drill to the machine, use a collet than does not have any scratch or dust. Also, reduce run-out of drill under 0.02mm.
6. Fasten the work material to reduce the possibility of work deformation, deflection of machined surface, or vibration.
7. This condition could be used on mist lubricant operation.
8. For 8D series, reduce speed by 20%.

Note : 1. For machine that cannot achieve the speeds indicated in the table please set rotation as high as possible. Tool life may be decreased.



# CARBIDE DRILLS CUTTING CONDITIONS

## AD - 2D / 4D

| Work Material      | Low Carbon Steel<br>Alloy Steel<br>( C<0.3% )<br><b>SS400・SCM</b><br>~710N/mm <sup>2</sup> |                       | Carbon Steel<br><b>S35C・S50C</b><br>~210HB<br>~710N/mm <sup>2</sup> |                       | Alloy Steel<br><b>SCM・SCr・SNCM</b><br>16~28HRC<br>710~900N/mm <sup>2</sup> |                       | Alloy Steel<br><b>SCM・SCr・SNCM</b><br>28~35HRC<br>900~1,100N/mm <sup>2</sup> |                       | Cast Iron<br><b>FC250</b><br>~350N/mm <sup>2</sup> |                       | Ductile Cast Iron<br><b>FCD450</b><br>400~600N/mm <sup>2</sup> |                       |
|--------------------|--------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------|-----------------------|----------------------------------------------------|-----------------------|----------------------------------------------------------------|-----------------------|
| Cutting Speed      | 70 ~ 120m/min                                                                              |                       | 60 ~ 120m/min                                                       |                       | 60 ~ 120m/min                                                              |                       | 50 ~ 90m/min                                                                 |                       | 60 ~ 120m/min                                      |                       | 50 ~ 100m/min                                                  |                       |
| Drill Dia.<br>(mm) | Speed<br>(min <sup>-1</sup> )                                                              | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                       | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                              | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                      | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                  | Feed Rate<br>(mm/rev) |
| 2                  | 12,000                                                                                     | 0.06 ~ 0.08           | 10,400                                                              | 0.06 ~ 0.08           | 10,400                                                                     | 0.06 ~ 0.08           | 8,800                                                                        | 0.06 ~ 0.08           | 10,400                                             | 0.06 ~ 0.08           | 9,600                                                          | 0.06 ~ 0.08           |
| 4                  | 8,000                                                                                      | 0.08 ~ 0.16           | 7,200                                                               | 0.08 ~ 0.16           | 7,200                                                                      | 0.08 ~ 0.16           | 5,600                                                                        | 0.08 ~ 0.16           | 7,200                                              | 0.08 ~ 0.16           | 6,000                                                          | 0.08 ~ 0.16           |
| 6                  | 5,300                                                                                      | 0.12 ~ 0.24           | 4,800                                                               | 0.12 ~ 0.24           | 4,800                                                                      | 0.12 ~ 0.24           | 3,700                                                                        | 0.12 ~ 0.24           | 4,800                                              | 0.12 ~ 0.24           | 4,000                                                          | 0.12 ~ 0.24           |
| 8                  | 4,000                                                                                      | 0.16 ~ 0.28           | 3,600                                                               | 0.16 ~ 0.28           | 3,600                                                                      | 0.16 ~ 0.28           | 2,800                                                                        | 0.16 ~ 0.28           | 3,600                                              | 0.16 ~ 0.28           | 3,000                                                          | 0.16 ~ 0.28           |
| 10                 | 3,200                                                                                      | 0.2 ~ 0.3             | 2,900                                                               | 0.2 ~ 0.3             | 2,900                                                                      | 0.2 ~ 0.3             | 2,200                                                                        | 0.2 ~ 0.3             | 2,900                                              | 0.2 ~ 0.3             | 2,400                                                          | 0.2 ~ 0.3             |
| 12                 | 2,700                                                                                      | 0.21 ~ 0.3            | 2,400                                                               | 0.21 ~ 0.3            | 2,400                                                                      | 0.21 ~ 0.3            | 1,900                                                                        | 0.21 ~ 0.3            | 2,400                                              | 0.21 ~ 0.3            | 2,000                                                          | 0.21 ~ 0.3            |
| 14                 | 2,300                                                                                      | 0.22 ~ 0.35           | 2,050                                                               | 0.22 ~ 0.35           | 2,050                                                                      | 0.22 ~ 0.35           | 1,400                                                                        | 0.22 ~ 0.35           | 2,050                                              | 0.22 ~ 0.35           | 1,700                                                          | 0.22 ~ 0.35           |
| 16                 | 2,000                                                                                      | 0.25 ~ 0.36           | 1,800                                                               | 0.25 ~ 0.36           | 1,800                                                                      | 0.25 ~ 0.36           | 1,200                                                                        | 0.25 ~ 0.36           | 1,800                                              | 0.25 ~ 0.36           | 1,500                                                          | 0.25 ~ 0.36           |
| 18                 | 1,800                                                                                      | 0.28 ~ 0.38           | 1,600                                                               | 0.28 ~ 0.38           | 1,600                                                                      | 0.28 ~ 0.38           | 1,050                                                                        | 0.28 ~ 0.38           | 1,600                                              | 0.28 ~ 0.38           | 1,350                                                          | 0.28 ~ 0.38           |
| 20                 | 1,600                                                                                      | 0.3 ~ 0.4             | 1,450                                                               | 0.3 ~ 0.4             | 1,450                                                                      | 0.3 ~ 0.4             | 950                                                                          | 0.3 ~ 0.4             | 1,450                                              | 0.3 ~ 0.4             | 1,200                                                          | 0.3 ~ 0.4             |

## ADO - 3D / 5D / 8D

| Work Material      | Mild Steel<br>Low Carbon Steel<br><b>SS400・S10C</b><br>~150HB<br>~500N/mm <sup>2</sup> |                  | Carbon Steel<br><b>S35C・S50C</b><br>~210HB<br>~710N/mm <sup>2</sup> |                  | Alloy Steel<br><b>SCM・SCr・SNCM</b><br>16~28HRC<br>710~900N/mm <sup>2</sup> |                  | Alloy Steel<br><b>SCM・SCr・SNCM</b><br>28~35HRC<br>900~1,100N/mm <sup>2</sup> |                  | Cast Iron<br><b>FC250</b><br>~350N/mm <sup>2</sup> |                  | Ductile Cast Iron<br><b>FCD450</b><br><b>FCD600</b><br>400~600N/mm <sup>2</sup> |                  | Stainless Steel<br><b>SUS300</b><br><b>SUS400</b><br>480~800N/mm <sup>2</sup> |                  | Special Alloy Steel・Hardened<br>Steel・Prehardened Steel<br><b>SKD61</b><br>( Unquenched )<br><b>34~40HRC</b><br>1,060~1,250N/mm <sup>2</sup> |                  |
|--------------------|----------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------|------------------|----------------------------------------------------------------------------|------------------|------------------------------------------------------------------------------|------------------|----------------------------------------------------|------------------|---------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Cutting Speed      | 80 ~ 120m/min                                                                          |                  | 80 ~ 160m/min                                                       |                  | 80 ~ 120m/min                                                              |                  | 60 ~ 90m/min                                                                 |                  | 80 ~ 120m/min                                      |                  | 60 ~ 100m/min                                                                   |                  | 40 ~ 80m/min                                                                  |                  | 30 ~ 60m/min                                                                                                                                 |                  |
| Drill Dia.<br>(mm) | Speed<br>(min <sup>-1</sup> )                                                          | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                       | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                              | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                      | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                   | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                 | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                                                                                | Feed<br>(mm/rev) |
| 3                  | 10,600                                                                                 | 0.06 ~ 0.12      | 10,600                                                              | 0.06 ~ 0.12      | 10,600                                                                     | 0.06 ~ 0.12      | 7,400                                                                        | 0.06 ~ 0.12      | 10,600                                             | 0.06 ~ 0.12      | 8,500                                                                           | 0.06 ~ 0.12      | 6,400                                                                         | 0.06 ~ 0.12      | 4,800                                                                                                                                        | 0.06 ~ 0.09      |
| 4                  | 8,000                                                                                  | 0.08 ~ 0.16      | 8,000                                                               | 0.08 ~ 0.16      | 8,000                                                                      | 0.08 ~ 0.16      | 5,600                                                                        | 0.08 ~ 0.16      | 8,000                                              | 0.08 ~ 0.16      | 6,400                                                                           | 0.08 ~ 0.16      | 4,800                                                                         | 0.08 ~ 0.16      | 3,600                                                                                                                                        | 0.08 ~ 0.12      |
| 5                  | 6,400                                                                                  | 0.1 ~ 0.2        | 6,400                                                               | 0.1 ~ 0.2        | 6,400                                                                      | 0.1 ~ 0.2        | 4,500                                                                        | 0.1 ~ 0.2        | 6,400                                              | 0.1 ~ 0.2        | 5,100                                                                           | 0.1 ~ 0.2        | 3,800                                                                         | 0.1 ~ 0.2        | 2,900                                                                                                                                        | 0.1 ~ 0.15       |
| 6                  | 5,300                                                                                  | 0.12 ~ 0.24      | 5,300                                                               | 0.12 ~ 0.24      | 5,300                                                                      | 0.12 ~ 0.24      | 3,700                                                                        | 0.12 ~ 0.24      | 5,300                                              | 0.12 ~ 0.24      | 4,200                                                                           | 0.12 ~ 0.24      | 3,200                                                                         | 0.12 ~ 0.24      | 2,400                                                                                                                                        | 0.12 ~ 0.18      |
| 7                  | 4,500                                                                                  | 0.14 ~ 0.26      | 4,500                                                               | 0.14 ~ 0.26      | 4,500                                                                      | 0.14 ~ 0.26      | 3,200                                                                        | 0.14 ~ 0.26      | 4,500                                              | 0.14 ~ 0.26      | 3,600                                                                           | 0.14 ~ 0.26      | 2,700                                                                         | 0.14 ~ 0.26      | 2,000                                                                                                                                        | 0.14 ~ 0.21      |
| 8                  | 4,000                                                                                  | 0.16 ~ 0.28      | 4,000                                                               | 0.16 ~ 0.28      | 4,000                                                                      | 0.16 ~ 0.28      | 2,800                                                                        | 0.16 ~ 0.28      | 4,000                                              | 0.16 ~ 0.28      | 3,200                                                                           | 0.16 ~ 0.28      | 2,400                                                                         | 0.16 ~ 0.28      | 1,800                                                                                                                                        | 0.16 ~ 0.24      |
| 9                  | 3,500                                                                                  | 0.18 ~ 0.3       | 3,500                                                               | 0.18 ~ 0.3       | 3,500                                                                      | 0.18 ~ 0.3       | 2,500                                                                        | 0.18 ~ 0.3       | 3,500                                              | 0.18 ~ 0.3       | 2,800                                                                           | 0.18 ~ 0.3       | 2,100                                                                         | 0.18 ~ 0.3       | 1,600                                                                                                                                        | 0.18 ~ 0.27      |
| 10                 | 3,200                                                                                  | 0.2 ~ 0.3        | 3,200                                                               | 0.2 ~ 0.3        | 3,200                                                                      | 0.2 ~ 0.3        | 2,200                                                                        | 0.2 ~ 0.3        | 3,200                                              | 0.2 ~ 0.3        | 2,500                                                                           | 0.2 ~ 0.3        | 1,900                                                                         | 0.2 ~ 0.3        | 1,400                                                                                                                                        | 0.2 ~ 0.3        |
| 11                 | 2,900                                                                                  | 0.2 ~ 0.3        | 2,900                                                               | 0.2 ~ 0.3        | 2,900                                                                      | 0.2 ~ 0.3        | 2,000                                                                        | 0.2 ~ 0.3        | 2,900                                              | 0.2 ~ 0.3        | 2,300                                                                           | 0.2 ~ 0.3        | 1,700                                                                         | 0.2 ~ 0.3        | 1,300                                                                                                                                        | 0.2 ~ 0.3        |
| 12                 | 2,700                                                                                  | 0.21 ~ 0.3       | 2,700                                                               | 0.21 ~ 0.3       | 2,700                                                                      | 0.21 ~ 0.3       | 1,900                                                                        | 0.21 ~ 0.3       | 2,700                                              | 0.21 ~ 0.3       | 2,100                                                                           | 0.21 ~ 0.3       | 1,600                                                                         | 0.21 ~ 0.3       | 1,200                                                                                                                                        | 0.21 ~ 0.3       |
| 13                 | 2,400                                                                                  | 0.21 ~ 0.33      | 2,400                                                               | 0.21 ~ 0.33      | 2,400                                                                      | 0.21 ~ 0.33      | 1,700                                                                        | 0.21 ~ 0.33      | 2,400                                              | 0.21 ~ 0.33      | 2,000                                                                           | 0.21 ~ 0.33      | 1,500                                                                         | 0.21 ~ 0.33      | 1,100                                                                                                                                        | 0.21 ~ 0.33      |
| 14                 | 2,300                                                                                  | 0.22 ~ 0.35      | 2,300                                                               | 0.22 ~ 0.35      | 2,300                                                                      | 0.22 ~ 0.35      | 1,600                                                                        | 0.22 ~ 0.35      | 2,300                                              | 0.22 ~ 0.35      | 1,800                                                                           | 0.22 ~ 0.35      | 1,400                                                                         | 0.22 ~ 0.35      | 1,000                                                                                                                                        | 0.22 ~ 0.35      |
| 16                 | 2,000                                                                                  | 0.25 ~ 0.36      | 2,000                                                               | 0.25 ~ 0.36      | 2,000                                                                      | 0.25 ~ 0.36      | 1,400                                                                        | 0.25 ~ 0.36      | 2,000                                              | 0.25 ~ 0.36      | 1,600                                                                           | 0.25 ~ 0.36      | 1,200                                                                         | 0.25 ~ 0.36      | 900                                                                                                                                          | 0.25 ~ 0.36      |
| 18                 | 1,800                                                                                  | 0.28 ~ 0.38      | 1,800                                                               | 0.28 ~ 0.38      | 1,800                                                                      | 0.28 ~ 0.38      | 1,200                                                                        | 0.28 ~ 0.38      | 1,800                                              | 0.28 ~ 0.38      | 1,400                                                                           | 0.28 ~ 0.38      | 1,100                                                                         | 0.28 ~ 0.38      | 800                                                                                                                                          | 0.28 ~ 0.38      |
| 20                 | 1,600                                                                                  | 0.3 ~ 0.4        | 1,600                                                               | 0.3 ~ 0.4        | 1,600                                                                      | 0.3 ~ 0.4        | 1,100                                                                        | 0.3 ~ 0.4        | 1,600                                              | 0.3 ~ 0.4        | 1,300                                                                           | 0.3 ~ 0.4        | 1,000                                                                         | 0.3 ~ 0.4        | 700                                                                                                                                          | 0.3 ~ 0.4        |



# CARBIDE DRILLS CUTTING CONDITIONS

## ADO-10D / 15D / 20D / 25D / 30D

| Work<br>Material   | Mild Steel<br>Low Carbon Steel<br>S5400・S10C<br>~150HB<br>~500N/mm <sup>2</sup> |                  | Carbon Steel<br>S35C・S50C<br>~210HB<br>~710N/mm <sup>2</sup> |                  | Alloy Steel<br>SCM・Scr・<br>SNCM<br>16~28HRC<br>710~900N/mm <sup>2</sup> |                  | Alloy Steel-<br>Prehardened Steel<br>(C≧0.3%)<br>SCM440<br>28~34HRC<br>900~1,060N/mm <sup>2</sup> |                  | Cast Iron<br>FC250<br>~350N/mm <sup>2</sup> |                  | Ductile Cast Iron<br>FCD450<br>FCD600<br>400~600N/mm <sup>2</sup> |                  | Stainless Steel<br>SUS400<br>480~800N/mm <sup>2</sup> |                  | Special Alloy Steel・Hardened<br>Steel・Prehardened Steel<br>SKD61<br>(Unquenched)<br>34~40HRC<br>1,060~1,250N/mm <sup>2</sup> |                  |
|--------------------|---------------------------------------------------------------------------------|------------------|--------------------------------------------------------------|------------------|-------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------|------------------|---------------------------------------------|------------------|-------------------------------------------------------------------|------------------|-------------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------|------------------|
| Cutting<br>Speed   | 60~125m/min                                                                     |                  | 60~125m/min                                                  |                  | 60~125m/min                                                             |                  | 50~70m/min                                                                                        |                  | 60~125m/min                                 |                  | 50~80m/min                                                        |                  | 40~80m/min                                            |                  | 30~50m/min                                                                                                                   |                  |
| Drill Dia.<br>(mm) | Speed<br>(min <sup>-1</sup> )                                                   | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                           | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                                     | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )               | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                     | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                         | Feed<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                                                                | Feed<br>(mm/rev) |
| 3                  | 7,500                                                                           | 0.06~0.12        | 7,500                                                        | 0.06~0.12        | 7,500                                                                   | 0.06~0.12        | 6,300                                                                                             | 0.08~0.11        | 7,500                                       | 0.06~0.12        | 7,500                                                             | 0.06~0.12        | 5,300                                                 | 0.06~0.12        | 4,200                                                                                                                        | 0.08~0.11        |
| 4                  | 6,400                                                                           | 0.08~0.16        | 6,400                                                        | 0.08~0.16        | 6,400                                                                   | 0.08~0.16        | 4,700                                                                                             | 0.1~0.15         | 6,400                                       | 0.08~0.16        | 5,600                                                             | 0.08~0.16        | 4,400                                                 | 0.08~0.16        | 3,100                                                                                                                        | 0.1~0.15         |
| 5                  | 5,800                                                                           | 0.1~0.2          | 5,800                                                        | 0.1~0.2          | 5,800                                                                   | 0.1~0.2          | 3,800                                                                                             | 0.12~0.18        | 5,800                                       | 0.1~0.2          | 4,500                                                             | 0.1~0.2          | 3,800                                                 | 0.1~0.2          | 2,500                                                                                                                        | 0.12~0.18        |
| 6                  | 4,800                                                                           | 0.12~0.24        | 4,800                                                        | 0.12~0.24        | 4,800                                                                   | 0.12~0.24        | 3,100                                                                                             | 0.14~0.2         | 4,800                                       | 0.12~0.24        | 3,800                                                             | 0.12~0.24        | 3,200                                                 | 0.12~0.24        | 2,100                                                                                                                        | 0.14~0.2         |
| 8                  | 3,600                                                                           | 0.16~0.28        | 3,600                                                        | 0.16~0.28        | 3,600                                                                   | 0.16~0.28        | 2,300                                                                                             | 0.16~0.24        | 3,600                                       | 0.16~0.28        | 2,800                                                             | 0.16~0.28        | 2,400                                                 | 0.16~0.28        | 1,500                                                                                                                        | 0.16~0.24        |
| 10                 | 2,900                                                                           | 0.2~0.35         | 2,900                                                        | 0.2~0.35         | 2,900                                                                   | 0.2~0.35         | 1,900                                                                                             | 0.18~0.27        | 2,900                                       | 0.2~0.35         | 2,300                                                             | 0.2~0.35         | 1,900                                                 | 0.2~0.35         | 1,200                                                                                                                        | 0.18~0.27        |
| 12                 | 2,400                                                                           | 0.24~0.42        | 2,400                                                        | 0.24~0.42        | 2,400                                                                   | 0.24~0.42        | 1,500                                                                                             | 0.24~0.3         | 2,400                                       | 0.24~0.42        | 1,900                                                             | 0.24~0.42        | 1,600                                                 | 0.24~0.42        | 1,000                                                                                                                        | 0.24~0.3         |

- The indicated speeds and feeds are for drilling with **water-soluble oil or MQL**.  
(We do not recommend mist drilling with stainless steels).
- Water-soluble oil (20-30 times dilution) is recommended
- When using non-water-soluble oil, set the cutting speed between 70-100% of the lowest limit.
- Make a **pilot hole** before using in accordance with recommended operation.
- A clogged oil hole can lead to a breakage. Make sure that a filter is attached to the oil feeder.
- Peck drilling of 1D-2D is strongly recommended.

## ADO-10D/15D/20D/30D/TRS-HO-10Dの

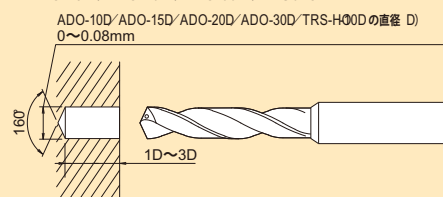
Recommended operation for using ADO-10D/15D/20D/30D/TRS-HO-10D

### ①ADO-PLT, ADO-3D, TRS-HO-3Dにて ガイド穴加工

Make a pilot hole with ADO-PLT, ADO-3D or TRS-HO-3D

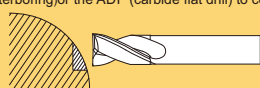
●ガイド穴加工用工具は、ADO-10D / ADO-15D / ADO-20D / ADO-30D / TRS-HO-10Dの直径 (D) 0~0.08mmの範囲でドリル径をお選び下さい。又、穴深さが深い程ガイド穴を深くあける事を推奨します。

For a pilot hole select 0.02~0.08mm larger size drill than ADO-10D / ADO-15D / ADO-20D / ADO-30D / TRS-HO-10D

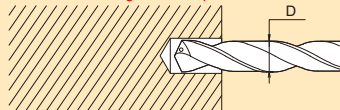


ADO-PLTにサイズが無い製品は、パイロットドリルとして同じドリル直径のADO-3Dまたは TRS-HO-3Dを推奨します。  
If the size is not available from standard ADO-PLT, we recommend the same diameter drill from ADO-3D or TRS-HO-3D.

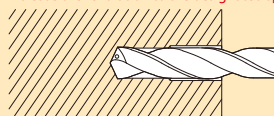
★湾曲部を加工の時は、ガイド穴加工前に座ぐり加工用エミルFX-ZDS、超硬フラットドリルADFにて座ぐり加工を行って下さい。  
When working on a curved surface, use the FX-ZDS(end mill for counterboring) or the ADF (carbide flat drill) to counterbore a pilot hole



### ②エキストラロングドリルを停止又は低回転で挿入 Insert the extra long drill into a pilot hole with zero or low revolution.

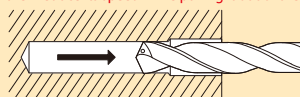


### ③所定の回転速度に上げ加工をスタート Increase the revolution to the designated speed and start drilling.



### ④加工後、ドリルを穴から抜く時には 穴底からドリルを離れた後 回転速度を下げて抜いて下さい

After drilling, move the drill away from the bottom of the hole; then reduce its speed while pulling it out of the hole.



※加工の際には必ず内部給油方式で加工下さい  
Make sure to use an internal coolant supply when drilling.



shaping your dreams

# CARBIDE DRILLS CUTTING CONDITIONS

## ADO-PLT

| Work Material   | Mild Steel<br>Low Carbon Steel<br><b>SS400・S10C</b><br>~150HB<br>~500N/mm <sup>2</sup> |               | Carbon Steel<br><b>S35C・S50C</b><br>~210HB<br>~710N/mm <sup>2</sup> |               | Alloy Steel<br><b>SCM・SCr・SNCM</b><br>16~28HRC<br>710~900N/mm <sup>2</sup> |               | Alloy Steel・Prehardened Steel<br>(C <sub>T</sub> ≥ 0.3%)<br><b>SCM440</b><br>28~34HRC<br>900~1,060N/mm <sup>2</sup> |               | Cast Iron<br><b>FC250</b><br>~350N/mm <sup>2</sup> |               | Ductile Cast Iron<br><b>FCD450</b><br><b>FCD600</b><br>400~600N/mm <sup>2</sup> |               | Stainless Steel<br><b>SUS400</b><br>480~800N/mm <sup>2</sup> |               | Special Alloy Steel・Hardened Steel・Prehardened Steel<br><b>SKD61</b><br>(Unquenched)<br>34~40HRC<br>1,060~1,250N/mm <sup>2</sup> |               |
|-----------------|----------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------|---------------|----------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------|---------------|---------------------------------------------------------------------------------|---------------|--------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------|---------------|
| Cutting Speed   | 60 ~ 125m/min                                                                          |               | 60 ~ 80m/min                                                        |               | 60 ~ 80m/min                                                               |               | 40 ~ 60m/min                                                                                                        |               | 60 ~ 80m/min                                       |               | 60 ~ 80m/min                                                                    |               | 40 ~ 60m/min                                                 |               | 30 ~ 50m/min                                                                                                                     |               |
| Drill Dia. (mm) | Speed (min <sup>-1</sup> )                                                             | Feed (mm/rev) | Speed (min <sup>-1</sup> )                                          | Feed (mm/rev) | Speed (min <sup>-1</sup> )                                                 | Feed (mm/rev) | Speed (min <sup>-1</sup> )                                                                                          | Feed (mm/rev) | Speed (min <sup>-1</sup> )                         | Feed (mm/rev) | Speed (min <sup>-1</sup> )                                                      | Feed (mm/rev) | Speed (min <sup>-1</sup> )                                   | Feed (mm/rev) | Speed (min <sup>-1</sup> )                                                                                                       | Feed (mm/rev) |
| <b>3.03</b>     | 7,400                                                                                  | 0.06 ~ 0.09   | 7,400                                                               | 0.06 ~ 0.09   | 7,400                                                                      | 0.06 ~ 0.09   | 5,200                                                                                                               | 0.06 ~ 0.09   | 7,400                                              | 0.06 ~ 0.09   | 7,400                                                                           | 0.06 ~ 0.09   | 5,200                                                        | 0.06 ~ 0.09   | 4,200                                                                                                                            | 0.06 ~ 0.09   |
| <b>4.03</b>     | 5,600                                                                                  | 0.08 ~ 0.12   | 5,600                                                               | 0.08 ~ 0.12   | 5,600                                                                      | 0.08 ~ 0.12   | 3,900                                                                                                               | 0.08 ~ 0.12   | 5,600                                              | 0.08 ~ 0.12   | 5,600                                                                           | 0.08 ~ 0.12   | 3,900                                                        | 0.08 ~ 0.12   | 3,100                                                                                                                            | 0.08 ~ 0.12   |
| <b>5.03</b>     | 4,500                                                                                  | 0.1 ~ 0.15    | 4,500                                                               | 0.1 ~ 0.15    | 4,500                                                                      | 0.1 ~ 0.15    | 3,100                                                                                                               | 0.1 ~ 0.15    | 4,500                                              | 0.1 ~ 0.15    | 4,500                                                                           | 0.1 ~ 0.15    | 3,100                                                        | 0.1 ~ 0.15    | 2,500                                                                                                                            | 0.1 ~ 0.15    |
| <b>6.03</b>     | 3,700                                                                                  | 0.12 ~ 0.18   | 3,700                                                               | 0.12 ~ 0.18   | 3,700                                                                      | 0.12 ~ 0.18   | 2,600                                                                                                               | 0.12 ~ 0.18   | 3,700                                              | 0.12 ~ 0.18   | 3,700                                                                           | 0.12 ~ 0.18   | 2,600                                                        | 0.12 ~ 0.18   | 2,100                                                                                                                            | 0.12 ~ 0.18   |
| <b>7.03</b>     | 3,200                                                                                  | 0.14 ~ 0.2    | 3,200                                                               | 0.14 ~ 0.2    | 3,200                                                                      | 0.14 ~ 0.2    | 2,300                                                                                                               | 0.14 ~ 0.2    | 3,200                                              | 0.14 ~ 0.2    | 3,200                                                                           | 0.14 ~ 0.2    | 2,300                                                        | 0.14 ~ 0.2    | 1,800                                                                                                                            | 0.14 ~ 0.2    |
| <b>8.03</b>     | 2,800                                                                                  | 0.14 ~ 0.2    | 2,800                                                               | 0.14 ~ 0.2    | 2,800                                                                      | 0.14 ~ 0.2    | 2,000                                                                                                               | 0.14 ~ 0.2    | 2,800                                              | 0.14 ~ 0.2    | 2,800                                                                           | 0.14 ~ 0.2    | 2,000                                                        | 0.14 ~ 0.2    | 1,600                                                                                                                            | 0.14 ~ 0.2    |
| <b>9.03</b>     | 2,500                                                                                  | 0.14 ~ 0.22   | 2,500                                                               | 0.14 ~ 0.22   | 2,500                                                                      | 0.14 ~ 0.22   | 1,800                                                                                                               | 0.14 ~ 0.22   | 2,500                                              | 0.14 ~ 0.22   | 2,500                                                                           | 0.14 ~ 0.22   | 1,800                                                        | 0.14 ~ 0.22   | 1,400                                                                                                                            | 0.14 ~ 0.22   |
| <b>10.03</b>    | 2,200                                                                                  | 0.15 ~ 0.24   | 2,200                                                               | 0.15 ~ 0.24   | 2,200                                                                      | 0.15 ~ 0.24   | 1,600                                                                                                               | 0.15 ~ 0.24   | 2,200                                              | 0.15 ~ 0.24   | 2,200                                                                           | 0.15 ~ 0.24   | 1,600                                                        | 0.15 ~ 0.24   | 1,300                                                                                                                            | 0.15 ~ 0.24   |
| <b>11.03</b>    | 2,000                                                                                  | 0.16 ~ 0.26   | 2,000                                                               | 0.16 ~ 0.26   | 2,000                                                                      | 0.16 ~ 0.26   | 1,500                                                                                                               | 0.17 ~ 0.24   | 2,000                                              | 0.16 ~ 0.26   | 2,000                                                                           | 0.16 ~ 0.26   | 1,400                                                        | 0.16 ~ 0.26   | 1,150                                                                                                                            | 0.17 ~ 0.24   |
| <b>12.03</b>    | 1,800                                                                                  | 0.18 ~ 0.28   | 1,800                                                               | 0.18 ~ 0.28   | 1,800                                                                      | 0.18 ~ 0.28   | 1,350                                                                                                               | 0.18 ~ 0.24   | 1,800                                              | 0.18 ~ 0.28   | 1,800                                                                           | 0.18 ~ 0.28   | 1,300                                                        | 0.18 ~ 0.28   | 1,100                                                                                                                            | 0.18 ~ 0.24   |

# CARBIDE DRILLS CUTTING CONDITIONS

## ADO-MICRO 2D/5D

| Work Material   | Mild Steel - Low Carbon Steel<br><b>SS400 · S10C</b><br>~150HB<br>~500N/mm <sup>2</sup> |                    | Carbon Steel<br><b>S35C · S50C</b><br>~210HB<br>~710N/mm <sup>2</sup> |                    | Alloy Steel<br><b>SCM · SCR · SNCM</b><br>16 ~ 28HRC<br>710 ~ 900N/mm <sup>2</sup> |                    | Alloy Steel<br><b>SCM · SCR · SNCM</b><br>28 ~ 35HRC<br>900 ~ 1,100N/mm <sup>2</sup> |                    | Austenitic Stainless Steel<br><b>SUS303 · SUS304</b><br><b>SUS316 · SUS316L</b> |                    | Special Alloy Steel<br><b>SUJ2 · SUS440</b> |                    |
|-----------------|-----------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------|--------------------|---------------------------------------------|--------------------|
| Cutting Speed   | 20~40~60m/min                                                                           |                    | 20~40~60m/min                                                         |                    | 20~40~60m/min                                                                      |                    | 20~30~40m/min                                                                        |                    | 20~30~70m/min                                                                   |                    | 25~35~45m/min                               |                    |
| Drill Dia. (mm) | Speed (min <sup>-1</sup> )                                                              | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                            | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                                         | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                                           | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                                      | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                  | Feed Rate (mm/rev) |
| 0.7             | 18,200                                                                                  | 0.007 ~ 0.021      | 18,200                                                                | 0.007 ~ 0.021      | 18,200                                                                             | 0.014 ~ 0.028      | 13,600                                                                               | 0.014 ~ 0.028      | 13,600                                                                          | 0.007 ~ 0.021      | 15,900                                      | 0.007 ~ 0.021      |
| 1               | 12,700                                                                                  | 0.01 ~ 0.03        | 12,700                                                                | 0.01 ~ 0.03        | 12,700                                                                             | 0.02 ~ 0.04        | 9,500                                                                                | 0.02 ~ 0.04        | 9,500                                                                           | 0.01 ~ 0.03        | 11,100                                      | 0.01 ~ 0.03        |
| 1.5             | 8,500                                                                                   | 0.015 ~ 0.045      | 8,500                                                                 | 0.015 ~ 0.045      | 8,500                                                                              | 0.03 ~ 0.06        | 6,400                                                                                | 0.03 ~ 0.06        | 6,400                                                                           | 0.015 ~ 0.045      | 7,400                                       | 0.015 ~ 0.045      |
| 2               | 6,400                                                                                   | 0.02 ~ 0.06        | 6,400                                                                 | 0.02 ~ 0.06        | 6,400                                                                              | 0.04 ~ 0.08        | 4,800                                                                                | 0.04 ~ 0.08        | 4,800                                                                           | 0.02 ~ 0.06        | 5,600                                       | 0.02 ~ 0.06        |

| Work Material   | Cast Iron<br><b>FC250</b><br>~350N/mm <sup>2</sup> |                    | Ductile Cast Iron<br><b>FCD450·FCD600</b><br>400 ~ 600N/mm <sup>2</sup> |                    | Aluminum Alloy<br><b>AC4C · ADC</b> |                    | Aluminum<br><b>A5052 · A7075</b> |                    | Titanium Alloy             |                    | Heat Resistant Alloy<br><b>Inconel 718</b> |                    |
|-----------------|----------------------------------------------------|--------------------|-------------------------------------------------------------------------|--------------------|-------------------------------------|--------------------|----------------------------------|--------------------|----------------------------|--------------------|--------------------------------------------|--------------------|
| Cutting Speed   | 40~50~60m/min                                      |                    | 30~40~50m/min                                                           |                    | 30~50~70m/min                       |                    | 20~40~60m/min                    |                    | 40~50~60m/min              |                    | 5~10~15m/min                               |                    |
| Drill Dia. (mm) | Speed (min <sup>-1</sup> )                         | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                              | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )          | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )       | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                 | Feed Rate (mm/rev) |
| 0.7             | 22,700                                             | 0.014 ~ 0.028      | 18,200                                                                  | 0.014 ~ 0.028      | 22,700                              | 0.014 ~ 0.042      | 18,200                           | 0.007 ~ 0.021      | 22,700                     | 0.011 ~ 0.018      | 4,500                                      | 0.004 ~ 0.014      |
| 1               | 15,900                                             | 0.02 ~ 0.04        | 12,700                                                                  | 0.02 ~ 0.04        | 15,900                              | 0.02 ~ 0.06        | 12,700                           | 0.01 ~ 0.03        | 15,900                     | 0.015 ~ 0.025      | 3,200                                      | 0.005 ~ 0.02       |
| 1.5             | 10,600                                             | 0.03 ~ 0.06        | 8,500                                                                   | 0.03 ~ 0.06        | 10,600                              | 0.03 ~ 0.09        | 8,500                            | 0.015 ~ 0.045      | 10,600                     | 0.023 ~ 0.038      | 2,100                                      | 0.008 ~ 0.03       |
| 2               | 8,000                                              | 0.04 ~ 0.08        | 6,400                                                                   | 0.04 ~ 0.08        | 8,000                               | 0.04 ~ 0.12        | 6,400                            | 0.02 ~ 0.06        | 8,000                      | 0.03 ~ 0.05        | 1,600                                      | 0.01 ~ 0.04        |

## ADO-MICRO 12D/20D/30D

| Work Material   | Mild Steel - Low Carbon Steel<br><b>SS400 · S10C</b><br>~150HB<br>~500N/mm <sup>2</sup> |                    | Carbon Steel<br><b>S35C · S50C</b><br>~210HB<br>~710N/mm <sup>2</sup> |                    | Alloy Steel<br><b>SCM · SCR · SNCM</b><br>16 ~ 28HRC<br>710 ~ 900N/mm <sup>2</sup> |                    | Alloy Steel<br><b>SCM · SCR · SNCM</b><br>28 ~ 35HRC<br>900 ~ 1,100N/mm <sup>2</sup> |                    | Austenitic Stainless Steel<br><b>SUS303 · SUS304</b><br><b>SUS316 · SUS316L</b> |                    | Special Alloy Steel<br><b>SUJ2 · SUS440</b> |                    |
|-----------------|-----------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------|--------------------|---------------------------------------------|--------------------|
| Cutting Speed   | 20~40~60m/min                                                                           |                    | 20~40~60m/min                                                         |                    | 20~40~60m/min                                                                      |                    | 20~30~40m/min                                                                        |                    | 20~30~70m/min                                                                   |                    | 25~35~45m/min                               |                    |
| Drill Dia. (mm) | Speed (min <sup>-1</sup> )                                                              | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                            | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                                         | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                                           | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                                      | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                  | Feed Rate (mm/rev) |
| 1               | 12,700                                                                                  | 0.01 ~ 0.03        | 12,700                                                                | 0.01 ~ 0.03        | 12,700                                                                             | 0.02 ~ 0.04        | 9,500                                                                                | 0.02 ~ 0.04        | 9,500                                                                           | 0.01 ~ 0.03        | 11,100                                      | 0.01 ~ 0.03        |
| 1.5             | 8,500                                                                                   | 0.015 ~ 0.045      | 8,500                                                                 | 0.015 ~ 0.045      | 8,500                                                                              | 0.03 ~ 0.06        | 6,400                                                                                | 0.03 ~ 0.06        | 6,400                                                                           | 0.015 ~ 0.045      | 7,400                                       | 0.015 ~ 0.045      |
| 2               | 6,400                                                                                   | 0.02 ~ 0.06        | 6,400                                                                 | 0.02 ~ 0.06        | 6,400                                                                              | 0.04 ~ 0.08        | 4,800                                                                                | 0.04 ~ 0.08        | 4,800                                                                           | 0.02 ~ 0.06        | 5,600                                       | 0.02 ~ 0.06        |

| Work Material   | Cast Iron<br><b>FC250</b><br>~350N/mm <sup>2</sup> |                    | Ductile Cast Iron<br><b>FCD450·FCD600</b><br>400 ~ 600N/mm <sup>2</sup> |                    | Aluminum Alloy<br><b>AC4C · ADC</b> |                    | Aluminum<br><b>A5052 · A7075</b> |                    | Titanium Alloy             |                    | Heat Resistant Alloy<br><b>Inconel 718</b> |                    |
|-----------------|----------------------------------------------------|--------------------|-------------------------------------------------------------------------|--------------------|-------------------------------------|--------------------|----------------------------------|--------------------|----------------------------|--------------------|--------------------------------------------|--------------------|
| Cutting Speed   | 40~50~60m/min                                      |                    | 30~40~50m/min                                                           |                    | 30~50~70m/min                       |                    | 20~40~60m/min                    |                    | 40~50~60m/min              |                    | 5~10~15m/min                               |                    |
| Drill Dia. (mm) | Speed (min <sup>-1</sup> )                         | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                                              | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )          | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )       | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                 | Feed Rate (mm/rev) |
| 1               | 15,900                                             | 0.02 ~ 0.04        | 12,700                                                                  | 0.02 ~ 0.04        | 15,900                              | 0.02 ~ 0.06        | 12,700                           | 0.01 ~ 0.03        | 15,900                     | 0.015 ~ 0.025      | 3,200                                      | 0.005 ~ 0.02       |
| 1.5             | 10,600                                             | 0.03 ~ 0.06        | 8,500                                                                   | 0.03 ~ 0.06        | 10,600                              | 0.03 ~ 0.09        | 8,500                            | 0.015 ~ 0.045      | 10,600                     | 0.023 ~ 0.038      | 2,100                                      | 0.008 ~ 0.03       |
| 2               | 8,000                                              | 0.04 ~ 0.08        | 6,400                                                                   | 0.04 ~ 0.08        | 8,000                               | 0.04 ~ 0.12        | 6,400                            | 0.02 ~ 0.06        | 8,000                      | 0.03 ~ 0.05        | 1,600                                      | 0.01 ~ 0.04        |

# CARBIDE DRILLS CUTTING CONDITIONS

## ADO-SUS-3D•5D•8D

| Work Material   | Ferritic Stainless Steel · Martensitic Stainless Steel |                    |                            |                    | Austenitic Stainless Steel |                    |                            |                    | Duplex Stainless Steel     |                    |                            |                    |
|-----------------|--------------------------------------------------------|--------------------|----------------------------|--------------------|----------------------------|--------------------|----------------------------|--------------------|----------------------------|--------------------|----------------------------|--------------------|
| Hardness        | ≤ 200HB                                                |                    | >200HB                     |                    | ≤ 200HB                    |                    | >200HB                     |                    | ≤ 290HB                    |                    | >290HB                     |                    |
| No. Steel Type  | 1                                                      |                    | 2                          |                    | 3                          |                    | 4                          |                    | 5                          |                    | 6                          |                    |
| Cutting Speed   | 60~80~100m/min                                         |                    | 40~60~80m/min              |                    | 60~80~100m/min             |                    | 40~60~80m/min              |                    | 40~60~80m/min              |                    | 30~40~50m/min              |                    |
| Drill Dia. (mm) | Speed (min <sup>-1</sup> )                             | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) |
| 2               | 12,700                                                 | 0.04~0.08          | 9,500                      | 0.04~0.08          | 12,700                     | 0.04~0.08          | 9,500                      | 0.04~0.08          | 9,500                      | 0.04~0.08          | 6,400                      | 0.04~0.08          |
| 3               | 8,500                                                  | 0.06~0.12          | 6,400                      | 0.06~0.12          | 8,500                      | 0.06~0.12          | 6,400                      | 0.06~0.12          | 6,400                      | 0.06~0.12          | 4,200                      | 0.06~0.12          |
| 4               | 6,400                                                  | 0.08~0.16          | 4,800                      | 0.08~0.16          | 6,400                      | 0.08~0.16          | 4,800                      | 0.08~0.16          | 4,800                      | 0.08~0.16          | 3,200                      | 0.08~0.16          |
| 6               | 4,200                                                  | 0.12~0.21          | 3,200                      | 0.12~0.21          | 4,200                      | 0.12~0.21          | 3,200                      | 0.12~0.21          | 3,200                      | 0.12~0.21          | 2,100                      | 0.12~0.21          |
| 8               | 3,200                                                  | 0.16~0.24          | 2,400                      | 0.16~0.24          | 3,200                      | 0.16~0.24          | 2,400                      | 0.16~0.24          | 2,400                      | 0.16~0.24          | 1,600                      | 0.16~0.24          |
| 10              | 2,500                                                  | 0.17~0.27          | 1,900                      | 0.17~0.27          | 2,500                      | 0.2~0.3            | 1,900                      | 0.17~0.27          | 1,900                      | 0.2~0.3            | 1,300                      | 0.17~0.27          |
| 12              | 2,100                                                  | 0.19~0.3           | 1,600                      | 0.19~0.3           | 2,100                      | 0.21~0.31          | 1,600                      | 0.19~0.3           | 1,600                      | 0.21~0.31          | 1,100                      | 0.19~0.3           |
| 16              | 1,600                                                  | 0.22~0.32          | 1,200                      | 0.22~0.32          | 1,600                      | 0.22~0.32          | 1,200                      | 0.22~0.32          | 1,200                      | 0.22~0.32          | 800                        | 0.22~0.32          |
| 20              | 1,300                                                  | 0.28~0.4           | 1,000                      | 0.28~0.4           | 1,300                      | 0.28~0.4           | 1,000                      | 0.28~0.4           | 1,000                      | 0.28~0.4           | 600                        | 0.28~0.4           |

| Work Material   | Precipitation Stainless Steel |                    | Titanium Alloy             |                    | Mild Steel · Low Carbon Steel<br>SS400 · S10C |                    | Carbon Steel<br>S35C · S50C       |                    | Alloy Steel<br>SCM · SCr · SNCM          |                    | Ni Nickel Alloy<br>Inconel 718 |                    | Copper Alloy<br>C1020·2600 |                    |
|-----------------|-------------------------------|--------------------|----------------------------|--------------------|-----------------------------------------------|--------------------|-----------------------------------|--------------------|------------------------------------------|--------------------|--------------------------------|--------------------|----------------------------|--------------------|
| Hardness        | ≤ 340HB                       |                    | 280HB ~ 340HB              |                    | ~ 150HB<br>~ 500N/mm <sup>2</sup>             |                    | ~ 210HB<br>~ 710N/mm <sup>2</sup> |                    | 16 ~ 28HRC<br>710 ~ 900N/mm <sup>2</sup> |                    | 38 ~ 45HRC                     |                    | —                          |                    |
| No. Steel Type  | 7                             |                    | —                          |                    | —                                             |                    | —                                 |                    | —                                        |                    | —                              |                    | —                          |                    |
| Cutting Speed   | 40~50~60 m/min                |                    | 30~40~50 m/min             |                    | 80~100~120 m/min                              |                    | 80~100~120 m/min                  |                    | 60~75~90 m/min                           |                    | 10~20~30 m/min                 |                    | 140~170~200 m/min          |                    |
| Drill Dia. (mm) | Speed (min <sup>-1</sup> )    | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )                    | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )        | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )               | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )     | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> ) | Feed Rate (mm/rev) |
| 2               | 8,000                         | 0.04~0.08          | 6,400                      | 0.04~0.08          | 12,700                                        | 0.04~0.08          | 12,700                            | 0.04~0.08          | 11,900                                   | 0.04~0.08          | 3,200                          | 0.03~0.05          | 22,300                     | 0.03~0.05          |
| 3               | 5,300                         | 0.06~0.12          | 4,200                      | 0.06~0.12          | 10,600                                        | 0.06~0.12          | 10,600                            | 0.06~0.12          | 8,000                                    | 0.06~0.12          | 2,100                          | 0.05~0.08          | 18,000                     | 0.05~0.08          |
| 4               | 4,000                         | 0.08~0.16          | 3,200                      | 0.08~0.16          | 8,000                                         | 0.08~0.16          | 8,000                             | 0.08~0.16          | 6,000                                    | 0.08~0.16          | 1,600                          | 0.06~0.1           | 13,500                     | 0.06~0.1           |
| 6               | 2,700                         | 0.12~0.21          | 2,100                      | 0.12~0.21          | 5,300                                         | 0.12~0.24          | 5,300                             | 0.12~0.24          | 4,000                                    | 0.12~0.24          | 1,100                          | 0.09~0.15          | 9,000                      | 0.09~0.15          |
| 8               | 2,000                         | 0.16~0.24          | 1,600                      | 0.16~0.24          | 4,000                                         | 0.16~0.28          | 4,000                             | 0.16~0.28          | 3,000                                    | 0.16~0.28          | 800                            | 0.12~0.2           | 6,800                      | 0.12~0.2           |
| 10              | 1,600                         | 0.2~0.3            | 1,300                      | 0.17~0.27          | 3,200                                         | 0.2~0.3            | 3,200                             | 0.2~0.3            | 2,400                                    | 0.2~0.3            | 640                            | 0.15~0.2           | 5,500                      | 0.15~0.25          |
| 12              | 1,300                         | 0.21~0.31          | 1,100                      | 0.19~0.3           | 2,700                                         | 0.21~0.3           | 2,700                             | 0.21~0.3           | 2,000                                    | 0.21~0.3           | 530                            | 0.15~0.2           | 4,500                      | 0.18~0.3           |
| 16              | 1,000                         | 0.22~0.32          | 800                        | 0.22~0.32          | 2,000                                         | 0.25~0.36          | 2,000                             | 0.25~0.36          | 1,500                                    | 0.25~0.36          | —                              | —                  | 3,400                      | 0.24~0.32          |
| 20              | 800                           | 0.28~0.4           | 600                        | 0.28~0.4           | 1,600                                         | 0.3~0.4            | 1,600                             | 0.3~0.4            | 1,200                                    | 0.3~0.4            | —                              | —                  | 2,700                      | 0.3~0.4            |

- The above speeds and feeds are for **water-soluble coolant and internal coolant supply**.
- Suitable cutting fluid is water-soluble high density coolant (20~30 times dilution).
- When using non-water-soluble or water-soluble coolant (over 20times dilution), reduce cutting speed by 30%.
- Equip the drill with a scratch- and dust-free collet and **minimize drill deflection to less than 0.02mm**.

- Fasten the work material to reduce the possibility of work deformation, deflection of machined surface, or vibration.
  - A clogged oil hole can lead to a breakage. Make sure that a filter is attached to the oil feeder.
  - Adjust the speed and feed accordingly based on chip shape when machining copper alloy.
- ※ The above cutting conditions are applicable to hole depth under 3D for heat-resistant alloys such as Inconel 718. When necessary please consider step drilling.

# CARBIDE DRILLS CUTTING CONDITIONS

## ADO-TRS-3D・5D

| Work Material      | Mild Steel・Low Carbon Steel<br><b>SS400, S10C</b><br>~150HB<br>~500N/mm <sup>2</sup> |                       | Carbon Steel<br><b>S35C, S50C</b><br>~210HB<br>~710N/mm <sup>2</sup> |                       | Alloy Steel<br><b>SCM, SCr, SNCM</b><br>16~28HRC<br>710 ~ 900N/mm <sup>2</sup> |                       |
|--------------------|--------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------|-----------------------|
| Cutting Speed      | 80~120m/min                                                                          |                       | 80~120m/min                                                          |                       | 60~100m/min                                                                    |                       |
| Drill Dia.<br>(mm) | Speed<br>(min <sup>-1</sup> )                                                        | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                        | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                  | Feed Rate<br>(mm/rev) |
| <b>3</b>           | 10,000                                                                               | 0.11 ~ 0.15           | 10,000                                                               | 0.11 ~ 0.15           | 8,500                                                                          | 0.11 ~ 0.15           |
| <b>4</b>           | 8,000                                                                                | 0.14 ~ 0.2            | 8,000                                                                | 0.14 ~ 0.2            | 6,400                                                                          | 0.14 ~ 0.2            |
| <b>5</b>           | 6,400                                                                                | 0.18 ~ 0.25           | 6,400                                                                | 0.18 ~ 0.25           | 5,100                                                                          | 0.18 ~ 0.25           |
| <b>6</b>           | 5,300                                                                                | 0.21 ~ 0.3            | 5,300                                                                | 0.21 ~ 0.3            | 4,200                                                                          | 0.21 ~ 0.3            |
| <b>7</b>           | 4,500                                                                                | 0.25 ~ 0.35           | 4,500                                                                | 0.25 ~ 0.35           | 3,600                                                                          | 0.25 ~ 0.35           |
| <b>8</b>           | 4,000                                                                                | 0.28 ~ 0.4            | 4,000                                                                | 0.28 ~ 0.4            | 3,200                                                                          | 0.28 ~ 0.4            |
| <b>9</b>           | 3,500                                                                                | 0.32 ~ 0.45           | 3,500                                                                | 0.32 ~ 0.45           | 2,800                                                                          | 0.32 ~ 0.45           |
| <b>10</b>          | 3,200                                                                                | 0.35 ~ 0.5            | 3,200                                                                | 0.35 ~ 0.5            | 2,500                                                                          | 0.35 ~ 0.5            |
| <b>11</b>          | 2,900                                                                                | 0.39 ~ 0.55           | 2,900                                                                | 0.39 ~ 0.55           | 2,300                                                                          | 0.39 ~ 0.55           |
| <b>12</b>          | 2,700                                                                                | 0.42 ~ 0.6            | 2,700                                                                | 0.42 ~ 0.6            | 2,100                                                                          | 0.42 ~ 0.6            |
| <b>13</b>          | 2,400                                                                                | 0.46 ~ 0.65           | 2,400                                                                | 0.46 ~ 0.65           | 2,000                                                                          | 0.46 ~ 0.65           |
| <b>14</b>          | 2,300                                                                                | 0.49 ~ 0.7            | 2,300                                                                | 0.49 ~ 0.7            | 1,800                                                                          | 0.49 ~ 0.7            |
| <b>15</b>          | 2,100                                                                                | 0.53 ~ 0.75           | 2,100                                                                | 0.53 ~ 0.7            | 1,700                                                                          | 0.53 ~ 0.7            |
| <b>16</b>          | 2,000                                                                                | 0.56 ~ 0.8            | 2,000                                                                | 0.56 ~ 0.72           | 1,600                                                                          | 0.56 ~ 0.72           |
| <b>17</b>          | 1,900                                                                                | 0.6 ~ 0.85            | 1,900                                                                | 0.6 ~ 0.77            | 1,500                                                                          | 0.6 ~ 0.77            |
| <b>18</b>          | 1,800                                                                                | 0.63 ~ 0.9            | 1,800                                                                | 0.63 ~ 0.81           | 1,400                                                                          | 0.63 ~ 0.81           |
| <b>19</b>          | 1,700                                                                                | 0.67 ~ 0.9            | 1,700                                                                | 0.67 ~ 0.86           | 1,300                                                                          | 0.67 ~ 0.86           |
| <b>20</b>          | 1,600                                                                                | 0.7 ~ 0.9             | 1,600                                                                | 0.7 ~ 0.9             | 1,300                                                                          | 0.7 ~ 0.9             |

| Work Material      | Alloy Steel<br><b>SCM, SCr, SNCM</b><br>28~35HRC<br>900 ~ 1,100N/mm <sup>2</sup> |                       | Cast Iron<br><b>FC250</b><br>~350N/mm <sup>2</sup> |                       | Ductile Cast Iron<br><b>FCD450, FCD600</b><br>400 ~ 600N/mm <sup>2</sup> |                       |
|--------------------|----------------------------------------------------------------------------------|-----------------------|----------------------------------------------------|-----------------------|--------------------------------------------------------------------------|-----------------------|
| Cutting Speed      | 60~90m/min                                                                       |                       | 80~120m/min                                        |                       | 60~100m/min                                                              |                       |
| Drill Dia.<br>(mm) | Speed<br>(min <sup>-1</sup> )                                                    | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                      | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                            | Feed Rate<br>(mm/rev) |
| <b>3</b>           | 8,000                                                                            | 0.11 ~ 0.15           | 10,000                                             | 0.11 ~ 0.18           | 8,500                                                                    | 0.11 ~ 0.15           |
| <b>4</b>           | 6,000                                                                            | 0.14 ~ 0.2            | 8,000                                              | 0.14 ~ 0.24           | 6,400                                                                    | 0.14 ~ 0.2            |
| <b>5</b>           | 4,800                                                                            | 0.18 ~ 0.25           | 6,400                                              | 0.18 ~ 0.3            | 5,100                                                                    | 0.18 ~ 0.25           |
| <b>6</b>           | 4,000                                                                            | 0.21 ~ 0.3            | 5,300                                              | 0.21 ~ 0.36           | 4,200                                                                    | 0.21 ~ 0.3            |
| <b>7</b>           | 3,400                                                                            | 0.25 ~ 0.35           | 4,500                                              | 0.25 ~ 0.42           | 3,600                                                                    | 0.25 ~ 0.35           |
| <b>8</b>           | 3,000                                                                            | 0.28 ~ 0.4            | 4,000                                              | 0.28 ~ 0.48           | 3,200                                                                    | 0.28 ~ 0.4            |
| <b>9</b>           | 2,700                                                                            | 0.32 ~ 0.45           | 3,500                                              | 0.32 ~ 0.54           | 2,800                                                                    | 0.32 ~ 0.45           |
| <b>10</b>          | 2,400                                                                            | 0.35 ~ 0.5            | 3,200                                              | 0.35 ~ 0.6            | 2,500                                                                    | 0.35 ~ 0.5            |
| <b>11</b>          | 2,200                                                                            | 0.39 ~ 0.55           | 2,900                                              | 0.39 ~ 0.66           | 2,300                                                                    | 0.39 ~ 0.55           |
| <b>12</b>          | 2,000                                                                            | 0.42 ~ 0.6            | 2,700                                              | 0.42 ~ 0.72           | 2,100                                                                    | 0.42 ~ 0.6            |
| <b>13</b>          | 1,800                                                                            | 0.46 ~ 0.65           | 2,400                                              | 0.46 ~ 0.78           | 2,000                                                                    | 0.46 ~ 0.65           |
| <b>14</b>          | 1,700                                                                            | 0.49 ~ 0.7            | 2,300                                              | 0.49 ~ 0.84           | 1,800                                                                    | 0.49 ~ 0.7            |
| <b>15</b>          | 1,600                                                                            | 0.53 ~ 0.7            | 2,100                                              | 0.53 ~ 0.75           | 1,700                                                                    | 0.53 ~ 0.7            |
| <b>16</b>          | 1,500                                                                            | 0.56 ~ 0.72           | 2,000                                              | 0.56 ~ 0.8            | 1,600                                                                    | 0.56 ~ 0.72           |
| <b>17</b>          | 1,400                                                                            | 0.6 ~ 0.77            | 1,900                                              | 0.6 ~ 0.85            | 1,500                                                                    | 0.6 ~ 0.77            |
| <b>18</b>          | 1,300                                                                            | 0.63 ~ 0.81           | 1,800                                              | 0.63 ~ 0.9            | 1,400                                                                    | 0.63 ~ 0.81           |
| <b>19</b>          | 1,300                                                                            | 0.67 ~ 0.86           | 1,700                                              | 0.67 ~ 0.95           | 1,300                                                                    | 0.67 ~ 0.86           |
| <b>20</b>          | 1,200                                                                            | 0.7 ~ 0.9             | 1,600                                              | 0.7 ~ 1               | 1,300                                                                    | 0.7 ~ 0.9             |

1. The indicated speeds and feeds are for drilling with water-soluble coolant.
2. Water-soluble high density coolant (less than 20 times dilution) is recommended.
3. When using non-water-soluble or water-soluble coolant (over 20 times dilution), reduce cutting speed by 30%.
4. Equip the drill with a scratch- and dust-free collet and minimize drill deflection to less than 0.02mm.
5. Fasten the work material to reduce the possibility of work deformation, deflection of machined surface, or vibration.
6. A dogged oil hole can lead to breakage. Make sure that a filter is attached to the oil feeder.

# CARBIDE DRILLS CUTTING CONDITIONS

## WHO55-5D

| Work Material   | SKD61<br>Special Alloy Steel·<br>Hardened Steel·<br>Prehardened Steel<br>(unquenched)<br>40 ~ 45HRC |                       | DAC55、DH31S、SKD61、SKD11、STAVAX |                       |                               |                       | Inconel<br>38 ~ 45HRC         |                       |
|-----------------|-----------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|-----------------------|-------------------------------|-----------------------|-------------------------------|-----------------------|
|                 |                                                                                                     |                       | 45 ~ 50HRC                     |                       | 50 ~ 56HRC                    |                       |                               |                       |
| Cutting Speed   | 30 ~ 50m/min                                                                                        |                       | 20 ~ 30m/min                   |                       | 20 ~ 30m/min                  |                       | 10 ~ 30m/min                  |                       |
| Drill Dia. (mm) | Speed<br>(min <sup>-1</sup> )                                                                       | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )  | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev) |
| 3.3             | 3,900                                                                                               | 0.033 ~ 0.066         | 2,400                          | 0.033 ~ 0.066         | 2,400                         | 0.033 ~ 0.066         | 1,900                         | 0.03 ~ 0.07           |
| 4               | 3,200                                                                                               | 0.04 ~ 0.08           | 2,000                          | 0.04 ~ 0.08           | 2,000                         | 0.04 ~ 0.08           | 1,600                         | 0.04 ~ 0.08           |
| 5               | 2,500                                                                                               | 0.05 ~ 0.1            | 1,600                          | 0.05 ~ 0.1            | 1,600                         | 0.05 ~ 0.1            | 1,300                         | 0.05 ~ 0.1            |
| 6               | 2,100                                                                                               | 0.06 ~ 0.12           | 1,300                          | 0.06 ~ 0.12           | 1,300                         | 0.06 ~ 0.12           | 1,100                         | 0.06 ~ 0.12           |
| 7               | 1,800                                                                                               | 0.07 ~ 0.14           | 1,100                          | 0.07 ~ 0.14           | 1,100                         | 0.07 ~ 0.14           | 900                           | 0.07 ~ 0.14           |
| 8               | 1,600                                                                                               | 0.08 ~ 0.16           | 1,000                          | 0.08 ~ 0.16           | 1,000                         | 0.08 ~ 0.16           | 800                           | 0.08 ~ 0.16           |
| 9               | 1,400                                                                                               | 0.09 ~ 0.18           | 900                            | 0.09 ~ 0.18           | 900                           | 0.09 ~ 0.18           | 700                           | 0.09 ~ 0.18           |
| 10              | 1,300                                                                                               | 0.1 ~ 0.2             | 800                            | 0.1 ~ 0.2             | 800                           | 0.1 ~ 0.2             | 600                           | 0.1 ~ 0.2             |
| 11              | 1,150                                                                                               | 0.11 ~ 0.22           | 720                            | 0.11 ~ 0.22           | 720                           | 0.11 ~ 0.22           | 600                           | 0.11 ~ 0.22           |
| 12              | 1,100                                                                                               | 0.12 ~ 0.24           | 700                            | 0.12 ~ 0.24           | 700                           | 0.12 ~ 0.24           | 500                           | 0.12 ~ 0.24           |

## WH70-DRL

| Work Material   | SKD11·SKT·SUS440<br>55 ~ 60HRC |                    | SKH·SKD11·SKS<br>60 ~ 70HRC |                    |
|-----------------|--------------------------------|--------------------|-----------------------------|--------------------|
| Cutting Speed   | 10 ~ 16m/min                   |                    | 8 ~ 13m/min                 |                    |
| Drill Dia. (mm) | Speed (min <sup>-1</sup> )     | Feed Rate (mm/rev) | Speed (min <sup>-1</sup> )  | Feed Rate (mm/rev) |
| 2               | 2,000                          | ~0.04              | 1,900                       | ~0.04              |
| 3               | 1,330                          | ~0.04              | 1,250                       | ~0.04              |
| 4               | 1,000                          | ~0.04              | 950                         | ~0.04              |
| 5               | 800                            | ~0.04              | 750                         | ~0.04              |
| 6               | 670                            | ~0.04              | 630                         | ~0.04              |
| 8               | 500                            | ~0.04              | 480                         | ~0.04              |
| 10              | 400                            | ~0.04              | 380                         | ~0.04              |
| 12              | 330                            | ~0.04              | 320                         | ~0.04              |
| 14.1            | 280                            | ~0.04              | 270                         | ~0.04              |
| 16.1            | 250                            | ~0.04              | 240                         | ~0.04              |
| 17.6            | 235                            | ~0.04              | 190                         | ~0.04              |
| 18.6            | 220                            | ~0.04              | 180                         | ~0.04              |



# CARBIDE DRILLS CUTTING CONDITIONS

## ADF-2D

| Work Material      | Low Carbon Steel- Alloy Steel<br>( C<0.3% )<br>S400-SCM<br>~710N/mm <sup>2</sup> |                       | Carbon Steel<br>S35C S50C<br>~210HB<br>~710N/mm <sup>2</sup> |                       | Alloy Steel<br>SCM SCr SNCM<br>28~35HRC<br>900~1,100N/mm <sup>2</sup> |                       | Plastic Mold Steel<br>NAK80<br>~40HRC |                       | Special Alloy Steel- Hardened Steel- Prehardened Steel<br>SKD61<br>~50HRC |                       | Cast Iron<br>FC250<br>~350N/mm <sup>2</sup> |                       | Ductile Cast Iron<br>FCD600<br>400~600N/mm <sup>2</sup> |                       | Aluminum<br>A5052-A7075 |                       | Aluminum Alloy<br>AC4C-ADC |                       |
|--------------------|----------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------------------------------------------|-----------------------|---------------------------------------------|-----------------------|---------------------------------------------------------|-----------------------|-------------------------|-----------------------|----------------------------|-----------------------|
| Cutting Speed      | 60 ~ 100m/min                                                                    |                       | 60 ~ 100m/min                                                |                       | 30 ~ 90m/min                                                          |                       | 20 ~ 40m/min                          |                       | 20 ~ 30m/min                                                              |                       | 60 ~ 120m/min                               |                       | 50 ~ 80m/min                                            |                       | 80 ~ 200m/min           |                       | 80 ~ 200m/min              |                       |
| Drill Dia.<br>(mm) | Speed<br>(min-1)                                                                 | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                             | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                                      | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                      | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                                          | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                            | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                        | Feed Rate<br>(mm/rev) | Speed<br>(min-1)        | Feed Rate<br>(mm/rev) | Speed<br>(min-1)           | Feed Rate<br>(mm/rev) |
| 2                  | 12,700                                                                           | 0.01~0.06             | 12,700                                                       | 0.01~0.06             | 9,550                                                                 | 0.01~0.06             | 4,750                                 | 0.01~0.04             | 4,000                                                                     | 0.01~0.03             | 14,300                                      | 0.01~0.06             | 10,350                                                  | 0.01~0.06             | 22,300                  | 0.01~0.06             | 22,300                     | 0.01~0.06             |
| 3                  | 8,500                                                                            | 0.015~0.09            | 8,500                                                        | 0.015~0.09            | 6,350                                                                 | 0.015~0.09            | 3,200                                 | 0.015~0.06            | 2,650                                                                     | 0.015~0.045           | 9,550                                       | 0.015~0.09            | 6,900                                                   | 0.015~0.09            | 14,850                  | 0.015~0.09            | 14,850                     | 0.015~0.09            |
| 4                  | 6,350                                                                            | 0.02~0.12             | 6,350                                                        | 0.02~0.12             | 4,750                                                                 | 0.02~0.12             | 2,400                                 | 0.02~0.08             | 2,000                                                                     | 0.02~0.06             | 7,150                                       | 0.02~0.12             | 5,150                                                   | 0.02~0.12             | 11,150                  | 0.02~0.12             | 11,150                     | 0.02~0.12             |
| 6                  | 4,250                                                                            | 0.03~0.18             | 4,250                                                        | 0.03~0.18             | 3,200                                                                 | 0.03~0.18             | 1,600                                 | 0.03~0.12             | 1,350                                                                     | 0.03~0.09             | 4,750                                       | 0.03~0.18             | 3,450                                                   | 0.03~0.18             | 7,450                   | 0.03~0.18             | 7,450                      | 0.03~0.18             |
| 8                  | 3,200                                                                            | 0.04~0.24             | 3,200                                                        | 0.04~0.24             | 2,400                                                                 | 0.04~0.24             | 1,200                                 | 0.04~0.16             | 1,000                                                                     | 0.04~0.12             | 3,600                                       | 0.04~0.24             | 2,600                                                   | 0.04~0.24             | 5,550                   | 0.04~0.24             | 5,550                      | 0.04~0.24             |
| 10                 | 2,550                                                                            | 0.05~0.3              | 2,550                                                        | 0.05~0.3              | 1,900                                                                 | 0.05~0.3              | 950                                   | 0.05~0.2              | 800                                                                       | 0.05~0.15             | 2,850                                       | 0.05~0.3              | 2,050                                                   | 0.05~0.3              | 4,450                   | 0.05~0.3              | 4,450                      | 0.05~0.3              |
| 12                 | 2,100                                                                            | 0.06~0.3              | 2,100                                                        | 0.06~0.3              | 1,600                                                                 | 0.06~0.3              | 800                                   | 0.06~0.24             | 650                                                                       | 0.06~0.18             | 2,400                                       | 0.06~0.3              | 1,700                                                   | 0.06~0.3              | 3,700                   | 0.06~0.36             | 3,700                      | 0.06~0.36             |
| 14                 | 1,800                                                                            | 0.07~0.35             | 1,800                                                        | 0.07~0.35             | 1,350                                                                 | 0.07~0.35             | 700                                   | 0.07~0.28             | 550                                                                       | 0.07~0.21             | 2,050                                       | 0.07~0.35             | 1,500                                                   | 0.07~0.35             | 3,200                   | 0.07~0.42             | 3,200                      | 0.07~0.42             |
| 16                 | 1,600                                                                            | 0.08~0.36             | 1,600                                                        | 0.08~0.36             | 1,200                                                                 | 0.08~0.36             | 600                                   | 0.08~0.32             | 500                                                                       | 0.08~0.24             | 1,800                                       | 0.08~0.36             | 1,300                                                   | 0.08~0.36             | 2,800                   | 0.08~0.48             | 2,800                      | 0.08~0.48             |
| 18                 | 1,400                                                                            | 0.09~0.38             | 1,400                                                        | 0.09~0.38             | 1,050                                                                 | 0.09~0.38             | 550                                   | 0.09~0.36             | 450                                                                       | 0.09~0.27             | 1,600                                       | 0.09~0.38             | 1,150                                                   | 0.09~0.38             | 2,500                   | 0.09~0.54             | 2,500                      | 0.09~0.54             |
| 20                 | 1,250                                                                            | 0.1~0.4               | 1,250                                                        | 0.1~0.4               | 950                                                                   | 0.1~0.4               | 500                                   | 0.1~0.4               | 400                                                                       | 0.1~0.3               | 1,450                                       | 0.1~0.4               | 1,050                                                   | 0.1~0.4               | 2,250                   | 0.1~0.6               | 2,250                      | 0.1~0.6               |

## ADFLS-2D

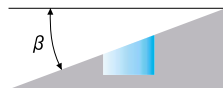
| Work Material      | Low Carbon Steel- Alloy Steel<br>( C<0.3% )<br>S400-SCM<br>~710N/mm <sup>2</sup> |                       | Carbon Steel<br>S35C S50C<br>~210HB<br>~710N/mm <sup>2</sup> |                       | Alloy Steel<br>SCM SCr SNCM<br>28~35HRC<br>900~1,100N/mm <sup>2</sup> |                       | Plastic Mold Steel<br>NAK80<br>~40HRC |                       | Special Alloy Steel- Hardened Steel- Prehardened Steel<br>SKD61<br>~50HRC |                       | Cast Iron<br>FC250<br>~350N/mm <sup>2</sup> |                       | Ductile Cast Iron<br>FCD600<br>400~600N/mm <sup>2</sup> |                       | Aluminum<br>A5052-A7075 |                       | Aluminum Alloy<br>AC4C-ADC |                       |
|--------------------|----------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------------------------------------------|-----------------------|---------------------------------------------|-----------------------|---------------------------------------------------------|-----------------------|-------------------------|-----------------------|----------------------------|-----------------------|
| Cutting Speed      | 60 ~ 100m/min                                                                    |                       | 60 ~ 100m/min                                                |                       | 30 ~ 90m/min                                                          |                       | 20 ~ 40m/min                          |                       | 20 ~ 30m/min                                                              |                       | 60 ~ 120m/min                               |                       | 50 ~ 80m/min                                            |                       | 80 ~ 200m/min           |                       | 80 ~ 200m/min              |                       |
| Drill Dia.<br>(mm) | Speed<br>(min-1)                                                                 | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                             | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                                      | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                      | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                                          | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                            | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                        | Feed Rate<br>(mm/rev) | Speed<br>(min-1)        | Feed Rate<br>(mm/rev) | Speed<br>(min-1)           | Feed Rate<br>(mm/rev) |
| 3                  | 8,500                                                                            | 0.045~0.075           | 8,500                                                        | 0.045~0.075           | 6,350                                                                 | 0.045~0.075           | 3,200                                 | 0.045~0.06            | 2,650                                                                     | 0.03~0.06             | 9,550                                       | 0.06~0.09             | 6,900                                                   | 0.06~0.09             | 14,850                  | 0.015~0.09            | 14,850                     | 0.015~0.09            |
| 4                  | 6,350                                                                            | 0.06~0.1              | 6,350                                                        | 0.06~0.1              | 4,750                                                                 | 0.06~0.1              | 2,400                                 | 0.06~0.08             | 2,000                                                                     | 0.04~0.08             | 7,150                                       | 0.08~0.12             | 5,150                                                   | 0.08~0.12             | 11,150                  | 0.02~0.12             | 11,150                     | 0.02~0.12             |
| 6                  | 4,250                                                                            | 0.09~0.15             | 4,250                                                        | 0.09~0.15             | 3,200                                                                 | 0.09~0.15             | 1,600                                 | 0.09~0.12             | 1,350                                                                     | 0.06~0.12             | 4,750                                       | 0.12~0.18             | 3,450                                                   | 0.12~0.18             | 7,450                   | 0.03~0.18             | 7,450                      | 0.03~0.18             |
| 8                  | 3,200                                                                            | 0.12~0.2              | 3,200                                                        | 0.12~0.2              | 2,400                                                                 | 0.12~0.2              | 1,200                                 | 0.12~0.16             | 1,000                                                                     | 0.08~0.16             | 3,600                                       | 0.16~0.24             | 2,600                                                   | 0.16~0.24             | 5,550                   | 0.04~0.24             | 5,550                      | 0.04~0.24             |
| 10                 | 2,550                                                                            | 0.15~0.25             | 2,550                                                        | 0.15~0.25             | 1,900                                                                 | 0.15~0.25             | 950                                   | 0.15~0.2              | 800                                                                       | 0.1~0.2               | 2,850                                       | 0.2~0.3               | 2,050                                                   | 0.2~0.3               | 4,450                   | 0.05~0.3              | 4,450                      | 0.05~0.3              |
| 12                 | 2,100                                                                            | 0.18~0.3              | 2,100                                                        | 0.18~0.3              | 1,600                                                                 | 0.18~0.3              | 800                                   | 0.18~0.24             | 650                                                                       | 0.12~0.24             | 2,400                                       | 0.24~0.36             | 1,700                                                   | 0.24~0.36             | 3,700                   | 0.06~0.36             | 3,700                      | 0.06~0.36             |
| 14                 | 1,800                                                                            | 0.21~0.35             | 1,800                                                        | 0.21~0.35             | 900                                                                   | 0.21~0.35             | 700                                   | 0.21~0.28             | 550                                                                       | 0.14~0.28             | 2,050                                       | 0.28~0.42             | 1,500                                                   | 0.28~0.42             | 3,200                   | 0.07~0.42             | 3,200                      | 0.07~0.42             |
| 16                 | 1,600                                                                            | 0.24~0.4              | 1,600                                                        | 0.24~0.4              | 800                                                                   | 0.24~0.4              | 600                                   | 0.24~0.32             | 500                                                                       | 0.16~0.32             | 1,800                                       | 0.32~0.48             | 1,300                                                   | 0.32~0.48             | 2,800                   | 0.08~0.48             | 2,800                      | 0.08~0.48             |
| 18                 | 1,400                                                                            | 0.27~0.45             | 1,400                                                        | 0.27~0.45             | 700                                                                   | 0.27~0.45             | 550                                   | 0.27~0.36             | 450                                                                       | 0.18~0.36             | 1,600                                       | 0.36~0.54             | 1,150                                                   | 0.36~0.54             | 2,500                   | 0.09~0.54             | 2,500                      | 0.09~0.54             |
| 20                 | 1,250                                                                            | 0.3~0.5               | 1,250                                                        | 0.3~0.5               | 650                                                                   | 0.3~0.5               | 500                                   | 0.3~0.4               | 400                                                                       | 0.2~0.4               | 1,450                                       | 0.4~0.6               | 1,050                                                   | 0.4~0.6               | 2,250                   | 0.1~0.6               | 2,250                      | 0.1~0.6               |

# CARBIDE DRILLS CUTTING CONDITIONS

## ADFO-3D

| Work Material      | Low Carbon Steel-Alloy Steel<br>(C<0.3%)<br>S400-SCM<br>~710N/mm <sup>2</sup> |                       | Carbon Steel<br>S35C S50C<br>~210HB<br>~710N/mm <sup>2</sup> |                       | Alloy Steel<br>SCM SCr SNCM<br>28~35HRC<br>900~1,100N/mm <sup>2</sup> |                       | Plastic Mold Steel<br>NAK80<br>~40HRC |                       | Stainless Steel<br>SUS304<br>480~800N/mm <sup>2</sup> |                       | Special Alloy Steel-Hardened Steel-Prehardened Steel<br>SKD61<br>~50HRC |                       | Cast Iron<br>FC250<br>~350N/mm <sup>2</sup> |                       | Ductile Cast Iron<br>FCD600<br>400~600N/mm <sup>2</sup> |                       | Aluminum<br>A5052-A7075 |                       | Aluminum Alloy<br>AC4C-ADC |                       |
|--------------------|-------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------|-----------------------|-------------------------------------------------------------------------|-----------------------|---------------------------------------------|-----------------------|---------------------------------------------------------|-----------------------|-------------------------|-----------------------|----------------------------|-----------------------|
| Cutting Speed      | 80 ~ 120m/min                                                                 |                       | 80 ~ 120m/min                                                |                       | 50 ~ 90m/min                                                          |                       | 20 ~ 40m/min                          |                       | 40 ~ 60m/min                                          |                       | 20 ~ 30m/min                                                            |                       | 80 ~ 120m/min                               |                       | 60 ~ 100m/min                                           |                       | 120~200m/min            |                       | 120~200m/min               |                       |
| Drill Dia.<br>(mm) | Speed<br>(min-1)                                                              | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                             | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                                      | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                      | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                      | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                                        | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                            | Feed Rate<br>(mm/rev) | Speed<br>(min-1)                                        | Feed Rate<br>(mm/rev) | Speed<br>(min-1)        | Feed Rate<br>(mm/rev) | Speed<br>(min-1)           | Feed Rate<br>(mm/rev) |
| 3                  | 10,600                                                                        | 0.045~0.09            | 10,600                                                       | 0.045~0.09            | 7,450                                                                 | 0.045~0.09            | 3,200                                 | 0.045~0.06            | 5,300                                                 | 0.045~0.09            | 2,650                                                                   | 0.045~0.06            | 10,600                                      | 0.045~0.09            | 8,500                                                   | 0.045~0.09            | 17,000                  | 0.045~0.09            | 17,000                     | 0.045~0.09            |
| 4                  | 8,000                                                                         | 0.045~0.12            | 8,000                                                        | 0.045~0.12            | 5,550                                                                 | 0.045~0.12            | 2,400                                 | 0.045~0.08            | 4,000                                                 | 0.045~0.12            | 2,000                                                                   | 0.045~0.08            | 8,000                                       | 0.045~0.12            | 6,350                                                   | 0.045~0.12            | 12,750                  | 0.045~0.12            | 12,750                     | 0.045~0.12            |
| 6                  | 5,300                                                                         | 0.06~0.18             | 5,300                                                        | 0.06~0.18             | 3,700                                                                 | 0.06~0.18             | 1,600                                 | 0.06~0.12             | 2,650                                                 | 0.06~0.18             | 1,350                                                                   | 0.06~0.12             | 5,300                                       | 0.06~0.18             | 4,250                                                   | 0.06~0.18             | 8,500                   | 0.06~0.18             | 8,500                      | 0.06~0.18             |
| 8                  | 4,000                                                                         | 0.08~0.24             | 4,000                                                        | 0.08~0.24             | 2,800                                                                 | 0.08~0.24             | 1,200                                 | 0.08~0.16             | 2,000                                                 | 0.08~0.24             | 1,000                                                                   | 0.08~0.16             | 4,000                                       | 0.08~0.24             | 3,200                                                   | 0.08~0.24             | 6,350                   | 0.08~0.24             | 6,350                      | 0.08~0.24             |
| 10                 | 3,200                                                                         | 0.1~0.3               | 3,200                                                        | 0.1~0.3               | 2,250                                                                 | 0.1~0.3               | 950                                   | 0.1~0.2               | 1,600                                                 | 0.1~0.3               | 800                                                                     | 0.1~0.2               | 3,200                                       | 0.1~0.3               | 2,550                                                   | 0.1~0.3               | 5,100                   | 0.1~0.3               | 5,100                      | 0.1~0.3               |
| 12                 | 2,650                                                                         | 0.12~0.36             | 2,650                                                        | 0.12~0.36             | 1,850                                                                 | 0.12~0.36             | 800                                   | 0.12~0.24             | 1,350                                                 | 0.12~0.36             | 650                                                                     | 0.12~0.24             | 2,650                                       | 0.12~0.36             | 2,100                                                   | 0.12~0.36             | 4,250                   | 0.12~0.36             | 4,250                      | 0.12~0.36             |
| 14                 | 2,250                                                                         | 0.14~0.42             | 2,250                                                        | 0.14~0.42             | 1,600                                                                 | 0.14~0.42             | 700                                   | 0.14~0.28             | 1,150                                                 | 0.14~0.42             | 550                                                                     | 0.14~0.28             | 2,250                                       | 0.14~0.42             | 1,800                                                   | 0.14~0.42             | 3,650                   | 0.14~0.42             | 3,650                      | 0.14~0.42             |
| 16                 | 2,000                                                                         | 0.16~0.48             | 2,000                                                        | 0.16~0.48             | 1,400                                                                 | 0.16~0.48             | 600                                   | 0.16~0.32             | 1,000                                                 | 0.16~0.48             | 500                                                                     | 0.16~0.32             | 2,000                                       | 0.16~0.48             | 1,600                                                   | 0.16~0.48             | 3,200                   | 0.16~0.48             | 3,200                      | 0.16~0.48             |
| 18                 | 1,750                                                                         | 0.18~0.54             | 1,750                                                        | 0.18~0.54             | 1,250                                                                 | 0.18~0.54             | 550                                   | 0.18~0.36             | 900                                                   | 0.18~0.54             | 450                                                                     | 0.18~0.36             | 1,750                                       | 0.18~0.54             | 1,400                                                   | 0.18~0.54             | 2,850                   | 0.18~0.54             | 2,850                      | 0.18~0.54             |
| 20                 | 1,600                                                                         | 0.2~0.6               | 1,600                                                        | 0.2~0.6               | 1,100                                                                 | 0.2~0.6               | 500                                   | 0.2~0.4               | 800                                                   | 0.2~0.6               | 400                                                                     | 0.2~0.4               | 1,600                                       | 0.2~0.6               | 1,250                                                   | 0.2~0.6               | 2,550                   | 0.2~0.6               | 2,550                      | 0.2~0.6               |

- Water-soluble coolant may be applied as noted in the above table only under the premise that the work surface has been flattened by milling.
- Use a rigid and precise machine and holder.
- Please minimize overhang length as much as possible during machining.
- Adjust the rotational speed and the feed in accordance with conditions such as the machining shape, machine rigidity, or work holding.
- Please set up the drill so that the runout of the cutting edge is under 0.02 mm.
- Please select a cutting fluid that is most suitable for the work material with minimal smoke formation.
- When machining an inclined plane, adjust the rotational speed and the feed in accordance with the angle of the incline ( $\beta$ ).
  - When the machining incline angle ( $\beta$ ) is less than 30°, please reduce the feed to 40-60%.
  - When the machining incline angle ( $\beta$ ) is over 30°, please reduce the speed to 60-80%, the feed to 40-60%.
- Please use step drilling in pre-drilled holes to improve cutting chip separation.
- If it is necessary to ensure the locating precision of the hole to be machined, adjust the rotational speed and the feed as indicated above (in accordance with the machining precision requirement).
- Please always use the appropriate cutting fluid recommended by the cutting fluid manufacturer in the machining of magnesium alloys. Be cautious with the cutting chips as they are highly flammable and may pose a serious fire risk if not properly handled.



# CARBIDE DRILLS CUTTING CONDITIONS

## EX - SUS - GDS / EX - SUS - GDR

| Work Material      | Stainless Steel               |                       |                               |                       |                               |                       |                               |                       | Aluminum<br>A5052-7075        | Alminum<br>Alloy Castings<br>AC4C-ADC | Copper<br>Copper Alloy<br>C1020-2600 | Low Carbon Steel<br>Mild Steel<br>S15C-SS400<br>~500n/mm2 |                               |                       |                               |                       |
|--------------------|-------------------------------|-----------------------|-------------------------------|-----------------------|-------------------------------|-----------------------|-------------------------------|-----------------------|-------------------------------|---------------------------------------|--------------------------------------|-----------------------------------------------------------|-------------------------------|-----------------------|-------------------------------|-----------------------|
|                    | Austenitic<br>SUS304-200      |                       | Martensitic<br>SUS420-440     |                       | Ferritic<br>SUS430-405        |                       | Precipitation<br>SUS630-631   |                       |                               |                                       |                                      |                                                           |                               |                       |                               |                       |
| Cutting Speed      | 12 ~ 15m/min                  |                       | 15 ~ 20m/min                  |                       | 15 ~ 20m/min                  |                       | 8 ~ 12m/min                   |                       | 32 ~ 63m/min                  |                                       | 63 ~ 100m/min                        |                                                           | 25 ~ 50m/min                  |                       | 32 ~ 40m/min                  |                       |
| Drill Dia.<br>(mm) | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev)                 | Speed<br>(min <sup>-1</sup> )        | Feed Rate<br>(mm/rev)                                     | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/rev) |
| 1                  | 4,460                         | 0.01 ~ 0.018          | 5,550                         | 0.02 ~ 0.04           | 5,550                         | 0.01 ~ 0.03           | 3,200                         | 0.01 ~ 0.03           | 15,000                        | 0.02 ~ 0.06                           | 25,000                               | 0.02 ~ 0.06                                               | 12,000                        | 0.01 ~ 0.03           | 10,000                        | 0.02 ~ 0.05           |
| 2                  | 2,230                         | 0.02 ~ 0.036          | 2,850                         | 0.05 ~ 0.07           | 2,850                         | 0.03 ~ 0.05           | 1,600                         | 0.03 ~ 0.05           | 8,000                         | 0.04 ~ 0.12                           | 10,000                               | 0.04 ~ 0.12                                               | 5,100                         | 0.04 ~ 0.06           | 5,700                         | 0.06 ~ 0.09           |
| 3                  | 1,490                         | 0.03 ~ 0.054          | 1,900                         | 0.06 ~ 0.09           | 1,900                         | 0.04 ~ 0.06           | 1,100                         | 0.04 ~ 0.06           | 5,300                         | 0.06 ~ 0.18                           | 6,700                                | 0.06 ~ 0.18                                               | 3,400                         | 0.06 ~ 0.09           | 3,850                         | 0.1 ~ 0.13            |
| 4                  | 1,030                         | 0.04 ~ 0.08           | 1,450                         | 0.08 ~ 0.12           | 1,450                         | 0.06 ~ 0.08           | 800                           | 0.06 ~ 0.08           | 4,000                         | 0.08 ~ 0.24                           | 6,400                                | 0.08 ~ 0.24                                               | 2,550                         | 0.08 ~ 0.11           | 2,900                         | 0.11 ~ 0.15           |
| 5                  | 830                           | 0.05 ~ 0.1            | 1,150                         | 0.12 ~ 0.15           | 1,150                         | 0.08 ~ 0.1            | 650                           | 0.08 ~ 0.1            | 3,200                         | 0.1 ~ 0.3                             | 5,000                                | 0.1 ~ 0.3                                                 | 2,050                         | 0.1 ~ 0.13            | 2,260                         | 0.12 ~ 0.18           |
| 6                  | 690                           | 0.06 ~ 0.12           | 950                           | 0.15 ~ 0.18           | 950                           | 0.09 ~ 0.12           | 550                           | 0.09 ~ 0.12           | 2,700                         | 0.12 ~ 0.36                           | 4,200                                | 0.12 ~ 0.36                                               | 1,700                         | 0.12 ~ 0.15           | 1,900                         | 0.13 ~ 0.19           |
| 8                  | 480                           | 0.08 ~ 0.16           | 720                           | 0.2 ~ 0.24            | 720                           | 0.12 ~ 0.16           | 400                           | 0.12 ~ 0.16           | 2,000                         | 0.16 ~ 0.45                           | 3,200                                | 0.16 ~ 0.45                                               | 1,250                         | 0.16 ~ 0.2            | 1,400                         | 0.17 ~ 0.24           |
| 10                 | 380                           | 0.10 ~ 0.2            | 570                           | 0.25 ~ 0.3            | 570                           | 0.15 ~ 0.2            | 320                           | 0.15 ~ 0.2            | 1,600                         | 0.2 ~ 0.55                            | 2,500                                | 0.2 ~ 0.55                                                | 1,000                         | 0.2 ~ 0.25            | 1,120                         | 0.2 ~ 0.28            |
| 12                 | 320                           | 0.12 ~ 0.24           | 480                           | 0.3 ~ 0.36            | 480                           | 0.18 ~ 0.24           | 280                           | 0.18 ~ 0.24           | 1,350                         | 0.24 ~ 0.66                           | 2,100                                | 0.24 ~ 0.66                                               | 850                           | 0.24 ~ 0.3            | 950                           | 0.24 ~ 0.34           |
| 13                 | 370                           | 0.26 ~ 0.36           | 440                           | 0.32 ~ 0.4            | 440                           | 0.2 ~ 0.26            | 250                           | 0.2 ~ 0.26            | 1,250                         | 0.25 ~ 0.72                           | 2,000                                | 0.25 ~ 0.72                                               | 780                           | 0.26 ~ 0.32           | 880                           | 0.26 ~ 0.36           |
| 14                 | 340                           | 0.28 ~ 0.39           | 410                           | 0.35 ~ 0.45           | 410                           | 0.21 ~ 0.3            | 225                           | 0.21 ~ 0.3            | 1,140                         | 0.27 ~ 0.74                           | 1,850                                | 0.27 ~ 0.74                                               | 730                           | 0.26 ~ 0.34           | 820                           | 0.27 ~ 0.39           |
| 15                 | 320                           | 0.29 ~ 0.4            | 380                           | 0.36 ~ 0.48           | 380                           | 0.22 ~ 0.31           | 210                           | 0.22 ~ 0.31           | 1,060                         | 0.29 ~ 0.8                            | 1,700                                | 0.29 ~ 0.8                                                | 680                           | 0.26 ~ 0.36           | 760                           | 0.28 ~ 0.42           |
| 16                 | 300                           | 0.3 ~ 0.43            | 355                           | 0.37 ~ 0.5            | 355                           | 0.23 ~ 0.32           | 200                           | 0.23 ~ 0.32           | 1,000                         | 0.3 ~ 0.83                            | 1,600                                | 0.3 ~ 0.83                                                | 640                           | 0.27 ~ 0.37           | 720                           | 0.29 ~ 0.43           |
| 17                 | 280                           | 0.31 ~ 0.45           | 335                           | 0.38 ~ 0.52           | 335                           | 0.24 ~ 0.34           | 185                           | 0.24 ~ 0.34           | 940                           | 0.31 ~ 0.88                           | 1,500                                | 0.31 ~ 0.88                                               | 600                           | 0.28 ~ 0.39           | 675                           | 0.3 ~ 0.46            |
| 18                 | 265                           | 0.32 ~ 0.47           | 320                           | 0.39 ~ 0.54           | 320                           | 0.25 ~ 0.36           | 175                           | 0.25 ~ 0.36           | 885                           | 0.32 ~ 0.94                           | 1,450                                | 0.32 ~ 0.94                                               | 570                           | 0.29 ~ 0.41           | 640                           | 0.32 ~ 0.49           |
| 19                 | 250                           | 0.33 ~ 0.48           | 300                           | 0.4 ~ 0.55            | 300                           | 0.25 ~ 0.38           | 170                           | 0.25 ~ 0.38           | 840                           | 0.34 ~ 0.97                           | 1,350                                | 0.34 ~ 0.97                                               | 540                           | 0.3 ~ 0.43            | 600                           | 0.33 ~ 0.51           |
| 20                 | 240                           | 0.34 ~ 0.5            | 285                           | 0.4 ~ 0.56            | 285                           | 0.26 ~ 0.4            | 160                           | 0.26 ~ 0.4            | 800                           | 0.36 ~ 1                              | 1,300                                | 0.36 ~ 1                                                  | 510                           | 0.3 ~ 0.44            | 570                           | 0.34 ~ 0.52           |
| 22                 | 215                           | 0.36 ~ 0.54           | 260                           | 0.42 ~ 0.61           | 260                           | 0.28 ~ 0.44           | 145                           | 0.28 ~ 0.44           | 730                           | 0.39 ~ 1.08                           | 1,200                                | 0.39 ~ 1.08                                               | 460                           | 0.32 ~ 0.48           | 520                           | 0.37 ~ 0.57           |
| 24                 | 200                           | 0.38 ~ 0.57           | 240                           | 0.43 ~ 0.65           | 240                           | 0.3 ~ 0.48            | 135                           | 0.3 ~ 0.48            | 670                           | 0.41 ~ 1.15                           | 1,100                                | 0.41 ~ 1.15                                               | 420                           | 0.33 ~ 0.52           | 480                           | 0.39 ~ 0.61           |
| 26                 | 185                           | 0.4 ~ 0.6             | 220                           | 0.44 ~ 0.7            | 220                           | 0.32 ~ 0.52           | 120                           | 0.32 ~ 0.52           | 620                           | 0.44 ~ 1.22                           | 1,000                                | 0.44 ~ 1.22                                               | 390                           | 0.34 ~ 0.56           | 450                           | 0.41 ~ 0.66           |
| 28                 | 170                           | 0.41 ~ 0.63           | 200                           | 0.45 ~ 0.74           | 200                           | 0.34 ~ 0.56           | 115                           | 0.34 ~ 0.56           | 570                           | 0.46 ~ 1.29                           | 930                                  | 0.46 ~ 1.29                                               | 360                           | 0.35 ~ 0.59           | 410                           | 0.43 ~ 0.71           |
| 30                 | 160                           | 0.42 ~ 0.66           | 190                           | 0.45 ~ 0.78           | 190                           | 0.36 ~ 0.6            | 105                           | 0.36 ~ 0.6            | 530                           | 0.48 ~ 1.35                           | 870                                  | 0.48 ~ 1.35                                               | 340                           | 0.36 ~ 0.63           | 380                           | 0.45 ~ 0.75           |
| 32                 | 150                           | 0.43 ~ 0.7            | 180                           | 0.45 ~ 0.82           | 180                           | 0.37 ~ 0.64           | 100                           | 0.37 ~ 0.64           | 500                           | 0.5 ~ 1.42                            | 820                                  | 0.5 ~ 1.42                                                | 320                           | 0.38 ~ 0.67           | 360                           | 0.47 ~ 0.8            |
| 40                 | 120                           | 0.44 ~ 0.76           | 140                           | 0.48 ~ 0.88           | 140                           | 0.4 ~ 0.7             | 80                            | 0.4 ~ 0.7             | 400                           | 0.6 ~ 1.4                             | 650                                  | 0.6 ~ 1.4                                                 | 250                           | 0.4 ~ 0.8             | 280                           | 0.48 ~ 1              |
| 50                 | 95                            | 0.45 ~ 0.8            | 115                           | 0.5 ~ 0.9             | 115                           | 0.45 ~ 0.75           | 60                            | 0.45 ~ 0.75           | 320                           | 0.7 ~ 0.75                            | 500                                  | 0.7                                                       | 200                           | 0.45 ~ 1              | 230                           | 0.5 ~ 1.2             |

- The indicated speeds and feeds are for drilling with **water-soluble oil**.
- The most suitable cutting fluid is water-soluble high density oil (5~10 times dilution)
- When drilling cast surface and black (ie.not ground surface), reduce drilling speed by 20%.
- For drilling depth>3D.reduce drilling speed (using the table below).
- Step feeding is required for drilling depth>4D.
- When using non-water-soluble oil or water-soluble oil (over 10 times dilution), reduce the drilling speed by 20%.

| Depth of Hole                  | D : drill dia |      |      |
|--------------------------------|---------------|------|------|
|                                | ≤4D           | ≤5D  | ≤6D  |
| Coefficient for reducing speed | ×0.9          | ×0.8 | ×0.8 |

# CARBIDE DRILLS CUTTING CONDITIONS

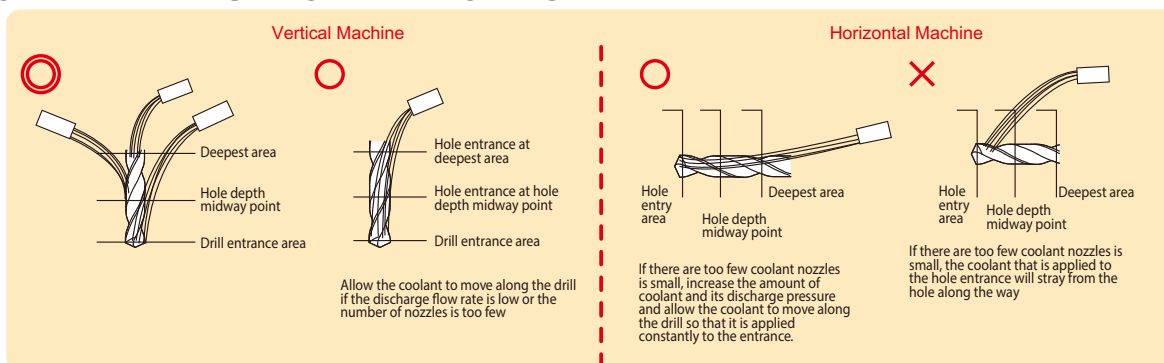
## TDXL 10D / 15D / 20D

| Work Material      | Carbon Steel<br>S35C, S50C<br>~210HB<br>500 ~ 710N/mm <sup>2</sup> |                       | Alloy Steel<br>SCM, SCr, SNCM<br>16 ~ 28HRC<br>710 ~ 900N/mm <sup>2</sup> |                       | Tool Steels Die Steel(unquenched)<br>SKD, SK, DH31, DAC<br>710 ~ 900N/mm <sup>2</sup> |                       | Cast Iron<br>FC250<br>~ 350N/mm <sup>2</sup> |                       | Ductile Cast Iron<br>FCD450, FCD600<br>400 ~ 600N/mm <sup>2</sup> |                       |
|--------------------|--------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------|-----------------------|----------------------------------------------|-----------------------|-------------------------------------------------------------------|-----------------------|
| Cutting Speed      | 20 ~ 24 m/min                                                      |                       | 18 ~ 22 m/min                                                             |                       | 12 ~ 16 m/min                                                                         |                       | 18 ~ 24 m/min                                |                       | 16 ~ 20 m/min                                                     |                       |
| Drill Dia.<br>(mm) | Speed<br>(min <sup>-1</sup> )                                      | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                             | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                                         | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                | Feed Rate<br>(mm/rev) | Speed<br>(min <sup>-1</sup> )                                     | Feed Rate<br>(mm/rev) |
| 1.6                | 4,400                                                              | 0.016 ~ 0.03          | 4,000                                                                     | 0.016 ~ 0.03          | 2,800                                                                                 | 0.016 ~ 0.03          | 4,200                                        | 0.03 ~ 0.05           | 3,600                                                             | 0.01 ~ 0.03           |
| 2                  | 3,500                                                              | 0.02 ~ 0.05           | 3,200                                                                     | 0.02 ~ 0.04           | 2,200                                                                                 | 0.02 ~ 0.04           | 3,300                                        | 0.04 ~ 0.06           | 2,900                                                             | 0.01 ~ 0.04           |
| 3                  | 2,300                                                              | 0.03 ~ 0.08           | 2,100                                                                     | 0.03 ~ 0.08           | 1,500                                                                                 | 0.03 ~ 0.07           | 2,200                                        | 0.06 ~ 0.1            | 1,900                                                             | 0.02 ~ 0.08           |
| 4                  | 1,800                                                              | 0.04 ~ 0.1            | 1,600                                                                     | 0.04 ~ 0.1            | 1,100                                                                                 | 0.04 ~ 0.09           | 1,700                                        | 0.08 ~ 0.13           | 1,400                                                             | 0.02 ~ 0.1            |
| 5                  | 1,400                                                              | 0.05 ~ 0.13           | 1,300                                                                     | 0.05 ~ 0.13           | 900                                                                                   | 0.05 ~ 0.12           | 1,300                                        | 0.1 ~ 0.16            | 1,100                                                             | 0.03 ~ 0.13           |
| 6                  | 1,200                                                              | 0.06 ~ 0.15           | 1,100                                                                     | 0.06 ~ 0.15           | 750                                                                                   | 0.06 ~ 0.14           | 1,100                                        | 0.12 ~ 0.19           | 950                                                               | 0.04 ~ 0.15           |
| 8                  | 900                                                                | 0.08 ~ 0.2            | 800                                                                       | 0.08 ~ 0.2            | 550                                                                                   | 0.08 ~ 0.18           | 850                                          | 0.16 ~ 0.26           | 700                                                               | 0.05 ~ 0.2            |
| 10                 | 700                                                                | 0.1 ~ 0.25            | 650                                                                       | 0.1 ~ 0.25            | 450                                                                                   | 0.1 ~ 0.23            | 650                                          | 0.2 ~ 0.32            | 550                                                               | 0.06 ~ 0.25           |
| 12                 | 600                                                                | 0.12 ~ 0.3            | 550                                                                       | 0.12 ~ 0.3            | 350                                                                                   | 0.12 ~ 0.28           | 550                                          | 0.24 ~ 0.38           | 500                                                               | 0.07 ~ 0.3            |

- The indicated speeds and feeds are for drilling with water-soluble oil.  
When using non-water-soluble oil, set the drilling speed, reduce the drilling speed by 20-30%.
- The most suitable cutting fluid is water-soluble oil (10-30 times dilution).
- If chips evacuation is difficult while non-step drilling, we recommend to add steps.
- If the number of nozzles on a horizontal machine center is too few or the discharge flow rate is insufficient, perform step-feed drilling. In this case, we recommend a

- step-feed method in which the drill is retracted to the entrance of the hole.  
5. Pilot or centering is necessary.  
1) For a pilot hole, select 0.05mm to 0.1mm larger size drill than TDXL. For deep hole, we recommend drilling a deeper pilot hole, 3 to 5D in depth.  
2) When centering it is recommended leading drill has a 130 degree point angle.  
6. **[TDXL 25D, 30D only] Performs 1D-3D step drilling.**

## COOLANT APPLICATION KEY POINTS

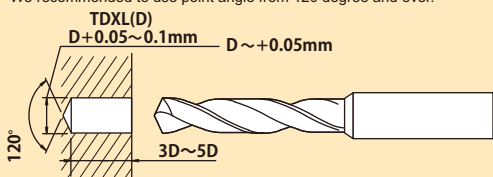


### For 15D, 20D, 25D and 30D Type

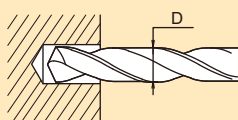
#### ① Make a pilot hole.

Recommended drill : EX-GDS

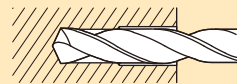
- For a pilot hole, select 0.05mm to 0.1mm larger size drill than TDXL. For deep hole, we recommend to drill deeper pilot hole.
- For a vertical machining center. When drilling many holes in a small area with vertical machining center. We recommend only centering by 130 degree point angle LDS to avoid chips building up in pilot holes, which can cause drill chipping or breakage. When drilling the pilot hole it is recommended to make the hole 3xD in depth, at a feed rate equal to (Drill  $\times$  0.01) per revolution. Straightness will be less accurate than a comparable operation in a horizontal machining center.
- We recommended to use point angle from 120 degree and over.



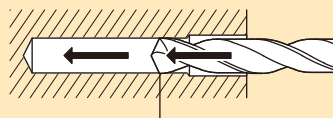
#### ② Insert the TDXL into a pilot hole with low revolution. (~500min<sup>-1</sup>)



#### ③ Start supplying the coolant.

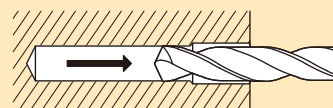


- Increase the revolution to the designated speed and start drilling.  
At the start of drilling, set the feed rate to 1% of the drill diameter and increase the feed rate when the depth reaches between 3xD and 5xD.



1 ~ 2% D! 3 ~ 5D 1% D  
Increase feed rate to between 1 and 2% D! 1% D between 3xD and 5xD

- After drilling, move the drill away from the bottom of the hole; then reduce its speed while pulling it out of the hole.



# A SIGMA CUTTING CONDITIONS

## A - SIGMA - SFT

|                                          |                  | Cutting Speed (m/min) |      |                     |    |       |    |    |    |       |    |    |  |  |  |  |  |  |
|------------------------------------------|------------------|-----------------------|------|---------------------|----|-------|----|----|----|-------|----|----|--|--|--|--|--|--|
|                                          |                  | 0                     | 5    | 10                  | 15 | 20    | 30 | 40 | 50 | 60    | 70 | 75 |  |  |  |  |  |  |
| Medium Carbon Steel<br>High Carbon Steel | S45C             |                       |      | 5—15                |    | 15—50 |    |    |    | 50—75 |    |    |  |  |  |  |  |  |
| Alloy Steel                              | SCM              |                       | 5—10 | 10—15               |    | 15—30 |    |    |    |       |    |    |  |  |  |  |  |  |
| Mild Steel                               | SS400            |                       |      | 5—20 <sup>(*)</sup> |    |       |    |    |    |       |    |    |  |  |  |  |  |  |
| Stainless Steel                          | SUS304<br>SUS420 |                       | 5—10 | 10—15               |    |       |    |    |    |       |    |    |  |  |  |  |  |  |
| Aluminum                                 | AC<br>ADC        |                       |      |                     |    | 5—50  |    |    |    |       |    |    |  |  |  |  |  |  |
| Ductile Cast iron                        | FCD              |                       |      |                     |    | 5—50  |    |    |    |       |    |    |  |  |  |  |  |  |

## A - SIGMA - POT

|                                          |                  | Cutting Speed (m/min) |      |      |       |       |    |       |    |       |    |    |  |  |  |  |  |  |
|------------------------------------------|------------------|-----------------------|------|------|-------|-------|----|-------|----|-------|----|----|--|--|--|--|--|--|
|                                          |                  | 0                     | 5    | 10   | 15    | 20    | 30 | 40    | 50 | 60    | 70 | 75 |  |  |  |  |  |  |
| Medium Carbon Steel<br>High Carbon Steel | S45C             |                       |      | 5—15 |       | 15—50 |    |       |    | 50—75 |    |    |  |  |  |  |  |  |
| Alloy Steel                              | SCM              |                       | 5—10 |      | 10—30 |       |    | 30—50 |    |       |    |    |  |  |  |  |  |  |
| Mild Steel                               | SS400            |                       |      | 5—15 |       | 15—50 |    |       |    | 50—75 |    |    |  |  |  |  |  |  |
| Stainless Steel                          | SUS304<br>SUS420 |                       | 5—15 |      | 15—30 |       |    |       |    |       |    |    |  |  |  |  |  |  |
| Aluminum                                 | AC<br>ADC        |                       |      |      |       | 5—50  |    |       |    |       |    |    |  |  |  |  |  |  |
| Ductile Cast iron                        | FCD              |                       |      |      |       | 5—50  |    |       |    |       |    |    |  |  |  |  |  |  |

# RECOMMENDED CUTTING SPEEDS AND LUBRICANTS

This chart shows the recommended cutting speeds and cutting fluids. Tap material, type of tap, chamfer length, dimension of drill hole, work materials and cutting fluids are important factors for determining suitable cutting speed.

Lubrication, cooling, capability and adhesion resistance are the three important factors effecting cutting fluid.

RECOMMENDED STANDARD CUTTING SPEEDS AND APPLICATION OF CUTTING FLUIDS

| WORK MATERIAL                          |                           | CUTTING SPEED (m/min) |                  |                    |                      |                |                      |                | CUTTING FLUIDS    |               |          |     |
|----------------------------------------|---------------------------|-----------------------|------------------|--------------------|----------------------|----------------|----------------------|----------------|-------------------|---------------|----------|-----|
|                                        |                           | ※STRAIGHT FLUTEDTAP   | SPIRAL FLUTEDTAP | ※SPIRAL POINTEDTAP | ※TUNGSTEN CARBIDETAP | ※FLUTELESS TAP | HIGHSPEED SYNCHROTAP | PIPE THREADTAP | NON-WATER-SOLUBLE | WATER-SOLUBLE | SEMI-DRY | DRY |
| LOW TENSILE STRENGTH STEEL             | ≤ C0.25%                  | 8 ~ 13                |                  | 15 ~ 25            | —                    | 8 ~ 13         | 27 ~ 32              | 3 ~ 6          | ◎                 | ○             | —        | —   |
| MEDIUM TENSILE STRENGTH STEEL          | C0.25 ~ 0.40%             | 7 ~ 12                | 7 ~ 12           | 10 ~ 15            | —                    | 7 ~ 10         | 27 ~ 32              | 3 ~ 6          | ◎                 | ○             | —        | —   |
| HIGH TENSILE STRENGTH STEEL            | ≥ C0.45%                  | 6 ~ 9                 |                  | 8 ~ 13             | —                    | 5 ~ 8          | 22 ~ 27              | 2 ~ 5          | ◎                 | ○             | —        | —   |
| ALLOY STEEL                            | SCM                       | 7 ~ 12                | 7 ~ 12           | 10 ~ 15            | —                    | 5 ~ 8          | 22 ~ 27              | 2 ~ 5          | ◎                 | △             | —        | —   |
| HARDENED STEEL                         |                           | 3 ~ 5<br>(4 ~ 8)      |                  | 4 ~ 6<br>(6 ~ 10)  | —                    | —              | —                    | 2 ~ 5          | ◎                 | △             | —        | —   |
| STAINLESS STEEL                        | SUS                       | 4 ~ 7                 | 5 ~ 8            | 8 ~ 13             | —                    | 5 ~ 10         | —                    | 3 ~ 6          | ◎                 | ○             | —        | —   |
| PRECIPITATION HARDENED STAINLESS STEEL | SUS630<br>SUS631          | 3 ~ 5                 |                  | 4 ~ 6              | —                    | —              | —                    | 2 ~ 5          | ◎                 | —             | —        | —   |
| TOOL STEEL                             | SKD                       | 6 ~ 9                 | 6 ~ 9            | 7 ~ 10             | —                    | —              | —                    | 2 ~ 5          | ◎                 | —             | —        | —   |
| CAST STEEL                             | SC                        | 6 ~ 11                |                  | 10 ~ 15            | —                    | —              | 17 ~ 22              | 2 ~ 5          | ◎                 | ○             | —        | —   |
| CAST IRON                              | FC                        | 10 ~ 15               | —                | —                  | 10 ~ 20              | —              | —                    | 2 ~ 5          | ◎                 | ○             | ○        | ○   |
| DUCTILE CAST IRON                      |                           | 7 ~ 12                |                  | 10 ~ 20            | 10 ~ 20              | —              | —                    | 4 ~ 8          | ◎                 | ○             | ○        | —   |
| COPPER                                 | Cu                        | 6 ~ 9                 | 6 ~ 11           | 7 ~ 12             | 10 ~ 20              | 7 ~ 12         | 27 ~ 32              | 2 ~ 5          | ○                 | ○             | —        | —   |
| BRASS BRASS CASTING                    | Bs· BsC                   | 10 ~ 15               |                  | 15 ~ 25            | 15 ~ 25              | 7 ~ 12         | 27 ~ 32              | 5 ~ 10         | ○                 | ○             | ○        | ○   |
| BRONZE BRONZE CASTING                  |                           | 6 ~ 11                | 6 ~ 11           | 10 ~ 20            | 10 ~ 20              | 7 ~ 12         | —                    | 6 ~ 11         | ○                 | ○             | —        | —   |
| ALUMINUM ROLLED STEEL                  | AL                        | 10 ~ 20               |                  | 15 ~ 25            | —                    | 10 ~ 20        | 100 ~ 300            | 5 ~ 10         | ◎                 | ○             | —        | —   |
| ALUMINUM ALLOY CASTING                 | AC· ADC                   | 10 ~ 15               | 10 ~ 15          | 15 ~ 20            | 10 ~ 20              | 10 ~ 15        | 80 ~ 300             | 10 ~ 15        | ◎                 | ○             | —        | —   |
| MAGNESIUM ALLOY CASTING                | MC                        | 7 ~ 12                |                  | 10 ~ 15            | 10 ~ 20              | —              | —                    | 10 ~ 15        | ◎                 | ○             | —        | —   |
| ZINC ALLOY CASTING                     | ZDC                       | 7 ~ 12                | 7 ~ 12           | 10 ~ 15            | 10 ~ 20              | 7 ~ 12         | 27 ~ 100             | 10 ~ 15        | ◎                 | ○             | —        | —   |
| THERMO SETTING PLASTIC                 | BAKELITE<br>PHENOL· EPOXY | 10 ~ 20               |                  | —                  | 15 ~ 25              | —              | —                    | 5 ~ 10         | —                 | ○             | ○        | ○   |
| THERMO PLASTIC                         | VINYL CHLORIDE<br>NYLON   | 10 ~ 20               | 10 ~ 15          | 10 ~ 20            | 10 ~ 20              | —              | 27 ~ 32              | 5 ~ 10         | —                 | ○             | —        | —   |

1. These are general recommendations which depending upon conditions, may be altered.

2. To select the best taps, please see TAP selection chart.

3. ( ) = recommendation for CPM taps.

※Please apply +30 ~ +50% higher speed for coated tap (Exclude Steam Oxide and Nitride Treatment)

◎IDEAL ○GOOD △APPLICABLE —NOTAPPLICABLE

# CUTTING CONDITIONS

|                                   |          | S-XPFLT-S-XPFS-OIL-XPFL |                              |                       |                |         |           |        |       |         |
|-----------------------------------|----------|-------------------------|------------------------------|-----------------------|----------------|---------|-----------|--------|-------|---------|
| WORKMATERIAL                      |          | CuttingSpeed(m/min)     |                              | Drill for pilot holes |                |         |           |        |       |         |
|                                   |          |                         | OIL-S-XPFL                   |                       |                |         |           |        |       |         |
|                                   |          | 10                      | 20                           | 30                    | S-XPFLT-S-XPFL | MRS-GDL | WX-MS-GDS | ADO-SD | AD-2D | VPH-GDS |
| LOW/MEDIUM TENSILE STRENGTH STEEL | C≤ 0.4%  | 15~40                   | S-XPFLT-S-XPFL<br>OIL-S-XPFL |                       | ◎              | —       | ◎         | ◎      | ◎     | ○       |
| HIGHTENSILE STRENGTH STEEL        | C≥ 0.45% | 15~30                   |                              |                       | ◎              | —       | ○         | ◎      | ◎     | ○       |
| ALLOYSTEEL                        | SCM      | 15~30                   |                              |                       | ◎              | —       | ○         | ◎      | ○     | ○       |
| HARDENEDSTEEL                     | 25~35HRC | 5~20                    |                              |                       | ◎              | —       | —         | ◎      | ○     | ◎       |
| CASTSTEEL                         | SC       | 15~40                   |                              |                       | ○              | —       | —         | ◎      | ○     | ◎       |
| ※ STAINLESSSTEEL                  | SUS      | 5~15                    |                              |                       | ◎ *1           | ◎       | ○         | ◎      | —     | —       |
| ※ COPPER                          | Cu       | 10~30                   |                              |                       | ◎              | —       | ◎         | ○      | ○     | —       |
| ※ BRASS/BRASS CASTING             | B9 BsC   | 10~30                   |                              |                       | ◎              | —       | ◎         | ◎      | ◎     | ◎       |
| ※ ALUMINUM ROLLEDSTELL            | AL       | 20~50                   |                              |                       | ◎              | —       | ◎         | ○      | —     | —       |
| ※ ALUMINUMALLOY CASTING           | AG ADC   | 20~40                   |                              |                       | ◎              | —       | ○         | ○      | ○     | —       |
| ※ ZINCALLOY CASTING               | ZDC      | 10~30                   |                              |                       | ◎              | —       | —         | ○      | ○     | —       |

Note : The indicated speeds and feeds are for tapping with chlorine-free water-soluble coolant.

: Cutting speed is recommended to be reduced by at least 30% in case of M24 and up.

※ : For Stainless Steel to Zinc Alloy Casting on the above, use EX-SUS and NEXUS drill series.

\* 1We recommend using the non-water-soluble fluid or highly lubricated water-soluble fluid for the stainless steels.

Ideal◎ Good○

|                                       |               | CC-SFT                |                |                       |                |
|---------------------------------------|---------------|-----------------------|----------------|-----------------------|----------------|
| WORK MATERIAL                         |               | M2~M6(2FLUTES)        |                | M6(3FLUTES) ~M24      |                |
|                                       |               | Cutting Speed (m/min) | Ideal ◎ Good ○ | Cutting Speed (m/min) | Ideal ◎ Good ○ |
| STAINLESS STEEL (AUSTENITIC-FERRITIC) | SUS304·SUS420 | 6 ~ 10                | ◎              | 6 ~ 10                | ◎              |
| MEDIUM TENSILE STRENGTH STEEL         | S45C          | 25 ~ 35               | ○              | 15 ~ 25               | ○              |
| ALLOY STEEL                           | SCM (30HRC)   | 15 ~ 30               | ◎              | —                     | —              |
| MILD STEEL                            | SS400         | 30 ~ 40               | ○              | —                     | —              |

· When machining steels, please do cyncronised feeding.

| WORK MATERIAL |          | WHR-NI-SFT            |                   |                    |                      |               |                        |                 |                   |               |          |     |
|---------------|----------|-----------------------|-------------------|--------------------|----------------------|---------------|------------------------|-----------------|-------------------|---------------|----------|-----|
|               |          | Cutting Speed (m/min) |                   |                    |                      |               |                        | CUTTING FLUIDS  |                   |               |          |     |
|               |          | STRAIGHT FLUTED TAP   | SPIRAL FLUTED TAP | SPIRAL POINTED TAP | TUNGSTEN CARBIDE TAP | FLUTELESS TAP | HIGH SPEED SYNCHRO TAP | PIPE THREAD TAP | NON-WATER-SOLUBLE | WATER-SOLUBLE | SEMI-DRY | DRY |
| NICKEL ALLOY  | Inconel® | —                     | 1 ~ 3             | 2 ~ 4              | —                    | —             | —                      | —               | ◎                 | —             | —        | —   |

· To machine 3B class internal threads, use synchronized feeding and a milling chuck as measures against the problem of enlarged internal threads.

| WORK MATERIAL  | V-TI-SFT,V-TI-POT     |                   |                    |                      |               |                        |                 |                   |               |          |     |
|----------------|-----------------------|-------------------|--------------------|----------------------|---------------|------------------------|-----------------|-------------------|---------------|----------|-----|
|                | Cutting Speed (m/min) |                   |                    |                      |               |                        |                 | CUTTING FLUIDS    |               |          |     |
|                | STRAIGHT FLUTED TAP   | SPIRAL FLUTED TAP | SPIRAL POINTED TAP | TUNGSTEN CARBIDE TAP | FLUTELESS TAP | HIGH SPEED SYNCHRO TAP | PIPE THREAD TAP | NON-WATER-SOLUBLE | WATER-SOLUBLE | SEMI-DRY | DRY |
| TITANIUM ALLOY | —                     | 3 ~ 5             | 4 ~ 6              | —                    | —             | —                      | —               | ◎                 | ○             | —        | —   |

|                     |            | V-XPM-HT              |                                  |                  |
|---------------------|------------|-----------------------|----------------------------------|------------------|
| WORK MATERIAL       |            | Cutting Speed (m/min) | CUTTING FLUIDS                   | MACHINE          |
| HIGH HARDENED STEEL | 40 ~ 50HRC | 2 ~ 4                 | Water-Soluble, Non-Water-Soluble | Machining Center |
| HIGH HARDENED STEEL | 50 ~ 55HRC | 1 ~ 3                 | Water-Soluble, Non-Water-Soluble | Machining Center |

1.Make sure to select the correct cutting speed and cutting fluids. Tapping paste is not recommended.

2.When you use water-soluble coolant, please select a coolant with better lubrication character.

3.The WH55-OT is designed for machine use only. Tapping by hand will cause chips to get stuck between the tool and the work material, and result in chipping of the taps.



# SPECIAL MADE TOOLS

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STEP DRILL



STEP BURNISHING DRILL



LEFT HAND HELIX DRILL



CARBIDE REAMER



SLOT CUTTER



NICKS AND CORNER RADIUS



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FIR-TREE CUTTER



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