# G-J

SUMITOMO
CARBIDE - CBN - DIAMOND

20|21

# MILLING TOOLS

Milling Cutters | Indexable Endmills | Solid Carbide Endmills

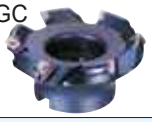
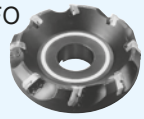
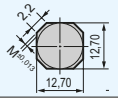
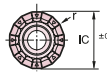
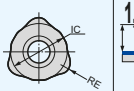
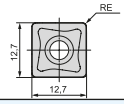
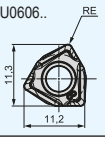
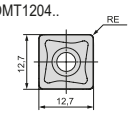
SUMITOMO ELECTRIC GROUP

# Milling Cutters

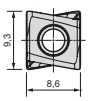
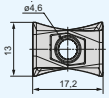
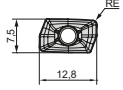
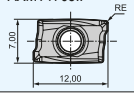
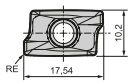
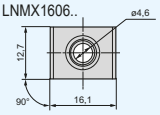
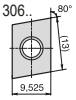
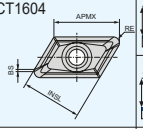
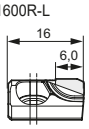
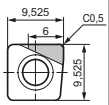
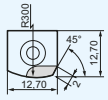
G

G1–G70

# Face Mill and Shoulder Mill
# Selection Guide

| Application | Cutter Type | Series | Insert Type | Approach Angle / Max. Depth of Cut (mm) | Cutter Diameter (mm) | Application: Face Milling – General Purpose | Face Milling – Finishing | Face Milling – High Feed | Shoulder Milling | Groove Milling | Ramping | Chamfering | Drilling | Profiling | Profile Finishing | Work Material: P – Carbon Steel / Alloy Steel | P – Tempered Steel / Die Steel | M – Stainless Steel | K – Cast Iron / Ductile Cast Iron | N – Non-Ferrous Metal | N – Aluminium Alloy | S – Ti Alloy / Heat Resistant Alloy | H – Hardened Steel HRC 45 ~ 55 | Ref. Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Face Milling | DGC  | DGC (-M/F) 13000RS | SNM/EU 13T6..  ONM/EU 05T6..  | SNMU 6 mm 45° | 40–250 | ◎ | | | | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | G8 |
| | | | | ONMU 3 mm 45° | 42,9–52,9 | | | | | | | | | | | | | | | | | | | |
| | WGX  | WGX (-M/F) 13000RS | SEE/MT 13T3..  | 6 mm 45° | 40–250 | ◎ | ◎ | | | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | G10 |
| | WGC  | WGC 3000 RS 4000 RS | SEE/MT0903.. (IC/ I = 9,525) SEE/MT13T3.. (IC/ I = 13,4)  | 4 mm 45° | 32–100 | ◎ | ◎ | | | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | G12 |
| | | WGC (-M/F) 4000 RS | | 6 mm 45° | 40–200 | | | | | | | | | | | | | | | | | | | |
| | UFO  | UFO (-F) 4000 RS | SFK-N/R12T3.., SFK-N1504...  | 5 mm 45° | 50–315 | ○ | ○ | | | ○ | | | | | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | G14 G15 |
| | | UFO 5000 RS | | 7 mm 45° | 80–315 | | | | | | | | | | | | | | | | | | | |
| | DNX  | DNX (-F) 12000RS | SNMT 1205..  | 8 mm 65° | 80–250 | ○ | ○ | | | | | | | | | ○ | | | ◎ | | | | | G16 |
| Radius Milling | RSX  | RSX (-F) 10000RS | RDET10T3.. RDET1204..  | 5 mm | 40–52 | ◎ | | ○ | ◎ | ○ | ◎ | | | ◎ | | ◎ | ◎ | ◎ | ◎ | | | ◎ | | G22 |
| | | RSX (-F) 12000RS | | 6 mm | 40–100 | | | | | | | | | | | | | | | | | | | |
| | | RSX (-F) 16000RS | | 8 mm | 63–160 | | | | | | | | | | | | | | | | | | | |
| | | RSX (-F) 20000RS | RDET1606.. RDET2006.. | 10 mm | 80–160 | | | | | | | | | | | | | | | | | | | |
| Multi-Purpose | WRCX  | WRCX (-F/X) 12000RS 16000RS 20000RS | QPMT1204../1606../2006 QPET1204../1606..  | 6 ~ 10 mm | 40–160 | ◎ | | ○ | ◎ | ○ | ◎ | | | ◎ | | ◎ | ◎ | ◎ | ◎ | | ◎ | ○ | ○ | G19 |
| High Feed Milling | MSX  | MSX 08000RS 12000RS 14000RS | WDMT0603../0804../1205.. 1406..  | 1,5 ~ 2,5 mm 20° | 40–100 | | | ◎ | ○ | ○ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | | | | ○ | G43 |
| | WFXH  | WFXH 08000RS | SOMT0803.. SOMT1204..  | 1,5 mm 15° | 40–63 | | | ◎ | ○ | ○ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | G46 G47 |
| | | WFXH 12000RS | | 2,5 mm 15° | 50–63 | | | | | | | | | | | | | | | | | | | |
| Shoulder Milling | DFC  | DFC (-M/F) 09000RS | XNMU0606..  | 6 mm 90° | 50–200 | ◎ | ○ | | ◎ | ○ | | | | | | ◎ | ◎ | ○ | ◎ | | | ○ | | G26 |
| | WFX  | WFX (-F/-M) 08000RS WFX (-F) 12000 RS | SOMT080.. SOMT1204..  | 6 mm 90° | 50–160 | ○ | ◎ | | ◎ | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | G30 G31 |
| | | | | 10 mm 90° | | | | | | | | | | | | | | | | | | | | |

◎ : Best
○ : Suitable

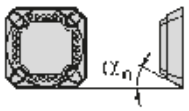
| Application | Cutter Type | Series | Insert Type | Approach Angle / Max. Depth of Cut (mm) | Cutter Diameter (mm) | Application: Face Milling – General Purpose | Face Milling – Finishing | Face Milling – High Feed | Shoulder Milling | Groove Milling | Ramping | Chamfering | Drilling | Profiling | Profile Finishing | Work Material: P – Carbon Steel / Alloy Steel | P – Tempered Steel / Die Steel | M – Stainless Steel | K – Cast Iron / Ductile Cast Iron | N – Non-Ferrous Metal | N – Aluminium Alloy | S – Ti Alloy / Heat Resistant Alloy | H – Hardened Steel HRC 45 ~ 55 | Ref. Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shoulder Milling | TSX  | TSX (-F) 08000RS<br>TSX (-M) 13000 RS | LNEX0804..,LNEX1306..  | 8 mm 90°<br>12 mm 90° | 40–63<br>40–160 | ◎ | ◎ | | ◎ | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | G34<br>G35 |
| | PWS  | PWS (-F) 4000 RS | LNMX1708..  | 16 mm 90° | 80–250 | ○ | | ◎ | ◎ | ○ | | | | | | ◎ | ○ | ○ | ○ | | | | | G37 |
| | WEZ New  | WEZ 11000R(S)<br>WEZ 17000R(S) | AOMT11T302PEER-G  | 10 mm 90°<br>15 mm 90° | 40–100<br>40–160 | ◎ | ◎ | | ◎ | ◎ | ◎ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | G45<br>G47 |
| | WEX  | WEX 1000F<br>WEX 2000F<br>WEX 3000F | AXMT0602..<br>AXMT1235..<br>AXMT1705..  | 5 mm 90°<br>10 mm 90°<br>14 mm 90° | 10–100 | ○ | | | ◎ | ◎ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | G48 |
| | WRX  | WRX 2000F<br>WRX 3000F | AXMT12350../1705..  | 18 ~ 36 mm 90°<br>27 ~ 53 mm 90° | 40–50<br>50–100 | ○ | | | ◎ | ◎ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | G49 |
| | PWC  | PWC (-F) 4000 RS | LNMX1606..  | 12 mm 88° | 80–200 | ○ | | ◎ | ○ | ○ | | | | | | | | | ◎ | | | | | G50 |
| | CNP  | CNP (-F) 13000 RS | CNMU1306..<br>CNMQ1306..  | 12 mm 90° | 40–200 | | | | ◎ | | | | | | | ◎ | ◎ | ◎ | ◎ | | | | | G52 |
| Aluminium Alloy and Non-Ferrous Metals | WAX  | WAX 3000 RS<br>WAX 4000 RS | AECT1604  | 16 ~ 18 mm 90°<br>22 ~ 24 mm 90° | 50–125 | ○ | | | ◎ | ◎ | ◎ | | | ◎ | | | | | | ○ | ◎ | | | G58<br>G59 |
| | ANX New  | ANXS 16000R(S)<br>ANXA 16000R(S) | ANB 1600R-L  | 3 mm 90° | 40–125<br>80–160 | ○ | ◎ | ◎ | ◎ | | | | | | | | | | | ◎ | ◎ | | | G62<br>G63 |
| | RF  | RF 4000 RS | SNEW1204..<br>SDET1204..  | 3 mm 90° | 80–315 | ◎ | ◎ | | | | | | | | | | | | | ○ | ◎ | | | G66 |
| | SRF  | SRF 50/63 RS | SNEW09T3..  | 5 mm 90° | 30–63 | ◎ | ◎ | | ○ | | | | | | | | | | | ○ | ◎ | | | G67 |
| High Speed Finishing of Cast Iron | FMU  | FMU 4000 RS | SNEW1203..  | 0,5 mm 45° | 80–315 | | ◎ | | | | | | | | | | | | ◎ | | | | | G68 |

# ISO Identification Table



| Insert shape | | | |
|---|---|---|---|
| C | 80° | A | 85° |
| D | 55° | B | 82° |
| E | 75° | K | 55° |
| F | 50° | H | 120° |
| V | 35° | O | 135° |
| R | - | P | 108° |
| S | 90° | L | 90° |
| T | 60° | M | 86° |
| W | 80° | | |

| Clearance angle | |
|---|---|
| A | 3° |
| B | 5° |
| C | 7° |
| D | 15° |
| E | 20° |
| F | 25° |
| G | 30° |
| N | 0° |
| P | 11° |

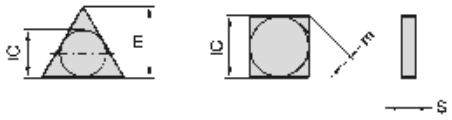


O Other clearance angle with specific description

| Insert type | | | |
|---|---|---|---|
| A | | W | |
| G | | T | |
| M | | | |
| N | | | |
| R | | X | Non standard |

**S E M T**

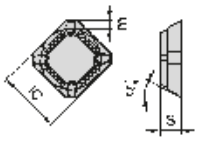
## Tolerances




IC: theoretical diameter of inscribed circle
m: nose height
s: thickness

| Class | Tolerances (mm) | | |
|---|---|---|---|
| | m | IC | s |
| A | ±0,005 | ±0,025 | ±0,025 |
| F | ±0,005 | ±0,013 | ±0,025 |
| C | ±0,013 | ±0,025 | ±0,025 |
| H | ±0,013 | ±0,013 | ±0,025 |
| E | ±0,025 | ±0,025 | ±0,025 |
| G | ±0,025 | ±0,025 | ±0,13 |

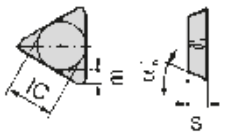
| Class | Tolerances (mm) | | |
|---|---|---|---|
| | m | IC | s |
| J | ±0,005 | ±0,05 – ±0,13* | ±0,025 |
| K | ±0,013 | ±0,05 – ±0,13* | ±0,025 |
| L | ±0,025 | ±0,05 – ±0,13* | ±0,025 |
| M | ±0,08~ ±0,18*) | ±0,05 – ±0,13* | ±0,13 |
| N | ±0,08~ ±0,18*) | ±0,05 – ±0,13* | ±0,025 |
| U | ±0,13~ ±0,38*) | ±0,08 – ±0,25* | ±0,13 |




*) The tolerance is dependent upon the insert size of IC. See tables below.

**Tolerance class for dimension m**

| m | S | T | C | W | V | D |
|---|---|---|---|---|---|---|
| 6,35 | ±0,08 | | | | - | ±0,11 |
| 9,525 | ±0,08 | | | | ±0,13 | ±0,11 |
| 12,7 | ±0,13 | | | | | ±0,15 |
| 15,875 | ±0,15 | | | | | ±0,18 |
| 19,05 | ±0,15 | | | | | ±0,18 |
| 25,4 | ±0,18 | | | | | |



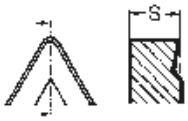

**Tolerance class for dimension IC**

| IC | S | T | C | D | V | W | R |
|---|---|---|---|---|---|---|---|
| 6,35 | ±0,05 | | | | | | |
| 9,525 | ±0,05 | | | | | | ±0,05 |
| 12,7 | ±0,08 | | | | | | ±0,08 |
| 15,875 | ±0,10 | | | | | | ±0,10 |
| 19,05 | ±0,10 | | | | | | ±0,10 |
| 25,4 | ±0,13 | | | | | | ±0,10 |

# ISO Identification Table



## Thickness

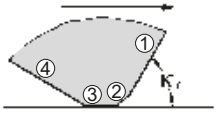


| | |
|---|---|
| **02** | s = 2,38 mm |
| **03** | s = 3,18 |
| **T3** | **s = 3,97** |
| **04** | s = 4,76 |
| **05** | s = 5,56 |
| **06** | s = 6,35 |
| **07** | s = 7,94 |
| **09** | s = 9,52 |

## Corner geometry with wiper flat

### Entering angle

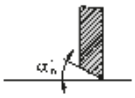
Feed direction



| | |
|---|---|
| **A** | **45°** |
| **D** | 60° |
| **E** | 75° |
| **F** | 85° |
| **P** | 90° |
| **Z** | - Others |

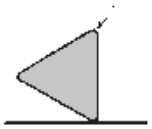
1. Major cutting edge
2. Chamfered corner
3. Wiper flat
4. Side cutting edge

### Clearance angle on wiper flat



| | |
|---|---|
| **A** | 3° |
| **B** | 5° |
| **C** | 7° |
| **D** | 15° |
| **E** | 20° |
| **F** | **25°** |
| **G** | 30° |
| **N** | 0° |
| **P** | 11° |
| **Z** | - **Others** |

## Radius



| | |
|---|---|
| **02** | r = 0,2 mm |
| **04** | r = 0,4 |
| **08** | r = 0,8 |
| **12** | r = 1,2 |
| **16** | r = 1,6 |
| **20** | r = 2,0 |
| **24** | r = 2,4 |

**M0** - Round insert (metric)
**00** - Round insert (inch)

**1 3 T 3 A G S R**

## Insert size

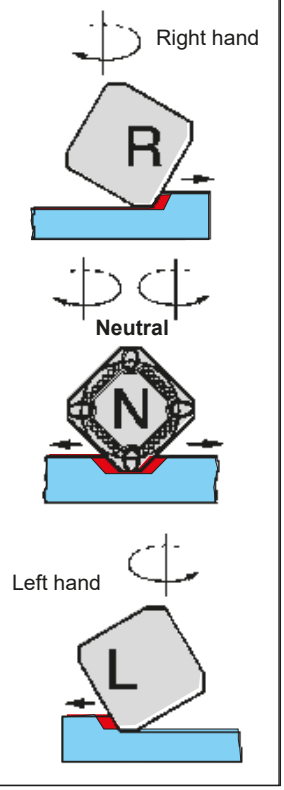
Symbol and cutting edge length (mm)

| Insert type / IC / d (mm) | C | D | R | S | T | V | W |
|---|---|---|---|---|---|---|---|
| 3,97 | | | | | **06** (6,9) | | |
| 4,76 | | | | | **08** (8,2) | | |
| 5,0 | | | **05** (5,0) | | | | |
| 5,56 | | | | | **09** (9,6) | **09** (9,7) | **03** (3,8) |
| 6,0 | | | **06** (6,0) | | | | |
| 6,35 | **06** (6,4) | **07** (7,7) | | **06** (6,35) | **11** (11,0) | **11** (11,1) | **04** (4,3) |
| 7,94 | **08** (8,0) | | | **07** (7,94) | | | **05** (5,4) |
| 8,0 | | | **08** (8,0) | | | | |
| 9,525 | **09** (9,7) | **11** (11,6) | **09** (9,525) | **09** (9,525) | **16** (16,5) | **16** (16,6) | **06** (6,5) |
| 10 | | | **10** (10,0) | | | | |
| 12 | | | **12** (12,0) | | | | |
| **12,7** | **12** (12,9) | **15** (15,5) | **12** (12,7) | **12** (12,7) | **22** (22,0) | | **08** (8,7) |
| 15,875 | **16** (16,1) | **19** (19,4) | **15** (15,875) | **15** (15,875) | **27** (27,5) | | **10** (10,9) |
| 16 | | | **16** (16,0) | | | | |
| 19,05 | **19** (19,3) | | **19** (19,05) | **19** (19,05) | **33** (33,0) | | |
| 20 | | | **20** (20,0) | | | | |
| 25 | | | **25** (25,0) | | | | |
| 25,4 | | | **25** (25,4) | **25** (25,4) | | | |
| 31,75 | | | **31** (31,75) | **31** (31,75) | | | |
| 32 | | | **32** (32,0) | | | | |

## Cutting edge condition

| | |
|---|---|
| **F** | Sharp |
| **E** | Rounded |
| **T** | Chamfered |
| **S** | Rounded and chamfered |

## Feed direction



# DGC(M/F) Type

## General Features

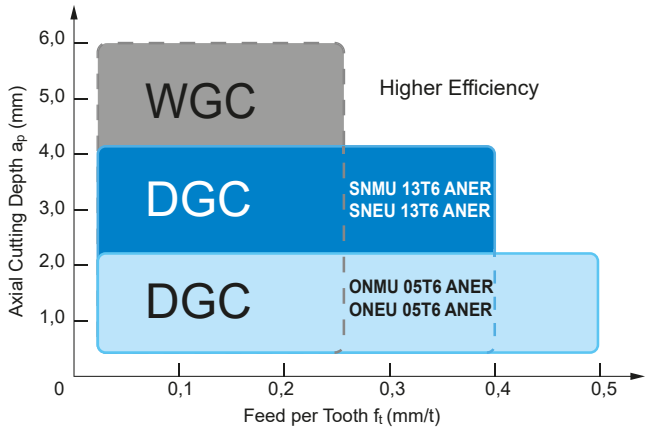
Sumi Dual Mill DGC type utilizes double-sided inserts for excellent economy. This is a general-purpose cutter featuring high cutting edge strength for high efficiency milling and low-burr chipbreaker design that provides high qualitiy machined surface.

The DGC type insert lineup includes double-sided SNMU / SNEU and ONMU / ONEU types.
Up to 16 corners can be used for improved economy.

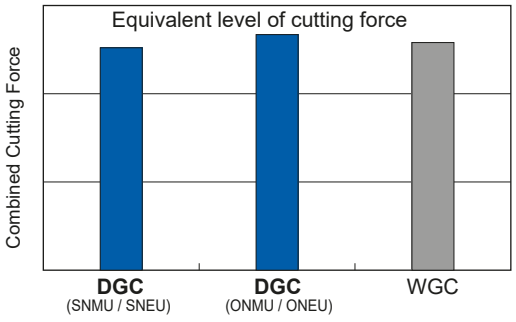

## Characteristics

- Same cutting performance as single-sided inserts plus superior economy.
- Achieves level of cutting edge sharpness and machined surface quality equivalent to single-sided cutter at a maximum cutting depth of $a_p \leq 3$ mm.

## Recommended Cutting Conditions for General Steel Milling




## Cutting Force Comparison




| | |
|---|---|
| Work Material: | 34CrMo4 |
| Tool: | Ø 100 |
| Cutting Data: | $v_c$=200m/min, $f_t$=0,3mm/t, $a_p$=3mm, $a_e$=85mm |

## Dual-Purpose Body

Two types of inserts can be used with a single body depending on milling application to help reduce costs. Stronger than single-sided cutters.


– first recommendation
– economical double-sided design offers 8 cutting edges with SN_U inserts
– maximum depth of cut: $a_p$ = 6 mm



– double-sided design with 16 corners for improved economy
– maximum depth of cut: $a_p$ = 3 mm

max. $a_p$ = 6 mm
8 corners use

Use two types of inserts for different applications.

max. $a_p$ = 3 mm
16 corners use

## Line-up

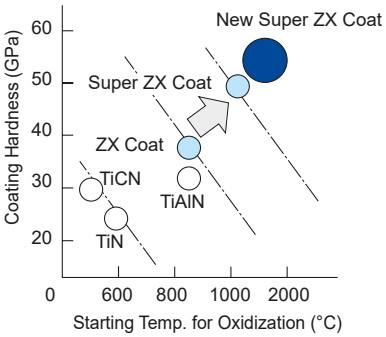
Choose a tool that fits your application from a comprehensive line-up

| Cat. No | DGC 13000 RS | DGCM 13000 RS | DGCF 13000 RS | DGC 13000 EW |
|---|---|---|---|---|
| Type | Standard pitch | Medium pitch | Fine pitch | Endmill type |
| Cutter Diameter | Ø 40 mm – Ø 250 mm | Ø 50 mm – Ø 250 mm | Ø 50 mm – Ø 250 mm | Ø 40 mm – Ø 63 mm |
| Cutting Edges | 3–10 | 4–14 | 5–18 | 3–4 |
| Shape |  |  |  |  H6 |

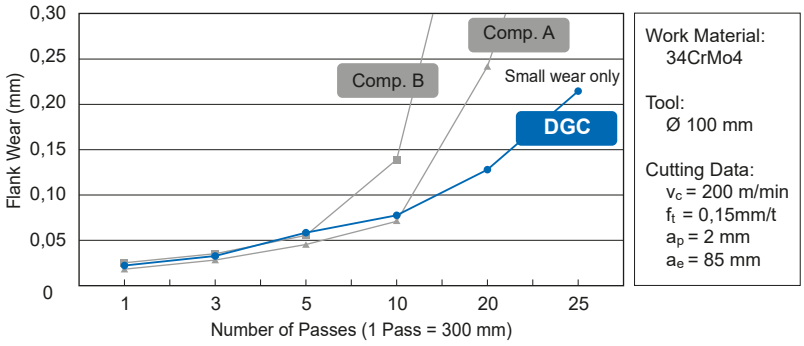
## High Reliability

Employs New Super ZX Coating, a multi-layer PVD coating grade and CVD coating grade with enhanced coating strength provided by newly developed stress control technology.
Improved run-out precision reduces tool life deviation to achieve highly reliable tool life.

## Multi-layer PVD Coating



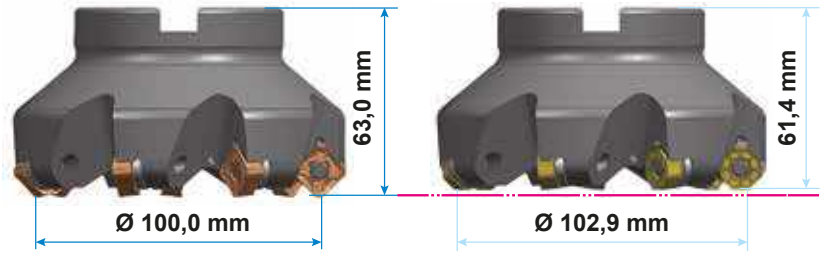

## Wear Resistance




## Cutter Diameter and Cutter Body Height

Insert: SN_U 13T6 ANER (square)

Insert: ON_U 05T6 ANER (octagonal)



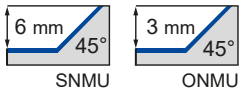

| Example: DC = 100mm | Number of Cutting Edges | Tool Diameter (mm) | Cutter Height (mm) | Max. Depth of Cut (mm) |
|---|---|---|---|---|
| SNMU/SNEU  | 8 | 100,0 | 63,0 | 6,0 |
| ONMU/ONEU  | 16 | 102,9 | 61,4 | 3,0 |

Square inserts (SNMU/SNEU) and octagonal inserts (ONMU/ONEU) can be used interchangeably on the same body.
Using these inserts the cutter will have different cutter diameter and cutter body height.

# DGC(M/F) Type

## General Milling of Steel and Cast Iron

| Rake Angle | | |
|---|---|---|
| | Radial | –10° |
| | Axial | –5° |




## ■ Body – Shell type

Fig. 1

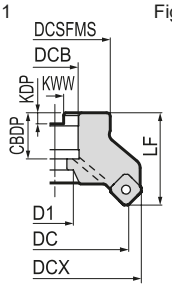



Fig. 2

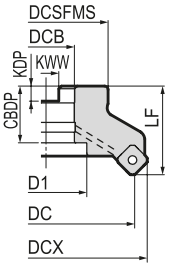



Fig. 3

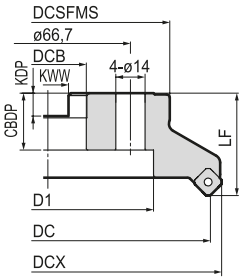
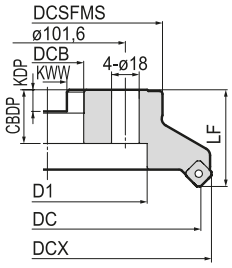



Fig. 4




Cutter body Ø DC ≥ 160 mm: no inner coolant

## ■ Body

### ● Type: DGC, Standard Pitch

| Cat. No. | Stock | Dimension (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | |
| DGC 13040 RS | ● | 40 (42,90) | 54 | 36 | 40 (38,44) | 16 | 13,5 | 8,4 | 5,6 | 18 | 3 | 0,3 | 1 |
| 13050 RS | ● | 50 (52,90) | 64 | 40 | 40 (38,44) | 22 | 18,0 | 10,4 | 6,3 | 20 | 3 | 0,4 | 1 |
| 13063 RS | ● | 63 (65,90) | 77 | 50 | 40 (38,44) | 22 | 18,0 | 10,4 | 6,3 | 20 | 4 | 0,5 | 1 |
| 13080 RS | ● | 80 (82,90) | 94 | 60 | 50 (48,44) | 27 | 20,0 | 12,4 | 7,0 | 25 | 4 | 1,2 | 1 |
| DGC 13100 RS | ● | 100 (102,90) | 114 | 70 | 50 (48,44) | 32 | 46,0 | 14,4 | 8,5 | 32 | 5 | 1,6 | 2 |
| 13125 RS | ● | 125 (127,90) | 139 | 80 | 63 (61,44) | 40 | 52,0 | 16,4 | 9,5 | 29 | 6 | 2,8 | 1 |
| 13160 RS | ● | 160 (162,90) | 174 | 130 | 63 (61,44) | 40 | 88,0 | 16,4 | 9,5 | 29 | 7 | 4,5 | 3 |
| DGC 13200 RS | ❑ | 200 (202,90) | 214 | 150 | 63 (61,44) | 60 | 130,0 | 25,7 | 14,0 | 35 | 8 | 7,1 | 4 |
| 13250 RS | ❑ | 250 (252,90) | 264 | 190 | 63 (61,44) | 60 | 160,0 | 25,7 | 14,0 | 35 | 10 | 11,2 | 4 |

### ● Type: DGCM, Medium Pitch

| Cat. No. | Stock | Dimension (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | |
| DGCM 13050 RS | ● | 50 (52,90) | 64 | 40 | 40 (38,44) | 22 | 18 | 10,4 | 6,3 | 20 | 4 | 0,3 | 1 |
| 13063 RS | ● | 63 (65,90) | 77 | 50 | 40 (38,44) | 22 | 18 | 10,4 | 6,3 | 20 | 5 | 0,5 | 1 |
| 13080 RS | ● | 80 (82,90) | 94 | 60 | 50 (48,44) | 27 | 20 | 12,4 | 7,0 | 25 | 6 | 1,1 | 1 |
| DGCM 13100 RS | ● | 100 (102,90) | 114 | 70 | 50 (48,44) | 32 | 46 | 14,4 | 8,5 | 32 | 7 | 1,5 | 2 |
| 13125 RS | ● | 125 (127,90) | 139 | 80 | 63 (61,44) | 40 | 52 | 16,4 | 9,5 | 29 | 8 | 2,8 | 1 |
| 13160 RS | ● | 160 (162,90) | 174 | 130 | 63 (61,44) | 40 | 88 | 16,4 | 9,5 | 29 | 10 | 4,6 | 3 |
| DGCM 13200 RS | ❑ | 200 (202,90) | 214 | 150 | 63 (61,44) | 60 | 130 | 25,7 | 14,0 | 35 | 12 | 7,0 | 4 |
| 13250 RS | ❑ | 250 (252,90) | 264 | 190 | 63 (61,44) | 60 | 160 | 25,7 | 14,0 | 35 | 14 | 11,1 | 4 |

### ● Type: DGCF, Fine Pitch

| Cat. No. | Stock | Dimension (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | |
| DGCF 13050 RS | ● | 50 (52,90) | 64 | 40 | 40 (38,44) | 22 | 18 | 10,4 | 6,3 | 20 | 5 | 0,3 | 1 |
| 13063 RS | ● | 63 (65,90) | 77 | 50 | 40 (38,44) | 22 | 18 | 10,4 | 6,3 | 20 | 6 | 0,5 | 1 |
| 13080 RS | ● | 80 (82,90) | 94 | 60 | 50 (48,44) | 27 | 20 | 12,4 | 7,0 | 25 | 8 | 1,1 | 1 |
| DGCF 13100 RS | ● | 100 (102,90) | 114 | 70 | 50 (48,44) | 32 | 46 | 14,4 | 8,5 | 32 | 10 | 1,4 | 2 |
| 13125 RS | ● | 125 (127,90) | 139 | 80 | 63 (61,44) | 40 | 52 | 16,4 | 9,5 | 29 | 12 | 2,7 | 1 |
| 13160 RS | ● | 160 (162,90) | 174 | 130 | 63 (61,44) | 40 | 88 | 16,4 | 9,5 | 29 | 14 | 4,4 | 3 |
| DGCF 13200 RS | ❑ | 200 (202,90) | 214 | 150 | 63 (61,44) | 60 | 130 | 25,7 | 14,0 | 35 | 16 | 6,9 | 4 |
| 13250 RS | ❑ | 250 (252,90) | 264 | 190 | 63 (61,44) | 60 | 160 | 25,7 | 14,0 | 35 | 18 | 11,0 | 4 |

( ) Figures in brackets indicate values for ONMU inserts.
Inserts are not included.

## ■ Identification Details

| DGC | M | 13 | 050 | R | S |
|---|---|---|---|---|---|
| Cutter Series | M: Medium F: Fine | Insert Size | Cutter Diameter | Direction | Metric |





● = Euro stock
❑ = Delivery on request

Recommended Tightening Torque (N·m)

## Inserts

| Application | Coated Carbide | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| High Speed/Light cut | P | | | K | | MS | | |
| General Purpose | | PM | M | K | | MS | | |
| Roughing | | PM | PM | | K | | MS | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | Fig. |
| SNMU 13T6ANER L | ● | ● | ● | ● | ● | | | 1 |
| 13T6ANER G | ● | ● | ● | ● | ● | | | 1 |
| 13T6ANER H | ● | ● | ● | ● | ● | | | 1 |
| 13T6ANER FL | ● | ● | ● | ● | ● | | | 2 |
| 13T6ANER FG | ● | ● | ● | ● | ● | | | 2 |
| SNEU 13T6ANER L | | | | | | ● | ● | 1 |
| 13T6ANER G | | | | | | ● | ● | 1 |
| 13T6ANER FL | | | | | | ● | ● | 2 |
| 13T6ANER FG | | | | | | ● | ● | 2 |
| XNEU 13T6ANEN W | | ● | | | ● | | | 3 |
| ONMU 05T6ANER L | ● | ● | ● | ● | ● | | | 4 |
| 05T6ANER G | ● | ● | ● | ● | ● | | | 4 |
| ONEU 05T6ANER L | | | | | | ● | ● | 4 |
| 05T6ANER G | | | | | | ● | ● | 4 |

Fig. 1

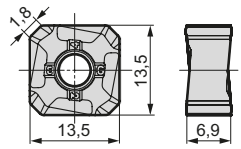



Fig. 2

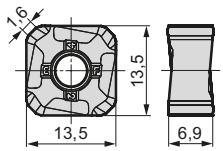



Fig. 3

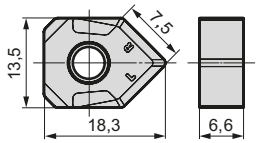
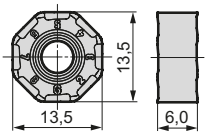
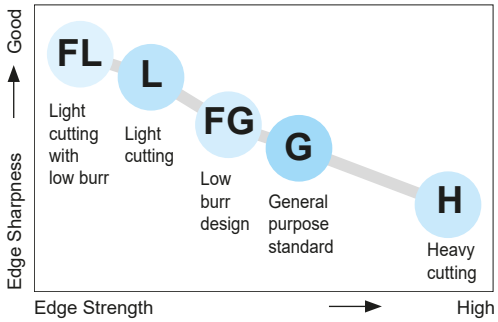



Fig. 4

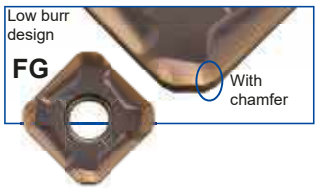



## Chipbreaker




## Improved Milling Quality

FG type chipbreakers feature chamfer to minimize burrs and provide excellent milling qualitiy.



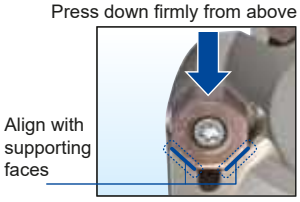


FG type inserts with low-burr design enable high-qualitiy milling with few burrs and little edge chipping.

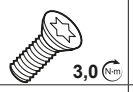
## Attaching Inserts


**Octagonal Inserts**

Firmly align insert with supporting face, press down in the direction of the arrow and tighten the screw to fix the insert.




## Spare Parts

| Shim | Shim Screw | L Seat Wrench | Insert Srew | Insert Wrench |
|---|---|---|---|---|
|  |  |  |   |  |
| DGCS13R | BW0609F | LH040 | BFTX0412IP | TRDR15IP |

Optional

| Insert Srew (*) |
|---|
|  |
| BFTX0418IP |

*Corners can be changed simply by loosening the screw. (Only suitable for DGC/DGCM types with body size ≥ Ø 80 mm).

## Recommended Cutting Conditions (SN_U)

| ISO | Work Material | Fit-ness | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (min/t) | Depth of Cut (mm) | Grade |
|---|---|---|---|---|---|---|
| P | General Steel | ◎ | 150–**200**–250 | 0,10–**0,25**–0,40 | <4 | ACP200 ACP300 |
| | Alloyed Steel | ◎ | 180–**250**–350 | 0,10–**0,30**–0,45 | <4 | ACP200 ACP300 |
| | Die Steel | ◎ | 100–**150**–200 | 0,15–**0,25**–0,35 | <4 | ACP200 ACP300 |
| M | Stainless Steel | ○ | 160–**200**–250 | 0,15–**0,23**–0,30 | <3 | ACM200 ACM300 ACP300 |
| K | GG+GGG | ◎ | 100–**200**–250 | 0,10–**0,25**–0,40 | <5 | ACK200 ACK300 |

Min. – **Optimum** – Max.

## Recommended Cutting Conditions (ON_U)

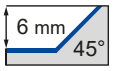
| ISO | Work Material | Fit-ness | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (min/t) | Depth of Cut (mm) | Grade |
|---|---|---|---|---|---|---|
| P | General Steel | ◎ | 150–**200**–250 | 0,10–**0,30**–0,50 | <2 | ACP200 ACP300 |
| | Alloyed Steel | ◎ | 180–**250**–350 | 0,10–**0,50**–0,50 | <2 | ACP200 ACP300 |
| | Die Steel | ◎ | 100–**150**–200 | 0,15–**0,25**–0,30 | <2 | ACP200 ACP300 |
| M | Stainless Steel | ○ | 160–**200**–250 | 0,15–**0,23**–0,30 | <2 | ACM200 ACM300 ACP300 |
| K | GG+GGG | ◎ | 100–**200**–250 | 0,10–**0,30**–0,50 | <2 | ACK200 ACK300 |

◎ Preferred choice ○ Suitable

# WGX (M/F) Type

## General Milling of Steel and Cast Iron

| Rake Angle | | |
|---|---|---|
| | Radial | 20°–24° |
| | Axial | 20°–22° |




## Body – Shell type

Fig. 1

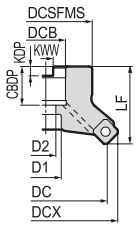



Fig. 2

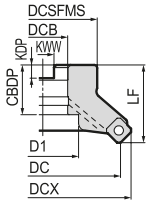



Fig. 3

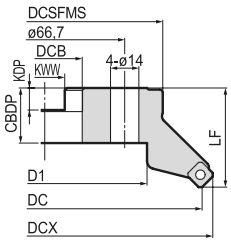
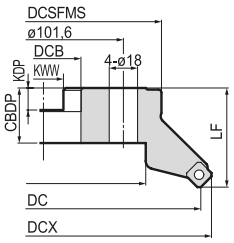



Fig. 4




Cutter body DC ≥ 160 mm: no inner coolant

## Body

Inner coolant available for DC ≤ Ø 125mm

### ● Type: WGX, Standard Pitch

| Cat. No. | Stock | Dimension (mm) | | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | D1 | D2 | KWW | KDP | CBDP | | | |
| WGX 13040 RS | ● | 40 | 52 | 32 | 40 | 16 | 14,0 | 9,0 | 8,4 | 5,6 | 18 | 3 | 0,3 | 1 |
| 13050 RS | ● | 50 | 62 | 40 | 40 | 22 | 18,0 | 11,0 | 10,4 | 6,3 | 20 | 3 | 0,4 | 1 |
| 13063 RS | ● | 63 | 76 | 50 | 40 | 22 | 18,0 | 11,0 | 10,4 | 6,3 | 20 | 4 | 0,6 | 1 |
| 13080 RS | ● | 80 | 93 | 55 | 50 | 27 | 20,0 | 13,5 | 12,4 | 7,0 | 25 | 4 | 1,2 | 1 |
| WGX 13100 RS | ● | 100 | 113 | 70 | 50 | 32 | 46,0 | - | 14,4 | 8,5 | 32 | 5 | 1,6 | 2 |
| 13125 RS | ● | 125 | 138 | 80 | 63 | 40 | 52,0 | 29,0 | 16,4 | 9,5 | 29 | 6 | 2,8 | 1 |
| 13160 RS | ● | 160 | 173 | 130 | 63 | 40 | 88,0 | - | 16,4 | 9,5 | 29 | 7 | 4,5 | 3 |
| WGX 13200 RS | ● | 200 | 213 | 150 | 63 | 60 | 130,0 | - | 25,7 | 14,0 | 35 | 8 | 7,1 | 4 |
| 13250 RS | ❑ | 250 | 263 | 190 | 63 | 60 | 160,0 | - | 25,7 | 14,0 | 35 | 10 | 11,2 | 4 |

### ● Type: WGXM, Medium Pitch

| Cat. No. | Stock | Dimension (mm) | | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | D1 | D2 | KWW | KDP | CBDP | | | |
| WGXM 13050 RS | ● | 50 | 62 | 40 | 40 | 22 | 18,0 | 11,0 | 10,4 | 6,3 | 20 | 4 | 0,4 | 1 |
| 13063 RS | ● | 63 | 77 | 50 | 40 | 22 | 18,0 | 11,0 | 10,4 | 6,3 | 20 | 5 | 0,6 | 1 |
| 13080 RS | ● | 80 | 94 | 55 | 50 | 27 | 20,0 | 13,5 | 12,4 | 7,0 | 25 | 6 | 1,1 | 1 |
| WGXM 13100 RS | ● | 100 | 114 | 70 | 50 | 32 | 46,0 | - | 14,4 | 8,5 | 32 | 7 | 1,6 | 2 |
| 13125 RS | ● | 125 | 139 | 80 | 63 | 40 | 52,0 | 29,0 | 16,4 | 9,5 | 29 | 8 | 2,8 | 1 |
| 13160 RS | ● | 160 | 174 | 130 | 63 | 40 | 88,0 | - | 16,4 | 9,5 | 29 | 10 | 4,5 | 3 |
| WGXM 13200 RS | ● | 200 | 214 | 150 | 63 | 60 | 130,0 | - | 25,7 | 14,0 | 35 | 12 | 7,0 | 4 |
| 13250 RS | ❑ | 250 | 264 | 190 | 63 | 60 | 160,0 | - | 25,7 | 14,0 | 35 | 14 | 11,1 | 4 |

### ● Type: WGXF, Fine Pitch

| Cat. No. | Stock | Dimension (mm) | | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | D1 | D2 | KWW | KDP | CBDP | | | |
| WGXF 13050 RS | ● | 50 | 62 | 40 | 40 | 22 | 18,0 | 11,0 | 10,4 | 6,3 | 20 | 5 | 0,4 | 1 |
| 13063 RS | ● | 63 | 77 | 50 | 40 | 22 | 18,0 | 11,0 | 10,4 | 6,3 | 20 | 6 | 0,6 | 1 |
| 13080 RS | ● | 80 | 94 | 55 | 50 | 27 | 20,0 | 13,5 | 12,4 | 7,0 | 25 | 8 | 1,1 | 1 |
| WGXF 13100 RS | ● | 100 | 114 | 70 | 50 | 32 | 46,0 | - | 14,4 | 8,5 | 32 | 10 | 1,5 | 2 |
| 13125 RS | ● | 125 | 139 | 80 | 63 | 40 | 52,0 | 29,0 | 16,4 | 9,5 | 29 | 12 | 2,7 | 1 |
| 13160 RS | ● | 160 | 174 | 130 | 63 | 40 | 88,0 | - | 16,4 | 9,5 | 29 | 16 | 4,5 | 3 |
| WGXF 13200 RS | ● | 200 | 214 | 150 | 63 | 60 | 130,0 | - | 25,7 | 14,0 | 35 | 20 | 6,9 | 4 |
| 13250 RS | ❑ | 250 | 264 | 190 | 63 | 60 | 160,0 | - | 25,7 | 14,0 | 35 | 24 | 11,0 | 4 |

( ) Figures in brackets indicate values for ONMU inserts.
Inserts are not included.

## Identification Details

| WGX | M | 13 | 050 | R | S |
|---|---|---|---|---|---|
| Cutter Series | M: Medium<br>F: Fine | Insert Size | Cutter Diameter | Direction | Metric |





● = Euro stock
❍ = Japan stock

❑ = Delivery on request

Recommended Tightening Torque (N·m)

# WGX (M/F) Type

## General Features

The Wavemill WGX Type employs unique chipbreaker design to provide lower cutting resistance and higher quality surface finishes than conventional tools.

## Series

| Type | Cat. No. | Cutter | No. of Teeth |
|---|---|---|---|
| Standard Pitch | WGX 13000RS | Ø 40 – Ø 250 | 3–10 |
| Medium Pitch | WGXM 13000RS | Ø 50 – Ø 250 | 4–14 |
| Fine Pitch | WGXF 13000RS | Ø 50 – Ø 250 | 5–24 |
| Endmill Type | WGX 13000EW | Ø 32 – Ø 63 | 3–5 |

Inner coolant available for DC ≤ Ø 125 mm

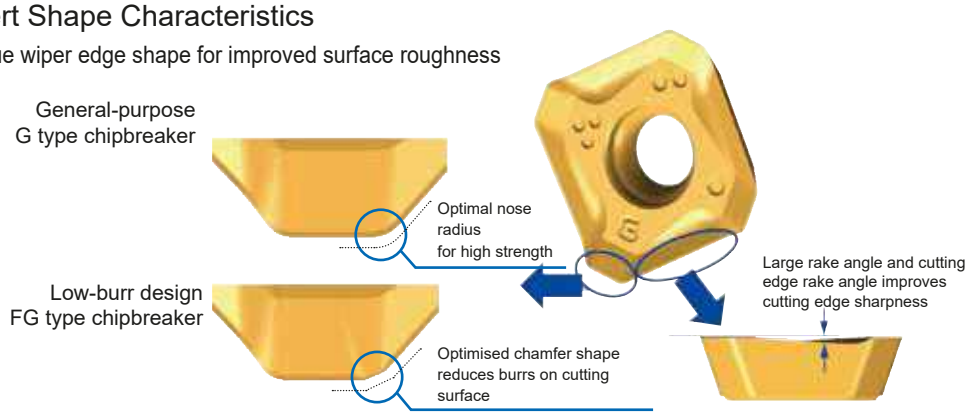
☞ H7

## Characteristics

- **Stable Cutting**
  Special chipbreaker designed for WGX enables lower cutting forces.
- **High Quality**
  Improved run-out precision and unique wiper edge shape ensure excellent surface finish quality.
  Optimised chamfer edge reduces burr and edge chipping.
- **Long Tool Life**
  Features high precision technology that reduces insert run-out variation and a new coating to provide stable and long tool life.

## Insert Shape Characteristics

Unique wiper edge shape for improved surface roughness




## Inserts

| Application | Coated Carbide | | | | | | | Carb. | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed/Light Cut | P | | | K | | MS | | KN | N | |
| General Purpose | | PM | M | K | | MS | MS | | N | |
| Roughing | | PM | PM | | K | | MS | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Fig. |
| SEET 13T3AGFR-L | | | | | | | | ❍ | ❍ | 1 |
| SEET 13T3AGSR-L | ❍ | ● | ❍ | ❍ | ❍ | ● | ❍ | | | 1 |
| 13T3AGSR-G | ❍ | ● | ● | ● | ❍ | ● | ❍ | | | 1 |
| SEMT 13T3AGSR-L | ● | ● | ● | ● | ❍ | ● | ● | | | 1 |
| 13T3AGSR-G | ● | ● | ● | ● | ● | ● | ● | | | 1 |
| 13T3AGSR-H | ● | ● | ● | ● | ● | ● | ● | | | 1 |
| SEMT 13T3AGSR-FG | ❍ | ● | ● | ❍ | ● | ● | ● | | | 2 |
| XEEW 13T3AGER-WR | | ❍ | | | ❍ | | | | | 3 |

Fig. 1

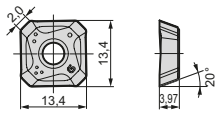



Fig. 2

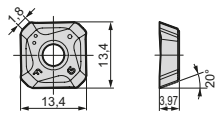
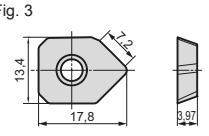
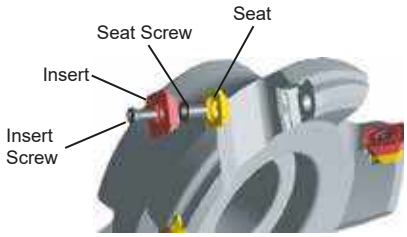



Fig. 3




## Spare Parts

| Applicable Cutters | Shim | Shim Screw | Insert Screw | Insert Wrench | Seat Wrench |
|---|---|---|---|---|---|
| |  |  |  3,0 N·m |  |  |
| WGX (-M/F) | WGCS 13 R | BW 0507 F | BFTX 03512 IP | TRDR 15 IP | LH 035 |

## Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/tooth) | Grade |
|---|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,15–**0,20**–0,25 | ACP200 |
| P | Soft Steel | ≤180 | 180–**265**–350 | 0,10–**0,25**–0,40 | ACP200 |
| P | Die Steel | 200–220 | 100–**150**–200 | 0,15–**0,20**–0,25 | ACP200 |
| M | Stainless Steel | - | 160–**205**–250 | 0,15–**0,23**–0,30 | ACM300 |
| K | Cast Iron | 250 | 100–**175** –250 | 0,15–**0,23**–0,30 | ACK200 |
| N | Non Ferrous Alloy | - | 500–**750**–1000 | 0,15–**0,23**–0,30 | DL1000 |
| S | Exotic Alloy | - | 30 – **50**– 80 | 0,10–**0,20**–0,30 | ACM300 |

Minimum-**Optimum**-Maximum

# WGC (M/F) Type

## General Milling for Steel, Cast Iron & Exotic Material

Fig. 1

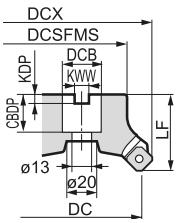



Fig. 2

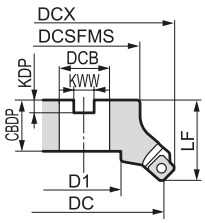
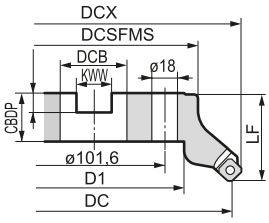



Fig. 3




## ■ Body

### ● Standard WGC - Type

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | | No. of Teeth | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | KWW | KDP | DCB | D2 | D1 | CBDP | | | |
| WGC 3032 RS | ▲ | 32 | 41 | 32 | 40 | 8,4 | 5,6 | 16 | 9 | 14 | 18 | 4 | 0,2 | 1 |
| 3040 RS | ▲ | 40 | 49 | 32 | 40 | 8,4 | 5,6 | 16 | 9 | 14 | 18 | 4 | 0,3 | 1 |
| 3050 RS | ▲ | 50 | 59 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 5 | 0,4 | 1 |
| 3063 RS | ▲ | 63 | 72 | 50 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 6 | 0,6 | 1 |
| 3080 RS | | 80 | 89 | 60 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 6 | 1,1 | 1 |
| WGC 3100 RS | | 100 | 109 | 70 | 50 | 14,4 | 8,5 | 32 | - | - | 32 | 7 | 1,5 | 2 |
| WGC 4040 RS | ▲ | 40 | 52 | 32 | 40 | 8,4 | 5,6 | 16 | 9 | 14 | 18 | 3 | 0,4 | 1 |
| 4050 RS | ▲ | 50 | 63 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 3 | 0,5 | 1 |
| 4063 RS | ▲ | 63 | 76 | 50 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 4 | 0,6 | 1 |
| 4080 RS | ▲ | 80 | 93 | 60 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 4 | 1,0 | 1 |
| WGC 4100 RS | ▲ | 100 | 113 | 70 | 50 | 14,4 | 8,5 | 32 | - | - | 32 | 5 | 1,5 | 2 |
| 4125 RS | ▲ | 125 | 138 | 80 | 63 | 16,4 | 9,5 | 40 | - | - | 38 | 6 | 2,6 | 2 |
| 4160 RS | ▲ | 160 | 173 | 100 | 63 | 16,4 | 9,5 | 40 | - | - | 38 | 7 | 4,0 | 2 |
| WGC 4200 RS | ▲ | 200 | 213 | 130 | 63 | 25,7 | 14,0 | 60 | - | - | 35 | 8 | 6,6 | 3 |

### ● Medium Pitch WGCM - Type

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | | No. of Teeth | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | KWW | KDP | DCB | D2 | D1 | CBDP | | | |
| WGCM 4050 RS | ▲ | 50 | 63 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 4 | 0,5 | 1 |
| 4063 RS | ▲ | 63 | 76 | 50 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 5 | 0,6 | 1 |
| 4080 RS | ▲ | 80 | 93 | 60 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 6 | 1,0 | 1 |
| WGCM 4100 RS | ▲ | 100 | 113 | 70 | 50 | 14,4 | 8,5 | 32 | - | - | 32 | 7 | 1,5 | 2 |
| 4125 RS | ▲ | 125 | 138 | 80 | 63 | 16,4 | 9,5 | 40 | - | - | 38 | 8 | 2,6 | 2 |
| 4160 RS | ▲ | 160 | 173 | 100 | 63 | 16,4 | 9,5 | 40 | - | - | 38 | 10 | 4,0 | 2 |
| WGCM 4200 RS | ▲ | 200 | 213 | 130 | 63 | 25,7 | 14,0 | 60 | - | - | 35 | 12 | 6,6 | 3 |

### ● Fine Pitch WGCF - Type

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | | No. of Teeth | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | KWW | KDP | DCB | D2 | D1 | CBDP | | | |
| WGCF 4050 RS | ▲ | 50 | 63 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 5 | 0,5 | 1 |
| 4063 RS | ▲ | 63 | 76 | 50 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 6 | 0,6 | 1 |
| 4080 RS | ▲ | 80 | 93 | 60 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 8 | 1,0 | 1 |
| WGCF 4100 RS | ▲ | 100 | 113 | 70 | 50 | 14,4 | 8,5 | 32 | - | - | 32 | 10 | 1,5 | 2 |
| 4125 RS | ▲ | 125 | 138 | 80 | 63 | 16,4 | 9,5 | 40 | - | - | 38 | 12 | 2,6 | 2 |
| 4160 RS | ▲ | 160 | 173 | 100 | 63 | 16,4 | 9,5 | 40 | - | - | 38 | 16 | 4,0 | 2 |
| WGCF 4200 RS | ▲ | 200 | 213 | 130 | 63 | 25,7 | 14,0 | 60 | - | - | 35 | 20 | 6,6 | 3 |

## ■ Spare Parts

| Cutter | Shim | Shim screw | Insert screw | | Wrench | Wrench |
|---|---|---|---|---|---|---|
| |  |  |  | |  |  |
| WGC 3000 RS | - | - | BFTX 0307 IP | **2,0** | TRDR 10 IP | - |
| WGC/-F 4000 RS | WGCS 13 R | BW 0507 F | BFTX 03512 IP | **3,0** | TRDR 15 IP | LH035 |

## ■ Structure




▲ = To be replaced by new item

(N·m) Recommended Tightening Torque (N·m)

# Face Mill
# WGC (M/F) Type

## Features

- Suitable for high speed machining $v_c$ < 400 m/min.
- Tough lightweight cutter body with wide chip pockets for fast metal removal.
- Low cost precision moulded inserts give G class performance at greatly reduced cost.
- Wide range of grades for most workpiece materials - including steels, irons, high temperature alloys, aluminium's etc.
- Improves metal removal rates, flatness, dimensional accuracy, and surface finish.


SEET, SEMT


SECW


XEEW

## Insert

| Application | | Coated Carbide | | | | | DLC | Carbide | | Cermet | PCD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed/Light Cut | | P | | | K | | N | | KN | | N | | |
| General Purpose | | | PM | M | K | | N | KS | | P | N | | |
| Roughing | | | PM | PM | | K | | | | | N | | |
| Cat. No. | | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | DL1000 | EH520 | H1 | T250A | DA2200 | Fig. | Applicable Endmill |
| SEET | 0903 AGFN-L | ▲ | ▲ | ▲ | ▲ | ▲ | | | ▲ | | | 1 | WGC 3000 Type |
| SEET | 0903 AGSN-G | ▲ | ▲ | ▲ | ▲ | ▲ | | | | | | 1 | |
| | 0903 AGSN-N | ▲ | ▲ | ▲ | ▲ | ▲ | | | | | | 1 | |
| SEMT | 0903 AGSN-L | ▲ | ▲ | ▲ | ▲ | ▲ | | | | | | 1 | |
| | 0903 AGSN-G | ▲ | ▲ | ▲ | ▲ | ▲ | | | | | | 1 | |
| SEET | 13T3 AGFN-L | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | | | 2 | WGC 4000 Type<br>WGC M/F 4000 Type |
| SEET | 13T3 AGSN-G | ▲ | ▲ | ▲ | ▲ | ▲ | | | | ▲ | | 2 | |
| | 13T3 AGSN-N | ▲ | ▲ | ▲ | ▲ | ▲ | | | | ▲ | | 2 | |
| SEMT | 13T3 AGSN-L | ▲ | ▲ | ▲ | ▲ | ▲ | | | | | | 2 | |
| | 13T3 AGSN-G | ▲ | ▲ | ▲ | ▲ | ▲ | | | | | | 2 | |
| | 13T3 AGSN-H | ▲ | ▲ | ▲ | ▲ | ▲ | | | | | | 2 | |
| SECW | 13T3 AGTN-N-NF | | | | | | | | | | | 2 | |
| XEEW | 13T3 AGFR-W-NF | | | | | | | | | | | 3 | |
| XEEW | 13T3 AGER-W | | | | | ▲ | | | | | | 3 | |

Fig. 1

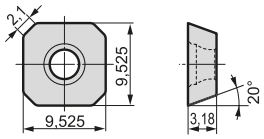



Fig. 2

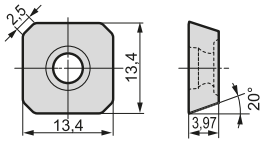
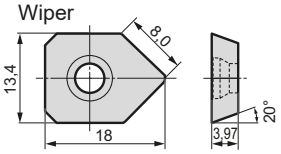
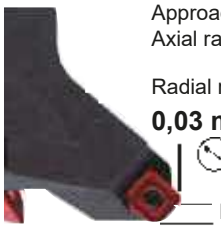



Fig. 3




## Specifications



Approach angle: 45°
Axial rake angle: + 20° ~ +22°
( + 20°)
Radial rake angle: - 20° ~ - 24°
( - 10° ~ - 19°)

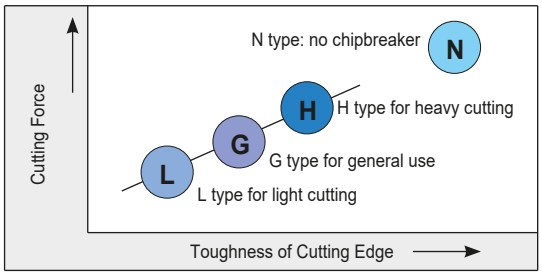
**0,03 mm**

Max. depth of cut: 6 mm
( 4 mm)

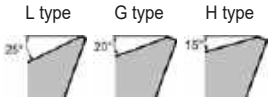
**0,02 mm**
Run-out with M class insert SEMT13T3

( ) shows WGC 3000 type

## Chip Breaker System




● Cutting Edge Geometry





## Recommended Cutting Conditions

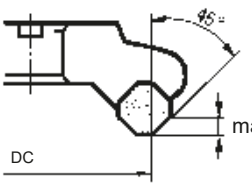
($v_c$ =m/min, $f_t$ =mm/tooth) (min.– **optimum** – max.)

| Insert Type | | SEMT 13T3 AGSN-G | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grade | | ACP100 | | | ACP200 | | | ACP300 | | ACK200 | | ACK300 | |
| Type / Work Material | | Low carbon steel | Alloy steel | Die steel | Low carbon steel | Alloy steel | Die steel | Stainless steel austenitic | Stainless steel martensitic | Cast iron | Ductile cast iron | Cast iron | Ductile cast iron |
| WGC (-M/-F) 4040–4200 | $v_c$ | 100-**250**-400 | 80-**220**-280 | 80-**150**-250 | 80-**200**-370 | 70-**150**-250 | 60-**130**-220 | 120-**180**-240 | 100-**140**-200 | 220-**270**-450 | 150-**180**-250 | 180-**220**-270 | 130-**160**-220 |
| | $f_t$ | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,4 | 0,1-**0,2**-0,3 | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,4 | 0,1-**0,2**-0,3 | 0,1-**0,2**-0,3 | 0,1-**0,2**-0,3 | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,4 |
| | $a_p$ | 1,0-**3,0**-5,0 | | | 1,0-**3,0**-5,0 | | | 1,0-**2,0**-3,0 | | 1,0-**3,0**-5,0 | | 1,0-**3,0**-5,0 | |

# UFO / UFOF Type

## General Milling for Steel, Cast Iron & Exotic Material

## Specifications




Approach angle: 45°
Axial rake angle: + 27°
Radial rake angle: - 7°
(-10° for ø 50 and ø 63)
max depth of cut: 5,0 mm (UFO 4000 type)
7,0 mm (UFO 5000 type)

## Body

| Cat. No. | Stock | | Dimensions (mm) | | | | | | | | No. of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | L | DC | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | | | | |
| UFO 4050 R/L-S | ● | | 50 | 74 | 45 | 50 | 22 | 10,4 | 6,3 | 20 | 4 | | 1,3 | 1 |
| 4063 R/L-S | ● | | 63 | 86 | 50 | 50 | 22 | 10,4 | 6,3 | 20 | 5 | | 1,6 | 1 |
| 4080 R/L-S | ● | | 80 | 103 | 60 | 50 | 27 | 12,4 | 7,0 | 25 | 5 | | 2,1 | 1 |
| UFO 4100 R/L-S | ● | | 100 | 122 | 75 | 50 | 32 | 14,4 | 8,5 | 29 | 6 | | 2,9 | 2 |
| 4125 R/L-S | ● | | 125 | 146 | 75 | 63 | 40 | 16,4 | 9,5 | 29 | 7 | 5,0 | 4,2 | 2 |
| 4160 R/L-S | ● | | 160 | 180 | 100 | 63 | 40 | 16,4 | 9,5 | 29 | 9 | | 6,6 | 3 |
| UFO 4200 R/L-S | ● | | 200 | 220 | 130 | 63 | 60 | 25,7 | 14,0 | 32 | 11 | | 9,5 | 4 |
| 4250 R/L-S | ❑ | | 250 | 270 | 300 | 63 | 60 | 25,7 | 14,0 | 40 | 13 | | 14,8 | 4 |
| UFO 4315 R/L-S | ❑ | | 315 | 335 | 240 | 80 | 60 | 25,7 | 14,0 | 40 | 15 | | 26,6 | 5 |
| UFO 5080 R/L-S | ● | | 80 | 102 | 60 | 50 | 27 | 12,4 | 7,0 | 25 | 5 | | 2,1 | 1 |
| UFO 5100 R/L-S | ● | | 100 | 119 | 75 | 50 | 32 | 14,4 | 8,5 | 29 | 6 | | 2,9 | 2 |
| 5125 R/L-S | ● | | 125 | 143 | 75 | 63 | 40 | 16,4 | 9,5 | 29 | 7 | | 4,2 | 2 |
| 5160 R/L-S | ● | | 160 | 177 | 100 | 63 | 40 | 16,4 | 9,5 | 29 | 9 | 7,0 | 6,6 | 3 |
| UFO 5200 R/L-S | ● | | 200 | 217 | 130 | 63 | 60 | 25,7 | 14,0 | 32 | 11 | | 9,5 | 4 |
| 5250 R/L-S | ❑ | | 250 | 267 | 200 | 63 | 60 | 25,7 | 14,0 | 40 | 13 | | 14,8 | 4 |
| UFO 5315 R/L-S | ❑ | | 315 | 332 | 240 | 80 | 60 | 25,7 | 14,0 | 40 | 15 | | 26,6 | 5 |

Fig. 1

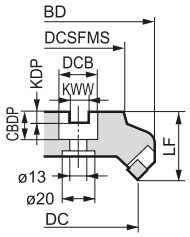



Fig. 2

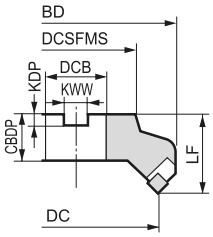



Fig. 3

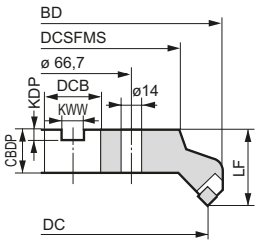



Fig. 4

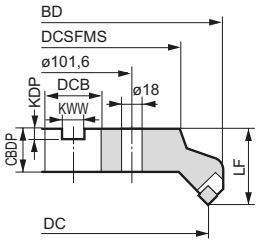
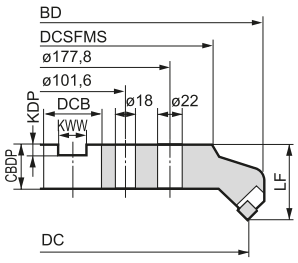
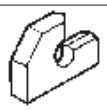



Fig. 5

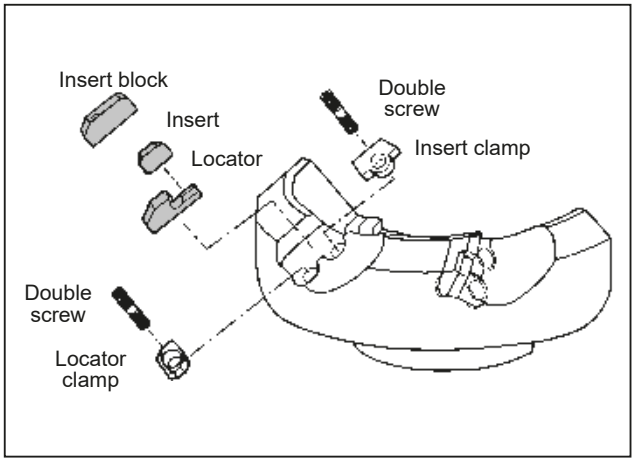



## Spare Parts

| Cutter | Locator | Insert block | Insert clamp |
|---|---|---|---|
| |  |  |  |
| 4050–4063 | UF 4 K R/L | S-UF 4 S R/L | UFTW R/L |
| 4080–4315 | UF 4 K R/L | UF 4 S R/L | |
| 5080–5315 | UF 5 K R/L | UF 5 S R/L | |

| Cutter | Locator clamp | Double screw | Wrench |
|---|---|---|---|
| |  |  |  |
| 4050–4063 | UFKW R/L | WB 7-15 T | TT 25 |
| 4080–4315 | | | |
| 5080–5315 | | | |

## Structure








● = Euro stock
○ = Japan stock
❑ = Delivery on request

# Face Mill
# UFO / UFOF Type

## Features

- 45° approach face mills
- 27° super high rake multi purpose cutter for outstanding productivity milling steels, irons and alloys
- Substantially improves metal removal rates on low powered machines
- Differential pitched inserts guarantee smooth cutting action
- Rigid body incorporates carbide locators and HSS shims resulting in extremely low run out

## Body (Fine Pitch Type)

| Cat. No. | Stock | | Dimensions (mm) | | | | | | | | No. of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | L | DC | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | | | | |
| UFOF 4080 R/L-S | ● | | 80 | 103 | 60 | 50 | 27 | 12,4 | 7,0 | 25 | 6 | | 2,1 | 1 |
| UFOF 4100 R/L-S | ● | | 100 | 122 | 75 | 50 | 32 | 14,4 | 8,5 | 29 | 8 | | 2,9 | 2 |
| 4125 R/L-S | ● | | 125 | 146 | 75 | 63 | 40 | 16,4 | 9,5 | 29 | 10 | | 4,2 | 2 |
| 4160 R/L-S | ● | | 160 | 180 | 100 | 63 | 40 | 16,4 | 9,5 | 29 | 12 | 5,0 | 6,6 | 3 |
| UFOF 4200 R/L-S | ❑ | | 200 | 220 | 130 | 63 | 60 | 25,7 | 14,0 | 32 | 16 | | 9,5 | 4 |
| 4250 R/L-S | ❑ | | 250 | 270 | 300 | 63 | 60 | 25,7 | 14,0 | 40 | 20 | | 14,8 | 4 |
| UFOF 4315 R/L-S | ❑ | | 315 | 335 | 240 | 80 | 60 | 25,7 | 14,0 | 40 | 24 | | 26,6 | 5 |

## Insert

| Grade | | Coated Carbide | | | | | Cermet | Uncoated Carbide | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed/Light Cut | | P | | | K | | | | | | | K M |
| General Purpose | | | P M | P M | K | | P | P | K | K | | |
| Roughing | | | P M | P M | | K | | | | | | |
| Cat. No. | | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | T250A | A30N | G10E | H1 | H10E | Fig. |
| UFO(F) 4000 | SFKN 12T3 AZFN | | | | ● | ● | | | ● | ❍ | | 1(2) |
| | 12T3 AZTN | ● | ● | ● | | | ● | ❍ | | | | 2 |
| | SFKR 12T3 AZTN | ❍ | ❍ | | | | | | | | | 3 |
| | UW 12500 R | | | | | | | | | | ❍ | 4 |
| UFO 5000 | SFKN 1504 AZFN | | | | ● | ❍ | | | ❍ | | | 5(6) |
| | 1504 AZTN | ● | ● | ● | | | | ❍ | | | | 6 |
| | UW 15500 R | | | | | | | | | | ❍ | 7 |

Fig. 1 (Grades: ACP_, ACK_)

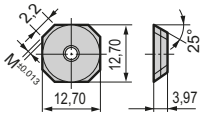



Fig. 2

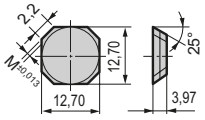



Fig. 3

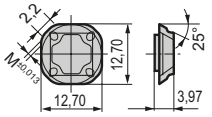



Fig. 4

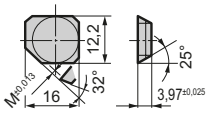



Fig. 5 (Grades: ACP_, ACK_)

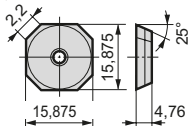



Fig. 6

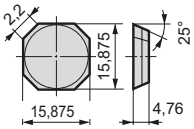
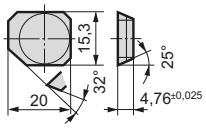



Fig. 7




## Recommended Cutting Conditions

($v_c$ =m/min, $f_t$ =mm/tooth) (min.– **optimum** – max.)

| Grade | | ACP100 | | | ACP200 | | | ACP300 | | ACK200 | | ACK300 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Work Material / Insert Type | | Low carbon steel | Alloy steel | Die steel | Low carbon steel | Alloy steel | Die steel | Stainless steel austenitic | Stainless steel martensitic | Cast iron | Ductile cast iron | Cast iron | Ductile cast iron |
| UFO (-F) 4000 | $v_c$ | 100–**250**–400 | 80–**220**–280 | 80–**150**–250 | 80–**200**–370 | 70–**150**–250 | 60–**130**–220 | 120–**180**–240 | 100–**140**–200 | 220–**270**–450 | 150–**180**–250 | 180–**220**–270 | 130–**160**–220 |
| | $f_t$ | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 | 0,1–**0,2**–0,3 | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 | 0,1–**0,2**–0,3 | 0,1–**0,2**–0,3 | 0,1-**0,2**-0,3 | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 |
| | $a_p$ | 1,0–**3,0**–5,0 | | | 1,0–**3,0**–5,0 | | | 1,0–**2,0**–3,0 | | 1,0–**3,0**–5,0 | | 1,0–**3,0**–5,0 | |
| UFO (-F) 5000 | $v_c$ | 100–**250**–400 | 80–**220**–280 | 80–**150**–250 | 80–**200**–370 | 70–**150**–250 | 60–**130**–220 | 120–**180**–240 | 100–**140**–200 | 220-**270**-450 | 150–**180**–250 | 180–**220**–270 | 130–**160**–220 |
| | $f_t$ | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 | 0,1–**0,2**–0,3 | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 | 0,1–**0,2**–0,3 | 0,1–**0,2**–0,3 | 0,1–**0,2**–0,3 | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 | 0,1–**0,25**–0,4 |
| | $a_p$ | 1,0–**4,0**–7,0 | | | 1,0–**4,0**–7,0 | | | 1,0–**2,0**–5,0 | | 1,0–**4,0**–7,0 | | 1,0–**4,0**–7,0 | |

# DNX / DNXF Type

## General Milling for Cast Iron and Steel

| | | |
|---|---|---|
| Approach angle | : | 65° |
| Axial rake angle | : | + 5° |
| Radial rake angle | : | - 6° |

8 mm / 65°

Fig. 1

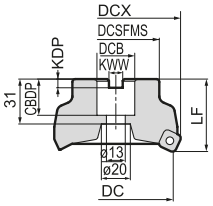



Fig. 2

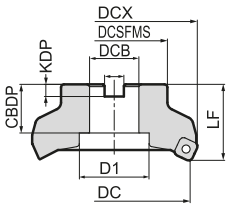



Fig. 3

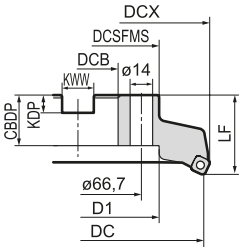
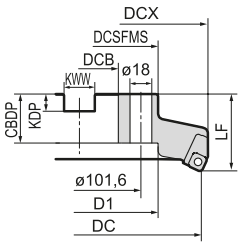



Fig. 4




## ■ Body

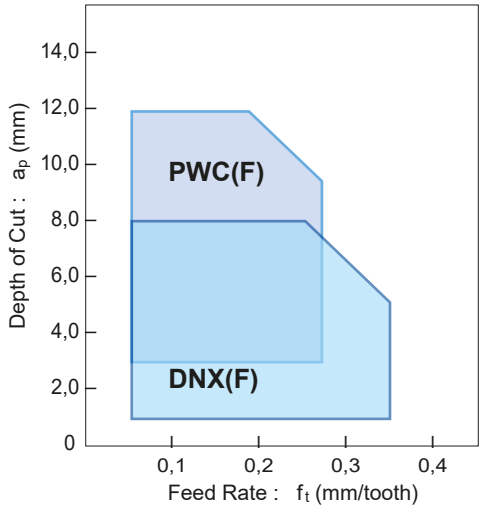
### ● Standard DNX - Type

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | | |
| DNX 12080 RS | ● | 80 | 88 | 60 | 50 | 27 | - | 12,4 | 7,0 | 25 | 6 | 8,0 | 1,2 | 1 |
| DNX 12100 RS | ● | 100 | 108 | 80 | 50 | 32 | 46 | 14,4 | 8,5 | 29 | 7 | | 1,6 | 2 |
| 12125 RS | ● | 125 | 133 | 80 | 63 | 40 | 56 | 16,4 | 9,5 | 29 | 8 | | 2,8 | 2 |
| 12160 RS | ● | 160 | 168 | 100 | 63 | 40 | 88 | 16,4 | 9,5 | 29 | 10 | | 4,4 | 3 |
| DNX 12200 RS | ❑ | 200 | 210 | 150 | 63 | 60 | 130 | 25,7 | 14,0 | 35 | 16 | | 8,0 | 4 |
| 12250 RS | ❑ | 250 | 260 | 180 | 63 | 60 | 160 | 25,7 | 14,0 | 25 | 20 | | 12,2 | 4 |

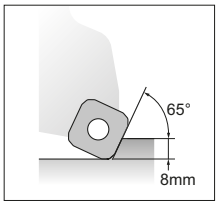
### ● Fine Pitch DNXF - Type

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | | |
| DNXF 12080 RS | ● | 80 | 88 | 60 | 50 | 27 | - | 12,4 | 7,0 | 25 | 8 | 8,0 | 1,2 | 1 |
| DNXF 12100 RS | ● | 100 | 108 | 80 | 50 | 32 | 46 | 14,4 | 8,5 | 29 | 10 | | 1,6 | 2 |
| 12125 RS | ● | 125 | 133 | 80 | 63 | 40 | 56 | 16,4 | 9,5 | 29 | 11 | | 2,7 | 2 |
| 12160 RS | ● | 160 | 168 | 100 | 63 | 40 | 88 | 16,4 | 9,5 | 29 | 12 | | 4,4 | 3 |

## ■ First Recommendation: DNX




## DNX / DNXF




Wiper width = 1,2 mm

| Max. depth of cut : 8 mm, Approach angle : 65° | | |
|---|---|---|
| Cutter Type | Diameter Range | Characteristics |
| DNX 12000 RS | Ø 80–Ø 250 mm | - General purpose<br>- Medium pitch type |
| DNXF 12000 RS | Ø 80–Ø 160 mm | - General purpose<br>- Fine pitch type |

## ■ Spare Parts

| Cutter | Insert Screw | Insert Wrench | Locator | Clamp Screw | Wrench |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| | 3,0 (N·m) | | | | |
| Ø 80 – Ø 160 | BFTX0412 IP | TRDR15 IP | – | – | – |
| Ø 200, Ø 250 | | | DNXK 12 R | BX 0515 | LH 040 |

## ■ Identification Details

**DNX F 12 080 R S**

| DNX | F | 12 | 080 | R | S |
|---|---|---|---|---|---|
| Cutter type | Fine pitch | Insert size | Diam. | Cutting direction | Shell type |



● = Euro stock
○ = Japan stock

❑ = Delivery on request

(N·m) Recommended Tightening Torque (N·m)

# DNX / DNXF Type

## Features

- Small inserts with 8 cutting edges
- Economic by double-side usage
- Excellent grade for cast iron machining
- Optimised geometry for best results in cast iron
- Special inserts for steel machining

## Insert

| Application | Coated Carbide | | | | | |
|---|---|---|---|---|---|---|
| High Speed/Light cut | | | K | K | | |
| General Purpose | PM | PM | K | K | | |
| Roughing | PM | PM | | | K | |
| Cat. No. | ACP200 | ACP300 | ACK100 | ACK200 | ACK300 | Fig. |
| SNMT 1205 ZNEN-G | ● | | ❍ | ● | ❍ | 1 |
| 1205 ZNEN-H | ● | | ❍ | ● | ● | 2 |
| 1205 ZNEN-SH | ● | ❑ | ● | ● | ● | 3 |

Fig. 1 **G** Type

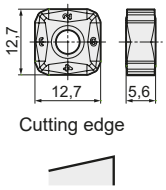



Fig. 2 **H** Type

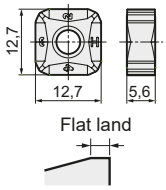
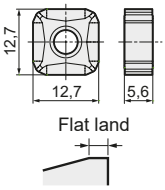



Fig. 3 **SH** Type




**G** Type : For general purpose
**H** Type : For heavy machining
**SH** Type : For steel machining

- Negative inserts
- Inserts with 8 cutting edges
- Applicable for steel machining

## Advantage of SH-Type when Steel machining

**G** Type

Chip packing causes higher cutting forces !

**SH** Type

Smooth chip evacuation reduces cutting forces !

## Recommended Cutting Conditions

($v_c$ = m/min, $f_t$ = mm/tooth) (min.– **optimum** – max.)

| ISO | Work Material | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/tooth) | Insert Grade |
|---|---|---|---|---|---|
| P | Carbon steel | 180–280 | 150–**175**–200 | 0,10–**0,15**–0,20 | ACP200 |
| | Alloy steel | 180–280 | 150–**175**–200 | 0,10–**0,15**–0,20 | ACP200 |
| K | Grey cast iron (GG) | 250 | 150–**225**–300 | 0,10–**0,20**–0,30 | ACK200/ACK300 |
| | Ductile cast iron (GGG) | 250 | 150–**225**–250 | 0,10–**0,18**–0,25 | ACK200/ACK300 |

# Wave Radius Mill
# WRCX Type

## High Durable Mill with Polygon Inserts

## Grades for Steels, Cast Iron and Aluminium

## Features

The "Wave Mill" WRCX type is a new multi purpose milling cutter for face milling, slotting, helical boring, plunging and profiling. Its unique design features 16 corner polygon inserts and a durable cutter body manufactured from high tensile alloyed steel protected by a hard surface treatment. Insert rigidity is maximised via close tolerance seat pockets and centre clamped using a torxscrew . Choose from a variety of insert grades such as our award winning Diamond like Carbon DL 1000 capable of high feed machining aluminium, our uncoated H1 grade suitable for non-ferrous metals or our new ACP/ACK grades for steels and irons.

## Advantages

- Durable cutter body – Special alloyed steel with hard surface.
- High feed cutting – Optimised pitch and high number of cutting edges
- Excellent chip removal – Wide pocket and integral coolant hole
- Maximum rigidity – Rigid clamping of inserts with TORXPLUS screw
- Wide application range – Carbon steels, alloy steels, stainless steels, high temperature alloys, diemould steels, aluminiums, non-ferrous metals etc

## Insert

| Application | Coated Carbide | | | | | Uncoated Carbide | Diamond Coated | Dimensions (mm) | | | Fig. | Applicable Endmill |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | IC | RE | S | | |
| High Speed / Light cut | P | | | K | | K N | N | | | | | |
| General Purpose | | P M | P M | K | | | N | | | | | |
| Roughing | | P M | P M | | K | | | | | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | H1 | DL1000 | | | | | |
| QPMT 120440 PPEN | ● | ● | ● | ● | ● | | | 12 | 4,0 | 4,76 | 1 | WRCX/-F 12000 RS |
| 120440 PPEN-H | ● | ● | ● | ● | ● | | | | | | | |
| QPET 120460 PPFR-S | | | | | | ● | ● | | 6,0 | | 2 | WRCX/-F/-X 16000 RS |
| QPMT 160660 PPEN | ● | ● | ● | ● | ● | | | 16 | 6,0 | 6,5 | 1 | |
| 160660 PPEN-H | ● | ● | ● | ● | ● | | | | | | | |
| QPET 160680 PPFR-S | | | | | | ● | ● | | 8,0 | | 2 | WRCXF 20000 RS |
| QPMT 200670 PPEN | ● | ● | ● | ● | ● | | | 20 | 7,0 | 6,5 | 1 | |
| 200670 PPEN-H | ● | ● | ● | ● | ● | | | | | | | |

Fig. 1

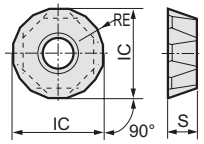
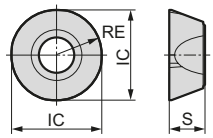



Fig. 2




QPMT... : Standard 16 cornered polygon type
QPMT...-H: Stronger cutting edge type

QPET...-S: Polished round insert for non-ferrous material

## ● Anti-Vibration Type (Paired Sets for Vibration Free Machining)

| Application | Coated Carbide | | | | | Uncoated Carbide | Diamond Coated | Dimensions (mm) | | | Fig. | Applicable Endmill |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | IC | RE | S | | |
| High Speed / Light cut | P | | | K | | K N | N | | | | | |
| General Purpose | | P M | P M | K | | | N | | | | | |
| Roughing | | P M | P M | | K | | | | | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | H1 | DL1000 | | | | | |
| QPMT 160608 PPEN | ● | ● | ● | ● | ● | | | 16 | 0,8 | 6,5 | 1 | WRCX/-F/-X 16000 RS |
| 160608 PPEN-CP | ● | ● | ● | ● | ● | | | | | | 3 | |
| QPMT 200608 PPEN | ● | ● | ● | ● | ● | | | 20 | 0,8 | 6,5 | 1 | WRCXF 20000 RS |
| 200608 PPEN-CP | ● | ● | ● | ● | ● | | | | | | 3 | |

Fig. 1
08

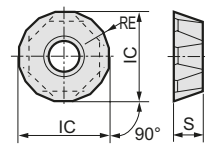
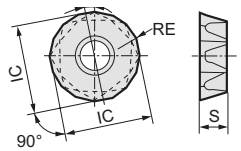
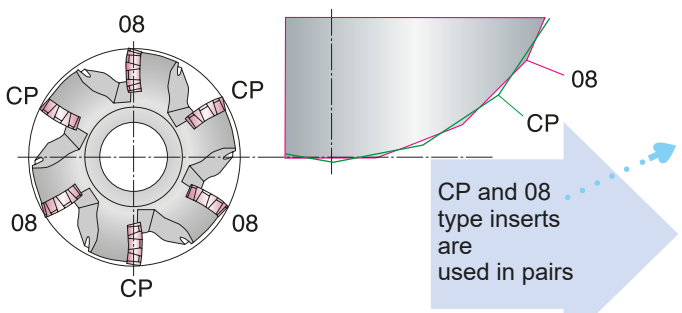



Fig.3
CP




The combination of different inserts in a staggered formation varies the cut depth and eliminates vibration when feed rate is

$f_t < 0,15$ (IC = 16 mm)
or
$f_t < 0,2$ (IC = 20 mm).




## ● Chip Formation

| Anti-vibration Type | Standard Type |
|---|---|
|  |  |

| | |
|---|---|
| Work Material: | 50C |
| Cutting Data: | $f_t$ = 0,1mm/tooth, $a_p$ = 7 mm |
| Insert Size: | IC = 20 mm |

● = Euro stock
❑ = Delivery on request

Recommended Tightening Torque (N·m)

Fig. 1

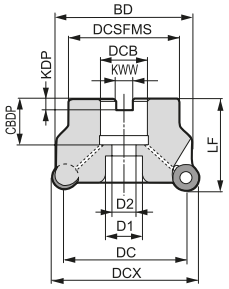



Fig. 2

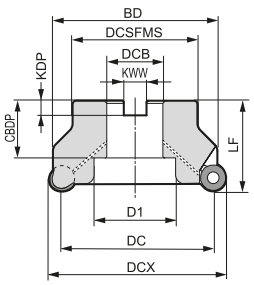
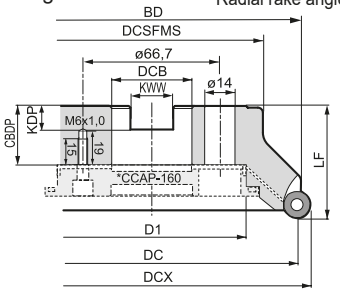



Fig. 3

Axial rake angle: - 3°
Radial rake angle: 0°




## ■ Body

* Note Fig.3 for DCX=160 : Coolant cap (CCAP-160) with 4 screws (BX0620) and wrench (TH050) is available seperately.

### ● Standard WRCX Type

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | | | No. of Teeth | Helical Boring øB Standard | Ramping αmax. | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX* | DC | BD | DCSFMS | LF* | KWW | KDP | DCB | D2 | D1 | CBDP | | | | | |
| WRCX 12040 RS | ● | 40 | 28 | 36 | 36 | 40 | 8,4 | 5,6 | 16 | 9 | 14 | 18 | 4 | 68 ± 11 | 10° | 0,2 | 1 |
| 12050 RS | ● | 50 | 38 | 46 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 4 | 88 ± 11 | 7° | 0,3 | 1 |
| 12052 RS | ● | 52 | 40 | 48 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 5 | 92 ± 11 | 6°30' | 0,3 | 1 |
| 12063 RS | ● | 63 | 51 | 59 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 5 | 114 ± 11 | 5° | 0,4 | 1 |
| 12080 RS | ● | 80 | 68 | 76 | 55 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 6 | 148 ± 11 | 3°30' | 0,9 | 1 |
| WRCX 16063 RS | ● | 63 | 47 | 50 | 50 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 3 | 110 ± 15 | 8° | 0,4 | 1 |
| 16080 RS | ● | 80 | 64 | 70 | 55 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 4 | 144 ± 15 | 5°30' | 0,8 | 1 |
| WRCX 16100 RS | ● | 100 | 84 | 90 | 70 | 50 | 14,4 | 8,5 | 32 | - | 46 | 32 | 5 | 184 ± 15 | 4° | 1,3 | 2 |
| 16125 RS | ❑ | 125 | 109 | 115 | 80 | 63 | 16,4 | 9,5 | 40 | - | 52 | 38 | 5 | 234 ± 15 | 3° | 2,4 | 2 |

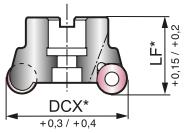
### ● Fine Pitch WRCXF Type

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | | | No. of Teeth | Helical Boring øB Standard | Ramping αmax. | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX* | DC | BD | DCSFMS | LF* | KWW | KDP | DCB | D2 | D1 | CBDP | | | | | |
| WRCXF 12050 RS | ❑ | 50 | 38 | 46 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 5 | 88 ± 11 | 7° | 0,3 | 1 |
| 12063 RS | ❑ | 63 | 51 | 59 | 40 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 6 | 114 ± 11 | 5° | 0,4 | 1 |
| WRCXF 16052 RS | ● | 52 | 36 | 45 | 45 | 40 | 10,4 | 6,3 | 22 | 11 | 17,7 | 20 | 4 | 88 ± 15 | 10° | 0,3 | 1 |
| 16063 RS | ● | 63 | 47 | 50 | 50 | 40 | 10,4 | 6,3 | 22 | 11 | 18 | 20 | 4 | 110 ± 15 | 8° | 0,4 | 1 |
| 16080 RS | ● | 80 | 64 | 70 | 55 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 5 | 144 ± 15 | 5°30' | 0,8 | 1 |
| WRCXF 16100 RS | ● | 100 | 84 | 90 | 70 | 50 | 14,4 | 8,5 | 32 | - | 46 | 32 | 6 | 184 ± 15 | 4° | 1,3 | 2 |
| 16125 RS | ● | 125 | 109 | 115 | 80 | 63 | 16,4 | 9,5 | 40 | 29 | 52 | 29 | 6 | 234 ± 15 | 3° | 2,4 | 1 |
| 16160 RS | ● | 160 | 144 | 150 | 100 | 63 | 16,4 | 9,5 | 40 | - | 93 | 29 | 8 | 304 ± 15 | 2° | 4,0 | 3* |
| WRCXF 20080 RS | ● | 80 | 60 | 68 | 55 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 5 | 140 ± 18 | 7° | 0,7 | 1 |
| WRCXF 20100 RS | ● | 100 | 80 | 88 | 70 | 50 | 14,4 | 8,5 | 32 | - | 46 | 32 | 6 | 180 ± 18 | 5° | 1,1 | 2 |
| 20125 RS | ● | 125 | 105 | 113 | 80 | 63 | 16,4 | 9,5 | 40 | 29 | 52 | 29 | 6 | 230 ± 18 | 3°30' | 2,3 | 1 |
| 20160 RS | ● | 160 | 140 | 148 | 100 | 63 | 16,4 | 9,5 | 40 | - | 93 | 29 | 8 | 300 ± 18 | 2°30' | 3,9 | 3* |

### ● Extra Fine Pitch WRCXX Type

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | | | No. of Teeth | Helical Boring øB Standard | Ramping αmax. | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX* | DC | BD | DCSFMS | LF* | KWW | KDP | DCB | D2 | D1 | CBDP | | | | | |
| WRCXX 16080 RS | ● | 80 | 64 | 70 | 55 | 50 | 12,4 | 7,0 | 27 | 13,5 | 20 | 25 | 6 | 144 ± 15 | 5°30' | 0,8 | 1 |
| 16100 RS | ● | 100 | 84 | 90 | 70 | 50 | 14,4 | 8,5 | 32 | - | 46 | 32 | 7 | 184 ± 15 | 4° | 1,3 | 2 |

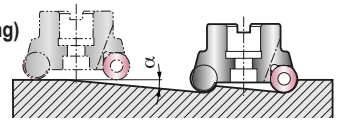
* Note : When using CP type anti-vibration inserts / IC = 16, please change above dimensions: DCX* +0,3 & LF* +0,15 mm
In case of anti-vibration inserts / IC = 20, please change above dimensions: DCX* +0,4 & LF* +0,2 mm




## ■ Maximum Rotation (min$^{-1}$) for Non-ferrous cutting when using QPET Insert

| Cutter DC (mm) | Insert Cat. No. | | |
|---|---|---|---|
| | QPET**10**...**S** | QPET**12**...**S** | QPET**16**...**S** |
| **25** | 28.000 | | |
| **32** | 25.000 | | |
| **40** | | 22.000 | 15.000 |
| **50** | | 20.000 | 14.000 |
| **63** | | 18.000 | 13.000 |
| **80** | | 16.000 | 12.000 |
| **100** | | | 10.000 |
| **125** | | | 9.000 |
| **160** | | | 8.000 |

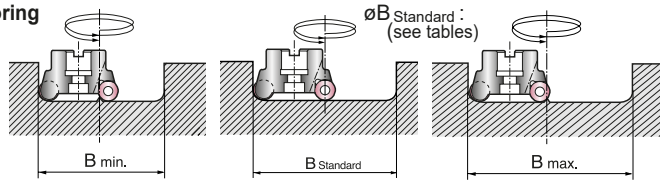
**Ramping (Slant Milling)**




α max : (see tables)

**Helical Boring**

øB Standard : (see tables)




## ■ Spare Parts

| Cutter | | Screw | | Screw |
|---|---|---|---|---|
| | |  | N·m |  |
| WRCX | 12○○○ | BFTX 0409 IP | 3,0 | TRDR 15 IP |
| WRCX/-F/-X | 16052–16100 | BFTX 0511 IP | 5,0 | TRDR 20 IP |
| | 16125–16160 | BFTX 0513 IP | 5,0 | |
| WRCX/-F | 20○○○ | BFTX 0615 IP | 5,0 | TRDR 25 IP |

## ■ Recommended Cutting Conditions

| DCX (mm) \ Material / Grade | | Carbon steel (ex. C40 ~ C50) | Alloy steel (Below HRC40) | Stainless steel (ex. X10CrNiS18-9) | Cast iron (ex. GG20) | Non-ferrous material |
|---|---|---|---|---|---|---|
| | | ACP100, ACP200 | ACP100, ACP200 | ACP200, ACP300 | ACK200, ACK300 | DL1000, H1 |
| 40 ~ 80 | $v_c$ | 100–**160**–200 | 100–**140**–180 | 80–**120**–160 | 80–**120**–160 | 200–**500**–1000 |
| | $f_t$ | 0,2–**0,4**–0,6 | 0,2–**0,3**–0,4 | 0,1–**0,2**–0,3 | 0,1–**0,2**–0,4 | 0,1–**0,3**–0,4 |
| 100 ~ 160 | $v_c$ | 150–**200**–250 | 100–**160**–200 | 160–**180**–200 | 100–**150**–200 | 200–**500**–1000 |
| | $f_t$ | 0,3–**0,4**–0,6 | 0,1–**0,3**–0,5 | 0,15–**0,2**–0,3 | 0,1–**0,15**–0,2 | 0,2–**0,3**–0,6 |

[$v_c$ = m/min, $f_t$ = mm/tooth] [min.– optimum – max.]

☞ H52

## Features

The Wave Radius Mill RSX Series enables stable machining even when using equipment with low clamp rigidity thanks to its body design achieving excellent cutting performance and rigidity.
In addition to the ACM Series for stainless steel and exotic alloys two grades have been added:
ACP200 grade for steel machining and
ACK300 grade for cast iron machining.
Handle an even wider range of milling needs with the RSX(F)08000 and RSX(F)20000 types.

## Characteristics

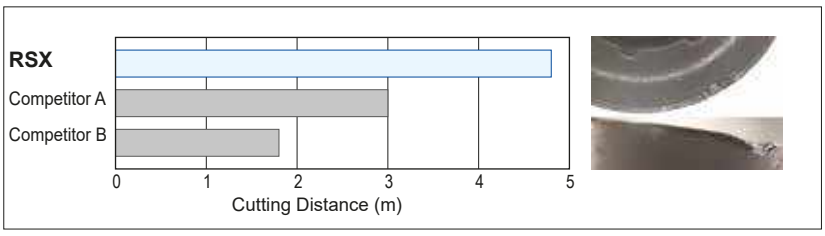
Smooth cutting action and low vibration machining provided based on the high rake angle design and high rigidity body.
High reliability achieved with ACM100/ACM200/ACM300 adopted for exotic alloy machining.
ACP200 for steel and ACK300 for cast iron enable stable machining in a wide range of applications.

## Series

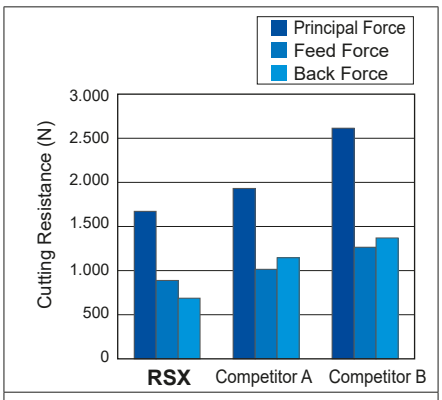
| Image | Series | Insert Size | Cat. No. | External Diameter (mm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ø 20 | Ø 25 | Ø 32 | Ø 40 | Ø 50 | Ø 52 | Ø 63 | Ø 66 | Ø 80 | Ø 100 | Ø 125 | Ø 160 |
| Shank Type  ☞ H54 | Standard | 08 | RSX 08000 ES | ● | ● | | | | | | | | | | |
| | | 10 | 10000 ES | | ● | ● | | | | | | | | | |
| | | 12 | 12000 ES | | | ● | | | | | | | | | |
| | Fine Pitch | 08 | RSXF 08000 ES | ● | ● | | | | | | | | | | |
| | | 10 | 10000 ES | | ● | ● | | | | | | | | | |
| | | 12 | 12000 ES | | | ● | | | | | | | | | |
| Shell Type  | Standard | 10 | RSX 10000 RS | | | | ● | ● | ● | | | | | | |
| | | 12 | 12000 RS | | | | ● | ● | ● | ● | ● | ● | ● | | |
| | | 16 | 16000 RS | | | | | | | ● | | ● | ● | ● | |
| | | 20 | 20000 RS | | | | | | | | | ● | ● | ● | ● |
| | Fine Pitch | 10 | RSXF 10000 RS | | | | ● | ● | ● | | | | | | |
| | | 12 | 12000 RS | | | | ● | ● | ● | ● | ● | ● | ● | | |
| | | 16 | 16000 RS | | | | | | | ● | | ● | ● | ● | ❑ |
| | | 20 | 20000 RS | | | | | | | | | ● | ● | ● | ● |
| Modular Type  ☞ H55 | Standard | 08 | RSX 08000 M | ● | ● | ● | | | | | | | | | |
| | | 10 | 10000 M | | ● | ● | | | | | | | | | |
| | | 12 | 12000 M | | | ● | ● | | | | | | | | |
| | Fine Pitch | 08 | RSXF 08000 M | ● | ● | ● | | | | | | | | | |
| | | 10 | 10000 M | | ● | ● | | | | | | | | | |
| | | 12 | 12000 M | | | ● | ● | | | | | | | | |

## Cutting Performance

### Tool Life Comparison (Fracture Resistance)

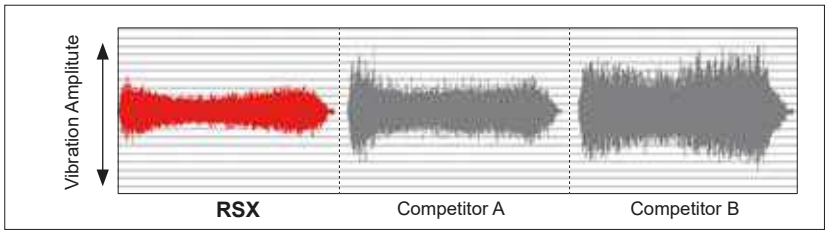



### Cutting Resistance Comparison




Work Material: X5CrNiS1810
Tool: Ø 50
Cutting Data: $v_c$ = 200m/min, $f_t$ = 0,5mm/t, $a_p$ = 2,0mm, $a_e$= 10,0mm, Wet

### Cutting Vibration Comparison

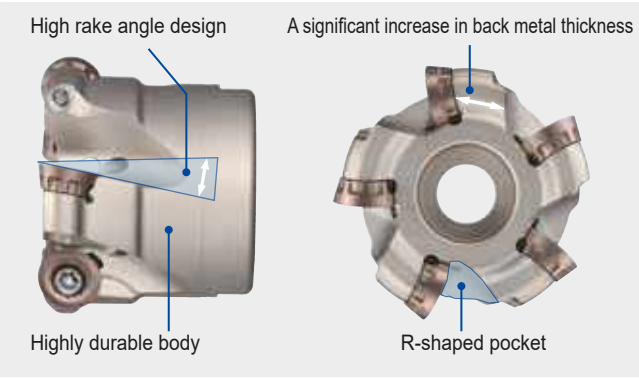





● = Euro stock
❑ = Delivery on request

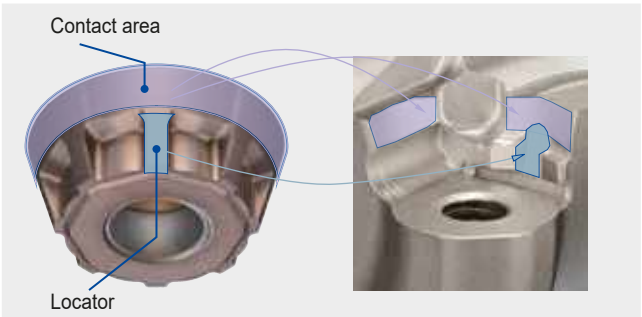
## Low Cutting Resistance, Less Vibration

Low cutting resistance and low vibration machining have been achieved with super high rake angle design + high rigidity body.



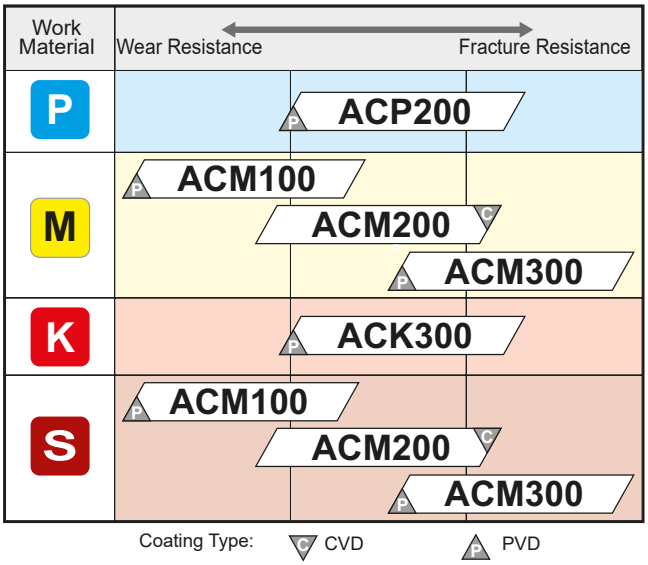

## High Operability

Ease of corner control has been achieved with the adoption of a unique positioning mechanism that is highly precise and highly operable.



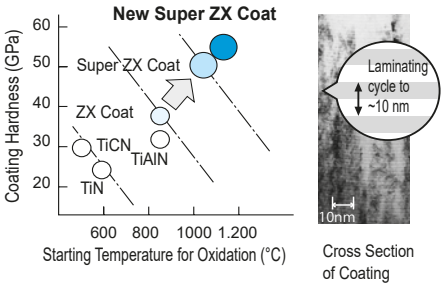

Insert size of 12 and 16 mm uses a maximum of 8 corners and an insert size of 10 mm uses a maximum of 4 corners.

## Stable and Long Tool Life

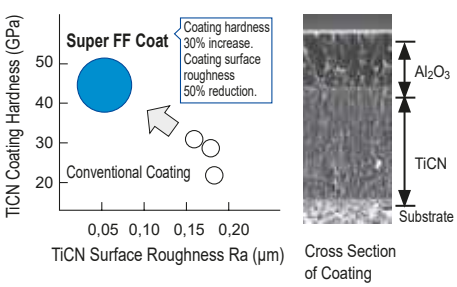



A long life ensured with the adoption of the ACM series and significant improvements have been made in processing exotic alloy and stainless steel machining.

**ACM100/ACM300**




**ACM200**




### New Super ZX Coat

The product series with a coating film hardness approximately 40 % higher and an oxidation onset temperature 200 °C higher than conventional products.
Enables machining at least 1,5 times faster and more efficiently than conventional products.
A product life at least twice as long as that of conventional products achieved under the same machining conditions.

### Super FF Coat

Smooth coating surface provides excellent adhesion and chipping resistance.
Improved coating adhesion strength.
Harder than conventional coatings with hugh improvements in wear resistance.
High speed, high effiency machining of more than 1,5 times than of conventional grades possible.
Achieving more than double the tool life of conventional grades under the same cutting conditions.

Milling of steel, stainless steel, cast iron and exotic alloys

| Rake Angle | | |
|---|---|---|
| | Radial | –5° |
| | Axial | 10° |

| 5 mm | 6 mm | 8 mm | 10 mm |
|---|---|---|---|
| (10000RS) | (12000RS) | (16000RS) | (20000RS) |

## Body – Dimensions

Fig. 1

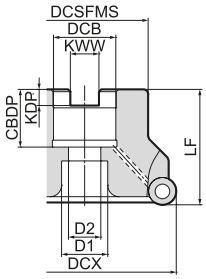



Fig. 2

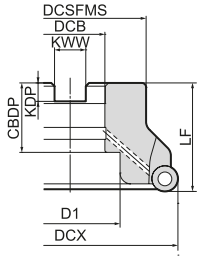
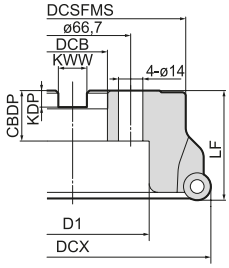



Fig. 3




## Body

### ● RSX...RS, Standard

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| RSX 10040 RS | ● | 40 | 34 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 4 | 0,2 | 1 |
| 10050 RS | ● | 50 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,3 | 1 |
| 10052 RS | ● | 52 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,4 | 1 |
| RSX 12040 RS | ● | 40 | 32 | 40 | 16 | 8,4 | 5,6 | 18 | 13,5 | 9 | 3 | 0,2 | 1 |
| 12050 RS | ● | 50 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,3 | 1 |
| 12052 RS | ● | 52 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,3 | 1 |
| 12063 RS | ● | 63 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,4 | 1 |
| 12066 RS | ● | 66 | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 6 | 0,7 | 1 |
| 12080 RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 6 | 1,0 | 1 |
| RSX 12100 RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8,5 | 32 | 46 | - | 6 | 1,4 | 2 |
| RSX 16063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,5 | 1 |
| 16080 RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 5 | 0,9 | 1 |
| RSX 16100 RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8,5 | 32 | 46 | - | 6 | 1,3 | 2 |
| 16125 RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9,5 | 29 | 52 | 29 | 6 | 2,6 | 1 |
| RSX 20080 RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7,0 | 22 | 20 | 14 | 4 | 0,9 | 1 |
| RSX 20100 RS | ● | 100 | 70 | 63 | 32 | 14,4 | 8,0 | 32 | 46 | - | 5 | 1,8 | 2 |
| 20125 RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9,0 | 29 | 52 | 29 | 6 | 2,6 | 1 |
| 20160 RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9,0 | 29 | 90 | - | 7 | 4,7 | 3 |

### ● RSXF...RS, Fine Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| RSXF 10040 RS | ● | 40 | 34 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 5 | 0,2 | 1 |
| 10050 RS | ● | 50 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,3 | 1 |
| 10052 RS | ● | 52 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,3 | 1 |
| RSXF 12040 RS | ● | 40 | 32 | 40 | 16 | 8,4 | 5,6 | 18 | 13,5 | 9 | 4 | 0,2 | 1 |
| 12050 RS | ● | 50 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,3 | 1 |
| 12052 RS | ● | 52 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,3 | 1 |
| 12063 RS | ● | 63 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,4 | 1 |
| 12066 RS | ● | 66 | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 7 | 0,7 | 1 |
| 12080 RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 7 | 0,9 | 1 |
| RSXF 12100 RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8,5 | 32 | 46 | - | 10 | 1,3 | 2 |
| RSXF 16063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,4 | 1 |
| 16080 RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 6 | 0,8 | 1 |
| RSXF 16100 RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8,5 | 32 | 46 | - | 7 | 1,3 | 2 |
| 16125 RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9,5 | 29 | 52 | 29 | 8 | 2,5 | 1 |
| 16160 RS | ❑ | 160 | 130 | 63 | 40 | 16,4 | 9,5 | 29 | 88 | - | 10 | 4,8 | 3 |
| RSXF 20080 RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7,0 | 22 | 20 | 14 | 5 | 0,9 | 1 |
| RSXF 20100 RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | - | 6 | 1,8 | 2 |
| 20125RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9,0 | 29 | 52 | 29 | 7 | 2,6 | 1 |
| 20160RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9,0 | 29 | 90 | - | 9 | 4,6 | 3 |

## Identification Details

| RSX | F | 12 | 040 | R | S |
|---|---|---|---|---|---|
| Cutter Series | Fine Pitch Type | Insert Size | Cutter Diameter | Cutting Direction | Metric |



● = Euro stock
○ = Japan stock

❑ = Delivery on request

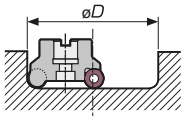
Recommended Tightening Torque (N·m)

## Various Machining Use

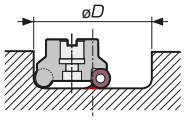
Various types of processing, such as mould engraving, slant milling and helical processing.

### Helical Milling

Helical Milling

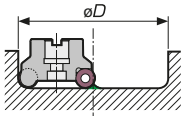



≤ Work Diameter




Center uncut portion cannot be removed by traverse cutting with the same cutter.

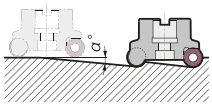
≥ Work Diameter




Center uncut portion can be removed by traverse cutting with the same cutter.

### Ramping

Use at $\alpha°$ or lower



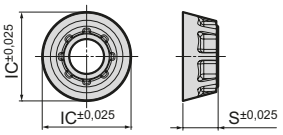

### Recommended Values for Helical and Ramping

| Insert Cat. No. | Helical | | | | Taper |
|---|---|---|---|---|---|
| | Cutter ØDC | Work Diameter | | | Ramping Angle α°(max) |
| | | Min. | Optimal Ø | Max. | |
| RDET10... | 25 | 33,0 | 40 | 49 | 10°30' |
| | 32 | 46,0 | 54 | 63 | 6°45' |
| | 40 | 62,0 | 70 | 79 | 4°30' |
| | 50 | 82,0 | 90 | 99 | 3°15' |
| | 52 | 86,0 | 94 | 103 | 3°10' |
| RDET12... | 32 | 41,5 | 52 | 63 | 12°30' |
| | 40 | 57,5 | 68 | 79 | 8°00' |
| | 50 | 77,5 | 88 | 99 | 5°30' |
| | 52 | 81,5 | 92 | 103 | 5°15' |
| | 63 | 103,5 | 114 | 125 | 4°00' |
| | 66 | 109,5 | 120 | 131 | 3°45' |
| | 80 | 137,5 | 148 | 159 | 2°50' |
| | 100 | 177,5 | 188 | 199 | 2°10' |
| RDET16... | 63 | 96,0 | 110 | 125 | 6°00' |
| | 80 | 130,0 | 144 | 159 | 4°10' |
| | 100 | 170,0 | 184 | 199 | 3°00' |
| | 125 | 220,0 | 234 | 249 | 2°20' |
| RDET20... | 80 | 122,0 | 140 | 159 | 4°15' |
| | 100 | 162,0 | 180 | 199 | 3°00' |
| | 125 | 212,0 | 230 | 249 | 2°00' |
| | 160 | 282,0 | 300 | 319 | 1°15' |

## Inserts

| Application | Grade | | | | |
|---|---|---|---|---|---|
| High Speed/Light Cut | | | MS | MS | |
| General Purpose | PM | | MS | MS | MS |
| Roughing | PM | K | | | MS |

| Cat. No. | ACP200 | ACK300 | ACM100 | ACM200 | ACM300 | Dimens. ød (IC) | Dimens. S | Applicable Cutters |
|---|---|---|---|---|---|---|---|---|
| RDET 10T3M0EN G | ● | ● | ● | ● | ● | 10 | 3,97 | RSX(F) 10000RS |
| 10T3M0EN H | ● | ● | ● | ● | ● | 10 | 3,97 | |
| RDET 1204M0EN G | ● | ● | ● | ● | ● | 12 | 4,76 | RSX(F) 12000RS |
| 1204M0EN H | ● | ● | ● | ● | ● | 12 | 4,76 | |
| RDET 1606M0EN G | ● | ● | ● | ● | ● | 16 | 6,5 | RSX(F) 16000RS |
| 1606M0EN H | ● | ● | ● | ● | ● | 16 | 6,5 | |
| RDET 2006M0EN G | ● | ● | ● | ● | ● | 20 | 6,5 | RSX(F) 20000RS |
| 2006M0EN H | ❍ | ● | ● | ● | ● | 20 | 6,5 | |




Cutting Edge Cross Section

**G** - Type **H** - Type

M0: IC is metric

## Spare Parts

| Applicable Cutters | Wrench | Screw | |
|---|---|---|---|
| |  |  | N·m |
| RSX(F) 10000RS | TRDR15IP | BFTX03584IP | **3,0** |
| RSX(F) 12000RS | | BFTX0409IP | **3,0** |
| RSX(F) 16000RS | TRDR20IP | BFTX0511IP | **5,0** |
| RSX(F) 20000RS | TRDR25IP | BFTX0615IP | **5,0** |

## Recommended Cutting Conditions

Min.-**Optimum**-Max.

| ISO | Work Material | | | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/t) | Grade |
|---|---|---|---|---|---|---|---|
| P | Carbon Steel | | | 180–280 | 100–**160**–200 | 0,20–**0,40**–0,60 | ACP200 |
| P | Alloy Steel | | | 180–280 | 100–**140**–180 | 0,20–**0,30**–0,40 | ACP200 |
| M | Stain-less Steel | Cr Based | Ferritic | 200 | 150–**180**–200 | 0,15–**0,25**–0,35 | ACM300 |
| M | | | Martensitic | 200–330 | 80–**120**–180 | 0,15–**0,25**–0,35 | ACM300 |
| M | | Cr-Ni Based | Austenitic | 200 | 150–**180**–200 | 0,15–**0,25**–0,35 | ACM300 |
| M | | | Austenitic, ferritic | 230–270 | 80–**120**–180 | 0,15–**0,25**–0,35 | ACM200 |
| M | | | Precipitation hardening | 330 | 60–**100**–160 | 0,15–**0,25**–0,35 | ACM200 |
| K | Cast Iron | | | 250 | 80–**120**–160 | 0,10–**0,30**–0,40 | ACK300 |
| S | Heat resistant alloy | | Ni based material | 250–350 | 20–**30**–40 | 0,10–**0,20**–0,30 | ACM100 ACM200 |
| S | Titanium | | Pure Titanium | (Rm 400) | 60–**80**–100 | 0,10–**0,20**–0,30 | |
| S | | | $\alpha + \beta$ alloy system | (Rm 1050) | 40–**50**–60 | 0,10–**0,20**–0,30 | |

# DFC Type

## General Features

The Sumi Dual Mill DFC type employs cost effective double-sided inserts for high toughness and enhanced accuracy.
The double-side inserts are flexible and reduces costs.

## Large Line-up

- Diameter from Ø 25 mm to Ø 200 mm
- Available as standard, fine and extra-fine pitch
- Bore diameter: metric
- Insert geometry: L, G, H

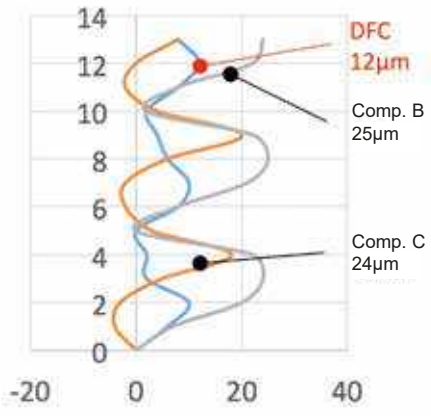
## Cutter Body

| Type | | Cat. No. | Diameter (mm) | No. of Teeth | Image |
|---|---|---|---|---|---|
| Shank ☞ H14 | Standard Pitch | DFC 09000 E | Ø 25–Ø 80 | 2–5 |  |
| | Medium Pitch | DFCM 09000 E | Ø 32–Ø 80 | 3–7 | |
| Shell | Standard Pitch | DCF 09000 RS | Ø 50–Ø 200 | 4–8 |  |
| | Medium Pitch | DFCM 09000 RS | Ø 50–Ø 200 | 5–12 | |
| | Fine Pitch | DFCF 09000 RS | Ø 50–Ø 200 | 6–16 | |

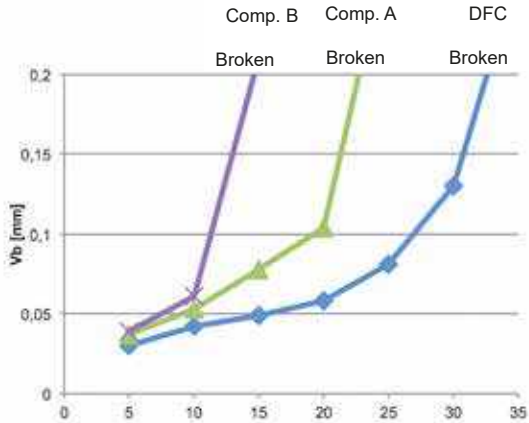
## 90 Degree Accuracy

Work material: Carbon steel

Cutting conditions:
$v_c$ = 200 m/min, $f_t$ = 0.1 mm/t
$a_e$ = 5.0 mm, $a_p$ = 5.0 mm x 3 passes




Shell type: ø 63 mm



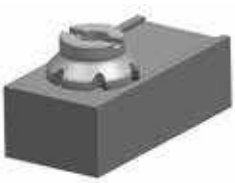

Number of passes (1 pass = 0.30 mm)

## Suitable Applications

Face milling

Shoulder milling

Slot milling



Side face milling

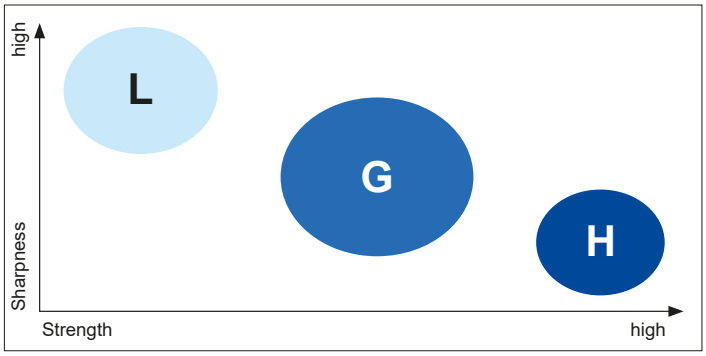


● = Euro stock

## ■ New Insert Design Provides Excellent Machining Accuracy

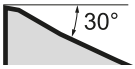
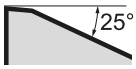
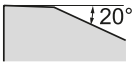
- The new insert design separates the location area and cutting edge producing an optimized solution.
- Machining accuracy is comparable to single sided inserts provided the DOC is less than 3 mm.
- The SEC-Sumi Dual Mill design, equips the user with a highly stable cutter for high feed machining applications.

### ● Chipbreaker Selection Map



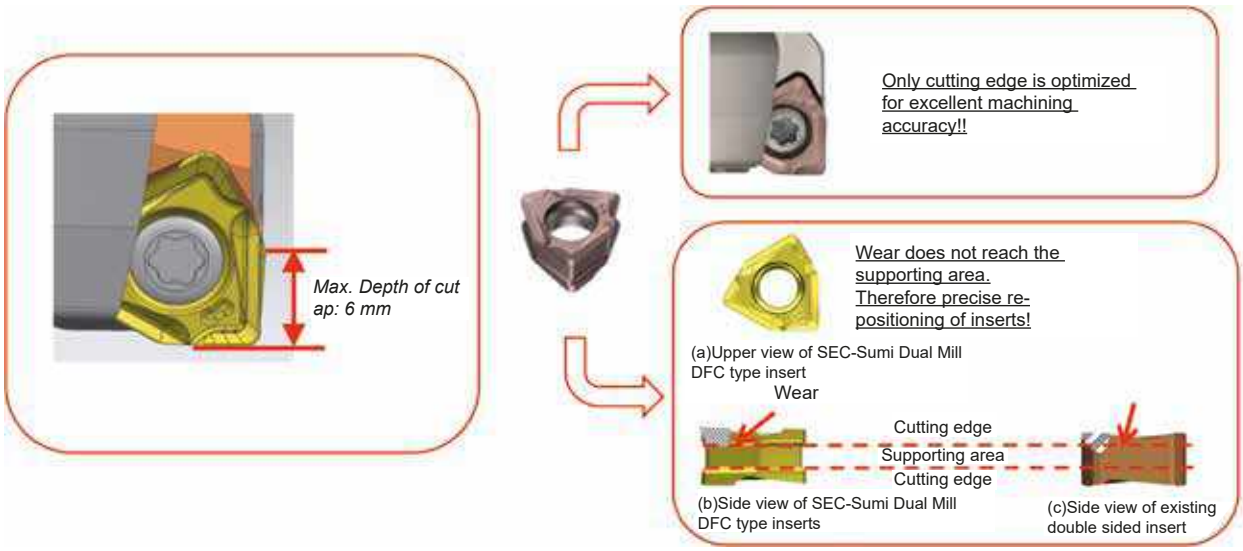

### ● Inserts

| Cat. No. | RE0,4 | RE0,8 | RE1,2 | RE1,6 |
|---|---|---|---|---|
| XNMU0606__PNER-L | ● | ● | ● | ● |
| XNMU0606__PNER-G | ● | ● | ● | ● |
| XNMU0606__PNER-H | ● | ● | ● | ● |

| Work Material | Steel, Cast Iron | | |
|---|---|---|---|
| Chipbreaker | L type | G type | H type |
| |  |  |  |
| Feature | Low cutting force | General purpose | Strong edge |
| Cutting edge geometry |   |   |   |
| Application | Light cut, low rigidity milling and reduced burrs | Main breaker for general purpose applications | Roughing, heavy interrupted and hardness steel milling |

## ■ Stable and High Cutting Performance Combined with High Toughness

- The excellent cutter performance offers efficient machining, enables high feed rate capability.
- The new insert construction provides extremely accurate edge to edge indexing whilst the location area offers high security and stability.



# DFC(M/F) 09000RS Type

## Body – Shell type

| Rake Angle | | |
|---|---|---|
| | Radial | –9° |
| | Axial | –5° |

Max. $a_p$: 6 mm

Fig.1

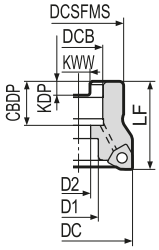



Fig.2

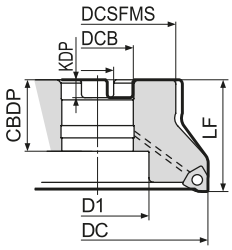
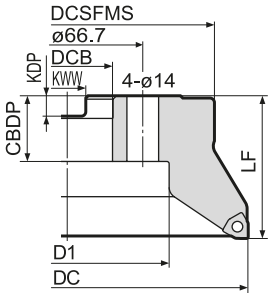



Fig.3




## ■ Body – Dimensions

### ● Sumi Dual Mill DFC type, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| DFC 09050RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,3 | 1 |
| 09063RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,5 | 1 |
| 09080RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7 | 22 | 20 | 14 | 5 | 1,0 | 1 |
| DFC 09100RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8 | 26 | 46 | - | 6 | 1,4 | 2 |
| 09125RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9 | 29 | 52 | 29 | 7 | 2,8 | 1 |
| 09160RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9 | 29 | 90 | - | 8 | 4,6 | 3 |
| DFC 09200RS | ❑ | 200 | 150 | 63 | 60 | 25,7 | 14 | 35 | 135 | - | 10 | 5,7 | |

### ● Sumi Dual Mill DFC type, Medium Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| DFCM 09050RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,3 | 1 |
| 09063RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,5 | 1 |
| 09080RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7 | 22 | 20 | 14 | 7 | 0,9 | 1 |
| DFCM 09100RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8 | 26 | 46 | - | 8 | 1,4 | 2 |
| 09125RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9 | 29 | 52 | 29 | 11 | 2,7 | 1 |
| 09160RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9 | 29 | 90 | - | 12 | 4,5 | 3 |
| DFCM 09200RS | ❑ | 200 | 150 | 63 | 60 | 25,7 | 14 | 35 | 135 | - | 16 | 5,6 | |

### ● Sumi Dual Mill DFC type, Fine Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| DFCF 09050RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,3 | 1 |
| 09063RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 7 | 0,5 | 1 |
| 09080RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7 | 22 | 20 | 14 | 9 | 0,9 | 1 |
| DFCF 09100RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8 | 26 | 46 | - | 11 | 1,3 | 2 |
| 09125RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9 | 29 | 52 | 29 | 14 | 2,6 | 1 |
| 09160RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9 | 29 | 90 | - | 16 | 4,6 | 3 |
| DFCF 09200RS | ❑ | 200 | 150 | 63 | 60 | 25,7 | 14 | 35 | 135 | - | 20 | 5,5 | |

## ■ Identification Details

| DFC | M | 09 | 050 | R | S |
|---|---|---|---|---|---|
| Cutter Series | M: Medium F: Fine | Insert Size | Cutter Diameter | Direction | Metric |

## ■ Spare Parts

| Screw | | Wrench |
|---|---|---|
|  | |  |
| BFTX03512IP | 5,0 | TRDR15IP |

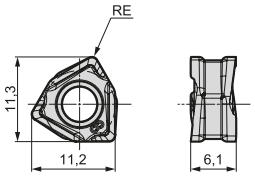


● = Euro stock
❑ = Delivery on request

Recommended Tightening Torque (N·m)

## Inserts

| Application | Coated Carbide | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light Cutting | PM | | | K | | MS | | P | Steel |
| General Purpose Cutting | | PM | PM | K | | MS | MS | M | Stainless Steel |
| Rough Cutting | | PM | PM | | K | | MS | K | Cast Iron |
| | | | | | | | | S | Exotic Alloy |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | Radius RE | |
| XNMU 060604 PNER-L | | ● | ● | | ● | | ● | 0,4 | |
| 060608 PNER-L | | ● | ● | | ● | | ● | 0,8 | |
| XNMU 060604 PNER-G | ● | ● | ● | ● | ● | ● | ● | 0,4 | |
| 060608 PNER-G | ● | ● | ● | ● | ● | ● | ● | 0,8 | |
| 060612 PNER-G | ● | ● | ● | ● | ● | ● | ● | 1,2 | |
| 060616 PNER-G | ● | ● | ● | ● | ● | ● | ● | 1,6 | |
| XNMU 060608 PNER-H | ● | ● | ● | ● | ● | ● | ● | 0,8 | |
| 060612 PNER-H | ● | ● | ● | ● | ● | ● | ● | 1,2 | |
| 060616 PNER-H | ● | ● | ● | ● | ● | ● | ● | 1,6 | |



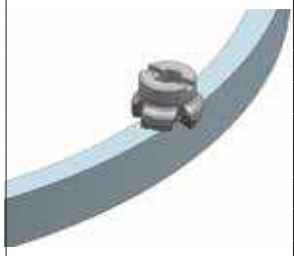

## Recommemded Cutting Conditions

| ISO | Work-material | Hardness (HB) | Cutting Speed (m/min) Min. - Optimum - Max. | Feed Rate Min. - Optimum - Max. | Depth of Cut (mm) | Grade |
|---|---|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,10–**0,20**–0,30 | < 6 | ACP200 ACP300 |
| | Soft Steel | ≤ 180 | 180–**250**–350 | 0,15–**0,25**–0,35 | < 6 | ACP200 ACP300 |
| | Die Steel | 200–220 | 100–**150**–200 | 0,10–**0,18**–0,25 | < 4 | ACP200 ACP300 |
| M | Stainless Steel | - | 160–**205**–250 | 0,12–**0,18**–0,25 | < 6 | ACM200 ACM300 |
| K | Cast Iron | 250 | 100–**175**–250 | 0,10–**0,20**–0,30 | < 6 | ACK200 ACK300 |

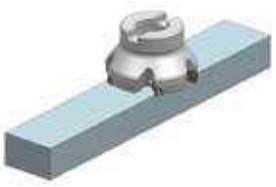
## Application Examples

| Work piece | | Sumitomo | Comp. |
|---|---|---|---|
| Workpiece material: Steel (HRB 269-330) | Breaker | G | |
| | Grade | ACP200 | |
| | $v_c$ (m/min) | 226 | 200 |
| | $v_f$ (mm/min) | 1260 | |
| | $f_t$ (mm/t) | 0,28 | 0,2 |
| | $a_p$ (mm) | 2 | 2 |
| | $a_e$ (mm) | 5 | 5 |
| | Dry or Wet | Wet | Wet |
| | Tool diam. Ø | 80 | |
| | No. of Teeth | 5 | |
| | Result | Efficiency: 158 % achieved | |
| | Evaluation | Wear resistance, efficiency | |

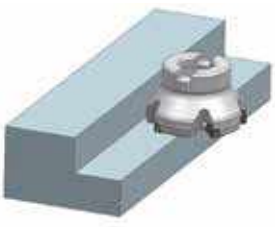
| Work piece | | Sumitomo | Comp. |
|---|---|---|---|
| Workpiece material: S235 (Carbon steel) Face milling | Breaker | G | |
| | Grade | ACP200 | |
| | $v_c$ (m/min) | 180 | 180 |
| | $v_f$ (mm/min) | 1092 | 910 |
| | $f_t$ (mm/t) | 0,3 | 0,2 |
| | $a_p$ (mm) | 2 x 2 mm | 2 x 2 mm |
| | $a_e$ (mm) | 50 | 50 |
| | Dry or Wet | Dry | Dry |
| | Tool diam. Ø | 63 mm | 63 mm |
| | No. of Teeth | 4 | 5 |
| | Result | Efficiency: 120 % achieved | |
| | Evaluation | Wear resistance, efficiency | |



| Work piece | | Sumitomo | Comp. |
|---|---|---|---|
| Workpiece material: Cast Iron | Breaker | G | |
| | Grade | ACP200 | |
| | $v_c$ (m/min) | 156 | 156 |
| | $v_f$ (mm/min) | 536 | 404 |
| | $f_t$ (mm/t) | 0,17 | 0,09 |
| | $a_p$ (mm) | 2,2 | 2,2 |
| | $a_e$ (mm) | 63,5 | 63,5 |
| | Dry or Wet | Dry | Dry |
| | Tool diam. Ø | 80 mm | 80 mm |
| | No. of Teeth | 5 | 7 |
| | Result | Efficiency: 133 % achieved<br>Tool life: 138 % achieved | |
| | Evaluation | Efficiency, tool life | |



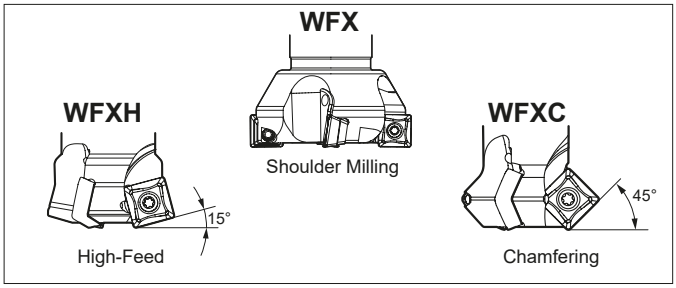
| Work piece | | Sumitomo | Comp. |
|---|---|---|---|
| Workpiece material: Cr-Mo alloy | Breaker | G | |
| | Grade | ACP200 | |
| | $v_c$ (m/min) | 200 | 200 |
| | $v_f$ (mm/min) | 838 | 838 |
| | $f_t$ (mm/t) | 0,2 | 0,13 |
| | $a_p$ (mm) | 6 | 6 |
| | $a_e$ (mm) | 43 | 43 |
| | Dry or Wet | Dry | Dry |
| | Tool diam. Ø | 80 mm | 80 mm |
| | No. of Teeth | 5 | 8 |
| | Result | Efficiency: 120 % achieved | |
| | Evaluation | Efficiency | |



# WFX Type

## General Features

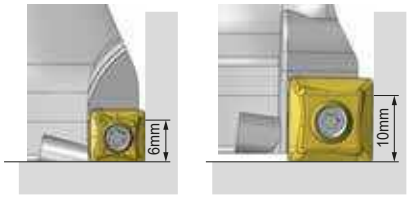
Wave Mill WFX type for shoulder milling is a screw-locking type cutter capable of using four corners.
Ideal cutting edge design delivers good squareness.
Series expansion with the high-feed **WFXH** type and the **WFXC** type for chamfering.
A comprehensive lineup that covers a wide variety of applications.




## Characteristics

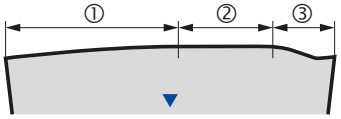
The insert shape, optimized for shoulder milling and combined with a high-precision body, leaves a superior machined surface finish.


### ● Max. Depth of Cut



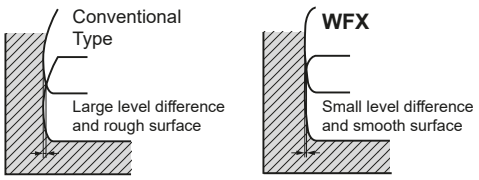

WFX08000 type　　WFX12000 type

### ● Optimized Edge Shape




① The convex shape ensures the cutting edge strength.

② The flat shape minimises differences in step levels.




③ The wiper edge function improves the surface roughness.

## Product Range

| Application | Type | Cat. No. | No. of Teeth | Cutter Diameter (mm) | Shape |
|---|---|---|---|---|---|
| Shoulder Milling | Shell Type | WFX 08000 RS | 3 - 8 | 40–1 00 | |
| | | WFXM 08000 RS | 4 - 10 | 40–100 | |
| | | WFXF 08000 RS | 6 - 12 | 40–100 | |
| | | WFX 08000 R | 6 - 8 | 80–100 | |
| | | WFXM 08000 R | 8 - 10 | 80–100 | |
| | | WFXF 08000 R | 10 - 12 | 80–100 | |
| | | WFX 12000 RS | 3 - 5 | 60–100 | |
| | | WFXF 12000 RS | 4 - 7 | 60–100 | |
| | | WFX 12000 R | 4 - 12 | 80–250 | |
| | | WFXF 12000 R | 6 - 18 | 80–250 | |
| | Endmill Type | WFX 08000 E | 2 - 5 | 20–63 | |
| | | WFXM 08000 E | 3 - 6 | 25–63 | |
| | | WFX 12000 E | 3 - 4 | 40–80 | |
| | | WFXF 12000 E | 4 - 6 | 60–80 | |
| | Modular Type | WFX 08000 M | 2 - 3 | 20–40 | |
| High Efficiency | Shell Type | WFXH 08000 RS | 4 - 6 | 40–63 | |
| | | WFXH 12000 RS | 4 - 5 | 60– 63 | |
| | Modular Type | WFXH 08000 M | 2 - 3 | 25–32 | |
| | | WFXH 12000 M | 3 | 40 | |
| Chamfering | Endmill Type | WFXC 08000 E | 1 - 2 | 8–16 | |
| | | WFXC 12000 E | 3 | 25–32 | |
| | Modular Type | WFXC 08000 M | 2 | 16 | |
| | | WFXC 12000 M | 3 | 25–32 | |

☞H16/17

## Inserts

| Cat. No. | RE0,2 | RE0,4 | RE0,8 | RE1,2 | RE1,6 |
|---|---|---|---|---|---|
| SOMT 0803_ _PZER-L | | ● | ● | | |
| 0803_ _PZER-G | | ● | ● | ● | |
| 0803_ _PZER-H | | | ● | ● | |
| SOET 0803_ _PZER-G | | ● | ● | ● | |
| 0803_ _PZFR-S | ● | ● | ● | | |
| SOMT 1204_ _PDER-L | | | ● | | |
| 1204_ _PDER-G | | ● | ● | ● | ● |
| 1204_ _PDER-H | | | ● | | |
| SOET 1204_ _PDFR-S | | | ● | | |

WFX08000 type insert (General Purpose G type chipbreaker)

WFX12000 type insert (General Purpose G type chipbreaker)

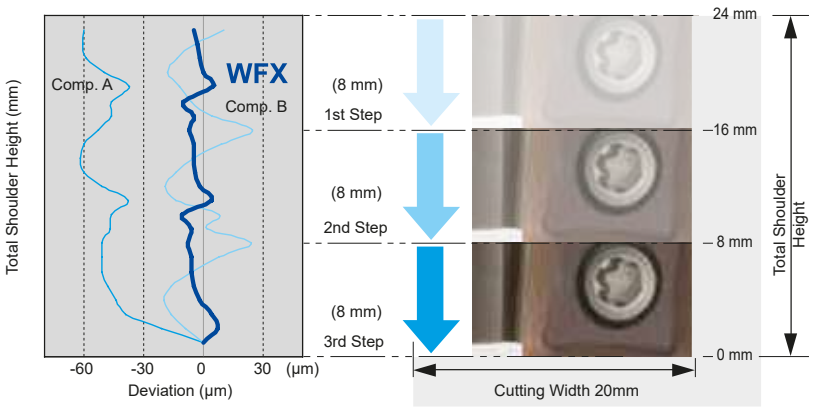


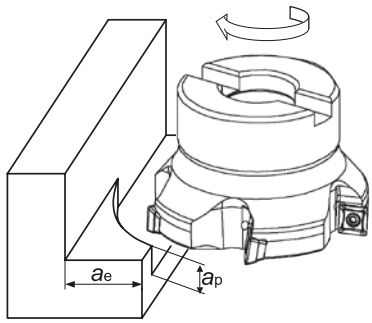


● = Euro stock

## Cutting Performance

### Squareness of Machined Shoulder




| | |
|---|---|
| Work Material: | C50 |
| Tool: | WFX12100RS (Ø 100 mm x 5 teeth) |
| Cutting Conditions: | $v_c$ = 200m/min, $a_p$ = 8,0 mm x 3 times |
| | $f_t$ = 0,15mm/t, $a_e$ = 20 mm |

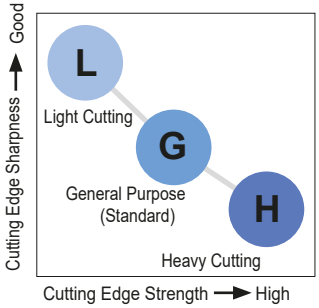
## Grade Selection

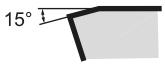
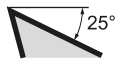
| ISO | Grade | Finishing to Light Cutting | Medium Cut | Rough to Heavy Cutting |
|---|---|---|---|---|
| P | Coated Carbide | ACP100 | ACP200 | ACP300 |
| M S | Coated Carbide | | ACM200 | ACM300 |

| ISO | Grade | Finishing to Light Cutting | Medium Cut | Rough to Heavy Cutting |
|---|---|---|---|---|
| K | Coated Carbide | ACK200 | ACK300 | |
| N | Coated Carbide | | DL1000 | |
| N | Carbide | | H1 | |

CVD PVD

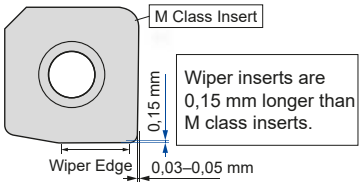
## Chipbreaker Selection

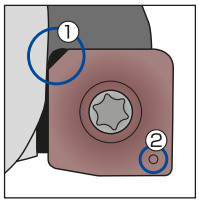



| Work Material | P K Steel, Cast Iron | | | | N Aluminium Alloy |
|---|---|---|---|---|---|
| | **L Type** | **G Type** | **H Type** | **Wiper Type** | **S Type** |
| Breaker |  |  |  |  |  |
| Characteristic | Low Cutting Force | General Purpose | Strong Edge | Wiper Edge | Sharp Edge |
| Cutting Edge Figure |  |  |  |  |  |
| Work Material-Application | Light Cutting Low rigidity Milling Low-Burr Design | **Main Chipbreaker** General to Interrupted Milling | Heavy Cut Heavy Interrupted Machining Tempered Steel | Precision Finishing | Non-Ferrous Metal |

## Wiper Insert

Optimised wiper edge shape provides superior surface roughness.




Wiper inserts are single-cornered.
Attach the wiper insert so that the chamfered corner is in location ① shown in the figure.
Be sure to use the corner with the ID mark (② in the figure).
(08 size inserts have no marks)

# WFX(M/F) 08000 RS

Shoulder Milling for Steel, Stainless Steel,
Die Steel, Cast Iron, Non-Ferrous Metal, Exotic Alloy

## Body - Shell Type

| Rake Angle | | |
|---|---|---|
| Radial | –6° | 6 mm |
| Axial | 12° | 90° |

WFX08000RS

WFXM08000RS

WFXF08000RS

Fig. 1

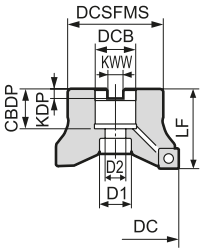
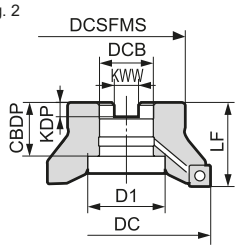



Fig. 2




## Body - WFX, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Figure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| WFX 08040 RS | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 3 | 0,2 | 1 |
| 08050 RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,3 | 1 |
| 08063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,6 | 1 |
| 08080 RS | ● | 80* | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 6 | 1,0 | 1 |
| WFX 08100 RS | ● | 100* | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | - | 8 | 1,4 | 2 |

## Body - WFXM, Medium Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Figure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| WFXM 08040 RS | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 4 | 0,2 | 1 |
| 08050 RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,3 | 1 |
| 08063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,5 | 1 |
| 08080 RS | ● | 80* | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 8 | 1,0 | 1 |
| WFXM 08100 RS | ● | 100* | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | - | 10 | 1,4 | 2 |

## Body - WFXF, Fine Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Figure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| WFXF 08040 RS | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 6 | 0,2 | 1 |
| 08050 RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 7 | 0,3 | 1 |
| 08063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 8 | 0,5 | 1 |
| 08080 RS | ● | 80* | 55 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 14 | 10 | 0,9 | 1 |
| WFXF 08100 RS | ● | 100* | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | - | 12 | 1,4 | 2 |

Inserts are not included.
*Please use JIS B1176 hexagonal bolt (Ø80: M12x30~35mm, Ø100: M16x40~45mm) for securing Ø80 / Ø100 cutter on the arbor.

## Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed | Feed Rate | DOC | Grades |
|---|---|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,08–**0,12**–0,18 | <6 | ACP200 ACP300 |
| P | Soft Steel | ≤180 | 180–**250**–350 | 0,10–**0,15**–0,20 | <6 | ACP200 ACP300 |
| P | Die Steel | 200–220 | 100–**150**–200 | 0,08–**0,12**–0,18 | <4 | ACP200 ACP300 |
| M | Stainless Steel | - | 160–**200**–250 | 0,10–**0,15**–0,20 | <6 | ACM300 |
| K | Cast Iron | 250 | 100–**175**–250 | 0,10–**0,15**–0,20 | <6 | ACK200 ACK300 |
| N | Non Ferrous Metal | - | 300–**500**–1000 | 0,10–**0,15**–0,20 | <6 | H1 DL1000 |

Min. - **Optimum** - Max.

## Identification Details

| WFX | F | 08 | 040 | R | S |
|---|---|---|---|---|---|
| Cutter Series | M: Medium Pitch<br>F: Fine Pitch | Insert Size | Cutter Diameter | Direction | Metric Type |

## Spare Parts

| Screw | | Wrench |
|---|---|---|
|  | |  |
| BFTX0306IP | 2,0 | TRDR08IP |

## Inserts

Fig. 3

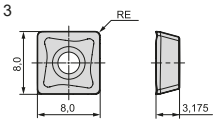
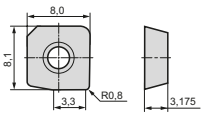



Fig. 4
Wiper Insert




| Application | Coated Carbide | | | | | | | Carbide | DLC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | | |
| General Purpose | | P M | P M | K | | M S | M S | | N | | |
| Roughing | | P M | P M | | K | | M S | | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE | Fig. |
| SOMT 080304 PZER L | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 3 |
| 080308 PZER L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 3 |
| SOMT 080304 PZER G | ❍ | ● | ● | ● | ❍ | ❍ | ❍ | – | – | 0,4 | 3 |
| 080308 PZER G | ❍ | ● | ● | ● | ● | ❍ | ● | – | – | 0,8 | 3 |
| 080312 PZER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 3 |
| SOMT 080308 PZER H | ❍ | ● | ● | ❍ | ● | ❍ | ❍ | – | – | 0,8 | 3 |
| 080312 PZER H | ❍ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 3 |
| SOET 080304 PZER G | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 3 |
| 080308 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 0,8 | 3 |
| 080312 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 3 |
| SOET 080302 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,2 | 3 |
| 080304 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,4 | 3 |
| 080308 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 3 |
| XOEW 080308 PZTR W | – | – | – | – | ❍ | – | – | – | – | 0,8 | 4 |





● = Euro stock
❍ = Japan stock

N·m Recommended Tightening Torque (N·m)

# "Wave Mill" Series
# WFX(F) 12000 RS

## Body - Shell Type

| Rake Angle | | |
|---|---|---|
| | Radial | –8° |
| | Axial | 8° |

10 mm, 90°

WFX 12000RS

WFXF12000RS

Fig. 1

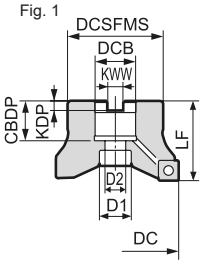



Fig. 2

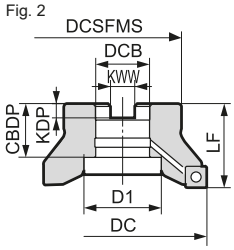
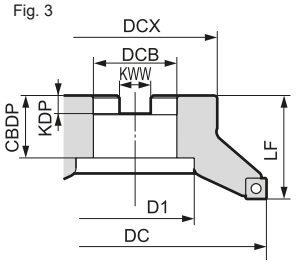



Fig. 3




## Body - WFX, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Figure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| WFX 12050 RS | ● | 50 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 3 | 0,2 | 1 |
| 12063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,4 | 1 |
| 12080 RS | ● | 80* | 60 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 13,5 | 4 | 0,9 | 1 |
| WFX 12100 RS | ● | 100* | 70 | 50 | 32 | 14,4 | 8,5 | 32 | 46 | - | 5 | 1,3 | 2 |
| 12125 RS | ● | 125 | 90 | 63 | 40 | 16,4 | 9,5 | 29 | 52 | - | 6 | 2,7 | 2 |
| 12160 RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9,5 | 29 | 88 | - | 8 | 4,8 | 3 |

## Body - WFXF, Fine Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Figure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| WFXF 12050 RS | ● | 50 | 40 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,2 | 1 |
| 12063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,4 | 1 |
| 12080 RS | ● | 80* | 60 | 50 | 27 | 12,4 | 7,0 | 25 | 20 | 13,5 | 6 | 0,9 | 1 |
| WFXF 12100 RS | ● | 100* | 70 | 50 | 32 | 14,4 | 8,5 | 32 | 46 | - | 7 | 1,2 | 2 |
| 12125 RS | ● | 125 | 90 | 63 | 40 | 16,4 | 9,5 | 29 | 52 | - | 8 | 2,6 | 2 |
| 12160 RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9,5 | 29 | 88 | - | 12 | 4,7 | 3 |

Inserts are not included.
*Please use JIS B1176 hexagonal bolt (Ø80: M12x30~35mm, Ø100: M16x40~45mm) for securing Ø80 / Ø100 cutter on the arbor.
Cutters ≥ Ø160 do not have coolant holes.

## Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed | Feed Rate | DOC | Grades |
|---|---|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,10–**0,15**–0,20 | <10 | ACP200 ACP300 |
| P | Soft Steel | ≤180 | 180–**250**–350 | 0,10–**0,15**–0,20 | <10 | ACP200 ACP300 |
| P | Die Steel | 200–220 | 100–**150**–200 | 0,10–**0,15**–0,20 | <6 | ACP200 ACP300 |
| M | Stainless Steel | - | 160–**200**–250 | 0,10–**0,15**–0,20 | <10 | ACM300 |
| K | Cast Iron | 250 | 100–**175**–250 | 0,10–**0,15**–0,20 | <10 | ACK200 ACK300 |
| N | Non Ferrous Metal | - | 300–**500**–1000 | 0,10–**0,15**–0,20 | <10 | H1 DL1000 |

Min. - **Optimum** - Max.

## Identification Details

| WFX | F | 12 | 050 | R | S |
|---|---|---|---|---|---|
| Cutter Series | F: Fine Pitch | Insert Size | Cutter Diameter | Direction | Metric Type |

## Inserts

Fig. 3

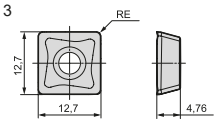
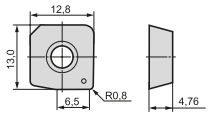


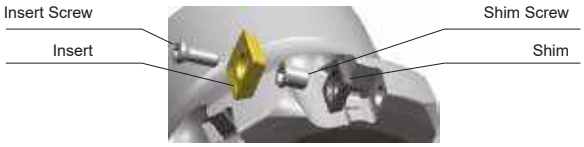

Fig. 4 Wiper Insert




| Application | Coated Carbide | | | | | | | Carbide | DLC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | | |
| General Purpose | | P M | P M | K | | M S | M S | | N | | |
| Roughing | | P M | P M | | K | | M S | | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE | Fig. |
| SOMT 120408 PDER L | ● | ● | ● | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 3 |
| SOMT 120404 PDER G | ❍ | ❍ | ● | ❍ | ● | ❍ | ● | – | – | 0,4 | 3 |
| 120408 PDER G | ● | ● | ● | ● | ❍ | ● | ● | – | – | 0,8 | 3 |
| 120412 PDER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 1,2 | 3 |
| 120416 PDER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,6 | 3 |
| SOMT 120408 PDER H | ❍ | ● | ❍ | ● | ● | ❍ | ❍ | – | – | 0,8 | 3 |
| SOET 120408 PDFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 3 |
| XOEW 120408 PDTR W | – | – | – | – | ❍ | – | – | – | – | – | 4 |

## Spare Parts

| Shim | Shim Screw | Insert Screw | | Insert Wrench | Wrench (Shim) |
|---|---|---|---|---|---|
|  |  |  | N·m |  |  |
| WFXS4R | BW0507F | BFTX03512IP | **3,0** | TRDR15IP | LH035 |



# TSX Type

## General Features

High-efficient and high precision tangential shoulder milling cutter with tangentially mounted carbide inserts.

## Characteristics

- **Tough & Sharp cutting edge**
  Tangentially mounted carbide insert design and optimized edge geometry realize extremely tough and sharp cutting action.

- **Very accurate and excellent surface finish**
  Thanks to newly developed fine carbide press / sintering technology and very accurate grinding technics, very periphery ground inserts generate very accurate and excellent surface finish.

- **Wide product range**
  2 different insert size series, 3 chip breaker range and various carbide grade combination offers wide range of machining application.

## Product Range

| | Cat. No. | Series | Diameter Range / No of Teeth | | | | | | | | | | | Shape |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ø16 | Ø20 | Ø25 | Ø32 | Ø40 | Ø50 | Ø63 | Ø80 | Ø100 | Ø125 | Ø160 | |
| Shell Type | TSX 08000RS | Standard Pitch | | | | | 4 | 5 | 6 | | | | |  |
| | TSXF 08000RS | Fine Pitch | | | | | 6 | 8 | 10 | | | | | |
| | TSX 13000RS | Standard Pitch | | | | | 3 | 4 | 5 | 5 | 6 | 7 | 8 | |
| | TSXM 13000RS | Medium Pitch | | | | | 4 | 5 | 6 | 7 | 8 | 10 | 12 | |
| Shank Type | TSX 08000E | Standard Pitch | 2 | 2 | 3 | 3 | 4 | | | | | | |  |
| | TSXF 08000E | Fine Pitch | | 3 | 4 | 5 | 6 | | | | | | | |
| | TSX 13000E | Standard Pitch | | | 2 | 2 | 3 | 4 | | | | | | |
| | TSXM 13000E | Medium Pitch | | | | 3 | 4 | 5 | | | | | | ☞ H18 |

## Special TSX Mills

Special orders repeater and side cutter available.

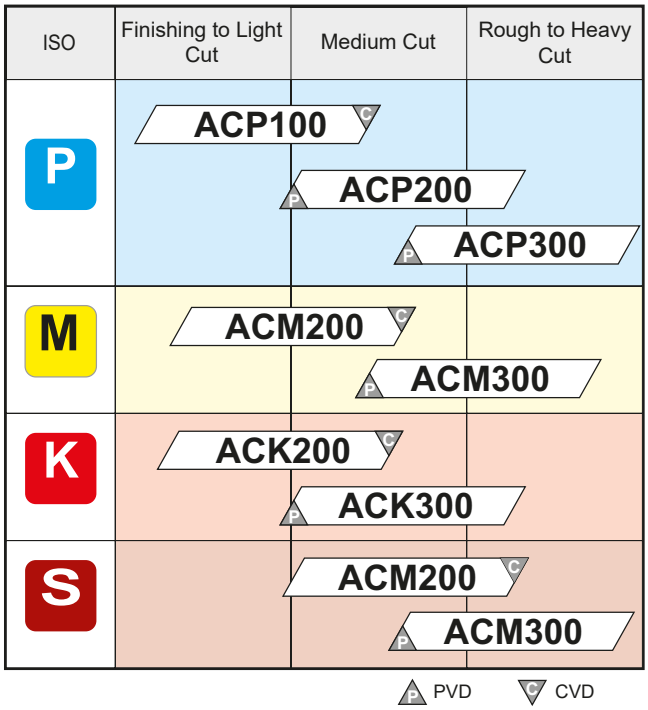


● = Euro stock

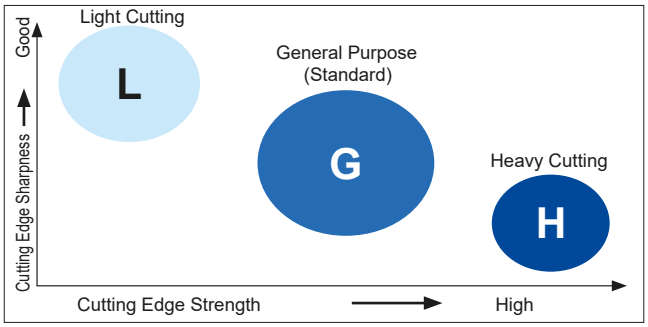
Recommended Tightening Torque (N·m)

## Insert Grade Selection

We have released ACP100 / ACP200 / ACP300 grades for steel machining, ACM200 / ACM300 grades for stainless stell machining and ACK200 / ACK300 grades for cast iron machining to cover a wide range of work materials.



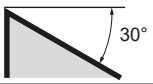
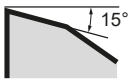
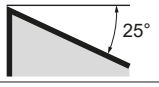
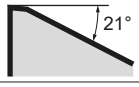
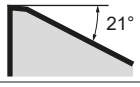

## Chipbreaker Selection




## Inserts

| Cat. No. | RE0,4 | RE0,8 | RE1,2 | RE1,6 | RE2,4 | RE3,2 |
|---|---|---|---|---|---|---|
| LNEX0804__PNER-L | ● | ● | | | | |
| LNEX0804__PNER-G | ● | ● | ● | ● | | |
| LNEX1306__PNER-L | ● | ● | | | | |
| LNEX1306__PNER-G | | ● | | ● | ● | ● |
| LNEX1306__PNER-H | ● | ● | | ● | ● | ● |

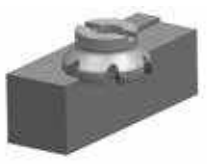
## Chipbreaker Lineup

| Work Material | P M K S | | |
|---|---|---|---|
| Chipbreaker | L type | G type | H type |
| |  |  |  |
| Feature | Low cutting force | General purpose | Strong edge |
| LNEX08 Cutting edge geometry |   |   | – |
| LNEX13 Cutting edge geometry |   |   |   |
| Application | Light cut, low rigidity milling and reduced burrs | Main breaker for general purpose applications | Roughing, heavy interrupted and hardness steel milling |

## Suitable Applications

Face milling

Shoulder milling



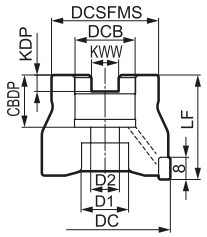
Slot milling

Side face milling

# TSX(F) 08000 RS

## ■ Body - Shell Type

| Rake Angle | | | 8 mm | 90° |
|---|---|---|---|---|
| | Radial | –20° | | |
| | Axial | –6° | | |




## ● Body - TSX, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | |
| TSX 08040 RS | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 4 | 0,21 |
| 08050 RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,30 |
| 08063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,53 |

Inserts are not included.

## ● Body - TSXF, Fine Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | |
| TSXF 08040 RS | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 6 | 0,21 |
| 08050 RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 8 | 0,31 |
| 08063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 10 | 0,54 |

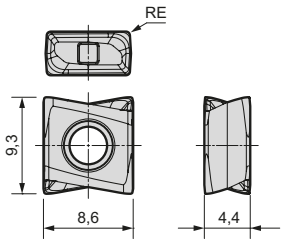
Inserts are not included.

## ■ Inserts

| Application | Coated Carbide | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light Cutting | P M | | | K | | M S | | | |
| General Purpose Cutting | P M | P M | | K | | M S | M S | | |
| Rough Cutting | | P M | P M | | K | | M S | | |

P Steel
M Stainless Steel
K Cast Iron
S Exotic Alloy

| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | Radius RE |
|---|---|---|---|---|---|---|---|---|
| LNEX 080404 PNER-L | ● | ● | ● | ● | ● | ● | ● | 0,4 |
| 080408 PNER-L | ● | ● | ● | ● | ● | ● | ● | 0,8 |
| LNEX 080404 PNER-G | ● | ● | ● | ● | ● | ● | ● | 0,4 |
| 080408 PNER-G | ● | ● | ● | ● | ● | ● | ● | 0,8 |
| 080412 PNER-G | ● | ● | ● | ● | ● | ● | ● | 1,2 |
| 080416 PNER-G | ● | ● | ● | ● | ● | ● | ● | 1,6 |




## ■ Recommended Cutting Conditions

Min. - **Optimum** - Max.

| ISO | Work-material | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/T) | Grade |
|---|---|---|---|---|---|
| P | Carbon Steel | 180–280 | 150–**225**–300 | 0,08–**0,20**–0,30 | ACP100 ACP200 ACP300 |
| | | > 280 | 75–**150**–230 | 0,08–**0,20**–0,30 | |
| | Alloy Steel | 180–280 | 100–**175**–250 | 0,08–**0,15**–0,25 | |
| M | Stainless Steel | 220–280 | 90–**135**–180 | 0,08–**0,15**–0,25 | ACM200 ACM300 |
| | | >280 | 75–**125**–170 | 0,08–**0,15**–0,25 | |
| K | Cast Iron Ductile Cast Iron | 250 | 100–**175**–250 | 0,08–**0,20**–0,30 | ACK200 ACK300 |
| S | Exotic Material | - | 30– **60**–90 | 0,05–**0,10**–0,15 | ACM200 ACM300 |

## ■ Identification Details

| TSX | F | 08 | 050 | R | S |
|---|---|---|---|---|---|
| Cutter Series | F: Fine Pitch | Insert Size | Cutter Diameter | Direction | Metric Type |

## ■ Spare Parts

| Screw | | Wrench |
|---|---|---|
|  | |  |
| BFTX0308IP | 2,0 | TRDR08IP |





● = Euro stock

Recommended Tightening Torque (N·m)

## Body - Shell Type

| Rake Angle | | |
|---|---|---|
| | Radial | –15° |
| | Axial | –6° |

12 mm, 90°

Fig. 1

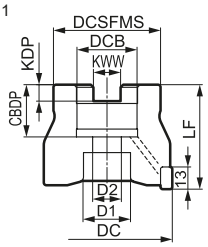



Fig. 2

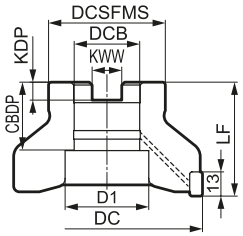
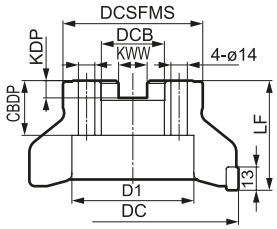



Fig. 3




## Body - TSX, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| TSX 13040 RS | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 3 | 0,20 | 1 |
| 13050 RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,30 | 1 |
| 13063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,50 | 1 |
| 13080 RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7,0 | 22 | 20 | 14 | 5 | 0,92 | 1 |
| TSX 13100 RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | - | 6 | 1,35 | 2 |
| 13125 RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9,0 | 29 | 52 | 29 | 7 | 2,55 | 1 |
| 13160 RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9,0 | 29 | 90 | - | 8 | 4,97 | 3 |

Inserts are not included.
*Please use JIS B1176 hexagonal bolt (Ø 80: M12 x 30–35 mm, Ø 100: M16 x 40–45 mm) for securing Ø 80 / Ø 100 cutter on the arbor.

## Body - TSXM, Medium Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | |
| TSXM 13040 RS | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 4 | 0,19 | 1 |
| 13050 RS | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,28 | 1 |
| 13063 RS | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,50 | 1 |
| 13080 RS | ● | 80 | 55 | 50 | 27 | 12,4 | 7,0 | 22 | 20 | 14 | 7 | 0,92 | 1 |
| TSXM 13100 RS | ● | 100 | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | - | 8 | 1,36 | 2 |
| 13125 RS | ● | 125 | 80 | 63 | 40 | 16,4 | 9,0 | 29 | 52 | 29 | 10 | 2,57 | 1 |
| 13160 RS | ● | 160 | 130 | 63 | 40 | 16,4 | 9,0 | 29 | 90 | - | 12 | 5,02 | 3 |

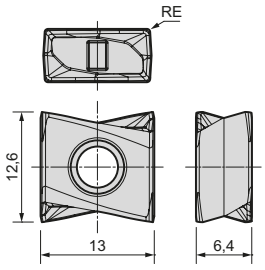
Inserts are not included.
*Please use JIS B1176 hexagonal bolt (Ø 80: M12 x 30 ~ 35 mm, Ø 100: M16 x 40 ~ 45 mm) for securing Ø 80 / Ø 100 cutter on the arbor.

## Inserts

| Application | Coated Carbide | | | | | | |
|---|---|---|---|---|---|---|---|
| High Speed / Light Cutting | P M | | | K | | M S | |
| General Purpose Cutting | P M | P M | | K | | M S | M S |
| Rough Cutting | | P M | P M | | K | | M S |

P Steel
M Stainless Steel
K Cast Iron
S Exotic Alloy

| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | Radius RE |
|---|---|---|---|---|---|---|---|---|
| LNEX 130604 PNER-L | ● | ● | ● | ● | ● | ● | ● | 0,4 |
| 130608 PNER-L | ● | ● | ● | ● | ● | ● | ● | 0,8 |
| LNEX 130604 PNER-G | ● | ● | ● | ● | ● | ● | ● | 0,4 |
| 130608 PNER-G | ● | ● | ● | ● | ● | ● | ● | 0,8 |
| 130616 PNER-G | ● | ● | ● | ● | ● | ● | ● | 1,6 |
| 130624 PNER-G | ● | ● | ● | ● | ● | ● | ● | 2,4 |
| 130632 PNER-G | ● | ● | ● | ● | ● | ● | ● | 3,2 |
| LNEX 130608 PNER-H | ● | ● | ● | ● | ● | | | 0,8 |
| 130616 PNER-H | | ● | ● | ● | ● | | | 1,6 |
| 130624 PNER-H | | ● | ● | ● | ● | | | 2,4 |
| 130632 PNER-H | | ● | ● | ● | ● | | | 3,2 |




## Recommended Cutting Conditions

☞ G34

## Identification Details

| TSX | M | 13 | 100 | R | S |
|---|---|---|---|---|---|
| Cutter Series | M: Medium Pitch | Insert Size | Cutter Diameter | Direction | Metric Type |

## Spare Parts

| Screw | | Wrench |
|---|---|---|
|  | |  |
| BFTX03510IP | 3,0 | TRDR15IP |

# PWS (-F) Type

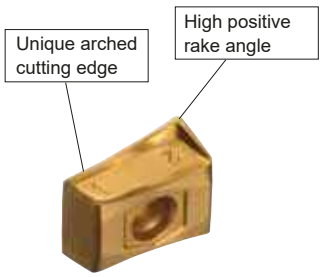
## Features

- **Smooth and stable performance under rough milling conditions**
  Tangentially mounted inserts, offering positive rake angle and unique curved cutting edge, realize stable and long lasting smooth cutting actions.
- **Precision 4 cutting edge inserts**
  The 4 cutting edge inserts offer maximum cost performance.
- **Less vibration under unstable condition**
  Optimized variable pitch design of the serrated inserts minimizes vibration during unstable conditions.
- **Tough and durable body**
  Cutter body shows excellent toughness and durability through special steel and surface treatment.

## Inserts - Design and Performance

### Comparison of Chip Shape

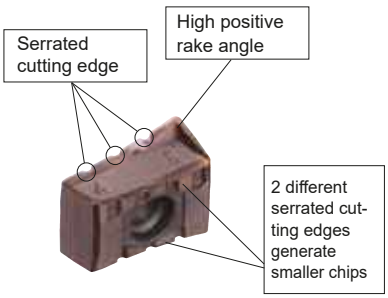
**General Purpose: Type G**



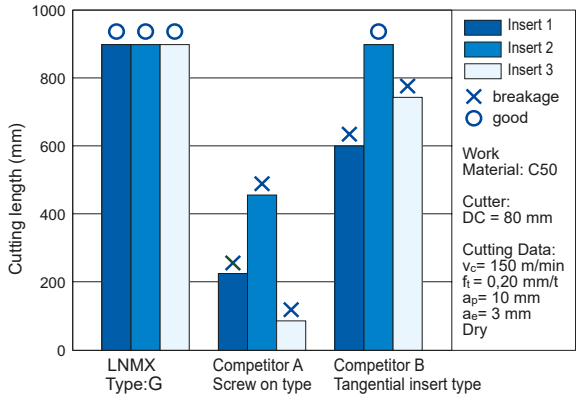


Work Material: C50
Cutter: DC =100mm
Cutting Data: $v_c$ =200m/min, $f_t$ =0,20mm/t, $a_p$ =20mm, $a_e$ =10mm
Coolant: Dry
Evaluation: The serrated inserts achieve high efficient machining by reducing chattering.

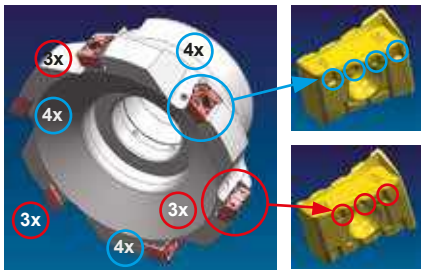
**Heavy Cut: Type R**


### Comparison of Cutting Edge Stability (Type G)



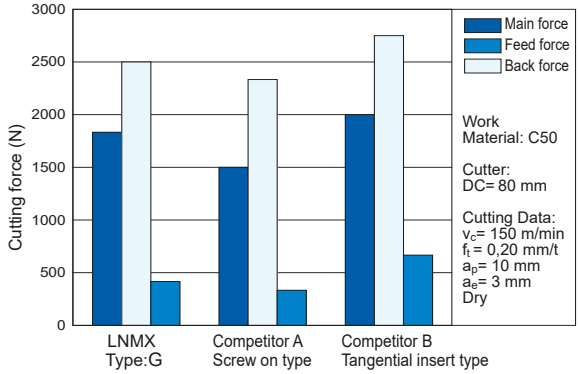

### Serrated Insert Application Guidance (Type R)



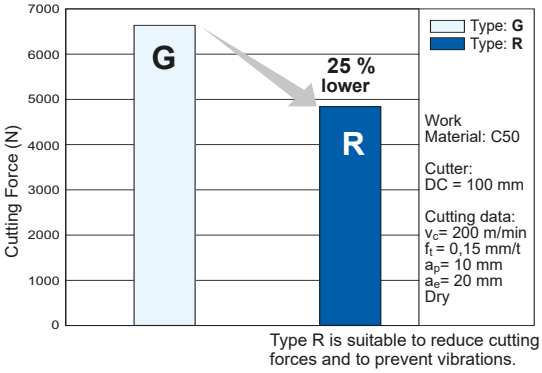

**Setting instruction:**
Please use two different serrated inserts (3x and 4x) as shown in the left figure.

**Remark about cutting conditions:**
Adjust feed rate up to $f_t$ = 0,25mm/tooth.

### Comparison of Cutting Force (Type G)




### Comparison of Cutting Force (Type G and R)




Type R is suitable to reduce cutting forces and to prevent vibrations.





▲ = To be replaced by new item

Recommended Tightening Torque (N·m)

## Body - Dimensions

| Rake Angle | | |
|---|---|---|
| | Radial | –15° |
| | Axial | –6° |

16 mm, 90°

Fig. 1

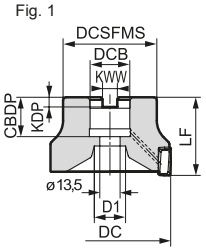



Fig. 2

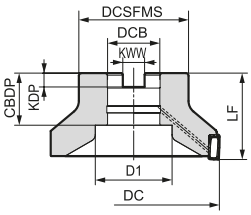



Fig. 3

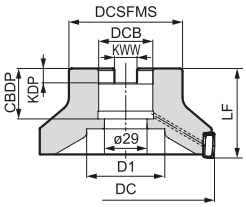



Fig. 4

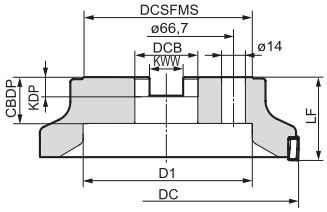
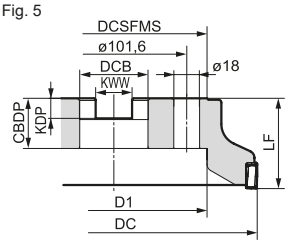



Fig. 5




Cutter body DC ≥ 160 mm: no inner coolant
Cutter body DC ≥ 200 mm: with seat PWSS4R

## Body - PWS, Standard

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | |
| PWS 4080 RS | ▲ | 80 | 60 | 50 | 27 | 20 | 12,4 | 7 | 25 | 4 | 1,0 | 1 |
| PWS 4100 RS | ▲ | 100 | 70 | 50 | 32 | 46 | 14,4 | 8,5 | 32 | 6 | 1,4 | 2 |
| 4125 RS | ▲ | 125 | 80 | 63 | 40 | 52 | 16,4 | 9,5 | 29 | 6 | 2,4 | 3 |
| 4160 RS | ▲ | 160 | 100 | 63 | 40 | 88 | 16,4 | 9,5 | 29 | 8 | 4,2 | 4 |

## Body - PWSF, Fine pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | |
| PWSF 4080 RS | ▲ | 80 | 60 | 50 | 27 | 20 | 12,4 | 7 | 25 | 6 | 0,9 | 1 |
| PWSF 4100 RS | ▲ | 100 | 70 | 50 | 32 | 46 | 14,4 | 8,5 | 32 | 8 | 1,3 | 2 |
| 4125 RS | ▲ | 125 | 80 | 63 | 40 | 52 | 16,4 | 9,5 | 29 | 8 | 2,3 | 3 |
| 4160 RS | ▲ | 160 | 100 | 63 | 40 | 88 | 16,4 | 9,5 | 29 | 10 | 4,1 | 4 |

Inserts are not included.

## Inserts

| Application | Coated Carbide | | | | |
|---|---|---|---|---|---|
| High speed/Light cut | P | | | K | |
| General purpose | | P M | M | K | |
| Roughing | | P M | P M | | K |

| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | Application | Remarks | Fig. |
|---|---|---|---|---|---|---|---|---|
| LNMX 170808PNSR-L | ▲ | ▲ | ▲ | ▲ | ▲ | Light cut | | 6 |
| 170808PNSR-G | ▲ | ▲ | ▲ | ▲ | ▲ | General purpose | 1st Choice | 6 |
| 170808PNSR-R | ▲ | ▲ | ▲ | ▲ | ▲ | Heavy cut | Serrated design | 7 |

Fig. 6

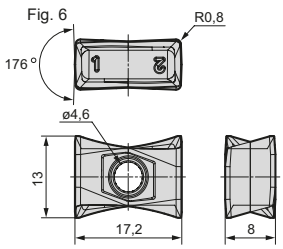
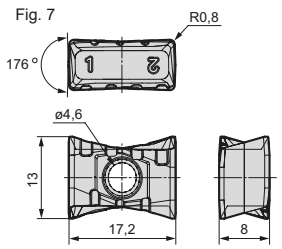



Fig. 7




## Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/t) | Grade |
|---|---|---|---|---|---|
| P | Carbon Steel | 180–280 | 150–**250**–350 | 0,10–**0,23**–0,35 | ACP200 |
| | Alloy Steel | 180–280 | 100–**175**–250 | 0,10–**0,18**–0,25 | ACP200 |
| M | Stainless Steel | - | 100–**150**–200 | 0,15–**0,18**–0,25 | ACP300 |
| K | Cast Iron Ductile Iron | 250 | 100–**175**–250 | 0,10–**0,23**–0,35 | ACK200 |

Min.-**Optimum**-Max.

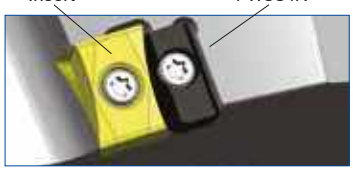
## Spare Parts

| Screw | Torx wrench | Sumi-Paste | Seat * |
|---|---|---|---|
|  3,0 Nm |  |  |  |
| BFTX0412IP | TTR15IP | SUMI-P | PWSS4R |

* from DC ≥ 200mm

Cutter Body DC ≥ 200mm
Please use seat PWSS4R for protection of cutter body.

Insert *PWSS4R



## Special Cutter Type PWSR

| Rake Angle | | |
|---|---|---|
| | Radial | –15° |
| | Axial | –6° |

31 mm, 90°

Delivery on request

# "Wave Mill" Series
# WEZ Type

New

## General Features

- **Supports Various Machining Operations**
  Applicable to various machining applications, the cutter lineup includes diameters of Ø 14 mm to Ø 160 mm, enabling large ramping.
- **Excellent Machining Quality**
  With a combination of optimised cutting edge shape and high-precision molding technology, superb wall surface accuracy and surface finish qualitiy are achieved.
- **Excellent Sharpness with Low Resistance**
  Reduces machining noise and suppresses burrs.
  Lineup includes ground inserts with a focus on sharpness.
- **General-purpose Grade Applicable to any Work Material**
  Introducing the new grade ACU2500, supporting machining in a wide range of fields and applicable to steel, stainless steel and cast iron.

## Product Range

| Type | Cat. No. | Diameter Range (mm) / No of Teeth | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ø14 | Ø16 | Ø18 | Ø20 | Ø22 | Ø25 | Ø28 | Ø30 | Ø32 | Ø35 | Ø40 | Ø50 | Ø63 | Ø80 | Ø100 | Ø125 | Ø160 |
| Shell | WEZ 11000RS | | | | | | | | | | | 4, 6 | 5,7 | 6, 8 | 7, 10 | 9, 12 | | |
| | WEZ 11000R (Inch) | | | | | | | | | | | | | | 7, 10 | 9, 12 | | |
| | WEZ 17000RS | | | | | | | | | | | 3, 4 | 3, 5 | 4, 6 | 4, 7 | 5, 8 | 6, 9, 11 | 8, 10 12 |
| | WEZ 17000R (Inch) | | | | | | | | | | | | | | 4, 7 | 5, 8 | 6, 9, 11 | 8, 10 12 |
| Shank | WEZ 11000E | 1 | 2* | 2 | 2*, 3* | 3 | 2, 3*, 4* | 4 | 4 | 2, 3, 4, 5* | 5 | 2, 4, 6 | 5, 7 | 8 | 10 | | | |
| | WEZ 11000EL | 1 | 2* | 2 | 2* | 2 | 2*, 3 | 2 | 2 | 2*, 3 | 2, 3 | 2 | 3 | | | | | |
| | WEZ 17000E | | | | | | 2* | 2 | 3 | 2, 3* | 3 | 3, 4 | 3*, 5* | 4*, 6* | 7 | | | |
| | WEZ 17000EL | | | | | | 2 | 2 | 2 | 2*, 3 | 2 | 2, 3, 4 | 3*, 5* | 4*, 6* | | | | |

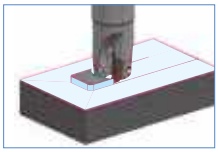
Shank Type ☞ H20-31

* Different shank diameters in stock

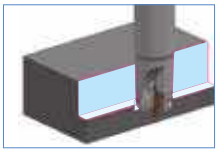
## Suitable Applications

- Supports Ramping, Helical Milling, Plunge Cutting

Face milling

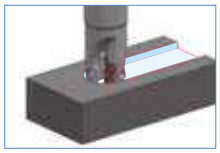


Shoulder milling

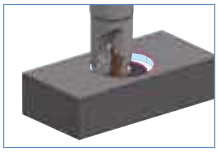


Side face milling

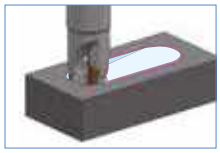
Groove milling



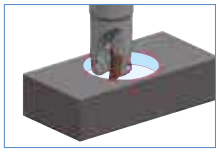
Hole expansion milling



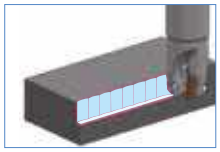
Ramping



Helical milling



Plunge cutting



## Optimised Body Design

Wide guide face for stable insert clamping.

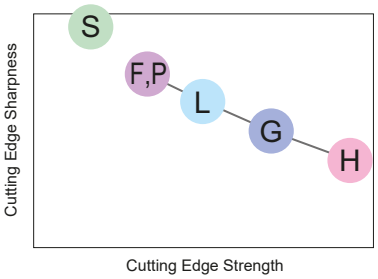
WEZ11 type



● = Euro stock
❍ = Japan stock

## Chipbreaker Lineup

| Work Material | P M K S H | | | | | N |
|---|---|---|---|---|---|---|
| Chipbreaker | L Type | G Type | H Type | F Type | P Type | S Type |
| **AO_T11** Cutting edge geometry | | 28° | 20° | 28° | 28° | 28° |
| **AO_T17** Cutting edge geometry | 28° | 20° | 10° | 28° | 28° | 28° |
| Applications | Light cut, low rigidity machining | Main breaker for general purpose to interrupted machining | Heavy cut, heavy interrup-ted machining, hardened steel | Light cut, finishing, low-burr design | Light cut, high-precision machining, high surface wall quality | For non-ferrous metals |



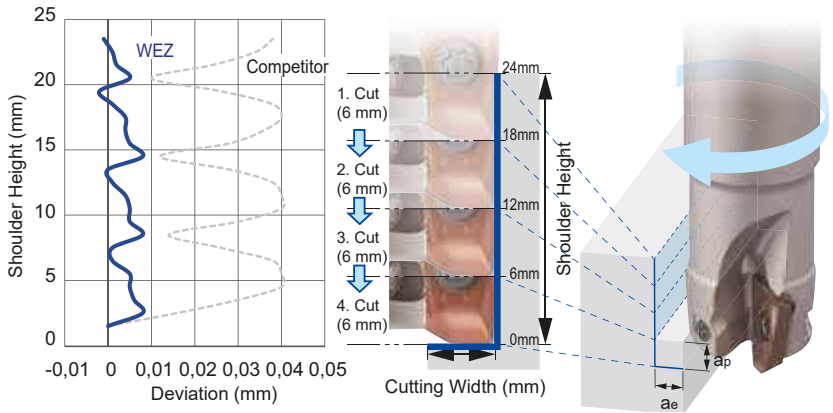

## Product Range Inserts

●: Standard stock ❍: Planned stock

| Cat. No. | Nose Radius (mm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R0,2 | R0,4 | R0,8 | R1,2 | R1,6 | R2,0 | R2,4 | R3,0 | R3,2 | R4,0 | R5,0 | R6,4 |
| AOMT 11T3__PEER-G | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| AOMT 11T3__PEER-H | | ● | ● | ● | ● | | | | | | | |
| AOET 11T3__PEER-F | ❍ | ● | ● | ❍ | | | | | | | | |
| AOET 11T3__PEER-P16 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 11T3__PEER-P20 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 11T3__PEER-P25 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 11T3__PEFR-S | ❍ | ● | ● | ❍ | | | | | | | | |
| AOMT 1705__PEER-L | ● | ● | ● | ● | ● | | | | | | | |
| AOMT 1705__PEER-G | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| AOMT 1705__PEER-H | | ● | ● | ❍ | ● | | | | | | | |
| AOET 1705__PEER-F | ❍ | ● | ● | ❍ | | | | | | | | |
| AOET 1705__PEER-P25 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 1705__PEER-P32 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 1705__PEFR-S | ❍ | ● | ● | ❍ | | | | | | | | |

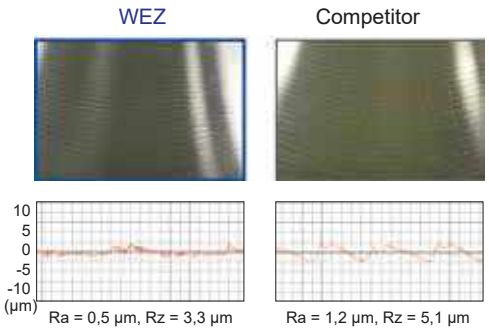
## Improved Milling Quality

### ● Excellent Squareness

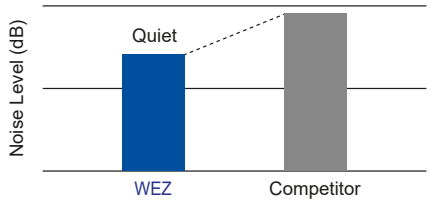



| | |
|---|---|
| Machine: | Vertical Machining Centre BT40, |
| Work Material: | C50 |
| Tool: | WEZ 11020 E03 (Ø 20, 3 teeth) |
| Insert: | AOMT11T308PEER-G (ACU2500) |
| Cutting Conditions: | $v_c$ = 150 m/min, $f_z$ = 0,15 mm/t, $a_p$ = 6 mm x 4 passes, $a_e$ = 5 mm, dry |

### ● Excellent Surface Quality




### ● Lower cutting force helps reduce machining noise

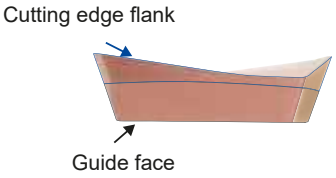



| | |
|---|---|
| Machine: | Vertical Machining Centre BT40, |
| Work Material: | C50 |
| Tool: | WEZ 11020 E03 (Ø 20, 3 teeth) |
| Insert: | AOMT11T308PEER-G (ACU2500) |
| Cutting Conditions: | $v_c$ = 150 m/min, $f_z$ = 0,15 mm/t, $a_p$ = 8 mm, $a_e$ = 5 mm, dry |

## High-precision Ground Class Insert with Excellent Sharpness

### Ground Finish on Cutting Edge and Guide Face

The guide face has a ground finish as well as the cutting edge, minimizing corner difference when mounting on the body.
Stable runout precision and machining qualitiy.




## Lineup of Chipbreakers for Ground Inserts

### F Type

Cutting edge specialized for sharpness and machining accuracy

Sharpness from ground finish enables burr control.

Excellent squareness with all diameters.

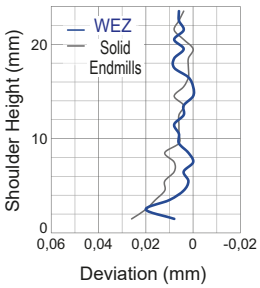
| | |
|---|---|
| Machine: | Vertical Machining Centre BT50, |
| Work Material | X5CrNiS18 9 |
| Tool: | WEZ 11050 RS07 (Ø 50, 7 teeth) |
| Insert: | AOET11T308PEER-F (ACU2500) |
| Cutting Conditions: | $v_c$ = 120 m/min, $f_z$ = 0,12 mm/t, $a_p$ = 1 mm, $a_e$ = 30 mm, dry |

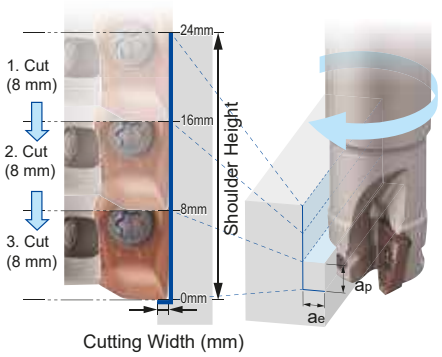
### P Type

Chipbreaker for wall surface squareness equivalent to solid endmills

Premium item with cutting edge shape optimised for each cutter diameter while maintaining the F type chipbreaker's sharpness.

Enables wall surface squareness equal to solid endmills through a blade shape optimised for each tool diameter.




P Type Chipbreaker Selection

| Cat. No. | Cutter Diameter (mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ø14 | Ø16 | Ø18 | Ø20 | Ø22 | Ø25 | Ø28 | Ø30 | Ø32 | Ø35 | => Ø40 |
| AOET11T3_ _PEER-P_ _ | -P16 | | -P20 | | – | -P25 | | – | | | |
| AOET1705_ _PEER-P_ _ | – | | | | | -P25 | | -P32 | | | – |

| | |
|---|---|
| Machine: | Vertical Machining Centre BT50, |
| Work Material: | C50 |
| Tool: | WEZ 11020 E03 (Ø 20, 3 teeth) |
| Insert: | AOET11T308PEER-P20 (ACU2500) |
| Cutting Conditions: | $v_c$ = 150 m/min, $f_z$ = 0,1 mm/t, $a_p$ = 8 mm x 3 passes, $a_e$ = 1 mm, dry |

### S Type

Sharp edge chipbreaker for non-ferrous metals, with excellent adhesion resistance

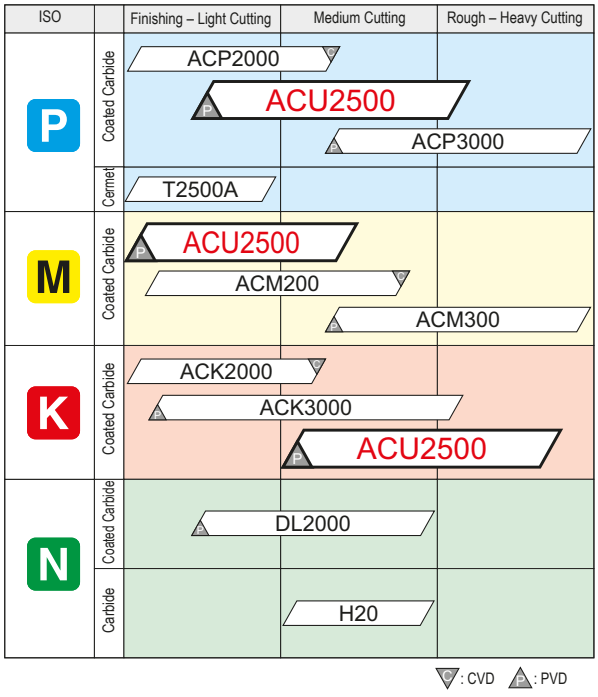
Suppresses adhesion with rake face lapping.

DLC coat inserts available for further improved adhesion resistance.


| | |
|---|---|
| Machine: | Vertical Machining Centre BT50, |
| Work Material: | AlSi12Cu |
| Tool: | WEZ 11020 E03 (Ø 20, 3 teeth) |
| Insert: | AOET11T308PEER-S (H20) |
| Cutting Conditions: | $v_c$ = 350 m/min, $f_z$ = 0,1 mm/t, $a_p$ = 3 mm, $a_e$ = 10 mm, dry |

## ■ Insert Grades Selection Guide

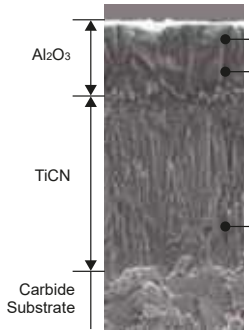
Newly developed general-purpose ACU2500 grade suitable for various work materials has been released. Enhanced lineup of coatings, cemented carbide and cermet for milling steel, stainless steel, cast iron and aluminum alloy.




## ■ Coating Features

New Absotech ™ (absolute technology) coating technology that realises absolute stability.

**ABSOTECH** **CVD**



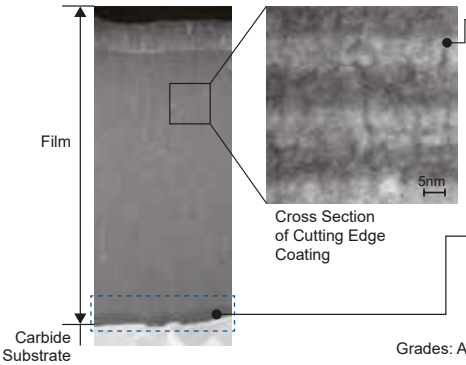

**Special Surface Treatment**
Suppresses thermal cracking by introducing high compressive stress, resulting in chipping resistance more than twice as good as conventional types

**Crystal Orientation Control $Al_2O_3$**
By controlling the growth direction, $Al_2O_3$ is reinforced for crater wear resistance more than twice as good as conventional types

**High Hardness TiCN**
Increased TiCN hardness by using a C-rich composition for flank wear resistance more than twice as good as conventional types.

Grades: ACP2000, ACK2000

**ABSOTECH** **PVD**




**New Super Multi-Layered Composition**
Higher hardness and twice the conventional wear resistance due to a fine crystal structure AlTiCrBN-based nano-layered coating.

**High Adhesion Strength**
Significantly improved coating adhesion. Chipping resistance more than twice as good as conventional types.

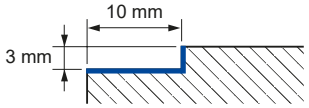
Grades: ACU2500, ACP3000, ACK3000

| ISO | Grade | Coating Thickness (μm) | Features |
|---|---|---|---|
| P M K | ACU2500 | 3 | General purpose grade applicable to steel and cast iron. Adopts a carbide substrate with excellent fracture resistance and wear resistance plus a new coating with excellent wear resistance and chipping reistance, realising stable long tool life with various work material grades. |
| P | ACP2000 | 10 | Stable long tool life with high-speed machining is realised by adopting a new coating and a tough carbide substrate with excellent thermal crack resistance. |
| | ACP3000 | 3 | Adopts a very tough carbide substrate plus a new coating with excellent wear resistance and chipping resistance, realising stable long tool life for wet machining of steel in particular. |
| | T2500A | – | Thanks to the excellent thermal crack resistance conferred by high termal conductivity and the impoved toughness due to the finer and more uniform structure, this cermet grade achieves high levels of fracture resistance and wear resistance. |
| M | ACM200 | 6 | Realises superb stability in machining of high-hardness stainless steel, due to a high-strength carbide substrate and highly wear-resistant coating. |
| | ACM300 | 3 | Realises superb stability in machining of stainless steel, due to a high-strength carbide substrate and highly chipping-resistant coating. |
| K | ACK2000 | 10 | Stable long tool life with high-speed machining of cast iron is realised by adopting a new coating with excellent thermal resistance and a tough carbide substrate. |
| | ACK3000 | 3 | Adopts a carbide substrate with excellent wear resistance plus a new coating with excellent wear resistance and chipping resistance, realising stable long tool life in dry machining of cast iron. |
| N | DL2000 | 0,5 | DLC coating grade for non-ferrous metal machining with a low coefficient of friction and excellent adhesion resistance. |
| | H20 | – | Uncoated grade for non-ferrous metal machining with excellent wear resistance and fracture resistance. |

## Recommended Cutting Conditions

### WEZ11 Type

Cutter: WEZ 11020 E03
Insert: AO_T11T3 type
Cutting Data: $a_p$ = 3 mm, $a_e$ = 10 mm, dry



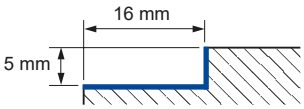

Min. - **Optimum** - Max.

| ISO | Material | HB | Chipbreaker | Grade | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ACU2500 | ACP2000 | ACP3000 | T2500A | ACK2000 | ACK3000 | ACM200 | ACM300 | DL2000 |
| | | | | Feed Rate (mm/tooth) | | | | | | | | |
| | | | | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,18 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,05–**0,10**–0,15 |
| | | | | Cutting Speed $v_c$ (m/min) | | | | | | | | |
| P | Unalloyed steel, <0, 15%C, annealed | 125 | G | 270–**320**–370 | 300–**350**–400 | 250–**300**–350 | 230–**280**–330 | | | | | |
| | " , <0, 45%C, annealed | 190 | G | 170–**220**–270 | 200–**250**–300 | 150–**200**–250 | 130–**180**–230 | | | | | |
| | " , <0, 45%C, tempered | 250 | G | 140–**180**–220 | 160–**200**–245 | 120–**160**–200 | 105–**145**–185 | | | | | |
| | " , <0, 75%C, annealed | 270 | G | 110–**145**–175 | 130–**165**–195 | 100–**130**–165 | 85–**115**–150 | | | | | |
| | " , <0, 75%C, tempered | 300 | G | 70–**90**–110 | 80–**100**–120 | 60–**80**–100 | 50–**70**–90 | | | | | |
| | Low alloyed steel, annealed | 180 | G | 160–**205**–255 | 190–**235**–280 | 140–**190**–235 | 120–**170**–215 | | | | | |
| | " , tempered | 275 | G | 90–**120**–150 | 110–**135**–165 | 80–**110**–140 | 70–**100**–125 | | | | | |
| | " , tempered | 300 | G | 85–**110**–130 | 100–**125**–150 | 75–**100**–125 | 65–**90**–115 | | | | | |
| | " , tempered | 350 | G | 60–**80**–100 | 70–**90**–110 | 50–**70**–90 | 45–**65**–85 | | | | | |
| | High alloyed and tool steel, annealed | 200 | G | 140–**180**–220 | 160–**200**–245 | 120–**160**–205 | | | | | | |
| | " , tempered | 325 | G | 55–**70**–85 | 60–**80**–100 | 50–**65**–80 | | | | | | |
| M | Stainless steel, ferritic/martensitic, annealed | 200 | G | 110–**140**–170 | | | | | | 140–**170**–190 | 90–**110**–140 | |
| | " , martensitic, tempered | 240 | G | 100–**125**–150 | | | | | | 125–**150**–170 | 80–**100**–125 | |
| | " , austenitic, plunged | 180 | G | 120–**150**–180 | | | | | | 150–**180**–200 | 100–**120**–150 | |
| K | Grey cast iron | | G | 150–**200**–250 | | | | 250–**300**–350 | 170–**220**–270 | | | |
| | Nodular cast iron | | G | 90–**120**–150 | | | | 150–**180**–210 | 100–**130**–160 | | | |
| S | High tempered resist. alloys, Fe based, annealed | | G | 30–**40**–55 | | | | | | 35–**45**–60 | 25–**35**–50 | |
| | " , hardened | | G | 60–**80**–100 | | | | | | 70–**90**–110 | 50–**70**–90 | |
| N | Aluminium alloy, Si < 12,6% | | S | | | | | | | | | 500–**750**–100 |
| | " , Si > 12,6% | | S | | | | | | | | | 170–**200**–250 |
| | Copper alloy | | S | | | | | | | | | 300–**330**–350 |

The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine, work shape and clamping. They will need to be adjusted according to machine rigidity, work clamp rigidity, cutting depth and other factors.
For groove milling, reduce the feed rate approximately 70 % of the corresponding value shown above.

### WEZ17 Type

Cutter: WEZ 17032 E03
Insert: AO_T1705 type
Cutting Data: $a_p$ = 5 mm, $a_e$ = 16 mm, dry



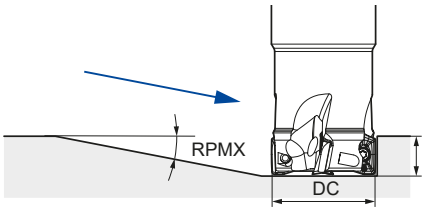

Min. - **Optimum** - Max.

| ISO | Material | | Chipbreaker | Grade | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ACU2500 | ACP2000 | ACP3000 | T2500A | ACK2000 | ACK3000 | ACM200 | ACM300 | DL2000 |
| | | | | Feed Rate (mm/tooth) | | | | | | | | |
| | | | | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,10–**0,15**–0,22 | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,05–**0,10**–0,15 |
| | | | | Cutting Speed $v_c$ (m/min) | | | | | | | | |
| P | Unalloyed steel, <0, 15%C, annealed | 125 | G | 285–**335**–390 | 315–**360**–420 | 265–**315**–370 | 240–**295**–345 | | | | | |
| | " , <0, 45%C, annealed | 190 | G | 180–**230**–285 | 210–**265**–315 | 160–**210**–265 | 135–**190**–240 | | | | | |
| | " , <0, 45%C, tempered | 250 | G | 145–**190**–230 | 170–**210**–255 | 130–**170**–215 | 110–**155**–195 | | | | | |
| | " , <0, 75%C, annealed | 270 | G | 115–**150**–185 | 135–**170**–205 | 100–**135**–170 | 90–**125**–155 | | | | | |
| | " , <0, 75%C, tempered | 300 | G | 70–**90**–115 | 85–**105**–125 | 65–**85**–105 | 55–**75**–95 | | | | | |
| | Low alloyed steel, annealed | 180 | G | 170–**220**–265 | 200–**245**–295 | 150–**200**–250 | 130–**180**–225 | | | | | |
| | " , tempered | 275 | G | 100–**130**–155 | 115–**145**–175 | 85–**115**–145 | 75–**105**–135 | | | | | |
| | " , tempered | 300 | G | 90–**115**–140 | 105–**130**–155 | 75–**105**–130 | 65–**90**–120 | | | | | |
| | " , tempered | 350 | G | 65–**85**–100 | 75–**95**–115 | 55–**75**–95 | 50–**70**–85 | | | | | |
| | High alloyed and tool steel, annealed | 200 | G | 145–**185**–230 | 170–**215**–255 | 130–**170**–215 | | | | | | |
| | " , tempered | 325 | G | 55–**75**–90 | 65–**85**–100 | 50–**65**–85 | | | | | | |
| M | Stainless steel, ferritic/martensitic, annealed | 200 | G | 115–**145**–175 | | | | | | 145–**175**–195 | 100–**115**–145 | |
| | " , martensitic, tempered | 240 | G | 105–**130**–155 | | | | | | 130–**155**–175 | 85–**105**–130 | |
| | " , austenitic, plunged | 180 | G | 125–**155**–190 | | | | | | 160–**190**–210 | 105–**125**–160 | |
| K | Grey cast iron | | G | 160–**210**–265 | | | | 265–**315**–370 | 180–**230**–285 | | | |
| | Nodular cast iron | | G | 95–**125**–160 | | | | 160–**190**–220 | 105–**140**–170 | | | |
| S | High tempered resist. alloys, Fe based, annealed | | G | 30–**40**–60 | | | | | | 35–**45**–60 | 25–**35**–50 | |
| | " , hardened | | G | 60–**85**–105 | | | | | | 75–**95**–115 | 50–**75**–95 | |
| N | Aluminium alloy, Si < 12,6% | | S | | | | | | | | | 500–**750**–100 |
| | " , Si > 12,6% | | S | | | | | | | | | 170–**200**–250 |
| | Copper alloy | | S | | | | | | | | | 300–**330**–350 |

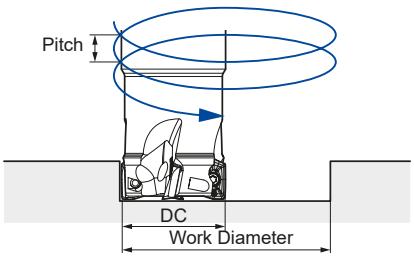
The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine, work shape and clamping. They will need to be adjusted according to machine rigidity, work clamp rigidity, cutting depth and other factors.
For groove milling, reduce the feed rate approximately 70 % of the corresponding value shown above.

## ■ Ramping / Helical Milling Upper Limits

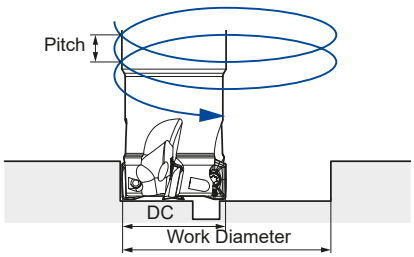
Ramping




Flat Bottom Machining




Machining with Prepared Hole




### ● WEZ11 Type

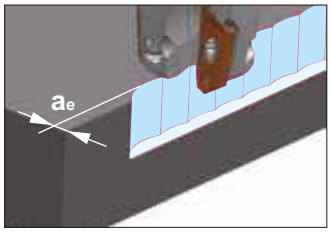
| DC Ø (mm) | Max.Ramping Angle | Flat Bottom Machining | | | | Machining with Prepared Hole | |
|---|---|---|---|---|---|---|---|
| | RPMX (°) | Max. Machining Diam. (mm) | Max. Pitch (mm/rev) | Min. Machining Diam. (mm) | Max. Pitch (mm/rev) | Min. Machining Diam. (mm) | Max. Pitch (mm/rev) |
| 14 | 13,2 | 25,3 | 8,4 | 23,1 | 5,9 | 19,0 | 1,9 |
| 16 | 10,5 | 29,3 | 7,6 | 27,0 | 5,6 | 21,7 | 1,5 |
| 18 | 8,1 | 33,3 | 6,7 | 30,9 | 5,0 | 25,2 | 1,4 |
| 20 | 6,5 | 37,3 | 6,0 | 34,9 | 4,6 | 29,1 | 1,3 |
| 22 | 5,3 | 41,3 | 5,4 | 38,8 | 4,3 | 32,9 | 1,3 |
| 25 | 4,1 | 47,3 | 4,8 | 44,8 | 3,9 | 38,9 | 1,3 |
| 28 | 3,4 | 53,3 | 4,4 | 50,7 | 3,6 | 44,9 | 1,3 |
| 30 | 3,0 | 57,3 | 4,2 | 54,7 | 3,5 | 48,8 | 1,3 |
| 32 | 2,7 | 61,3 | 4,0 | 58,7 | 3,3 | 52,8 | 1,2 |
| 35 | 2,3 | 67,3 | 3,8 | 64,6 | 3,1 | 58,8 | 1,2 |
| 40 | 1,8 | 77,3 | 3,4 | 74,6 | 2,9 | 68,8 | 1,2 |
| 50 | 1,2 | 97,3 | 3,0 | 94,6 | 2,6 | 88,8 | 1,1 |
| 63 | 0,8 | 123,3 | 2,8 | 120,5 | 2,5 | 114,7 | 1,1 |

### ● WEZ17 Type

| DC Ø (mm) | Max.Ramping Angle | Flat Bottom Machining | | | | Machining with Prepared Hole | |
|---|---|---|---|---|---|---|---|
| | RPMX (°) | Max. Machining Diam. (mm) | Max. Pitch (mm/rev) | Min. Machining Diam. (mm) | Max. Pitch (mm/rev) | Min. Machining Diam. (mm) | Max. Pitch (mm/rev) |
| 25 | 10,8 | 47,3 | 13,0 | 41,0 | 8,3 | 33,1 | 1,8 |
| 28 | 8,1 | 53,3 | 11,1 | 46,9 | 7,5 | 39,0 | 1,8 |
| 30 | 7,0 | 57,3 | 10,2 | 50,9 | 7,0 | 43,0 | 1,8 |
| 32 | 6,1 | 61,3 | 9,5 | 54,9 | 6,7 | 47,0 | 1,7 |
| 35 | 5,1 | 67,3 | 8,7 | 60,8 | 6,2 | 53,0 | 1,7 |
| 40 | 4,0 | 77,3 | 7,7 | 70,8 | 5,7 | 63,0 | 1,7 |
| 50 | 2,5 | 97,3 | 6,5 | 90,7 | 5,0 | 83,0 | 1,6 |
| 63 | 1,8 | 123,3 | 5,6 | 116,7 | 4,5 | 109,0 | 1,6 |

* The table above shows values with nose radius 0,8 mm

## ■ Plunge Cutting - Upper Limit for Radial Width $a_e$




| Type | Max. $a_e$ (mm) |
|---|---|
| WEZ11 | 3 |
| WEZ17 | 5 |

# WEZ 11000 R(S)

New

| Rake Angle | | |
|---|---|---|
| | Radial | -7° – -11° |
| | Axial | 14° – 15° |

10 mm 90°

Fig. 1

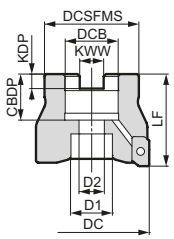



Fig. 2

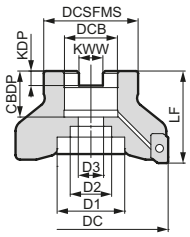
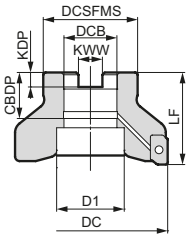



Fig. 3




## Body - WEZ (Shell Type)

Dimensions (mm)

| | Cat. No. | Stock | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | D3 | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric | WEZ 11040RS04 | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | – | 4 | 0,21 | 1 |
| | 11040RS06 | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | – | 6 | 0,20 | 1 |
| | 11050RS05 | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | – | 5 | 0,32 | 1 |
| | 11050RS07 | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | – | 7 | 0,31 | 1 |
| | 11063RS06 | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | – | 6 | 0,58 | 1 |
| | 11063RS08 | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | – | 8 | 0,57 | 1 |
| | 11080RS07 | ● | *80 | 55 | 50 | 27 | 12,4 | 7,0 | 22 | 20 | 14 | – | 7 | 1,08 | 1 |
| | 11080RS10 | ● | *80 | 55 | 50 | 27 | 12,4 | 7,0 | 22 | 20 | 14 | – | 10 | 1,07 | 1 |
| | 11100RS09 | ● | 100 | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | – | – | 9 | 1,57 | 3 |
| | 11100RS12 | ● | 100 | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | – | – | 12 | 1,56 | 3 |
| Inch | WEZ 11080R07 | ❍ | *80 | 55 | 50 | 25,4 | 9,5 | 6,0 | 25 | 20 | 14 | – | 7 | 1,09 | 1 |
| | 11080R10 | ❍ | *80 | 55 | 50 | 25,4 | 9,5 | 6,0 | 25 | 20 | 14 | – | 10 | 1,08 | 1 |
| | 11100R09 | ❍ | *100 | 70 | 63 | 31,75 | 12,7 | 8,0 | 32 | 46 | 27 | 18 | 9 | 2,12 | 2 |
| | 11100R12 | ❍ | *100 | 70 | 63 | 31,75 | 12,7 | 8,0 | 32 | 46 | 27 | 18 | 12 | 2,10 | 2 |

Inserts are sold separately. Check the arbor mounting size (DCB) when selecting the cutter.

* For securing the Ø 80 mm and Ø 100 mm cutter to the arbors, use JIS B1176 hexagonal bolt.
(Ø 80 mm: M12x30 to 35 mm, Ø 100 mm: M16x40x45 mm)

## Spare Parts

| Applicable Cutters | Insert Screw | | Wrench |
|---|---|---|---|
| |  | N·m |  |
| WEZ 11040RS04<br>11040RS06<br>11050RS05<br>11050RS07<br>11063RS06<br>11063RS08<br>11080R(S)07<br>11080R(S)10<br>11100R(S)09<br>11100R(S)12 | BFTX0306IP | 1,5 | TRDR08IP |

## Identification Details

| WEZ | 11 | 050 | R | S | 07 |
|---|---|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Feed Direction | Metric | Number of Teeth |

## Recommended Cutting Conditions

☞ G42

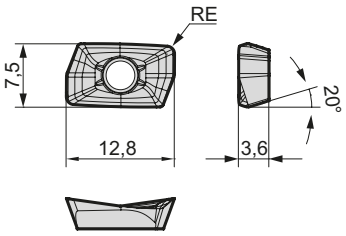


● = Euro stock
❍ = Japan stock

N·m Recommended Tightening Torque (N·m)

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light Cut | | P | | K | | M S | | | N | P | |
| General Purpose | K P M S | | P | | K | M S | M S | N | N | | |
| Roughing | K P M S | | P | | K | | M S | | | | |
| Cat. No. | ACU2500 | ACP2000 | ACP3000 | ACK2000 | ACK3000 | ACM200 | ACM300 | H20 | DL2000 | T2500A | RE (mm) |
| AOMT 11T302PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,2 |
| 11T304PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,4 |
| 11T308PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,8 |
| 11T312PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,2 |
| 11T316PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,6 |
| 11T320PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,0 |
| 11T324PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,4 |
| 11T330PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,0 |
| 11T332PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,2 |
| AOMT 11T304PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,4 |
| 11T308PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,8 |
| 11T312PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,2 |
| 11T316PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,6 |
| AOET 11T302PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 11T302PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 11T302PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 11T302PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 11T302PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 0,2 |
| 11T304PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,4 |
| 11T308PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,8 |
| 11T312PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 1,2 |




L: Low cutting force
G: General purpose
H: Strong edge
F: Finishing
P: High-precision machining
S: Non ferrous metals

*P16 is applicable to cutter diameters Ø 14 mm and Ø 16 mm.
*P20 is applicable to cutter diameters Ø 18 mm, Ø 20 mm.
*P25 is applicable to cutter diameters Ø 25 mm, Ø 28 mm.

– = Not available

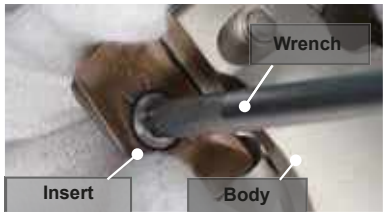
### Precautions for Mounting

(1) Clean the mounting seat and contact parts.

(2) Apply screw lubrication to the screw thread as well as the screw head face to prevent seizure.

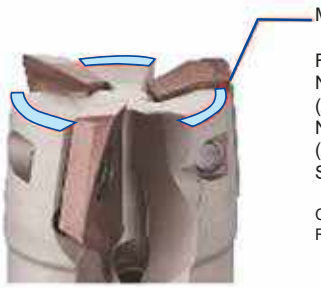
(3) While pressing the insert solidly against the seat surface, tighten at the screws with the included wrench.

(4) After tightening, check that there are no gaps between the surfaces.





*When mounting inserts with nose radius of ≥ 3,0 mm, modification of the body is required.




Reworking guidelines
Nose radius = 3,0 mm: C = 1 mm (AOMT11T330PEER)
Nose radius = 3,2 mm: C = 1 mm (AOMT11T332PEER)
Standard: R = 1 mm

C: Chamfer
R: Radius

# WEZ 17000 R(S)

New

| Rake Angle | | |
|---|---|---|
| | Radial | -4° – -9° |
| | Axial | 10° – 15° |

15 mm 90°

Fig. 1

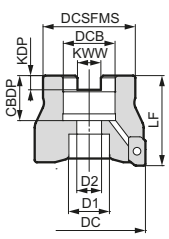



Fig. 2

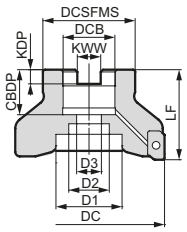



Fig. 3

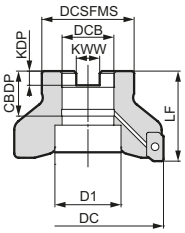



Fig. 4

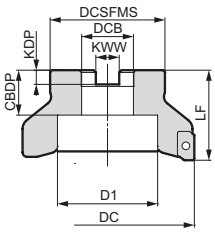
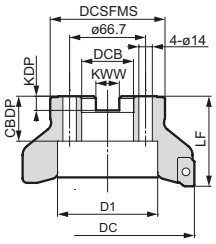



Fig. 5




## Body - WEZ (Shell Type)

Dimensions (mm)

| | Cat. No. | Stock | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | D3 | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric | WEZ 17040RS03 | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | – | 3 | 0,19 | 1 |
| | 17040RS04 | ● | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | – | 4 | 0,16 | 1 |
| | 17050RS03 | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | – | 3 | 0,30 | 1 |
| | 17050RS05 | ● | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | – | 5 | 0,26 | 1 |
| | 17063RS04 | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | – | 4 | 0,54 | 1 |
| | 17063RS06 | ● | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | – | 6 | 0,51 | 1 |
| | 17080RS04 | ● | *80 | 55 | 50 | 27 | 12,4 | 7,0 | 22 | 20 | 14 | – | 4 | 1,10 | 1 |
| | 17080RS07 | ● | *80 | 55 | 50 | 27 | 12,4 | 7,0 | 22 | 20 | 14 | – | 7 | 1,05 | 1 |
| | 17100RS05 | ● | 100 | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | – | – | 5 | 1,58 | 3 |
| | 17100RS08 | ● | 100 | 70 | 50 | 32 | 14,4 | 8,0 | 32 | 46 | – | – | 8 | 1,57 | 3 |
| | 17125RS06 | ● | 125 | 80 | 63 | 40 | 16,4 | 9,0 | 29 | 52 | 29 | – | 6 | 3,04 | 1 |
| | 17125RS09 | ● | 125 | 80 | 63 | 40 | 16,4 | 9,0 | 29 | 52 | 29 | – | 9 | 3,07 | 1 |
| | 17125RS11 | ● | 125 | 80 | 63 | 40 | 16,4 | 9,0 | 29 | 52 | 29 | – | 11 | 3,02 | 1 |
| | 17160RS08 | ● | 160 | 130 | 63 | 40 | 16,4 | 9,0 | 29 | 90 | – | – | 8 | 5,24 | 5 |
| | 17160RS10 | ● | 160 | 130 | 63 | 40 | 16,4 | 9,0 | 29 | 90 | – | – | 10 | 5,31 | 5 |
| | 17160RS12 | ● | 160 | 130 | 63 | 40 | 16,4 | 9,0 | 29 | 90 | – | – | 12 | 5,26 | 5 |
| Inch | WEZ 17080R04 | ❍ | *80 | 55 | 50 | 25,4 | 9,5 | 6,0 | 25 | 20 | 14 | – | 4 | 1,10 | 1 |
| | 17080R07 | ❍ | *80 | 55 | 50 | 25,4 | 9,5 | 6,0 | 25 | 20 | 14 | – | 7 | 1,06 | 1 |
| | 17100R05 | ❍ | *100 | 70 | 63 | 31,75 | 12,7 | 8,0 | 32 | 46 | 27 | 18 | 5 | 2,08 | 2 |
| | 17100R08 | ❍ | *100 | 70 | 63 | 31,75 | 12,7 | 8,0 | 32 | 46 | 27 | 18 | 8 | 2,07 | 2 |
| | 17125R06 | ❍ | 125 | 80 | 63 | 38,1 | 15,9 | 10,0 | 35,5 | 55 | 30 | – | 6 | 3,09 | 1 |
| | 17125R09 | ❍ | 125 | 80 | 63 | 38,1 | 15,9 | 10,0 | 35,5 | 55 | 30 | – | 9 | 3,11 | 1 |
| | 17125R11 | ❍ | 125 | 80 | 63 | 38,1 | 15,9 | 10,0 | 35,5 | 55 | 30 | – | 11 | 3,06 | 1 |
| | 17160R08 | ❍ | 160 | 100 | 63 | 50,8 | 19,1 | 11,0 | 38 | 72 | – | – | 8 | 5,04 | 4 |
| | 17160R10 | ❍ | 160 | 100 | 63 | 50,8 | 19,1 | 11,0 | 38 | 72 | – | – | 10 | 5,09 | 4 |
| | 17160R12 | ❍ | 160 | 100 | 63 | 50,8 | 19,1 | 11,0 | 38 | 72 | – | – | 12 | 5,04 | 4 |

Inserts are sold separately. Check the arbor mounting size (DCB) when selecting the cutter.

* For securing the Ø 80 mm and Ø 100 mm cutter to the arbors, use JIS B1176 hexagonal bolt. (Ø 80 mm: M12x30 to 35 mm, Ø 100 mm: M16x40x45 mm)

## Spare Parts

| Applicable Cutters | Insert Screw | | Wrench | Handle Grip | Wrench Bit |
|---|---|---|---|---|---|
| WEZ 17040RS03 | BFTX0409IP | 3,0 | – | HPS1015 | TRB15IP |
| 17040RS04 | | | | | |
| 17050RS03 | | | | | |
| 17050RS05 | | | | | |
| 17063RS04 | | | | | |
| 17063RS06 | | | | | |
| 17080R(S)04 | | | | | |
| 17080R(S)07 | | | | | |
| 17100R(S)05 | | | | | |
| 17100R(S)08 | | | | | |
| 17125R(S)06 | | | | | |
| 17125R(S)09 | | | | | |
| 17125R(S)11 | | | | | |
| 17160R(S)08 | | | TRDR15IP | – | – |
| 17160R(S)10 | | | | | |
| 17160R(S)12 | | | | | |

## Identification Details

| WEZ | 17 | 100 | R | S | 05 |
|---|---|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Feed Direction | Metric | Number of Teeth |

## Recommended Cutting Conditions

☞ G42

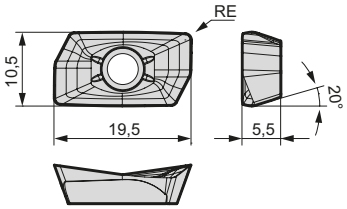


● = Euro stock
❍ = Japan stock

Recommended Tightening Torque (N·m)

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light Cut | | P | | K | | M S | | | N | P | |
| General Purpose | K P M S | | P | | K | M S | M S | N | N | | |
| Roughing | K P M S | | P | | K | | M S | | | | |
| Cat. No. | ACU2500 | ACP2000 | ACP3000 | ACK2000 | ACK3000 | ACM200 | ACM300 | H20 | DL2000 | T2500A | RE (mm) |
| AOMT 170502PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,2 |
| 170504PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,4 |
| 170508PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,8 |
| 170512PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 1,2 |
| 170516PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 1,6 |
| AOMT 170502PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,2 |
| 170504PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,4 |
| 170508PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,8 |
| 170512PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,2 |
| 170516PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,6 |
| 170520PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,0 |
| 170524PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,4 |
| 170530PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,0 |
| 170532PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,2 |
| 170540PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 4,0 |
| 170550PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 5,0 |
| 170564PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 6,4 |
| AOMT 170504PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,4 |
| 170508PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,8 |
| 170512PEER-H | ❍ | ● | ● | ● | ● | ● | ● | – | – | – | 1,2 |
| 170516PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,6 |
| AOET 170502PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 170502PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 170502PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 170502PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 0,2 |
| 170504PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,4 |
| 170508PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,8 |
| 170512PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 1,2 |




L: Low cutting force
G: General purpose
H: Strong edge
F: Finishing
P: High-precision machining
S: Non ferrous metals

*P25 is applicable to cutter diameters Ø 25 mm and Ø 28 mm.
*P32 is applicable to cutter diameters Ø 30 mm, Ø 32 mm and Ø 35 mm.

– = Not available

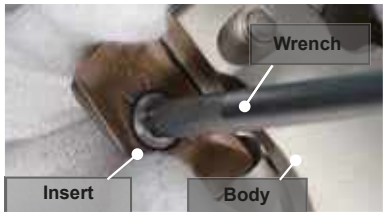
### Precautions for Mounting

(1) Clean the mounting seat and contact parts.

(2) Apply screw lubrication to the screw thread as well as the screw head face to prevent seizure.

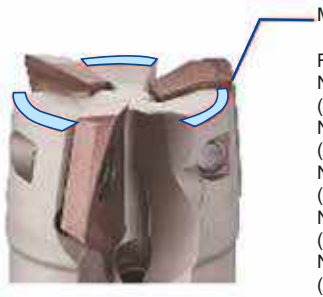
(3) While pressing the insert solidly against the seat surface, tighten at the screws with the included wrench.

(4) After tightening, check that there are no gaps between the surfaces.





*When mounting inserts with nose radius of ≥ 3,0 mm, modification of the body is required.




Reworking guidelines
Nose radius = 3,0 mm: C = 1 mm (AOMT170530PEER)
Nose radius = 3,2 mm: C = 1 mm (AOMT170532PEER)
Nose radius = 4,0 mm: C = 2 mm (AOMT170540PEER)
Nose radius = 5,0 mm: C = 5 mm (AOMT170550PEER)
Nose radius = 6,4 mm: C = 5 mm (AOMT170564PEER)
Standard: R = 1 mm

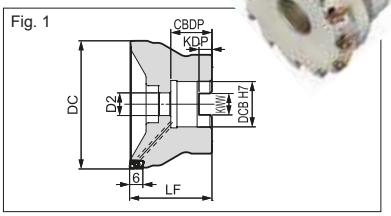
C: Chamfer
R: Radius

# WEX (-F) Type



5 mm 90°

Fig. 1




10 mm 90°

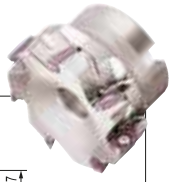
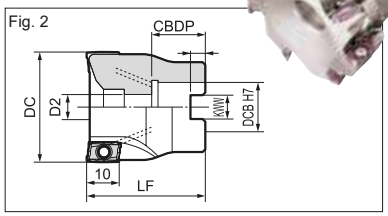
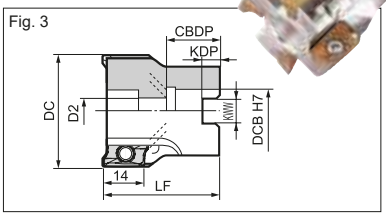


Fig. 2




14 mm 90°

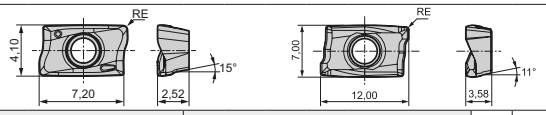
Fig. 3




## Body (Shell Type ”F”)

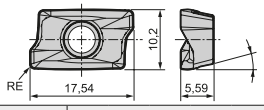
| Cat. No. | Dimensions (mm) | | | | | | | | No.of Teeth | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Stock | DC | DCB | D2 | KWW | KDP | LF | CBDP | | |
| WEX 1032 F | ● | 32 | 16 | 9 | 8,4 | 5,6 | 40 | 18 | 8 | 1 |
| 1040 F | ● | 40 | 16 | 11 | 8,4 | 5,6 | 40 | 18 | 10 | 1 |
| 1050 F | ● | 50 | 22 | 11 | 10,4 | 6,3 | 40 | 20 | 12 | 1 |
| 1063 F | ● | 63 | 22 | 11 | 10,4 | 6,3 | 40 | 20 | 14 | 1 |
| WEX 2040 F | ● | 40 | 16 | 9 | 8,4 | 5,6 | 40 | 18 | 6 | 2 |
| 2050 F | ● | 50 | 22 | 11 | 10,4 | 6,3 | 40 | 20 | 7 | 2 |
| 2063 F | ● | 63 | 22 | 11 | 10,4 | 6,3 | 40 | 20 | 8 | 2 |
| 2080 F | ● | 80 | 27 | 13,5 | 12,4 | 7,0 | 50 | 25 | 10 | 2 |
| WEX 2100 F | ❑ | 100 | 32 | 32 | 14,4 | 8,5 | 50 | 26 | 12 | 2 |
| WEX 3040 F | ● | 40 | 16 | 9 | 8,4 | 5,6 | 40 | 18 | 4 | 3 |
| 3050 F | ● | 50 | 22 | 11 | 10,4 | 6,3 | 40 | 20 | 5 | 3 |
| 3063 F | ● | 63 | 22 | 11 | 10,4 | 6,3 | 40 | 20 | 6 | 3 |
| 3080 F | ● | 80 | 27 | 13,5 | 12,4 | 7,0 | 50 | 25 | 7 | 3 |
| WEX 3100 F | ● | 100 | 32 | 32 | 14,4 | 8,5 | 50 | 26 | 8 | 3 |

## Inserts for WEX1000 / 2000 Type




| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | MS | | KN | N | |
| General Purpose | | P | | K | | MS | MS | | N | |
| Roughing | | P | P | | K | | MS | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
| AXMT 060204 PDER-L | ❍ | ● | ❍ | ❍ | ● | ● | ● | | | 0,4 |
| 060208 PDER-L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | | | 0,8 |
| 060212 PDER-L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | | | 1,2 |
| AXMT 060204 PDER-G | ❍ | ● | ● | ❍ | ❍ | ❍ | ● | | | 0,4 |
| 060208 PDER-G | ❍ | ● | ● | ❍ | ❍ | ● | ● | | | 0,8 |
| 060212 PDER-G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ● | | | 1,2 |
| AXMT 060204 PDER-H | ❍ | ● | ● | ❍ | ● | ❍ | ● | | | 0,4 |
| 060208 PDER-H | ❍ | ● | ● | ❍ | ● | ● | ● | | | 0,8 |
| 060212 PDER-H | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | | | 1,2 |
| AXMT 123504 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,4 |
| 123508 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 123512 PEER-G | ● | ● | ● | ● | ● | | | – | – | 1,2 |
| AXMT 123504 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,4 |
| 123508 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 123512 PEER-H | ● | ● | ● | ❍ | ● | | | – | – | 1,2 |
| AXMT 123504 PEER-E | | | | | | ● | ● | – | – | 0,4 |
| 123508 PEER-E | | | ▲ | | | ● | ● | – | – | 0,8 |
| 123512 PEER-E | | | | | | ● | ● | – | – | 1,2 |
| AXMT 123508 PEER-EH | | | ▲ | | | ● | ● | – | – | 0,8 |
| AXMT 060202 PDFR-S | – | – | – | – | – | – | – | ❍ | ❍ | 0,2 |
| AXET 123502 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 123504 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 123508 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,8 |

## Inserts for WEX3000 Type



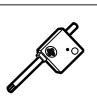
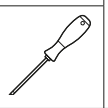

| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | MS | | KN | N | |
| General Purpose | | P | | K | | MS | MS | | N | |
| Roughing | | P | P | | K | | MS | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
| AXMT 170508 PEER-L | ● | ● | ● | ❍ | ● | | | – | – | 0,8 |
| AXMT 170504 PEER-G | ❍ | ● | ● | ● | ● | | | – | – | 0,4 |
| 170508 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 170512 PEER-G | ❍ | ● | ● | ❍ | ● | | | – | – | 1,2 |
| 170516 PEER-G | ❍ | ● | ● | ❍ | ● | | | – | – | 1,6 |
| 170520 PEER-G* | ❍ | ● | ● | ● | ● | | | – | – | 2,0 |
| 170530 PEER-G* | ● | ● | ● | ● | ● | | | – | – | 3,0 |
| AXMT 170508 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 170512 PEER-H | ● | ● | ● | ● | ● | | | – | – | 1,2 |
| AXMT 170504 PEER-E | | | | | | ● | ● | – | – | 0,4 |
| 170508 PEER-E | | | ▲ | | | ● | ● | – | – | 0,8 |
| 170512 PEER-E | | | | | | ● | ● | – | – | 1,2 |
| 170516 PEER-E | | | | | | ❍ | ● | – | – | 1,6 |
| 170520 PEER-E* | | | | | | ❍ | ● | – | – | 2,0 |
| 170530 PEER-E* | | | | | | ● | ● | – | – | 3,0 |
| AXMT 170508 PEER-EH | | | ▲ | | | ● | ● | – | – | 0,8 |
| AXET 170502 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 170504 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 170508 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,8 |

* Cutter body modification is required. ☞ H36

– Unable to produce

L – Low cutting force
G – General type
H – Strong cutting edge
E – For stainless steel
EH– Strong edge for stainless steel
S – For aluminium

## Spare Parts

| Screw | Wrench | | N·m | Applicable Endmill |
|---|---|---|---|---|
|  |  |  | | |
| BFTX 01804 IP | TRX 06 IP | | 0,5 | WEX 1000 F |
| BFTX 0306 IP | | TRDR 08 IP | 2,0 | WEX 2000 F |
| BFTX 0409 IP | | TRDR 15 IP | 3,0 | WEX 3000 F |

## Identification Details

| WEX | 2 | 016 | F |
|---|---|---|---|
| Cutter Series | 2000 Series | Cutter Diameter | Shell Type |

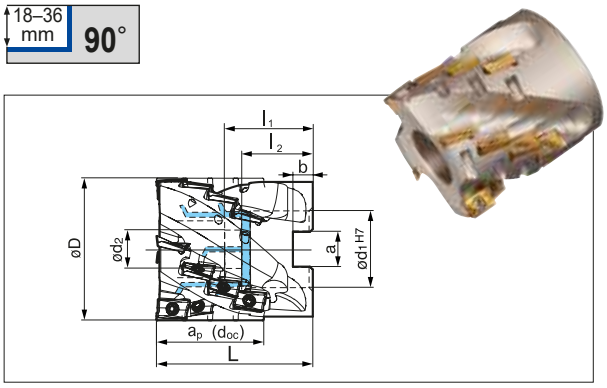


● = Euro stock
❍ = Japan stock
❑ = Delivery on request
▲ = To be replaced by new item

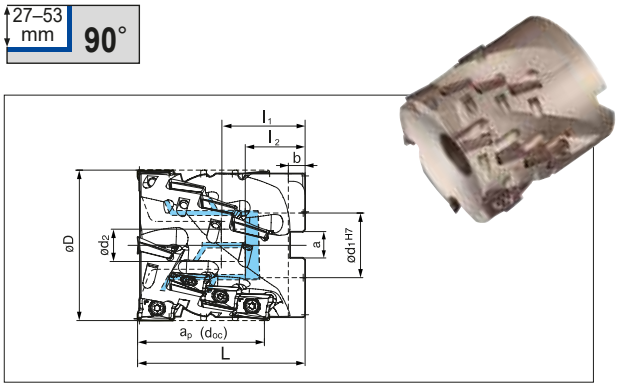
☞ H34-36

N·m Recommended Tightening Torque (N·m)

18–36 mm 90°




27–53 mm 90°



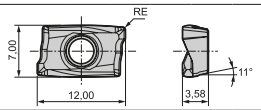

## Body (Shell Type "F")

| Cat. No. | Stock | Depth of cut ($a_p$) | Dimensions (mm) øD | ød1 | ød2 | a | b | l1 | l | l | No. of teeth | No. of rows | Effective teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WRX2040RH18F16 | ❑ | 18 | 40 | 16 | 9 | 8,4 | 5,6 | 50 | 39 | 18 | 10 | 2 | 5 |
| WRX2040RH36F16 | ● | 36 | 40 | 16 | 9 | 8,4 | 5,6 | 55 | 44 | 18 | 16 | 4 | 4 |
| WRX2050RH18F22 | ❑ | 18 | 50 | 22 | 11 | 10,4 | 6,3 | 50 | 36 | 20 | 10 | 2 | 5 |
| WRX2050RH36F22 | ● | 36 | 50 | 22 | 11 | 10,4 | 6,3 | 55 | 41,5 | 20 | 16 | 4 | 4 |

## Body (Shell Type "F")

| Cat. No. | Stock | Depth of Cut ($a_p$) | Dimensions (mm) øD | ød1 | ød2 | a | b | l1 | l | l | No. of teeth | No. of rows | Effective teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WRX3050RH27F22 | ❑ | 27 | 50 | 22 | 11 | 10 | 6,3 | 50 | 36 | 20 | 8 | 2 | 4 |
| WRX3050RH53F22 | ● | 53 | 50 | 22 | 11 | 10 | 6,3 | 70 | 56 | 20 | 12 | 4 | 3 |
| WRX3063RH27F27 | ❑ | 27 | 63 | 27 | 13,5 | 12 | 7 | 70 | 34 | 2 | 10 | 2 | 5 |
| WRX3063RH53F27 | ● | 53 | 63 | 27 | 13,5 | 12 | 7 | 70 | 54 | 2 | 16 | 4 | 4 |
| WRX3080RH27F32 | ❑ | 27 | 80 | 32 | 17 | 14 | 8 | 50 | 30 | 2 | 12 | 2 | 6 |
| WRX3080RH53F32 | ● | 53 | 80 | 32 | 17 | 14 | 8 | 85 | 63 | 2 | 20 | 4 | 5 |
| WRX3100RH27F40 | ❑ | 27 | 100 | 40 | 21 | 16 | 9,5 | 85 | 40 | 30 | 14 | 2 | 7 |
| WRX3100RH53F40 | ● | 53 | 100 | 40 | 21 | 16 | 9,5 | 85 | 59 | 30 | 24 | 4 | 6 |

## Inserts (Same as for Wavemill WEX 2000 Type)

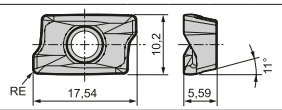



| Application | Coated Carbide | | | | | | | Carbide | DLC |
|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N |
| General Purpose | | P | | K | | M S | M S | | N |
| Roughing | | P | P | | K | | M S | | |

| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
|---|---|---|---|---|---|---|---|---|---|---|
| AXMT 123504 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,4 |
| 123508 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 123512 PEER-G | ● | ● | ● | ● | ● | | | – | – | 1,2 |
| AXMT 123504 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,4 |
| 123508 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 123512 PEER-H | ● | ● | ● | ❍ | ● | | | – | – | 1,2 |
| AXMT 123504 PEER-E | | | | | | ● | ● | – | – | 0,4 |
| 123508 PEER-E | | | ▲ | | | ● | ● | – | – | 0,8 |
| 123512 PEER-E | | | | | | ● | ● | – | – | 1,2 |
| AXMT 123508 PEER-EH | | | ▲ | | | ● | ● | – | – | 0,8 |
| AXET 123502 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 123504 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 123508 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,8 |

– Unable to produce
L – Low cutting force
G – General type
H – Strong cutting edge
E – For stainless steel
EH– Strong edge for stainless steel
S – For aluminium

## Inserts (Same as for Wavemill WEX 3000 Type)




| Application | Coated Carbide | | | | | | | Carbide | DLC |
|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N |
| General Purpose | | P | | K | | M S | M S | | N |
| Roughing | | P | P | | K | | M S | | |

| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
|---|---|---|---|---|---|---|---|---|---|---|
| AXMT 170508 PEER-L | ● | ● | ● | ❍ | ● | | | – | – | 0,8 |
| AXMT 170504 PEER-G | ❍ | ● | ● | ● | ● | | | – | – | 0,4 |
| 170508 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 170512 PEER-G | ❍ | ● | ● | ❍ | ● | | | – | – | 1,2 |
| 170516 PEER-G | ❍ | ● | ● | ❍ | ● | | | – | – | 1,6 |
| 170520 PEER-G* | ❍ | ● | ● | ● | ● | | | – | – | 2,0 |
| 170530 PEER-G* | ● | ● | ● | ● | ● | | | – | – | 3,0 |
| AXMT 170508 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 170512 PEER-H | ● | ● | ● | ● | ● | | | – | – | 1,2 |
| AXMT 170504 PEER-E | | | | | | ● | ● | – | – | 0,4 |
| 170508 PEER-E | | | ▲ | | | ● | ● | – | – | 0,8 |
| 170512 PEER-E | | | | | | ● | ● | – | – | 1,2 |
| 170516 PEER-E | | | | | | ❍ | ● | – | – | 1,6 |
| 170520 PEER-E* | | | | | | ❍ | ● | – | – | 2,0 |
| 170530 PEER-E* | | | | | | ● | ● | – | – | 3,0 |
| AXMT 170508 PEER-EH | | | ▲ | | | ● | ● | – | – | 0,8 |
| AXET 170502 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 170504 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 170508 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,8 |

* Cutter body modification is required.

☞ H36

## Spare Parts

| Screw | Wrench | N·m | Applicable Endmill |
|---|---|---|---|
| BFTX 0306 IP | TRDR 08 IP | 2,0 | WRX 2_ _ _ _ RH_ _F_ _ |
| BFTX 0409 IP | TRDR 15 IP | 3,0 | WRX 3_ _ _ _ RH_ _F_ _ |

## Identification Details

WRX **20** Insert Size — **40** Tool øD — **R** Cutting Direction — **H** Inner coolant — **18** Cutting Edge Length — **F** Arbor Type — **16** Arbor Diameter

**E** - Straight Shank
**W** - Weldon Shank
**F** - Shell Type

☞ H44-47

# PWC Type

## Powerful Tangential Milling System for Cast Iron

| | | |
|---|---|---|
| Approach angle | : | 88° |
| Axial rake angle | : | + 5° |
| Radial rake angle | : | - 5° |

Fig. 1

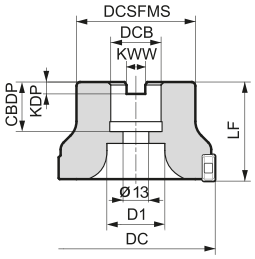



Fig. 2

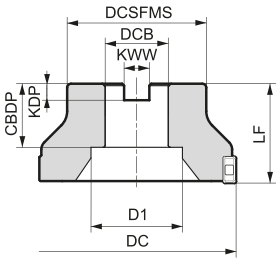
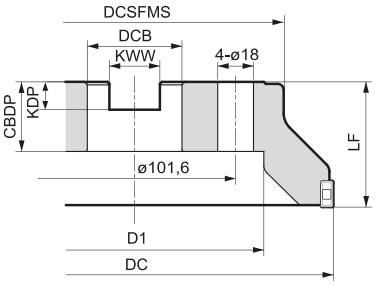



Fig. 3




## ■ Body (Standard, PWC Type)

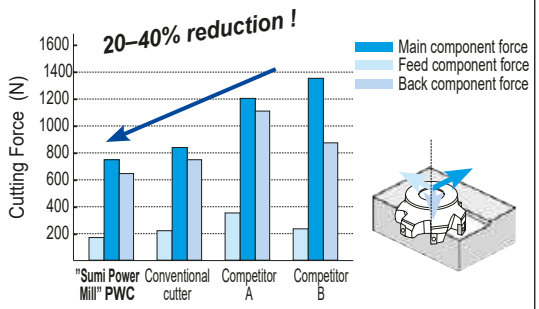
| Cat. No. | Stock | | Dimensions (mm) | | | | | | | | No of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | L | DC | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | | |
| PWC 4080 R/L-S | ▲ | ▲ | 80 | 60 | 50 | 27 | 29,5 | 12,4 | 7,0 | 25 | 7 | | 0,9 | 1 |
| PWC 4100 R/L-S | ▲ | ▲ | 100 | 70 | 50 | 32 | 46 | 14,4 | 8,5 | 29 | 8 | | 1,3 | 2 |
| 4125 R/L-S | ▲ | ▲ | 125 | 80 | 63 | 40 | 56 | 16,4 | 9,5 | 29 | 10 | 12,0 | 2,5 | 2 |
| 4160 R/L-S | ▲ | ▲ | 160 | 100 | 63 | 40 | 88 | 16,4 | 9,5 | 29 | 12 | | 4,2 | 3 |
| PWC 4200 R/L-S | ▲ | ▲ | 200 | 150 | 63 | 60 | 130 | 25,7 | 14,0 | 35 | 16 | | 7,2 | 3 |

## ■ Body (Fine Pitch, PWCF Type)

| Cat. No. | Stock | | Dimensions (mm) | | | | | | | | No of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | L | DC | DCSFMS | LF | DCB | D1 | KWW | KDP | CBDP | | | | |
| PWCF 4080 R/L-S | ▲ | ▲ | 80 | 60 | 50 | 27 | 29,5 | 12,4 | 7,0 | 25 | 9 | | 0,9 | 1 |
| PWCF 4100 R/L-S | ▲ | ▲ | 100 | 70 | 50 | 32 | 46 | 14,4 | 8,5 | 29 | 12 | | 1,4 | 2 |
| 4125 R/L-S | ▲ | ▲ | 125 | 80 | 63 | 40 | 56 | 16,4 | 9,5 | 29 | 15 | 12,0 | 2,6 | 2 |
| 4160 R/L-S | ▲ | ▲ | 160 | 100 | 63 | 40 | 88 | 16,4 | 9,5 | 29 | 18 | | 4,3 | 3 |
| PWCF 4200 R/L-S | ▲ | ▲ | 200 | 150 | 63 | 60 | 130 | 25,7 | 14,0 | 35 | 24 | | 7,4 | 3 |

## ■ Performance

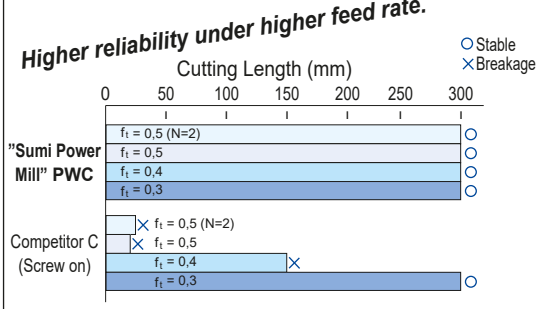
● Comparison of cutting force




Work Material : GG25
Tool : PWC 4080 RS, ø 80
Insert : LNMX160608PNSN-G
Grade : ACK200

Cutting Conditions
$v_c$ = 200 m/min
$f_t$ = 0,1 mm/tooth
Depth of cut : 4,0 mm
Width of cut : 50 mm
Dry

● Comparison of cutting edge strength



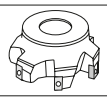

Work Material : GG25
Tool : PWC 4080 RS, ø 80
Insert : LNMX160608PNSN-G
Grade : ACK200

Cutting Conditions
$v_c$ = 160 m/min
$f_t$ = 0,3–0,5 mm/tooth
Depth of cut : 5,0 mm
Width of cut : 80 mm
Dry

## ■ Recommended Cutting Conditions

| Material | Grey Cast Iron (GG) | Ductile Cast Iron (GGG) |
|---|---|---|
| Cutting speed (m/min) | 100 150 200 250 300 | 100 150 200 250 |
| Feed rate (mm/tooth) | 0,1 0,2 0,3 0,4 0,5 | 0,05 0,1 0,2 0,25 0,3 |
| Grade | ACK200, ACK300 | |

## ■ Spare Parts

| Cutter | Screw | Wrench |
|---|---|---|
|  |  3,0 (N·m) |  |
| PWC (F) 4000 | BFTX 0412 N | TTX 15 W |



▲ =To be replaced by new item

(N·m) Recommended Tightening Torque (N·m)

# PWC Type

High Metal Removal
High Volume Insert Capacity
High Performance Inserts

## ● Geometry

Rake angle
G type : 20°
H type : 15°

Wiper width = 2,4 mm

## ■ Advantages

● High volume insert capacity
The tangential orientation of the strong carbide inserts increases the number of cutting edges (eg 3 edges /inch) maximising edge contact with the workpiece.

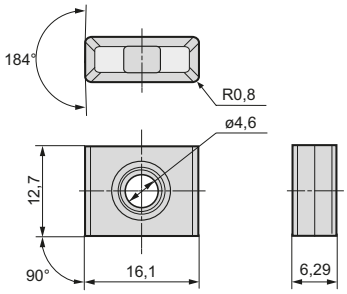
● Cost effective tooling
Using M Class precision sintered inserts with 8 cutting edges both acquisition and operating costs are substantially reduced.

● Increased tool life
New Cast Iron grades ACK200 for general cutting and ACK300 for heavy cutting provide increased tool life and high productivity

● Durable cutter body
The robust cutter body is manufactured from a special alloyed steel then coated with a hard surface to resist swarf damage, scratching, and corrosion.



## ■ Inserts




● G type insert
for light cutting

(Fig. 1)

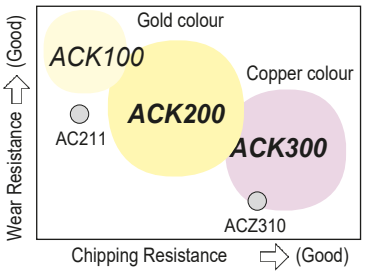
● H type insert
with strong cutting edge

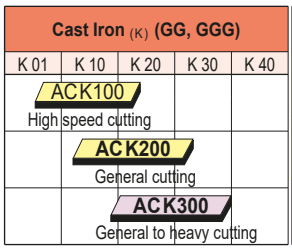
(Fig. 2)


| Application | Coated Carbide | | |
|---|---|---|---|
| High speed/Light cut | K | K | |
| General purpose | K | K | |
| Roughing | | | K |

| Cat. No. | ACK100 | ACK200 | ACK300 | Fig. | Application | Remarks |
|---|---|---|---|---|---|---|
| LNMX 160608 PNSN-G | | ▲ | ▲ | 1 | General application | First remommendation |
| 160608 PNSN-L | ▲ | ▲ | ▲ | 2 | Instable machining, heavy interruption | Suitable for instable condition |

## ■ New Coated Grade for Cast Iron




| Grade | Characteristic · Application |
|---|---|
| ACK100 | High wear resistance with special hard substrate and fine Ti-based $Al_2O_3$ CVD coating for high speed machining |
| ACK200 | Excellent wear resistance with fine Ti-based and tough $Al_2O_3$ CVD coating |
| ACK300 | Excellent toughness with fine grain carbide substrate. Cr added new PVD coating could improve hardness and oxidation resistance. |

# CNP / CNPF Type

## Shoulder Milling for Steel, Stainless Steel & Cast Iron

| | | |
|---|---|---|
| Approach angle | : | 90° |
| Axial rake angle | : | + 10° – 17° |
| Radial rake angle | : | + 10° – 16° |

Fig. 1

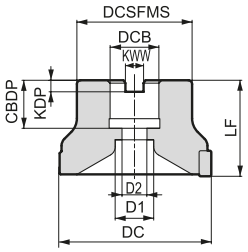



Fig. 2

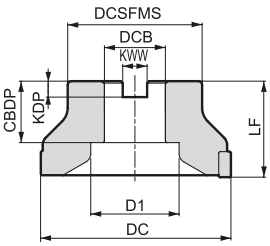
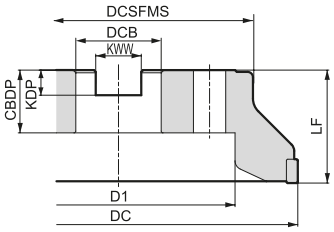



Fig. 3




## ■ Body (Standard, CNP Type)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | D1 | D2 | KWW | KDP | CBDP | | | | |
| CNP 13040 RS | ▲ | 40 | 36 | 40 | 22 | 14 | 9 | 8,4 | 5,6 | 18 | 4 | 12,0 | 0,3 | 1 |
| 13050 RS | ▲ | 50 | 40 | 40 | 27 | 18 | 11 | 10,4 | 6,3 | 20 | 4 | | 0,4 | 1 |
| 13063 RS | ▲ | 63 | 40 | 40 | 22 | 18 | 11 | 10,4 | 6,3 | 20 | 5 | | 0,4 | 1 |
| 13080 RS | ▲ | 80 | 60 | 50 | 27 | 20 | 13 | 12,4 | 7,0 | 25 | 5 | | 0,9 | 1 |
| CNP 13100 RS | ▲ | 100 | 70 | 50 | 32 | - | - | 14,4 | 8,5 | 32 | 6 | | 1,3 | 2 |
| 13125 RS | ▲ | 125 | 80 | 63 | 40 | - | - | 16,4 | 9,5 | 38 | 7 | | 2,5 | 2 |
| 13160 RS | ▲ | 160 | 100 | 63 | 40 | - | - | 16,4 | 9,5 | 38 | 8 | | 4,2 | 2 |
| CNP 13200 RS | | 200 | 150 | 63 | 60 | - | - | 25,7 | 14,0 | 34 | 10 | | 7,2 | 3 |

## ■ Body (Fine Pitch, CNPF Type)

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNPF 13063 RS | ▲ | 63 | 40 | 40 | 22 | 18 | 11 | 10,4 | 6,3 | 20 | 7 | 12,0 | 0,4 | 1 |
| 13080 RS | ▲ | 80 | 60 | 50 | 27 | 20 | 13 | 12,4 | 7,0 | 25 | 7 | | 0,9 | 1 |
| CNPF 13100 RS | ▲ | 100 | 70 | 50 | 32 | - | - | 14,4 | 8,5 | 32 | 8 | | 1,4 | 2 |
| 13125 RS | ▲ | 125 | 80 | 63 | 40 | - | - | 16,4 | 9,5 | 38 | 9 | | 2,4 | 2 |
| 13160 RS | ▲ | 160 | 100 | 63 | 40 | - | - | 16,4 | 9,5 | 38 | 11 | | 4,3 | 2 |
| CNPF 13200 RS | | 200 | 150 | 63 | 60 | - | - | 25,7 | 14,0 | 34 | 13 | | 7,4 | 3 |

## ■ Inserts

Fig. 1

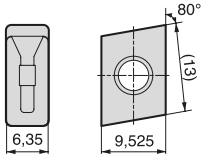
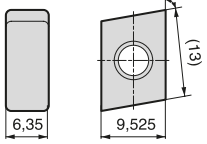



Fig. 2




| Application | Coated Carbide | | | | | |
|---|---|---|---|---|---|---|
| High Speed / Light cut | P | P M | P M | K | | |
| General Purpose | | P M | P M | K | | |
| Roughing | | | | | K | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | Fig. |
| CNMU 130608 N-G | ▲ | ▲ | ▲ | ▲ | ▲ | 1. |
| 130608 N-H | ▲ | ▲ | ▲ | ▲ | ▲ | |
| CNMQ 130608 N | | | | | | 2. |
| 130616 N | ▲ | ▲ | ▲ | ▲ | ▲ | |

G: General purpose
H: Strong cutting edge

## ■ Spare Parts

| Cutter | Screw | Wrench |
|---|---|---|
| |  3,0 (N·m) |  |
| CNP-(F) 13000 | BFTX 0412 N | TTX 15 W |

## ■ Recommended Cutting Conditions

[$v_c$ =m/min, $f_t$ =mm/tooth] [min.– **optimum** – max.]

| Insert Type | | CNMU / CNMQ 1306○○ N / -G/ -H | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grade | | ACP100 | | | ACP200 | | | ACP300 | | | ACK200 | | ACK300 | |
| Work Material / Type | | Low carbon steel | Alloy steel | Die steel | Low carbon steel | Alloy steel | Die steel | Stainless steel | | | Cast iron | Ductile cast iron | Cast iron | Ductile cast iron |
| | | | | | | | | austenitic | | martensitic | | | | |
| CNP 13000 | $v_c$ | 100-**250**-400 | 80-**220**-280 | 80-**150**-250 | 80-**200**-370 | 70-**150**-250 | 60-**130**-220 | 120-**180**-240 | | 100-**140**-200 | 220-**270**-450 | 150-**180**-250 | 180-**220**-270 | 130-**160**-220 |
| | $f_t$ | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,35 | 0,1-**0,2**-0,3 | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,35 | 0,1-**0,2**-0,3 | 0,1-**0,2**-0,25 | | 0,1-**0,2**-0,25 | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,4 | 0,1-**0,25**-0,4 |
| | $a_p$ | ~**10** | | | ~**10** | | | ~**10** | | | ~**10** | | ~**10** | |



● = Euro stock
❍ = Japan stock

▲ = To be replaced by new item

(N·m) Recommended Tightening Torque (N·m)

## High Feed Milling of Steel, Stainless Steel, Die Steel and Cast Iron

H8-10

1,5 mm 20° (MSX 08000□□)

2,0 mm 20° (MSX 12000□□)

2,5 mm 20° (MSX 14000□□)

Fig. 1

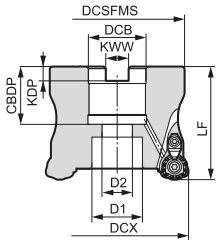
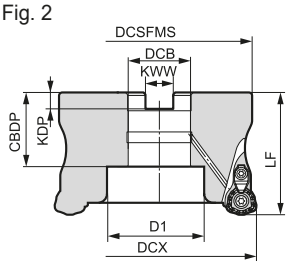


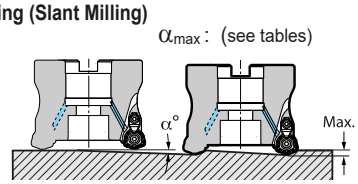

Fig. 2



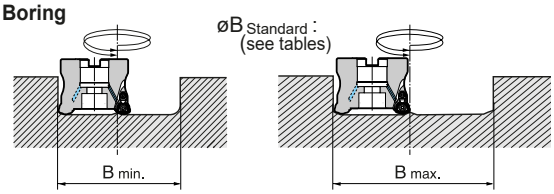

## Body

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of teeth | Helical Boring øB (max-min) | Ramping αmax. | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | | | | |
| MSX 08040 RS | ● | 40 | 37 | 45 | 16 | 8,4 | 5,6 | 18 | 13,5 | 9 | 4 | 65 ~ 78 | 1°30' | 0,2 | 1 |
| MSX 12050 RS | ● | 50 | 47 | 50 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 78 ~ 99 | 2°30' | 0,3 | 1 |
| 12052 RS | ● | 52 | 47 | 50 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 82 ~ 103 | 2°00' | 0,3 | 1 |
| 12063 RS | ● | 63 | 60 | 50 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 104 ~ 125 | 1°30' | 0,4 | 1 |
| 12066 RS | ● | 66 | 60 | 63 | 27 | 12,4 | 7,0 | 25 | 20 | 13,5 | 5 | 110 ~ 131 | 1°00' | 0,4 | 1 |
| MSX 14050 RS | ● | 50 | 47 | 50 | 22 | 10,4 | 6,3 | 20 | 17 | 11 | 3 | 73 ~ 98 | 3°30' | 0,3 | 1 |
| 14063 RS | ● | 63 | 60 | 50 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 99 ~ 124 | 2°00' | 0,6 | 1 |
| 14066 RS | ● | 66 | 60 | 63 | 27 | 12,4 | 7,0 | 25 | 13,5 | 20 | 4 | 107 ~ 132 | 2°00' | 0,7 | 1 |
| 14080 RS | ● | 80 | 76 | 63 | 27 | 12,4 | 7,0 | 25 | 13,5 | 20 | 5 | 133 ~ 158 | 1°30' | 1,2 | 1 |
| MSX 14100 RS | ● | 100 | 96 | 63 | 32 | 14,4 | 8,5 | 32 | - | 44 | 6 | 173 ~ 198 | 1°00' | 1,8 | 2 |

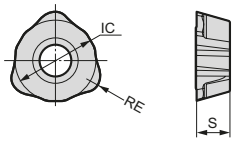
**Ramping (Slant Milling)**




**Helical Boring**




## Inserts




| Application | Coated Carbide | | |
|---|---|---|---|
| High Speed / Light cut | | | |
| General Purpose | P M | P M | |
| Roughing | P M | P M | K |

| Cat. No. | ACP200 | ACP300 | ACK300 | Dimensions (mm) IC | S | RE |
|---|---|---|---|---|---|---|
| WDMT 0804 ZDTR | ● | ● | ❍ | 8,5 | 4,0 | 2,0 |
| 0804 ZDTR-H | ● | ● | ❍ | | | |
| WDMT 1205 ZDTR | ● | ● | ● | 12 | 5,0 | 2,0 |
| 1205 ZDTR-H | ● | ● | ● | | | |
| WDMT 1406 ZDTR | ● | ● | ● | 14 | 6,0 | 2,0 |
| 1406 ZDTR-H | ● | ● | ● | | | |

ZDTR-H : Stronger cutting edge

## Recommended Cutting Conditions

Depth of cut : $a_p$ (mm)
Feed rate : $f_t$ (mm/tooth)

| Work Material | Insert Type | Cutting Speed $v_c$ (m/min) | Insert Cat. No. | ø 40 | | ø 50–66 | | ø 80–100 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $a_p$ | $f_t$ | $a_p$ | $f_t$ | $a_p$ | $f_t$ |
| General Steel (Below HB200) | ACP200 | 100-**150**-200 | WDMT 0804 | 1,0 | 1,2 | – | – | – | – |
| | | | WDMT 1205 | – | – | 1,2 | 1,4 | – | – |
| | | | WDMT 1406 | – | – | 1,5 | 1,5 | 1,5 | 1,5 |
| Alloy Steel (Below HRC45) | ACP200 | 80-**130**-180 | WDMT 0804 | 0,8 | 1,2 | – | – | – | – |
| | | | WDMT 1205 | – | – | 1,0 | 1,4 | – | – |
| | | | WDMT 1406 | – | – | 1,3 | 1,5 | 1,3 | 1,5 |
| Stainless Steel (X5CRNI1810) | ACP300 | 80-**120**-150 | WDMT 0804 | 1,0 | 0,8 | – | – | – | – |
| | | | WDMT 1205 | – | – | 1,2 | 1,2 | – | – |
| | | | WDMT 1406 | – | – | 1,5 | 1,3 | 1,5 | 1,3 |
| Cast Iron GG, GGG | ACK300 | 100-**150**-200 | WDMT 0804 | 1,0 | 1,4 | – | – | – | – |
| | | | WDMT 1205 | – | – | 1,2 | 1,5 | – | – |
| | | | WDMT 1406 | – | – | 1,5 | 1,8 | 1,5 | 1,8 |
| Hardened Steel (Below HRC50) | ACK300 | 40-**80**-100 | WDMT 0804 | 0,5 | 0,8 | – | – | – | – |
| | | | WDMT 1205 | – | – | 0,6 | 1,0 | – | – |
| | | | WDMT 1406 | – | – | 1,0 | 1,2 | 1,0 | 1,2 |

- The above recommended cutting conditions may require adjustment according to machine rigidity and work rigidity.
- The above figures are guidelines for use with the BT50 machine tool.

## Spare Parts

| Screw | | Wrench | Clamp | C Ring | Cramp screw | Applicable endmill |
|---|---|---|---|---|---|---|
| BFTX 0306 IP | **2,0** | TRDR 08 IP | CCH 3,5 | CR 03 | BFTX 03510 IP 08 | MSX 08000RS |
| BFTX 0409 IP | **3,0** | TRDR 15 IP | CCH 3,5 | CR 03 | BFTX 03510 IP 15 | MSX 12000RS |
| BFTX 0511 IP | **5,0** | TRDR 20 IP | CCH 4,5 | CR 03 | BFTX 04513 IP 20 | MSX 14000RS |

Remark: If depth-of-cut exceeds 5 mm, reduce recommended feedrates by 50 %.
The conditions above are meant as a guide, please adjust the cutting conditions according to actual work material and machine ridgidity.

# WFXH Type

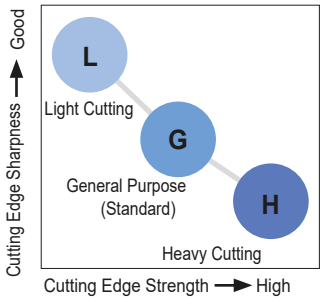
## General Features

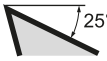
WaveMill WFXH type is a high efficiency, multi-purpose cutter, that uses the WFX series inserts for high-feed roughing and a variety of processes.

## Characteristics

Stable, high-efficiency milling with superior cutting edge sharpness.
Supports various types of processes (ramping and helical milling).
Able to use the selection of inserts from the WFX series.

## Chipbreaker Selection




| Work Material | P M K Steel, Stainless Steel, Cast Iron | | | N Aluminium Alloy |
|---|---|---|---|---|
| Breaker | **L Type** | **G Type** | **H Type** | **S Type** |
| |  |  |  |  |
| Characteristic | Low Cutting Force | General Purpose | Strong Edge | Sharp Edge |
| Cutting Edge Figure |  20° |  15° |  10° |  25° |
| Work Material Application | Light Cutting<br>Low rigidity Milling<br>Low-Burr Design | **Main Chipbreaker**<br>General to Interrupted Milling | Heavy Cut<br>Heavy Interrupted Machining<br>Tempered Steel | Non-Ferrous Metal |

## Notes on Corner Finishing - Remaining Material

Actual machined corners will have uncut and overcut portions due to the shape of the inserts.

Fig. 1

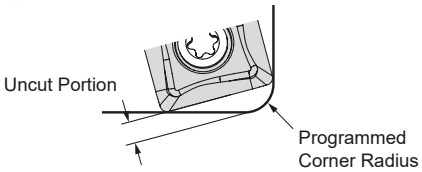
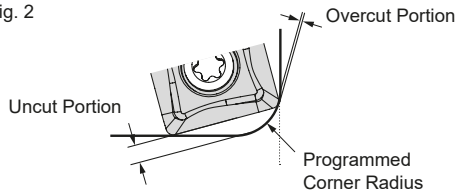



Fig. 2




### WFXH 08000 RS Type

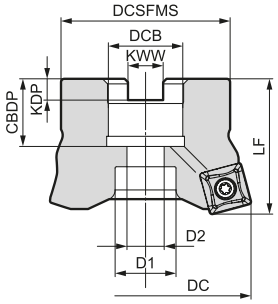
| Programmed Corner R | SOMT 08○○04-□ | | | SOMT 08○○08-□ | | | SOMT 08○○12-□ | | |
|---|---|---|---|---|---|---|---|---|---|
| | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape |
| 2,0 | 1,41 | 0 | Fig. 1 | 1,30 | 0 | Fig. 1 | 1,21 | 0 | Fig. 1 |
| 2,5 | 1,30 | 0,02 | Fig. 2 | 1,19 | 0,01 | Fig. 2 | 1,09 | 0 | Fig. 2 |
| 3,0 | - | - | - | - | - | - | 0,98 | 0,05 | Fig. 2 |

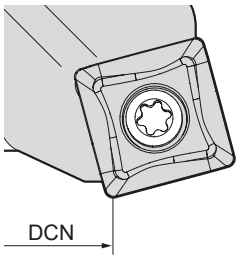
### WFXH 12000 RS Type

| Programmed Corner R | SOMT 12○○04-□ | | | SOMT 12○○08-□ | | | SOMT 12○○12-□ | | | SOMT 12○○16-□ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape |
| 2,0 | 2,58 | 0 | Fig. 1 | 2,48 | 0 | Fig. 1 | 2,37 | 0 | Fig. 1 | 2,25 | 0 | Fig. 1 |
| 2,5 | 2,47 | 0 | Fig. 1 | 2,37 | 0 | Fig. 1 | 2,25 | 0 | Fig. 1 | 2,14 | 0 | Fig. 1 |
| 3,0 | 2,36 | 0 | Fig. 1 | 2,26 | 0 | Fig. 1 | 2,14 | 0 | Fig. 1 | 2,11 | 0 | Fig. 1 |
| 3,5 | 2,24 | 0,01 | Fig. 2 | 2,14 | 0 | Fig. 1 | 2,03 | 0 | Fig. 1 | 1,91 | 0 | Fig. 1 |
| 4,0 | - | - | - | 2,03 | 0,04 | Fig. 2 | 1,91 | 0,03 | Fig. 2 | 1,8 | 0,01 | Fig. 2 |

## Minimum Cutting Diameter

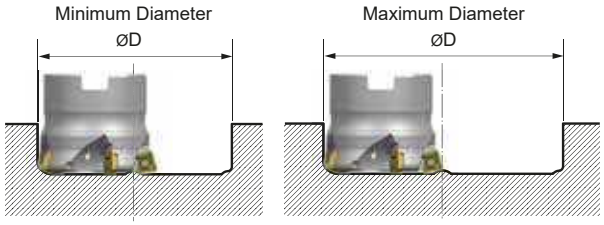
Minimum cutting diameter (DCN) will depend on the insert that is used. Using an insert with a large nose radius is recommended for the WFXH type.




| Body Cat. No. | DC | DCN based on insert nose | | | |
|---|---|---|---|---|---|
| | | RE0,4 | RE0,8 | RE1,2 | RE1,6 |
| WFXH 08025 M12Z2 | 25 | 10,4 | 10,9 | 11,5 | - |
| 08032 M12Z3 | 32 | 17,4 | 17,9 | 18,5 | - |
| WFXH 08040 RS | 40 | 25,4 | 25,9 | 26,5 | - |
| 08050 RS | 50 | 35,4 | 35,9 | 36,5 | - |
| 08050 RSZ6 | 50 | 35,4 | 35,9 | 36,5 | - |
| 08063 RS | 63 | 48,4 | 48,9 | 49,5 | - |
| WFXH 12040 M12Z3 | 40 | 16,6 | 17,1 | 17,5 | 18,1 |
| WFXH 12050 RS | 50 | 26,6 | 27,2 | 27,7 | 28,2 |
| 12063 RS | 63 | 39,5 | 40,0 | 40,4 | 41,1 |

## Taper Cutting and Helical Milling



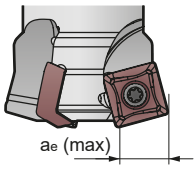
Minimum and Maximum Diameters

Ramping Angle

| Insert Cat. No. | DC | Helical Millilng | | Taper Cutting |
|---|---|---|---|---|
| | | Min. | Max. | Max. Ramping Angle |
| SOMT 08○○04-□ | 25 | 35 | 49 | 1°30‘ |
| | 32 | 49 | 63 | 0°30‘ |
| | 40 | 65 | 79 | 0°30‘ |
| | 50 | Impossible | Impossible | 0°30‘ |
| | 63 | Impossible | Impossible | Impossible |
| SOMT 08○○08-□ | 25 | 35 | 48 | 3° |
| | 32 | 49 | 62 | 1°30‘ |
| | 40 | 65 | 78 | 1° |
| | 50 | 85 | 98 | 0°30‘ |
| | 63 | 111 | 124 | 0°30‘ |
| SOMT 08○○12-□ | 25 | 34 | 47 | 4°30‘ |
| | 32 | 48 | 61 | 2°30‘ |
| | 40 | 64 | 77 | 1°30‘ |
| | 50 | 84 | 97 | 1° |
| | 63 | 110 | 123 | 0°30‘ |

| Insert Cat. No. | DC | Helical Millilng | | Taper Cutting |
|---|---|---|---|---|
| | | Min. | Max. | Max. Ramping Angle |
| SOMT 12○○04-□ | 40 | 56 | 79 | 1° |
| | 50 | 76 | 99 | 0°30‘ |
| | 63 | Impossible | Impossible | Impossible |
| SOMT 12○○08-□ | 40 | 56 | 78 | 1°30‘ |
| | 50 | 76 | 98 | 1° |
| | 63 | 102 | 124 | 0°30‘ |
| SOMT 12○○12-□ | 40 | 55 | 77 | 2°30‘ |
| | 50 | 75 | 97 | 1°30‘ |
| | 63 | 101 | 123 | 1° |
| SOMT 12○○16-□ | 40 | 55 | 76 | 3°30‘ |
| | 50 | 75 | 96 | 2° |
| | 63 | 101 | 122 | 1°30‘ |

## Maximum Width of Cut when Plunge Milling




| Insert Cat. No. | Max. Width of Cut ae (max) |
|---|---|
| SOMT08 | 6 mm |
| SOMT12 | 10 mm |

Lower the feed rate when plunge milling.

## Recommended Cutting Conditions

| ISO | Work Material | Grade | Cutting Speed (vc (m/min) | Insert Cat. No. | Ø 25 | | Ø 32 | | Ø 40 | | Ø 50 | | Ø 63 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ap (mm) | ft (mm/t) | ap (mm) | ft (mm/t) | ap (mm) | ft (mm/t) | ap (mm) | ft (mm/t) | ap (mm) | ft (mm/t) |
| P | General Steel <200HB | ACP200 | 100 - **150** - 200 | SOMT08 | 0,8 | 0,8 | 0,8 | 0,8 | - | - | 0,8 | 0,8 | 0,8 | 0,8 |
| | | | | SOMT12 | - | - | - | - | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 | 1,0 |
| | Alloy Steel <HRC45 | ACP200 | 80 - **130** - 180 | SOMT08 | 0,7 | 0,8 | 0,7 | 0,8 | - | - | 0,7 | 0,8 | 0,7 | 0,8 |
| | | | | SOMT12 | - | - | - | - | 0,8 | 1,0 | 0,8 | 1,0 | 0,8 | 1,0 |
| K | Stainless Steel (X5CrNiS18 10, other) | ACM300 | 80 - **120** - 150 | SOMT08 | 0,8 | 0,7 | 0,8 | 0,7 | - | - | 0,8 | 0,7 | 0,8 | 0,7 |
| | | | | SOMT12 | - | - | - | - | 1,0 | 0,8 | 1,0 | 0,8 | 1,0 | 0,8 |
| M | Cast Iron FC, FCD | ACK300 | 100 - **150** - 200 | SOMT08 | 0,8 | 1,0 | 0,8 | 1,0 | - | - | 0,8 | 1,0 | 0,8 | 1,0 |
| | | | | SOMT12 | - | - | - | - | 1,0 | 1,2 | 1,0 | 1,2 | 1,0 | 1,2 |
| H | Hardened Steel <HRC50 | ACK300 | 40 - **80** - 100 | SOMT08 | 0,5 | 0,5 | 0,5 | 0,5 | - | - | 0,5 | 0,5 | 0,5 | 0,5 |
| | | | | SOMT12 | - | - | - | - | 0,6 | 0,8 | 0,6 | 0,8 | 0,6 | 0,8 |

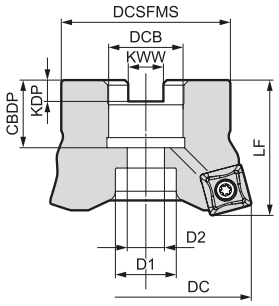
The above recommended cutting conditions may require adjustment according to machine rigidity and work rigidity. The above figures are guidelines for use with the BT50 machine tool.
The above conditions assume a tool overhang length of L/D = 3 (i.e. overhang length is 3 times tool diameter) or less.
When tool overhang is more than L/D = 3 and less or equal L/D = 5, settings should be adjusted to approximately 70 % to 80 % of those indicated in the above cutting conditions (i.e. $a_p$ and $f_z$).
When tool overhang is more than L/D = 5 and less or equal L/D = 8, settings should be adjusted to approximately 50 % to 60 % of those indicated in the above cutting conditions (i.e. $a_p$ and $f_z$).

# WFXH 08000 RS

## High Efficiency Machining for Steel, Stainless Steel, Die Steel and Non-Ferrous Metal

| Rake Angle | | |
|---|---|---|
| | Radial | –6° |
| | Axial | 6° |

1,5 mm, 15°




## Body - WFXH08000RS

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | |
| WFXH 08040 RS | ❍ | 40 | 33 | 40 | 16 | 8,4 | 5,6 | 18 | 14 | 9 | 4 | 0,2 |
| 08050 RS | ❍ | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,3 |
| 08050 RSZ6 | ❍ | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,3 |
| 08063 RS | ❍ | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 6 | 0,5 |

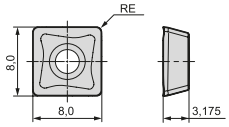
Inserts are not included.

## Identification Details

| WFX | H | 08 | 040 | R | S | - Z6 |
|---|---|---|---|---|---|---|
| Cutter Series | High Efficiency Milling | Insert Size | Cutter Diameter | Direction | Metric Type | Fine Pitch Type (Value is number of teeth) |

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | MS | | KN | | |
| General Purpose | | PM | PM | K | | MS | MS | | N | |
| Roughing | | PM | PM | | K | | MS | | N | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius (mm) RE |
| SOMT 080304 PZER L | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 |
| 080308 PZER L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 0,8 |
| SOMT 080304 PZER G | ❍ | ● | ● | ● | ❍ | ❍ | ● | – | – | 0,4 |
| 080308 PZER G | ❍ | ● | ● | ● | ● | ❍ | ● | – | – | 0,8 |
| 080312 PZER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ● | – | – | 1,2 |
| SOMT 080308 PZER H | ❍ | ● | ● | ❍ | ● | ❍ | ● | – | – | 0,8 |
| 080312 PZER H | ❍ | ❍ | ● | ❍ | ❍ | ❍ | ● | – | – | 1,2 |
| SOET 080304 PZER G | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ● | – | – | 0,4 |
| 080308 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 0,8 |
| 080312 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 1,2 |
| SOET 080302 PZFR S* | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 080304 PZFR S* | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 080308 PZFR S* | – | – | – | – | – | – | – | ● | ● | 0,8 |




* If the cutting edge lacks strength when performing high efficiency milling of non-ferrous metals, try G type chipbreakers (ACK300).

## Spare Parts

| Screw | | Wrench |
|---|---|---|
| BFTX0306IP | 2,0 | TRDR08IP |

## Recommended Cutting Conditions

☞ G55

## Programming and Dimension Information

☞ G54



● = Euro stock
❍ = Japan stock

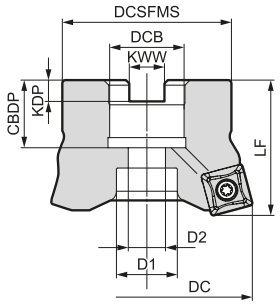
Recommended Tightening Torque (N·m)

# WFXH 12000 RS

## High Efficiency Machining for Steel, Stainless Steel, Die Steel and Non-Ferrous Metal

| Rake Angle | | |
|---|---|---|
| | Radial | –6° |
| | Axial | 6° |

2,5 mm, 15°




## Body - WFXH12000RS

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | | |
| WFXH 12050 RS | ❍ | 50 | 41 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 4 | 0,3 |
| 12063 RS | ❍ | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 20 | 18 | 11 | 5 | 0,4 |

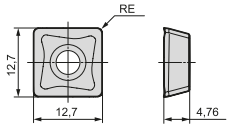
Inserts are not included.

## Identification Details

| WFX | H | 12 | 050 | R | S |
|---|---|---|---|---|---|
| Cutter Series | High Efficiency Milling | Insert Size | Cutter Diameter | Direction | Metric Type |

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | MS | | KN | | |
| General Purpose | | PM | PM | K | | MS | MS | | N | |
| Roughing | | PM | PM | | K | | MS | | N | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius (mm) RE |
| SOMT 120408 PDER L | ● | ● | ● | ❍ | ❍ | ❍ | ● | – | – | 0,8 |
| SOMT 120404 PDER G | ❍ | ❍ | ● | ❍ | ● | ❍ | ● | – | – | 0,4 |
| 120408 PDER G | ● | ● | ● | ● | ❍ | ● | ● | – | – | 0,8 |
| 120412 PDER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 1,2 |
| 120416 PDER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,6 |
| SOMT 120408 PDER H | ❍ | ● | ❍ | ● | ● | ❍ | ❍ | – | – | 0,8 |
| SOET 120408 PDFR S* | – | – | – | – | – | – | – | ● | ● | 0,8 |




* If the cutting edge lacks strength when performing high efficiency milling of non-ferrous metals, try G type chipbreakers (ACK300).

## Spare Parts

| Screw | | Wrench |
|---|---|---|
| BFTX03512IP | 3,0 | TRDR15IP |

## Recommended Cutting Conditions

☞ G55

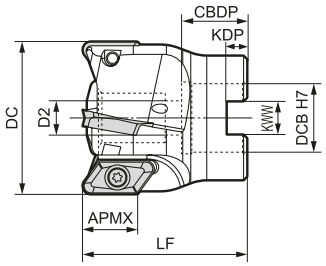
## Programming and Dimension Information

☞ G54

# WAX 3000 RS Type

16–18mm 90° P M K S N

**(Shellmill)**




## Body

(For inserts with nose radius ≤ 3,2 mm)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | No.of teeth | Weight (Kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCB | LF | D2 | KWW | KDP | CBDP | | |
| WAX 3050 RS-3.2 | ● | 50 | 22 | 50 | 11 | 10,4 | 6.3 | 21 | 4 | 0,34 |
| 3063 RS-3.2 | ● | 63 | 22 | 50 | 11 | 10,4 | 6.3 | 21 | 5 | 0,6 |
| 3080 RS-3.2 | ● | 80 | 27 | 50 | 13,5 | 12,4 | 7 | 23 | 5 | 1,0 |
| WAX 3100 RS-3.2 | ● | 100 | 32 | 63 | 18 | 14,4 | 8 | 26 | 6 | 2,2 |
| 3125 RS-3.2 | ● | 125 | 40 | 63 | 22 | 16,4 | 9 | 29 | 7 | 3,5 |

## Body

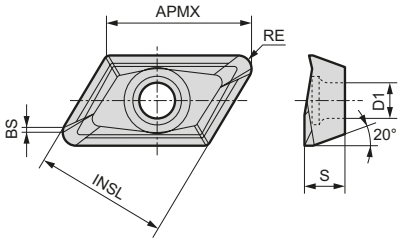
(For inserts with nose radius ≥ 4,0mm)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | No.of teeth | Weight (Kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCB | LF | D2 | KWW | KDP | CBDP | | |
| WAX 3050 RS-4.0 | ● | 50 | 22 | 50 | 11 | 10,4 | 6.3 | 21 | 4 | 0,34 |
| 3063 RS-4.0 | ● | 63 | 22 | 50 | 11 | 10,4 | 6.3 | 21 | 4 | 0,6 |
| 3080 RS-4.0 | ● | 80 | 27 | 50 | 13,5 | 12,4 | 7 | 23 | 5 | 1,0 |
| WAX 3100 RS-4.0 | ● | 100 | 32 | 63 | 18 | 14,4 | 8 | 26 | 6 | 2,2 |
| 3125 RS-4.0 | ● | 125 | 40 | 63 | 22 | 16,4 | 9 | 29 | 7 | 3,5 |

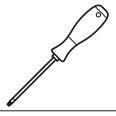
## Inserts for WAX 3000 Type

| Application | DLC Coated | Carbide |
|---|---|---|
| High Speed / Light cut | K N | N |
| General Purpose | | N |
| Roughing | | |

| Cat. No. | DL1000 | H1 | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | APMX | INSL | BS | RE | S | D1 |
| AECT 160404 PEFRA | ● | ● | 18 | 16,4 | 1,4 | 0,4 | 5 | 4,4 |
| 160408 PEFRA | ● | ● | 18 | 16,4 | 1,0 | 0,8 | 5 | 4,4 |
| 160412 PEFRA | ● | ● | 18 | 16,4 | 0,6 | 1,2 | 5 | 4,4 |
| 160416 PEFRA | ● | ● | 17,5 | 16,4 | 0,5 | 1,6 | 5 | 4,4 |
| 160420 PEFRA | ● | ● | 17,5 | 16,4 | 0,5 | 2,0 | 5 | 4,4 |
| 160430 PEFRA | ● | ● | 17 | 16,4 | 0,7 | 3,0 | 5 | 4,4 |
| 160432 PEFRA | ● | ● | 17 | 16,4 | 0,5 | 3,2 | 5 | 4,4 |
| AECT 160440 PRFRA | ● | ● | 16,5 | 16,4 | 0,5 | 4,0 | 5 | 4,4 |
| 160450 PEFRA | ● | ● | 16 | 16,4 | 0,4 | 5,4 | 5 | 4,4 |




## Spare Parts

| Screw | Insert Wrench | Applicable Endmill |
|---|---|---|
|  3,0 N·m |  | |
| BFTX 0408 | TRD 15 | Ø 50 – Ø 125 |





● = Euro stock
❑ = Delivery on request

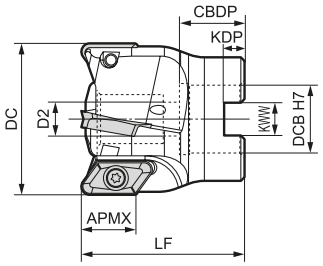
H39-40

N·m Recommended Tightening Torque (N·m)

# WAX 4000 RS Type

22–24mm 90°

**(Shellmill**




## Body

(For inserts with nose radius ≤ 3,2 mm)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | No.of teeth | Weight (Kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCB | LF | D2 | KWW | KDP | CBDP | | |
| WAX 4050RS-3.2 | ❑ | 50 | 16 | 50 | 9 | 8,4 | 5,6 | 18 | 2 | 0,37 |
| 4063RS-3.2 | ❑ | 63 | 22 | 50 | 11 | 10,4 | 6,3 | 21 | 3 | 0,54 |
| 4080RS-3.2 | ❑ | 80 | 27 | 50 | 13,5 | 12,4 | 7 | 23 | 4 | 0,81 |
| WAX 4100RS-3.2 | ❑ | 100 | 32 | 63 | 18 | 14,4 | 8 | 26 | 5 | 1,7 |
| 4125RS-3.2 | ❑ | 125 | 40 | 63 | 22 | 16,4 | 9 | 29 | 6 | 2,6 |

## Body

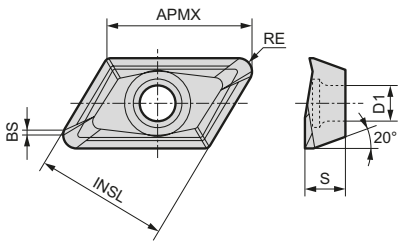
(For inserts with nose radius ≥ 4,0 mm)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | No.of teeth | Weight (Kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCB | LF | D2 | KWW | KDP | CBDP | | |
| WAX 4050RS-4.0 | ❑ | 50 | 16 | 50 | 9 | 8,4 | 5,6 | 18 | 2 | 0,37 |
| 4063RS-4.0 | ❑ | 63 | 22 | 50 | 11 | 10,4 | 6,3 | 21 | 3 | 0,54 |
| 4080RS-4.0 | ❑ | 80 | 27 | 50 | 13,5 | 12,4 | 7 | 23 | 4 | 0,81 |
| WAX 4100RS-4.0 | ❑ | 100 | 32 | 63 | 18 | 14,4 | 8 | 26 | 5 | 1,7 |
| 4125RS-4.0 | ❑ | 125 | 40 | 63 | 22 | 16,4 | 9 | 29 | 6 | 2,6 |

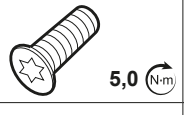
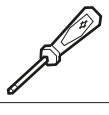
## Inserts for WAX 4000 Type

| Application | DLC Coated | Carbide |
|---|---|---|
| High Speed / Light cut | K N | N |
| General Purpose | | N |
| Roughing | | |

| Cat. No. | DL1000 | H1 | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | APMX | INSL | BS | RE | S | D1 |
| AECT 220604 PEFRA | ❑ | ❑ | 24 | 21,8 | 1,5 | 0,4 | 6,35 | 6 |
| 220608 PEFRA | ❑ | ❑ | 24 | 21,8 | 1,2 | 0,8 | 6,35 | 6 |
| 220612 PEFRA | ❑ | ❑ | 24 | 21,8 | 0,8 | 1,2 | 6,35 | 6 |
| 220616 PEFRA | ❑ | ❑ | 24 | 21,8 | 0,4 | 1,6 | 6,35 | 6 |
| 220620 PEFRA | ❑ | ❑ | 24 | 21,8 | 0,5 | 2,0 | 6,35 | 6 |
| 220630 PEFRA | ❑ | ❑ | 23 | 21,8 | 0,6 | 3,0 | 6,35 | 6 |
| 220632 PEFRA | ❑ | ❑ | 23 | 21,8 | 0,4 | 3,2 | 6,35 | 6 |
| AECT 220640 PRFRA | ❑ | ❑ | 22 | 21,8 | 1,2 | 4,0 | 6,35 | 6 |
| 220650 PEFRA | ❑ | ❑ | 22 | 21,8 | 0,4 | 5,0 | 6,35 | 6 |




## Spare Parts

| Screw | Insert Wrench | Applicable Endmill |
|---|---|---|
|  5,0 N·m |  | |
| BFTX0511N | TRD20 | Ø 50 – Ø 125 |

H41

# ANX Series

New

## Features

- **Drastically Reduced Runout Adjustment Time**
  Simple screw-fastening structure enables fine adjustments to be made easily.

- **Blade Through Coolant**
  Secures a supply of coolant to the cutting edge and breaks chips thoroughly.

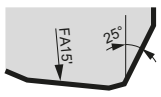
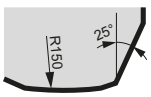
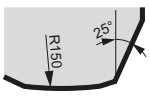
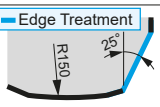
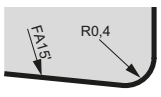
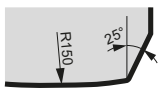
- **Lightweight Aluminum Alloy Body**
  Utilizing aluminum alloy to achieve a total weight of less than 1,3 kg for a Ø 125 mm cutter with 22 teeth.

## Product Range

| Type | Cat. No. | Body Material | Diameter Range (mm) / No of Teeth | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ø32 | Ø40 | Ø50 | Ø63 | Ø80 | Ø100 | Ø125 | Ø160 |
| Shell | ANXA 16000RS | Aluminum Alloy | | | | | 10, 14 | 12, 18 | 14, 22 | 20, 28 |
| | ANXA 16000R (Inch) | Aluminum Alloy | | | | | 10, 14 | 12, 18 | 14, 22 | 20, 28 |
| | ANXS 16000RS | Steel | | 6 | 6, 9 | 8, 12 | 10, 14 | 12, 18 | 14, 22 | |
| | ANXS 16000R (Inch) | Steel | | | | 8, 12 | 10, 14 | 12, 18 | 14, 22 | |
| Shank | ANXS 16000E ☞ H61 | Steel | 4 | 6 | | | | | | |

Inch Inch Bore

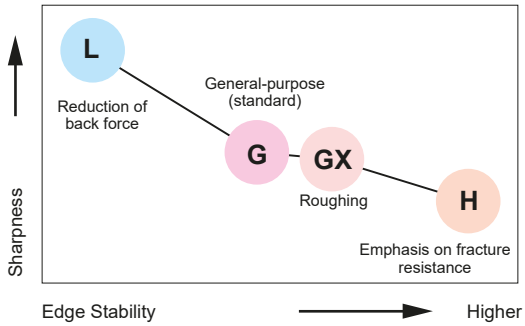
## Blade Selection Guide

| Work Material | N | | | | | |
|---|---|---|---|---|---|---|
| Type | L | G | GX | H | — | W |
| Cutting Edge Shape |  |  |  |  |  |  |
| Features | Low Cutting Force | Standard | Long Edge | High Strength | Corner Radius | Wiper |
| Applications | Finishing / Light Cutting | General Purpose | Roughing | | | |
| Edge Length* | 6,0 mm | 6,0 mm | 9,0 mm | 6,0 mm | | |



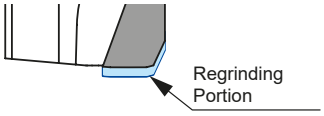
*Edge length
GX type = 9,0 mm

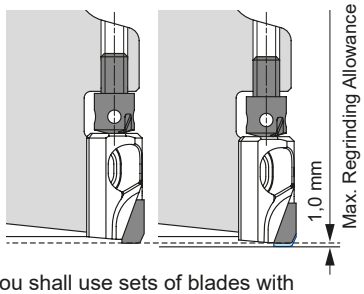
## Edge Selection Guide




- **Reduces Running Costs by Drastically Increasing Blade, Insert Regrinding Allowance (to 1,0 mm)**

Assuming 0,2 mm of regrinding each time, an edge can be used up to 6 times.
(Peripheral edge cannot be reground.)



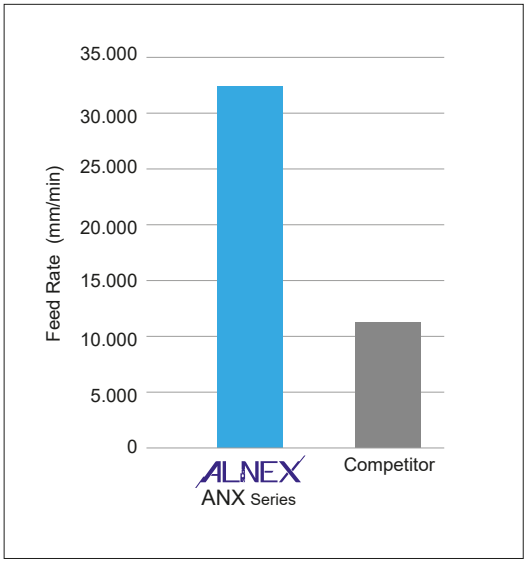




If you wish to use reground blades you shall use sets of blades with matching size of the same level in order to keep the balance.

## Performances

### High-Speed / High-Efficiency Cutting

Realizes ultra-high efficiency machining with $v_f$ = 30.000 mm/min

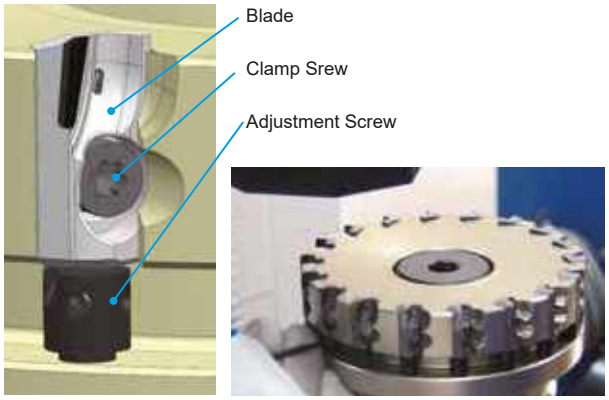


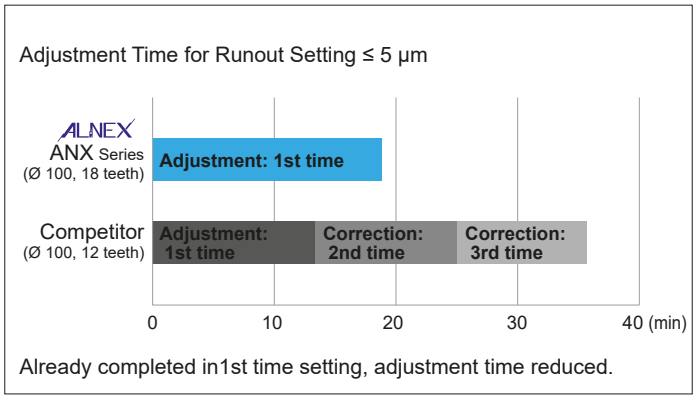

Comparison: Cutter Diameter Ø 100 mm

| | Spindle Speed $min^{-1}$ | Number of Teeth | Feed Rate $v_f$ (mm/min) |
|---|---|---|---|
| ANX Series | 18.000 | 18 | 32.400 |
| Competitor | 9.500 | 12 | 11.400 |

### Drastically Reduces Runout Adjustment Time

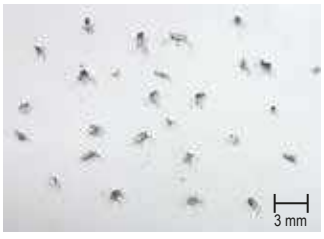
– Simple screw-fastening structure
– Enables fine adjustments to be made easily
– High-rigidity body




### Chip Control


Blade-Through Coolant Chip Breaking




ALNEX ANX Series


Competitor

Work Material: G-AlSi12Cu
Cutting Conditions: $v_c$ = 2500 m/min, $f_z$ = 0,05 mm/t, $a_p$ = 0,5 mm, wet

# ANXS 16000 R(S)

New

| Rake Angle | Radial | +5° |
|---|---|---|
| | Axial | +5° |

3 mm | 90°

Fig. 1

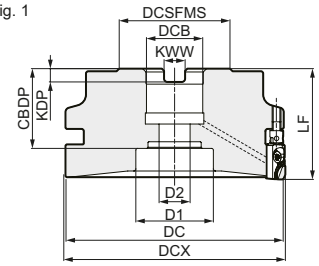
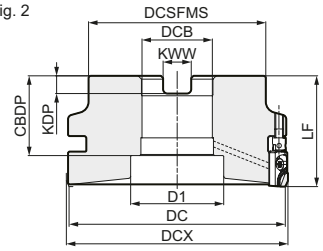



Fig. 2




## Body - ANXS (Steel)

Dimensions (mm)

| | Cat. No. | Stock | DC | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric | ANXS 16040RS06 | ❍ | 38 | 40 | 38,5 | 40 | 16 | 8,4 | 5,6 | 26 | 14 | 9 | 6 | 0,3 | 1 |
| | 16050RS06 | ❍ | 48 | 50 | 48,5 | 40 | 22 | 10,4 | 6,3 | 26 | 18 | 11 | 6 | 0,4 | 1 |
| | 16050RS09 | ❍ | 48 | 50 | 48,5 | 40 | 22 | 10,4 | 6,3 | 26 | 18 | 11 | 9 | 0,5 | 1 |
| | 16063RS08 | ❍ | 61 | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 26 | 18 | 11 | 8 | 0,7 | 1 |
| | 16063RS12 | ❍ | 61 | 63 | 50 | 40 | 22 | 10,4 | 6,3 | 26 | 18 | 11 | 12 | 0,7 | 1 |
| | 16080RS10 | ❍ | 78 | 80 | 50 | 50 | 27 | 12,4 | 7 | 34 | 35 | 14 | 10 | 1,2 | 1 |
| | 16080RS14 | ❍ | 78 | 80 | 50 | 50 | 27 | 12,4 | 7 | 34 | 35 | 14 | 14 | 1,2 | 1 |
| | 16100RS12 | ❍ | 98 | 100 | 80 | 50 | 32 | 14,4 | 8 | 32 | 46 | – | 12 | 2,0 | 2 |
| | 16100RS18 | ❍ | 98 | 100 | 80 | 50 | 32 | 14,4 | 8 | 32 | 46 | – | 18 | 2,0 | 2 |
| | 16125RS14 | ❍ | 123 | 125 | 80 | 63 | 40 | 16,4 | 9 | 35 | 52 | – | 14 | 3,9 | 2 |
| | 16125RS22 | ❍ | 123 | 125 | 80 | 63 | 40 | 16,4 | 9 | 35 | 52 | – | 22 | 3,9 | 2 |
| Inch | ANXS 16063R08 | ❍ | 61 | 63 | 50 | 50 | 25,4 | 9,5 | 6 | 31 | 20 | 14 | 8 | 0,9 | 1 |
| | 16063R12 | ❍ | 61 | 63 | 50 | 50 | 25,4 | 9,5 | 6 | 31 | 20 | 14 | 12 | 0,9 | 1 |
| | 16080R10 | ❍ | 78 | 80 | 50 | 50 | 25,4 | 9,5 | 6 | 34 | 35 | 14 | 10 | 1,2 | 1 |
| | 16080R14 | ❍ | 78 | 80 | 50 | 50 | 25,4 | 9,5 | 6 | 34 | 35 | 14 | 14 | 1,2 | 1 |
| | 16100R12 | ❍ | 98 | 100 | 80 | 50 | 31,75 | 12,7 | 8 | 36 | 42 | – | 12 | 2,0 | 2 |
| | 16100R18 | ❍ | 98 | 100 | 80 | 50 | 31,75 | 12,7 | 8 | 36 | 42 | – | 18 | 2,0 | 2 |
| | 16125R14 | ❍ | 123 | 125 | 80 | 63 | 38,1 | 15,9 | 10 | 42,5 | 52 | – | 14 | 3,9 | 2 |
| | 16125R22 | ❍ | 123 | 125 | 80 | 63 | 38,1 | 15,9 | 10 | 42,5 | 52 | – | 22 | 3,9 | 2 |

Blades are sold separately. If using a blade for corner radius machining (ANB1604R), DC = DCX.

## Identification Details

| ANX | S | 16 | 100 | R | S | 18 |
|---|---|---|---|---|---|---|
| Cutter Series | Steel Body | Blade Size | Cutter Diameter | Feed Direction | Metric | Number of Teeth |

## Blades

☞ G64

## Recommended Cutting Conditions

☞ G64

## Max. Allowable Spindle Speed

| Cat. No. | n max (min$^{-1}$) |
|---|---|
| ANXS 16040RS06 | 25.000 |
| 16050RS06 | 25.000 |
| 16050RS09 | 25.000 |
| 16063RS08 | 22.000 |
| 16063RS12 | 22.000 |
| 16080RS10 | 20.000 |
| 16080RS14 | 20.000 |
| 16100RS12 | 18.000 |
| 16100RS18 | 18.000 |
| 16125RS14 | 16.000 |
| 16125RS22 | 16.000 |
| ANXS 16063R08 | 22.000 |
| 16063R12 | 22.000 |
| 16080R10 | 20.000 |
| 16080R14 | 20.000 |
| 16100R12 | 18.000 |
| 16100R18 | 18.000 |
| 16125R14 | 16.000 |
| 16125R22 | 16.000 |

## Spare Parts

Sold separately.

| Applicable Cutters | Clamp Screw | | Adjustment Screw | Wrench | Adjustment Wrench | Centre Bolt | Assembly Wrench |
|---|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |  |
| ANXS 16040RS06 | BXA0310IP | 2,0 | HFJ | TRXW10IP | ANT | BXH0825-D13 | HFVT |
| 16050RS_ _ | | | | | | BXH1030-D16 | |
| 16063RS_ _ | | | | | | | |
| 16080RS_ _ | | | | | | BXH1235-D33 | |
| 16100RS_ _ | | | | | | BXH1635-D40 | |
| 16125RS_ _ | | | | | | BXH2036-D50 | |
| 16063R_ _ | | | | | | BXH1235-D18 | |
| 16080R_ _ | | | | | | BXH1235-D33 | |
| 16100R_ _ | | | | | | BXH1635-D40 | |
| 16125R_ _ | | | | | | BXH2036-D50 | |





❍ = Japan stock

Recommended Tightening Torque (N·m)

# ANXA 16000 R(S)

New

| Rake Angle | | |
|---|---|---|
| | Radial | +5° |
| | Axial | +5° |

3 mm | 90°

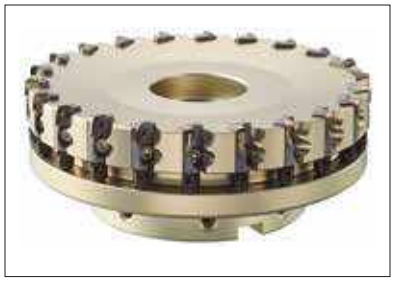
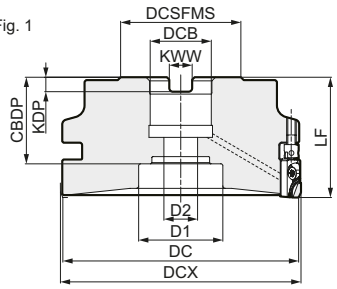


Fig. 1




## Body - ANXA (Aluminum Alloy)

Dimensions (mm)

| | Cat. No. | Stock | DC | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | D1 | D2 | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric | ANXA 16080RS10 | ❍ | 78 | 80 | 50 | 50 | 27 | 12,4 | 7 | 34 | 35 | 14 | 10 | 0,5 |
| | 16080RS14 | ❍ | 78 | 80 | 50 | 50 | 27 | 12,4 | 7 | 34 | 35 | 14 | 14 | 0,5 |
| | 16100RS12 | ❍ | 98 | 100 | 50 | 50 | 27 | 12,4 | 7 | 34 | 35 | 14 | 12 | 0,8 |
| | 16100RS18 | ❍ | 98 | 100 | 50 | 50 | 27 | 12,4 | 7 | 34 | 35 | 14 | 18 | 0,9 |
| | 16125RS14 | ❍ | 123 | 125 | 50 | 50 | 27 | 12,4 | 7 | 34 | 35 | 14 | 14 | 1,2 |
| | 16125RS22 | ❍ | 123 | 125 | 50 | 50 | 27 | 12,4 | 7 | 34 | 35 | 14 | 22 | 1,3 |
| | 16160RS20 | ❍ | 158 | 160 | 80 | 63 | 40 | 16,4 | 9 | 35 | 52 | 29 | 20 | 2,6 |
| | 16160RS28 | ❍ | 158 | 160 | 80 | 63 | 40 | 16,4 | 9 | 35 | 52 | 29 | 28 | 2,6 |
| Inch | ANXA 16080R10 | ❍ | 78 | 80 | 50 | 50 | 25,4 | 9,5 | 6 | 34 | 35 | 14 | 10 | 0,5 |
| | 16080R14 | ❍ | 78 | 80 | 50 | 50 | 25,4 | 9,5 | 6 | 34 | 35 | 14 | 14 | 0,5 |
| | 16100R12 | ❍ | 98 | 100 | 50 | 50 | 25,4 | 9,5 | 6 | 34 | 35 | 14 | 12 | 0,9 |
| | 16100R18 | ❍ | 98 | 100 | 50 | 50 | 25,4 | 9,5 | 6 | 34 | 35 | 14 | 18 | 0,9 |
| | 16125R14 | ❍ | 123 | 125 | 50 | 50 | 25,4 | 9,5 | 6 | 34 | 35 | 14 | 14 | 1,2 |
| | 16125R22 | ❍ | 123 | 125 | 50 | 50 | 25,4 | 9,5 | 6 | 34 | 35 | 14 | 22 | 1,3 |
| | 16160R20 | ❍ | 158 | 160 | 80 | 63 | 38,1 | 15,9 | 10 | 42,5 | 55 | 30 | 20 | 2,4 |
| | 16160R28 | ❍ | 158 | 160 | 80 | 63 | 38,1 | 15,9 | 10 | 42,5 | 55 | 30 | 28 | 2,6 |

Blades are sold separately. If using a blade for corner radius machining (ANB1604R), DC = DCX.

## Identification Details

| ANX | A | 16 | 100 | R | S | 18 |
|---|---|---|---|---|---|---|
| Cutter Series | Aluminum Alloy Body | Blade Size | Cutter Diameter | Feed Direction | Metric | Number of Teeth |

## Blades

☞ G64

## Recommended Cutting Conditions

☞ G64

## Max. Allowable Spindle Speed

| Cat. No. | n max (min$^{-1}$) |
|---|---|
| ANXA 16080RS10 | 20.000 |
| 16080RS14 | 20.000 |
| 16100RS12 | 18.000 |
| 16100RS18 | 18.000 |
| 16125RS14 | 16.000 |
| 16125RS22 | 16.000 |
| 16160RS20 | 14.000 |
| 16160RS28 | 14.000 |
| ANXA 16080R10 | 20.000 |
| 16080R14 | 20.000 |
| 16100R12 | 18.000 |
| 16100R18 | 18.000 |
| 16125R14 | 16.000 |
| 16125R22 | 16.000 |
| 16160R20 | 14.000 |
| 16160R28 | 14.000 |

## Spare Parts

Sold separately.

| Applicable Cutters | Clamp Screw | | Adjustment Screw | Wrench | Adjustment Wrench | Centre Bolt | Assembly Wrench |
|---|---|---|---|---|---|---|---|
| ANXA 16080RS_ _ | BXA0310IP | 2,0 | HFJ | TRXW10IP | ANT | BXH1235-D33 | HFVT |
| 16100RS_ _ | | | | | | | |
| 16125RS_ _ | | | | | | BXH2036-D50 | |
| 16160RS_ _ | | | | | | | |
| 16080R_ _ | | | | | | BXH1235-D33 | |
| 16100R_ _ | | | | | | | |
| 16125R_ _ | | | | | | | |
| 16160R_ _ | | | | | | BXH2036-D50 | |

## Blades

| Application | SUMIDIA |
|---|---|
| High Speed / Light Cut | N |
| General Purpose | N |
| Roughing | N |

| Cat. No. | DA1000 | Cutting Edge Length | Wiper Edge Shape | Applications | Fig. |
|---|---|---|---|---|---|
| ANB 1600R-L | ❍ | 6,0 | Linear | Low Cutting Force | 1 |
| 1600R-G | ❍ | 6,0 | Arc-Shaped | General Purpose | 1 |
| 1600R-H | ❍ | 6,0 | Arc-Shaped | Strong Edge | 1 |
| 1600R-GX | ❍ | 9,0 | Arc-Shaped | Long Edge | 2 |
| 1604R | ❍ | 6,0 | Linear | Corner Radius | 3 |
| 1600R-W | ❍ | – | Arc-Shaped | Wiper | 4 |

Fig. 1

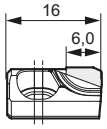



Fig. 2

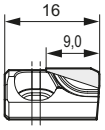



Fig. 3

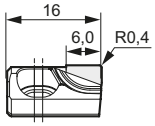
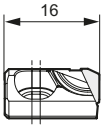



Fig. 4




Wiper Blade

## Recommended Cutting Conditions

Si content ≤ 12,6 %

Min. - **Optimum** - Max.

| ISO | Work Material | Hard-ness | Cutting Speed $v_c$ (m/min) | Feed Rate $f_z$ (mm/t) | Grade |
|---|---|---|---|---|---|
| N | Aluminium alloy | – | 2.000–**2.500**–3.000 | 0,05–**0,13**–0,20 | DA1000 |

Si content ≥ 12,6 %

Min. - **Optimum** - Max.

| ISO | Work Material | Hard-ness | Cutting Speed $v_c$ (m/min) | Feed Rate $f_z$ (mm/t) | Grade |
|---|---|---|---|---|---|
| N | Aluminium alloy | – | 400–**600**–800 | 0,05–**0,13**–0,20 | DA1000 |

The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine rigidity, work clamp rigidity, depth of cut and other factors.





❍ = Japan stock

Recommended Tightening Torque (N·m)

## ■ ALNEX Series Usage Manual

### ● Adjustment of the Blades, Runout Alignment

① Before inserting the blade, make sure that the seat and screws are free of debris by cleaning those areas.

② Insert the blade into its seat.

③ While holding the blade against the seat, install the clamping bolt using the provided wrench, pre-tightening the bolt (recommended pre-torque is 1 N·m).

④ Using the provided wrench for the height adjustment screw, set the height to your predetermined value.

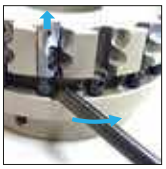
⑤ Fully tighten the clamp bolt (recommended torque is 2 N·m).

⑥ Use 1 blade as a datum point and adjust all blade heights to match.

⑦ After tightening, verify that there is no gap between the seat and blade.

② 

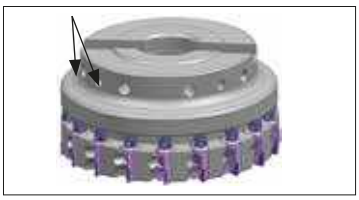
③ 
Pre-tighten (1N·m)

④ 
Adjust height

⑤ 
Final tighten (2N·m)

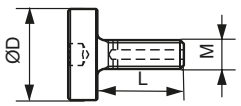
### ● Balance Adjustments

The cutter comes pre-balanced to a G 6,3 specification.
Under normal circumstances, it is not necessary to adjust the balance of the cutter.



### ● Clamp Bolts for Arbor

| Work Material | Dim. | | | Max. Torque | Applicable Cutters |
|---|---|---|---|---|---|
| | M | L | D | | |
| BXH0825-D13 | 8 | 25 | 13 | 15 | ANXS16040RS_ _ |
| BXH1030-D16 | 10 | 30 | 16 | 25 | ANXS16040RS_ _ , ANXS16063RS_ _ |
| BXH1235-D18 | 12 | 35 | 18 | 40 | ANXS16063R_ _ |
| BXH1235-D33 | 12 | 35 | 33 | 50 | ANXS16080R(S)_ _ , ANXA16080/100/125R(S)_ _ |
| BXH1635-D40 | 16 | 35 | 40 | 100 | ANXS16100R(S)_ _ |
| BXH2036-D50 | 20 | 36 | 50 | 200 | ANXS16125R(S)_ _ , ANXA16160R(S)_ _ |




### ● Other Precautions

- Please use only Sumitomo genuine parts.
- Please regularly replace clamp bolts.
- If you wish to reduce the # of effective blades in use, to maintain balance and protect the body, please use dummy blades (set height well below effective blades).
- Please do not operate after releasing the interlock or opening the cover.
- Please avoid use and consult with Sumitomo if you mistakenly crash the body.
- As the blades are very sharp, it is very easy to get hurt when touching the blades with your hands directly, so please wear gloves when taking the blade out of the case to set into the cutter or when setting the cutter into machine tool.

# RF Type

## High Speed Finishing of Aluminium Alloy

Fig. 1

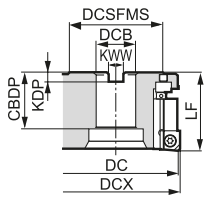
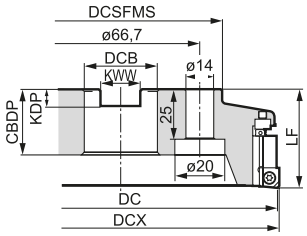



Fig. 2




## ■ Body

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | No. of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | | | | |
| RF 4080 RS | ● | 80 | 82 | 60 | 50 | 27 | 12,4 | 7,0 | 29 | 6 | 3,0 | 0,7 | 1 |
| RF 4100 RS | ● | 100 | 102 | 75 | 50 | 32 | 14,4 | 8,5 | 29 | 6 | | 1,0 | 1 |
| 4125 RS | ● | 125 | 127 | 75 | 63 | 40 | 16,4 | 9,5 | 29 | 8 | | 1,6 | 1 |
| 4160 RS | ❑ | 160 | 162 | 100 | 63 | 40 | 16,4 | 9,5 | 29 | 10 | | 2,6 | 2 |

Remark: PCD blades and inserts are not included.

## ■ Insert for Roughing and Finishing

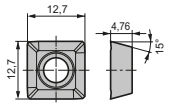



Fig. 1

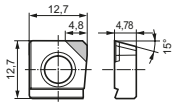



Fig. 2

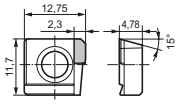
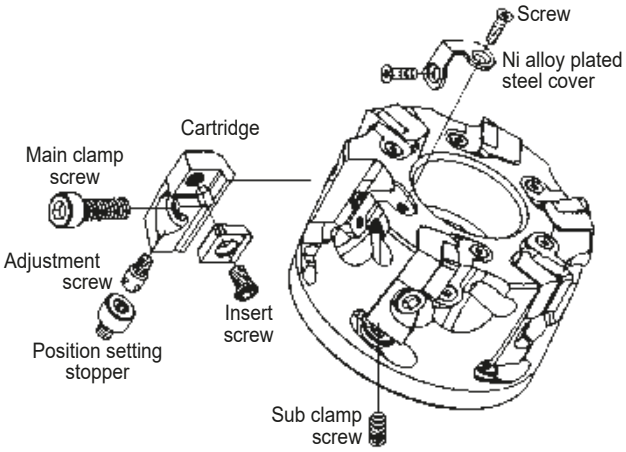


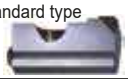

Fig. 3

| Application | Carbide | SUMIDIA | | |
|---|---|---|---|---|
| High Speed / Light cut | N | N | N | |
| General Purpose | N | N | N | |
| Roughing | N | N | N | |
| **Cat. No.** | **H1** | **DA1000** | **DA2200** | **Fig.** |
| SDET 1204 ZDFR | ● | | | 1 |
| SNEW 1204 ADFR-NF | | ● | ▲ | 2 |
| SNEW 1204 ADFR-W-NF | | ❍ | ▲ | 3 |

## ■ Structure




## ■ "Sumidia" Blade

| PCD grade DA2200 | Cat. No. | Stock |
|---|---|---|
| Standard type  | **RFB** | ❑ |
| Wiper type  | **RFBW** | ❑ |

## ■ Cartridge

| Shape | Cat. No. | Stock |
|---|---|---|
| For carbide insert  | **RFR** | ● |
| For Sumidia insert  | **RFF** | ● |

## ■ Dummy Blade

| | | |
|---|---|---|
|  | **RFD** | ❑ |

## ■ Cutting Insert Selection

**For easy assembling**:
PCD blade **RFB**
PCD blade **RFB** (wiper type)

**For finishing**:
Cartridge **RFF**
PCD insert SNEW 1204 ADFR-NF (standard type)
SNEW 1204 ADFR-W-NF (wiper type)
PCD grade: DA1000

**For roughing:**
Cartridge **RFR**
Uncoated carbide insert
SDET 1204 ZDFR, grade: H1

## ■ Spare Parts

|  |  |  10,0 N·m |  3,0 N·m |  |  |  6,0 N·m |  TH050 TH015,TH025 |  |
|---|---|---|---|---|---|---|---|---|
| Cover | Position setting stoper | Main clamp screw | Sub clamp screw | Cover clamp screw | Adjustment screw | Insert clamp screw | Insert wrench | Cartridge wrench |
| RFC | RFS | BX0620 | BTD0510 | FBUP2-A0-8 | RFJ | BFTX0509N | TH015, TH025 TH050 | TTX20 |

## ■ Setting Gauge

RF-SET

Dial-gauge is not included.



● = Euro stock
❍ = Japan stock
❑ = Delivery on request
▲ = To be replaced by new item

## High Speed Finishing of Aluminium Alloy

Fig. 1

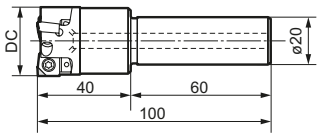
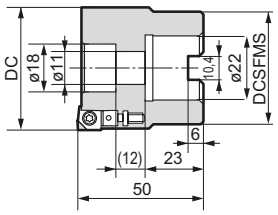



Fig. 2




## Body

| Cat. No. | Stock | Dimensions (mm) | | No. of teeth | Fig. | Weight (Kg) |
|---|---|---|---|---|---|---|
| | | DC | DCSFMS | | | |
| SRF 30 R-ST | ❍ | 30 | - | 3 | 1 | 0,34 |
| SRF 40 R-ST | ❍ | 40 | - | 4 | 1 | 0,50 |
| SRF 50 RS | ❑ | 50 | 46,5 | 5 | 2 | 0,59 |
| SRF 63 RS | ❑ | 63 | 45,0 | 6 | 2 | 0,67 |

Inserts are sold seperately.

## Inserts

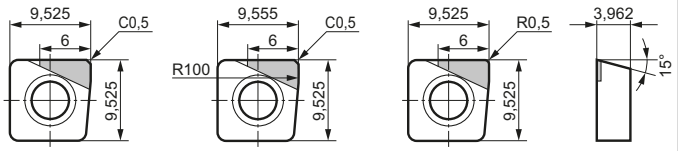


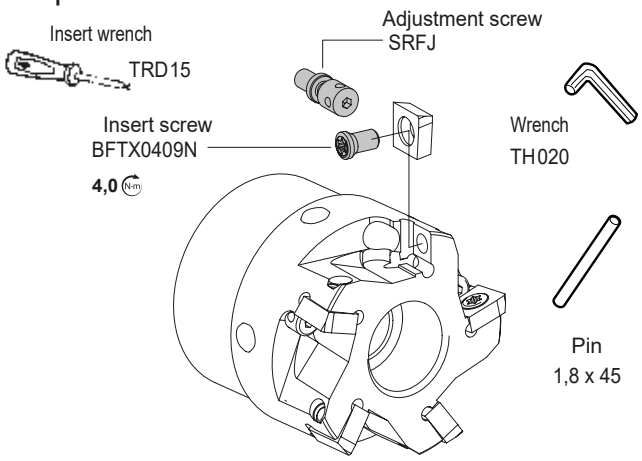

Fig. 1 Fig. 2 Fig. 3

| Application | SUMIDIA |
|---|---|
| High Speed / Light cut | N |
| General Purpose | N |
| Roughing | N |

| Cat. No. | DA1000 | Cutting Edge | Fig. |
|---|---|---|---|
| SNEW 09T3 ADTR-NF | ❍ | Standard | 1 |
| 09T3 ADTR-U-NF | ❍ | Wiper | 2 |
| 09T3 ADTR-R-NF | ❍ | Nose Radius | 3 |

- Standard inserts and Wiper inserts can be used on the same cutter body.
- Standard inserts with nose radius should be used where vibration is present. As such, Wiper-inserts will not be applicable.
- Inserts can be regrind 3 times (up to minimum IC diameter 9,225 mm).
- When using reground inserts, it is advisable to reconfirm insert height and cutting diameter with a tool pre-setter.
- Do not mix new and reground inserts, or even inserts with different regrind amount on the same cutter.

## Spare Parts




## Maximum D.O.C. Guide (SRF50RS, 5 teeth)

The contains guidelines on the maximum D.O.C., determined from internal tests. "O" mark indicates the possible application range. Actual cutting conditions should be set, based on actual machine and work characteristics.

| Feed / D.O.C. (mm) | Feed Speed, $v_f$ (mm/min) | | |
|---|---|---|---|
| | 2.500 | 4.000 | 5.000 |
| | Feed Rate, $f_t$ (mm/tooth) | | |
| | 0,05 | 0,08 | 0,10 |
| 0,5 | ○ | ○ | ○ |
| 1,0 | ○ | ○ | ○ |
| 1,5 | ○ | ○ | ○ |
| 2,0 | ○ | ○ | ○ |
| 2,5 | ○ | ○ | ○ |
| 3,0 | ○ | ○ | ○ |
| 3,5 | ○ | ○ | – |
| 4,0 | ○ | – | – |
| 4,5 | ○ | – | – |
| 5,0 | ○ | – | – |

● Cutting Conditions

Cutter: SRF 50 RS
Insert: SNEW 09T3 ADFR-NF (DA1000)
n : 10.000 rpm
Width: 35mm at D.O.C. indicated above

## Recommended Cutting Conditions for RF and SRF Type Cutters

| Work Material | | Process | Grade | Cutting Speed (m/min) | | Feed Rate (mm/tooth) | Depth of Cut (mm) | |
|---|---|---|---|---|---|---|---|---|
| | | | | RF Type | SRF Type | | RF Type | SRF Type |
| Aluminium Alloy | Si < 13 % | Finishing | **DA1000** (PCD) | 2.000–5.000 | –4.000 | 0,05–0,2 | –3,0 | –5,0 |
| | | Roughing | H1 (Carbide) | 1.000–2.500 | – | | | |
| | Si ≥ 13 % | Finishing | **DA1000** (PCD) | 400–800 | –800 | | | |
| | | Roughing | H1 (Carbide) | 200–400 | – | | | |

# FMU Type

## High Speed Finishing of Grey Cast Iron

### Features

- High speed machining $v_c$=1.500m/min
- Excellent surface roughness Rz = 3,2 (Ra = 1,0)
- Safety structure for the centrifugal force under high speed cutting conditions
- Run-out is less than 10 µm
- Easy assembling method using the setting gauge
- Running cost is reduced because of economical insert

## SUMIBORON ”BN Finish Mill”

### Application

GG25–GG30 (HB200–250) grey cast iron with pearlite matrix, and ferrite matrix (HB130–160)
Application examples: engine block, cylinder block, etc

### Specifications

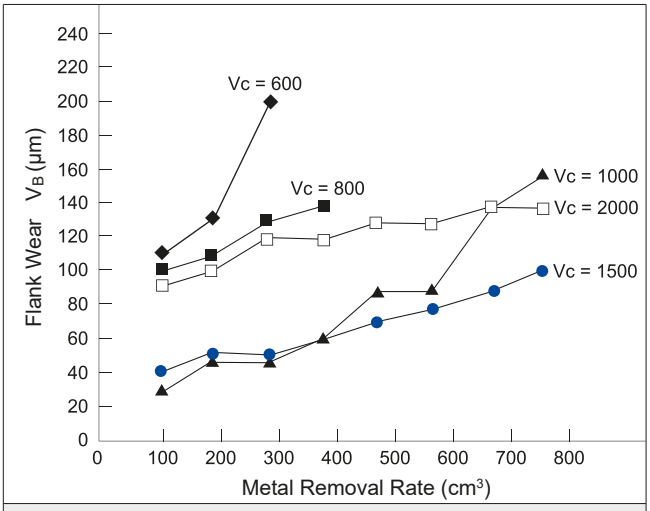
FMU Type: ø80–ø315 mm
Insert: SNEW1203ADTR/L
Low cutting force type: SNEW1203ADTR/L-S

### Recommended Cutting Conditions

Speed: $v_c$ = 800–2000 m/min
Feed: $f_t$ = 0,1–0,3 mm/tooth
Depth: $a_p$ = 0,5 mm or less
Dry cutting

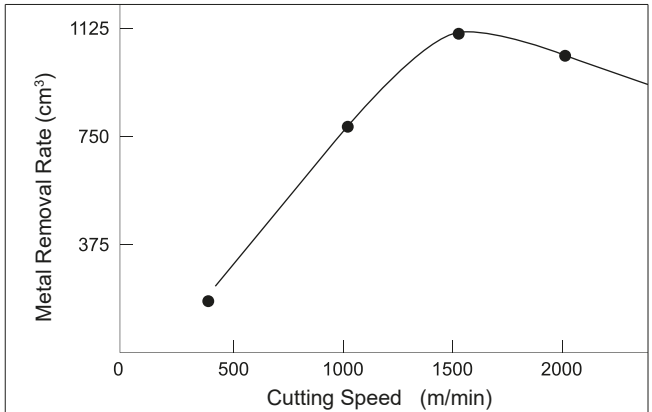
### Performance

● Tool Life Diagram




Work Material : GG25 $H_B$ 240 (Pearlite)
Cutting Speed : $v_c$ = 600–4000 m/min
Feed Rate : $f_t$ = 0,15 mm/tooth
Depth of Cut : $a_p$ = 0,5 mm, Dry

● Estimated Tool Life




Work Material : GG25 $H_B$ 240 (Pearlite)
Cutting Speed : $v_c$ = 400–4000 m/min
Feed Rate : $f_t$ = 0,15 mm/tooth
Depth of Cut : $a_p$ = 0,5 mm, Dry

- Milling of ductile cast iron and alloy steel casting do not produce the best results.
- Dry cutting is recommended. Wet cutting will result in chipping of cutting edges in the early stages due to thermal cracking.



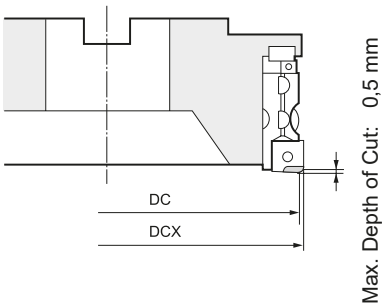


● = Euro stock
❍ = Japan stock
❑ = Delivery on request
▲ = To be replaced by new item
Recommended Tightening Torque (N·m)

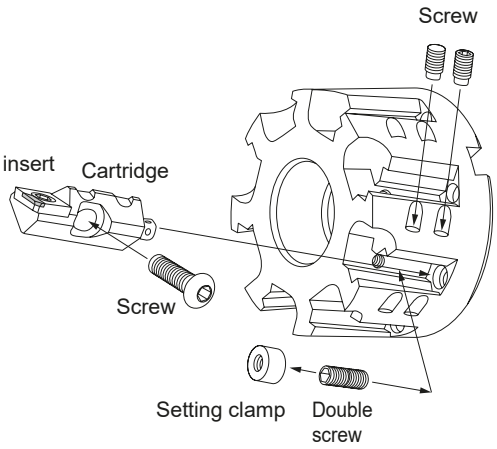
# FMU Type

## Specifications

Approach angle: 90°
Axial rake angle: + 8°
Radial rake angle: + 2°




## Structure




## Body

Fig. 1

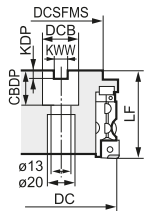



Fig. 2

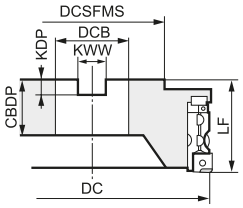



Fig. 3

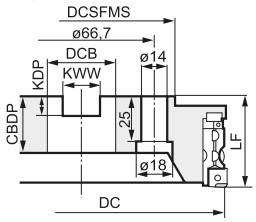



Fig. 4

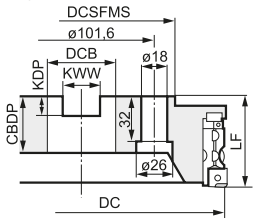
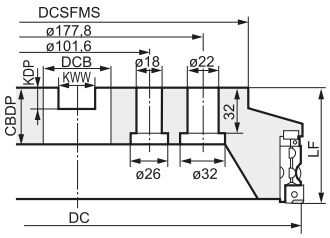



Fig. 5




| Cat. No. | Stock | Dimensions (mm) | | | | | | | | No. of Teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DCSFMS | LF | DCB | KWW | KDP | CBDP | | | | |
| FMU 4080 RS | ● | 80 | 82,8 | 60 | 63 | 27 | 12,4 | 7,0 | 25 | 6 | 0,5 | 1,6 | 1 |
| FMU 4100 RS | ● | 100 | 102,8 | 76 | 63 | 32 | 14,4 | 8,5 | 29 | 8 | | 2,4 | 2 |
| 4125 RS | ❑ | 125 | 127,8 | 75 | 63 | 40 | 16,4 | 9,5 | 29 | 10 | | 3,4 | 2 |
| 4160 RS | ❑ | 160 | 162,8 | 100 | 63 | 40 | 16,4 | 9,5 | 29 | 12 | | 5,6 | 3 |
| FMU 4200 RS | ❑ | 200 | 202,8 | 130 | 63 | 60 | 25,7 | 14,0 | 38 | 16 | | 9,2 | 4 |
| 4250 RS | ❑ | 250 | 252,8 | 130 | 63 | 60 | 25,7 | 14,0 | 38 | 20 | | 14,3 | 4 |
| FMU 4315 RS | | 315 | 317,8 | 240 | 80 | 60 | 25,7 | 14,0 | 40 | 24 | | 27,8 | 5 |

## Inserts

Fig. 1

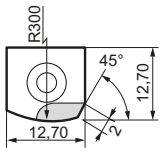
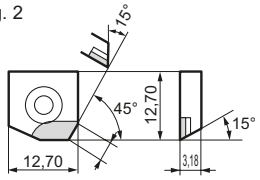
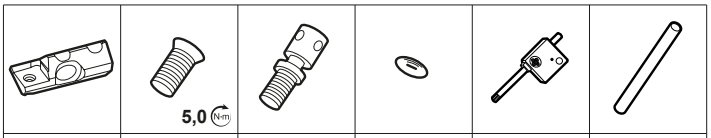



Fig. 2



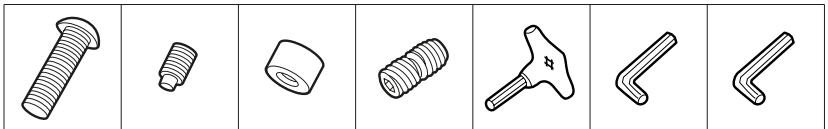

| Application | CBN | |
|---|---|---|
| High Speed / Light cut | K | K |
| General Purpose | K | K |
| Roughing | | |
| Cat. No. | BN700 | BN7000 | Figure |
| SNEW 1203 ADT R | ▲ | ❍ | 1 |
| 1203 ADT R-S | ▲ | ❍ | 2 |

## Cartridge




| Cartridge | Insert Screw | Adjustment Screw | O-ring | Insert Wrench | Pin |
|---|---|---|---|---|---|
| FMUU | BFTX0509N | FMUJ | P3 | TRX20 | 1,8 x 45 |

## Spare Parts



| Cartridge Screw | Screw | Setting clamp | Double screw | Wrench | Wrench | Wrench |
|---|---|---|---|---|---|---|
| BH0620 | BTD0609 | FMUE | WB5-10 | TH040 | LH030 | LH025 |

## Gauge

RF-SET

Dial-gauge is not included.

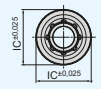
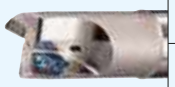
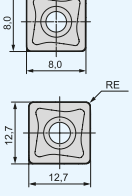
# Indexable Endmills

**H1–H62**

# Selection Guide

| Application | Cutter Type | Series | Insert Type | Approach Angle / Max. Depth of Cut (mm) | Cutter Diameter (mm) | Application: Face Milling – General Purpose | Face Milling – Finishing | Face Milling – High Feed | Shoulder Milling | Groove Milling | Ramping | Chamfering | Drilling | Profiling | Profile Finishing | Work Material: P – Carbon Steel / Alloy Steel | P – Tempered Steel / Die Steel | M – Stainless Steel | K – Cast Iron / Ductile Cast Iron | N – Non-Ferrous Metal | N – Aluminium Alloy | S – Ti Alloy / Heat Resistant Alloy | H – Hardened Steel HRC 45–55 | Ref. Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Face Milling | DGC | DGC 13000-EW | SNMU13T6.. ONMU05T6.. | 3–6 mm, 45° | 40(42,9)–63 (65,9) | ◎ | | | | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | H6 |
| | WGX | WGX 13000-EW | SEE/MT 13T3.. | 6 mm, 45° | 32–63 | ◎ | ◎ | | | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | H7 |
| High Feed Milling | MSX | MSX(ES/EM/EW) 06000 08000 12000 14000 | WDMT0603.. WDMT0804.. WDMT1205.. WDMT1406.. | 1,0–2,5 mm, 20° | 16–63 | | | ◎ | ○ | ○ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | | | | ○ | H9 |
| | MSX-M | MSX 06000-M 08000-M 12000-M | | 1,0–2,0 mm, 20° | 16–40 | | | ◎ | ○ | ○ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | | | | ○ | H10 |
| | WFXH-M | WFXH 08000-M | (12000 Type) SOMT 1204.. | 1,5 mm, 15° | 25–32 | | | ◎ | ○ | ○ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | H13 |
| | | WFXH 12000-M | | 2,5 mm, 15° | 40 | | | | | | | | | | | | | | | | | | | |
| Shoulder Milling | DFC | DFC (M) 09000-E | XNMU 0606.. | 6 mm, 90° | 25–80 | ◎ | ○ | | ◎ | ○ | | | | | | ◎ | ◎ | ○ | ◎ | | | ○ | | H15 |
| | WFX | WFX(M/F) 08000-E 12000-E | SOMT 0803.. | 6 mm, 90° | 20–80 | ○ | ◎ | | ◎ | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | H16 H17 |
| | WFX-M | WFX 08000-M | SOMT 1204.. | 10 mm, 90° | | | | | | | | | | | | | | | | | | | | |
| | TSX | TSX (-F) 08000E TSX (-M) 13000E | LNEX 0804..,LNEX1306.. | 8 mm, 90° | 40–63 | ◎ | ◎ | | ◎ | ○ | | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | H19 |
| | | | | 12 mm, 90° | 40–160 | | | | | | | | | | | | | | | | | | | |
| | WEZ New | WEZ 11000-E/EL | AOMT 170502-PEER-G | 10 mm, 90° | 14–80 | ◎ | ◎ | | ◎ | ◎ | ◎ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | H24 H26 H28 H30 |
| | | WEZ 17000-E/EL | | 15 mm, 90° | 25–80 | | | | | | | | | | | | | | | | | | | |
| | WEX | WEX 1000-E/EL | AXMT0602 (WEX 1000 E/F) | 5 mm, 90° | 10–25 | ◎ | ◎ | | ◎ | ◎ | ◎ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | H34 H35 H36 |
| | | WEX 2000-E/EL | | 10 mm, 90° | 14–63 | | | | | | | | | | | | | | | | | | | |
| | | WEX 3000-E/EL | AXMT1235 (WEX 2000 E/F/M) | 14 mm, 90° | 25–63 | | | | | | | | | | | | | | | | | | | |
| | WEX-M | WEX 2000-M | | 10 mm, 90° | 16–40 | ○ | | | ◎ | ◎ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | H35 H36 |
| | | WEX 3000-M | AXMT1705.. (WEX 3000 E/F/M) | 14 mm, 90° | 25–40 | | | | | | | | | | | | | | | | | | | |
| | WRX | WRX 2000-E/W | AXMT1235.. (WRX2000) | 18–36 mm, 90° | 20–40 | ○ | | | ◎ | ◎ | ○ | | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | H45 H46 |
| | | WRX 3000-E/W | AXMT1705.. (WRX3000) | 27–53 mm, 90° | 32–50 | | | | | | | | | | | | | | | | | | | |

◎ : Preferred choice
○ : Suitable

| Application | Cutter Type | Series | Insert Type | Approach Angle / Max. Depth of Cut (mm) | Cutter Diameter (mm) | Application: Face Milling – General Purpose | Face Milling – Finishing | Face Milling – High Feed | Shoulder Milling | Groove Milling | Ramping | Chamfering | Drilling | Profiling | Profile Finishing | Work Material: P – Carbon Steel / Alloy Steel | P – Tempered Steel / Die Steel | M – Stainless Steel | K – Cast Iron / Ductile Cast Iron | N – Non-Ferrous Metal | N – Aluminium Alloy | S – Ti Alloy / Heat Resistant Alloy | H – Hardened Steel HRC 45–55 | Ref. Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Multi-Purpose | WRCX  | WRCX 08000-E<br>10000-E | QPMT 0803../10T3../1204..<br>QPET 10T35../1204.. | 4–5 mm | 12–32 | ◎ | | ○ | ◎ | ○ | ◎ | | | ◎ | | ◎ | ◎ | ◎ | ◎ | | ◎ | ○ | ○ | H52 |
| | WRCX-M  | WRCX 08000-M<br>12000-M |  | 4–6 mm | 20–40 | ◎ | | ○ | ○ | ○ | ◎ | | | ◎ | | ◎ | ◎ | ◎ | ◎ | | ◎ | ○ | ○ | H53 |
| | RSX  | RSX(F)<br>08000-ES<br>10000-ES<br>12000-ES | RDET0803..RDET10T3..<br>RDET1204.. | 4 mm<br>5 mm<br>6 mm | 20–<br>32(ES)<br>40(M) | ◎ | | ○ | ◎ | ○ | ◎ | | | ◎ | | ◎ | ◎ | ◎ | ◎ | | | ◎ | | H54<br>H55 |
| | RSX-M  | RSX(F)<br>08000-M<br>10000-M<br>12000-M |  | | | | | | | | | | | | | | | | | | | | | |
| | WMM(H)  | WMM(H) 2000<br>3000 | APMT 1035../1605..<br>APET 1035../1605.. | 17–26 mm 90°<br>39 mm 90° | 20–25<br>32–40 | ◎ | | | ◎ | ◎ | ◎ | | ○ | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | H43 |
| Alumimium | WAX  | WAX 3000-E/EL | AECT1604..<br>(WAX 3000E/EL) | 16–18 mm 90° | 20–40 | ○ | | | ◎ | ◎ | ◎ | | | ◎ | | | | | | ○ | ◎ | | | H40<br>H41 |
| | | WAX 4000-E/EL | AECT2206..<br>(WAX 4000E/EL) | 22–24 mm 90° | 25–40 | | | | | | | | | | | | | | | | | | | |
| 3D Profiling | WBMR  | WBMR 2000 | ZNMT 1804100-C<br>2004100-S | 20–43 mm | R10 (20)–<br>R25 (50) | | | | | ◎ | | | | ◎ | | ◎ | ◎ | ◎ | ◎ | | | ○ | ○ | H49 |
| | | WBMR 2000-L | | | | | | | | | | | | | | | | | | | | | | |
| | WBMF  | WBMF 1000 | ZPGU 1551050 | 0,1–0,4 mm | R5 (10)–<br>R15 (30) | | | | | ◎ | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | | | ○ | H51 |
| Chamfering | WFXC-E  | WFXC 08000-E | SOMT0803../1204..<br>SOET0803../1204.. | 45° | 08–16 | | | | | | | ◎ | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | H57 |
| | | WFXC 12000-E | | | 25–32 | | | | | | | | | | | | | | | | | | | |
| | WFXC-M  | WFXC 08000-M |  | 45° | 16 | | | | | | | ◎ | | | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | H58 |
| | | WFXC 12000-M | | | 25–32 | | | | | | | | | | | | | | | | | | | |
| | ANX New  | ANXS 16000-E | ANB 1600R-L | 3 mm 90° | 32–40 | ○ | ◎ | ◎ | ◎ | | | | | | | | | | | ◎ | ◎ | | | H61 |

# Modular Tools

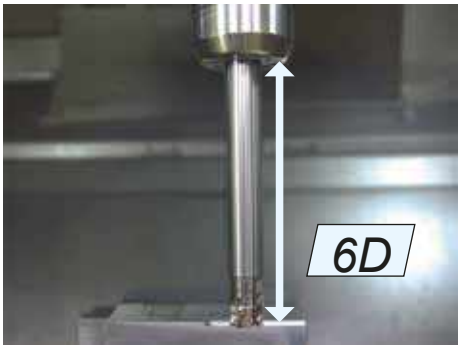
## General Features

- Exchangeable head endmills are available in 7types !
  - Endmill for Shoulder Milling **WFX** Type
  - High Feed Endmill **WFXH** Type
  - Radius Endmill **RSX** Type
  - Endmill for Chamfering **WFXC** Type
  - Endmill for Shoulder Milling **WEX** Type
  - High Feed Endmill **MSX** Type
  - Multipurpose Radius Endmill **WRCX** Type
- A wide variety of possible combinations with carbide arbors (16 items) and steel arbors (4 items) !

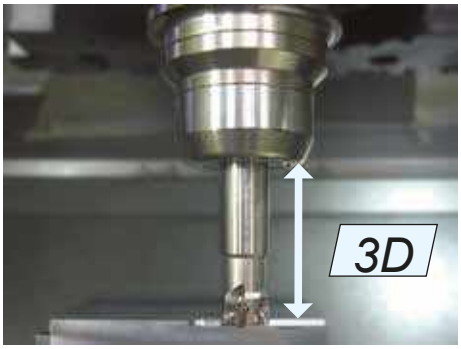
## Characteristics

● Up to 6 x D from Modular End Mill with Carbide Arbor

**Modular Head + Carbide Arbor**




Standard Shank Type Endmill

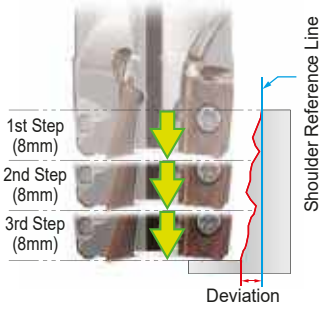



| | | |
|---|---|---|
| Work Material | : | C50 |
| Tool | : | WEX2025M12Z4 (ø D = 25, 4 teeth) |
| Cutting Conditions: | | $v_c$ = 100 m/min, $f_t$ = 0,1 mm/tooth |
| | | $a_p$ = 8 mm x 3 passes, $a_e$ = 2,0 mm, Equipment: M/C BT50 |

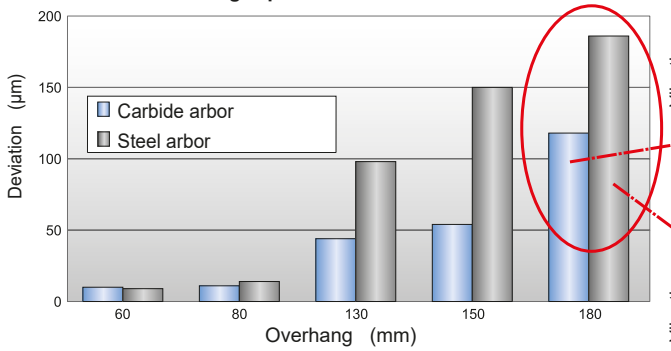
Note
Cutting conditions can vary according to cutter reach, rigidity of machine tool / workpiece etc.

## Performance

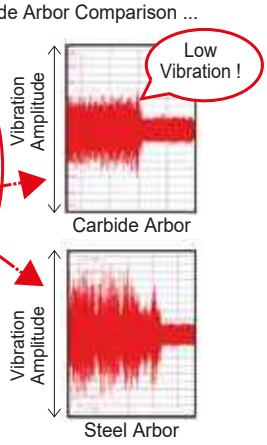
● A Carbide Arbor improves feed rates, surface finish, sizing, and tool life.




● **Shoulder Milling Squareness**




Carbide Arbor Comparison ...




| | | |
|---|---|---|
| Work Material | : | C50 |
| Tool | : | WEX2025M12Z4 (ø D = 25, 4 teeth) |
| Cutting Conditions: | | $v_c$ = 100 m/min, $f_t$ = 0,1mm/tooth |
| | | $a_p$ = 8 mm x 3 passes, $a_e$ = 2,0 mm, Equipment: M/C BT50 |

Suitable for milling with **long overhangs** when combined with carbide or steel arbors!

**Economically designed exchangeable head!**

Easy to change screw-on endmill type WEX and carbide arbor



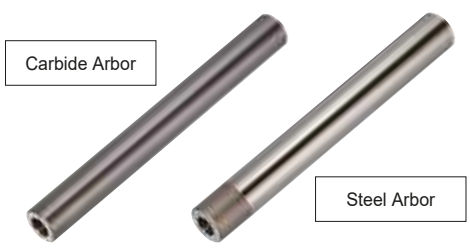


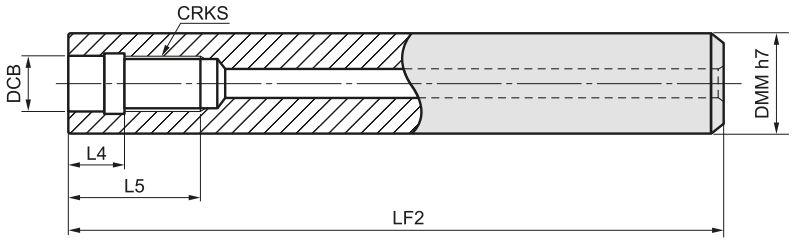
● = Euro stock

Recommended Tightening Torque (N·m)

## Modular Type

### Carbide and Steel Arbor




### Carbide Arbor

| Cat. No. | Stock | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | CRKS | DCB | DMM | LF2 | L4 | L5 | LF* |
| MA 15 M08 L120C | ● | M8 | 8,5 | 15 | 120 | 10 | 18 | 145 |
| 15 M08 L160C | ● | M8 | 8,5 | 15 | 160 | 10 | 18 | 185 |
| MA 16 M08 L120C | ● | M8 | 8,5 | 16 | 120 | 10 | 18 | 145 |
| 16 M08 L160C | ● | M8 | 8,5 | 16 | 160 | 10 | 18 | 185 |
| MA 18 M10 L150C | ● | M10 | 10,5 | 18 | 150 | 10 | 20 | 180 |
| 18 M10 L200C | ● | M10 | 10,5 | 18 | 200 | 10 | 20 | 230 |
| MA 20 M10 L150C | ● | M10 | 10,5 | 20 | 150 | 10 | 20 | 180 |
| 20 M10 L200C | ● | M10 | 10,5 | 20 | 200 | 10 | 20 | 230 |
| MA 23 M12 L200C | ● | M12 | 12,5 | 23 | 200 | 10 | 22 | 235 |
| 23 M12 L250C | ● | M12 | 12,5 | 23 | 250 | 10 | 22 | 285 |
| MA 25 M12 L200C | ● | M12 | 12,5 | 25 | 200 | 10 | 22 | 235 |
| 25 M12 L250C | ● | M12 | 12,5 | 25 | 250 | 10 | 22 | 285 |
| MA 28 M16 L200C | ● | M16 | 17,0 | 28 | 200 | 10 | 24 | 240 |
| 28 M16 L300C | ● | M16 | 17,0 | 28 | 300 | 10 | 24 | 340 |
| MA 32 M16 L200C | ● | M16 | 17,0 | 32 | 200 | 10 | 24 | 240 |
| 32 M16 L300C | ● | M16 | 17,0 | 32 | 300 | 10 | 24 | 340 |

### Steel Arbor

| Cat. No. | Stock | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | CRKS | DCB | DMM | LF2 | L4 | L5 | LF* |
| MA 16 M08 L120S | ● | M8 | 8,5 | 16 | 120 | 10 | 18 | 145 |
| MA 20 M10 L150S | ● | M10 | 10,5 | 20 | 150 | 10 | 20 | 180 |
| MA 25 M12 L200S | ● | M12 | 12,5 | 25 | 200 | 10 | 22 | 235 |
| MA 32 M16 L200S | ● | M16 | 17,0 | 32 | 200 | 10 | 24 | 240 |

### Identification of Catalogue No.

**MA 15 M08 L120 C**

- MA: Modular Arbor
- 15: Shank Diameter
- M08: Mounting Screw
- L120: Arbor Length
- C: Material — C: Carbide, S: Steel

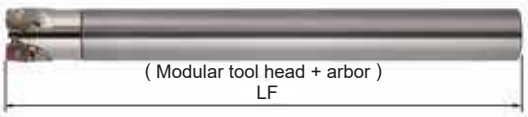
### Recommended Tightening Torque

| Screw | Wrench | | (N·m) |
|---|---|---|---|
| | W | S | |
| M 8 | 8 | 13 | 23 |
| M10 | 8 | 15 | 46 |
| M12 | 10 | 19 | 60 |
| M16 | 10 | 24 | 80 |

Notes about tightening the head:

- Refer to the Head Cat. No. chart on pages H18, H19, H35 and H37 to select the arbor size in the table above.
- Check the mounting screw size of the head and arbor beforehand.
- When attaching head to an arbor, follow the standard tighting torque in the table above.

●*Modular Tool System




### Product Range

| Application | Work Material | Series | Cat. No. | Page |
|---|---|---|---|---|
| Shoulder Milling | Shoulder milling of Steel, Die Steel, Cast Iron, Stainless Steel and Non-Ferrous Metal | „Wave Mill“ - Series | WFX 08000-M | ☞ H16 |
| | High efficiency milling of Steel, Cast Iron, Stainless Steel and Non-Ferrous Metal | „Wave Mill“ - Series | WEX 2000-M<br>3000-M | ☞ H35<br>☞ H36 |
| High Feed Milling | High feed milling of Steel, Die Steel, Cast Iron, Stainless Steel and Non-Ferrous Metal | „Wave Mill“ - Series | WFXH 08000-M<br>12000-M | ☞ H13 |
| | High feed milling of Steel, Cast Iron and Stainless Steel | „Metal Slash Mill“ - Series | MSX 06000-M<br>08000-M<br>12000-M | ☞ H10 |
| Radius Milling | Milling of Exotic Alloy | „Wave Radius Mill“ - Series | WRCX 08000-M<br>12000-M<br>16000-M | ☞ H53 |
| | Milling of Steel, Cast Iron, Stainless Steel and Non-Ferrous Metal | „Wave Radius Mill“ - Series | RSX(F) 10000-M<br>12000-M | ☞ H55 |
| Chamfering | Chamfering of Steel, Die Steel, Cast Iron, Stainless Steel and Non-Ferrous Metal | „Wave Mill“ - Series | WFXC 08000-M | ☞ H58 |

# "Sumi Dual Mill" Face Mill
# DGC (EW) Type

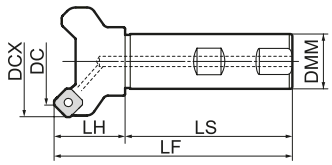
General Milling for Steel and Cast Iron

| Rake Angle | | |
|---|---|---|
| | Radial | -10° |
| | Axial | -5° |

SNMU / SNEU: 6 mm, 45°

ONMU / ONEU: 3 mm, 45°

## Body – Shank Type




## Body

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DMM | LH | LS | LF | | |
| DGC 13040 EW | ● | 40 (42,90) | 54 | 32 | 40 (38,44) | 85 | 125 | 3 | 0,7 |
| 13050 EW | ● | 50 (52,90) | 65 | 32 | 40 (38,44) | 85 | 125 | 3 | 0,9 |
| 13063 EW | ● | 63 (65,90) | 77 | 32 | 40 (38,44) | 85 | 125 | 4 | 1,1 |

( ) Figures in brackets indicate values for inserts of type ONMU

## Identification Details

| DGC | 13 | 040 | EW |
|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Endmill Type Weldon |

## Inserts

| Application | Coated Carbide | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| High Speed/Light cut | P | | | K | | MS | | |
| General Purpose | | PM | M | K | | MS | | |
| Roughing | | PM | PM | | K | | MS | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | Fig. |
| SNMU 13T6ANER L | ● | ● | ● | ● | ● | | | 1 |
| 13T6ANER G | ● | ● | ● | ● | ● | | | 1 |
| 13T6ANER H | ● | ● | ● | ● | ● | | | 1 |
| 13T6ANER FL | ● | ● | ● | ● | ● | | | 2 |
| 13T6ANER FG | ● | ● | ● | ● | ● | | | 2 |
| SNEU 13T6ANER L | | | | | | ● | ● | 1 |
| 13T6ANER G | | | | | | ● | ● | 1 |
| 13T6ANER FL | | | | | | ● | ● | 2 |
| 13T6ANER FG | | | | | | ● | ● | 2 |
| XNEU 13T6ANEN W | | ● | | | ● | | | 3 |
| ONMU 05T6ANER L | ● | ● | ● | ● | ● | | | 4 |
| 05T6ANER G | ● | ● | ● | ● | ● | | | 4 |
| ONEU 05T6ANER L | | | | | | ● | ● | 4 |
| 05T6ANER G | | | | | | ● | ● | 4 |

Fig. 1

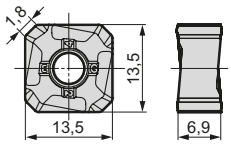



Fig. 2

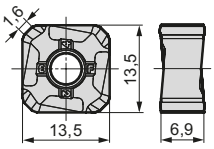



Fig. 3

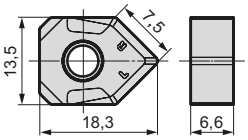
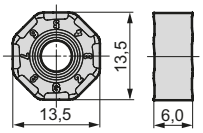



Fig. 4

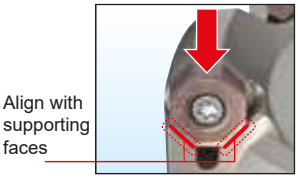




**Attaching Octagonal Inserts**

Firmly align insert with supporting face, press down in the direction of the arrow and tighten the screw to fix the insert.

Press down firmly from above




## Spare Parts

| Shim | Shim Screw | L Seat Wrench | Insert Srew | Insert Wrench |
|---|---|---|---|---|
|  |  |  |   |  |
| DGCS 13 R | BW 0609 F | LH 040 | BFTX 0412 IP | TRDR 15 IP |

### Optional

| Insert Srew (*) |
|---|
|  |
| BFTX 0418 IP |

*Corners can be changed simply by loosening the screw. (Only suitable for DGC / DGCM types with body size ≥ Ø 80).

## SNMU – Recommended Cutting Conditions

| ISO | Work Material | Fit-ness | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (min/t) | Depth of Cut (mm) | Grade |
|---|---|---|---|---|---|---|
| P | General Steel | ◎ | 150–**200**–250 | 0,10–**0,25**–0,40 | <4 | ACP200 ACP300 |
| | Alloyed Steel | ◎ | 180–**250**–350 | 0,10–**0,30**–0,45 | <4 | ACP200 ACP300 |
| | Die Steel | ◎ | 100–**150**–200 | 0,15–**0,25**–0,35 | <4 | ACP200 ACP300 |
| M | Stainless Steel | ○ | 160–**200**–250 | 0,15–**0,23**–0,30 | <3 | ACM200 ACM300 ACP300 |
| K | GG+GGG | ◎ | 100–**200**–250 | 0,10–**0,25**–0,40 | <5 | ACK200 ACK300 |

Min. – **Optimum** – Max.

## ONMU – Recommended Cutting Conditions

| ISO | Work Material | Fit-ness | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (min/t) | Depth of Cut (mm) | Grade |
|---|---|---|---|---|---|---|
| P | General Steel | ◎ | 150–**200**–250 | 0,10–**0,30**–0,50 | <2 | ACP200 ACP300 |
| | Alloyed Steel | ◎ | 180–**250**–350 | 0,10–**0,50**–0,50 | <2 | ACP200 ACP300 |
| | Die Steel | ◎ | 100–**150**–200 | 0,15–**0,25**–0,30 | <2 | ACP200 ACP300 |
| M | Stainless Steel | ○ | 160–**200**–250 | 0,15–**0,23**–0,30 | <2 | ACM200 ACM300 ACP300 |
| K | GG+GGG | ◎ | 100–**200**–250 | 0,10–**0,30**–0,50 | <2 | ACK200 ACK300 |

◎ Preferred choice ○ Suitable





● = Euro stock
○ = Japan stock

G6/G7

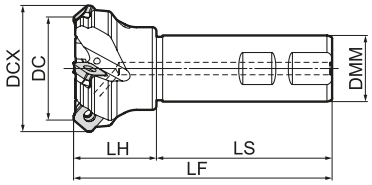
Recommended Tightening Torque (N·m)

## General Milling for Steel and Cast Iron

| Rake Angle | | |
|---|---|---|
| | Radial | -20°–24° |
| | Axial | 20°–22° |

6 mm, 45°

### Body – Shank Type




### Body – Dimensions

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|---|
| | | DC | DCX | DMM | LH | LS | LF | |
| WGX 13032 EW | ❍ | 32 | 44 | 32 | 40 | 85 | 125 | 3 |
| 13040 EW | ❍ | 40 | 52 | 32 | 40 | 85 | 125 | 3 |
| 13050 EW | ❍ | 50 | 62 | 32 | 40 | 85 | 125 | 4 |
| 13063 EW | ❍ | 63 | 76 | 32 | 40 | 85 | 125 | 5 |

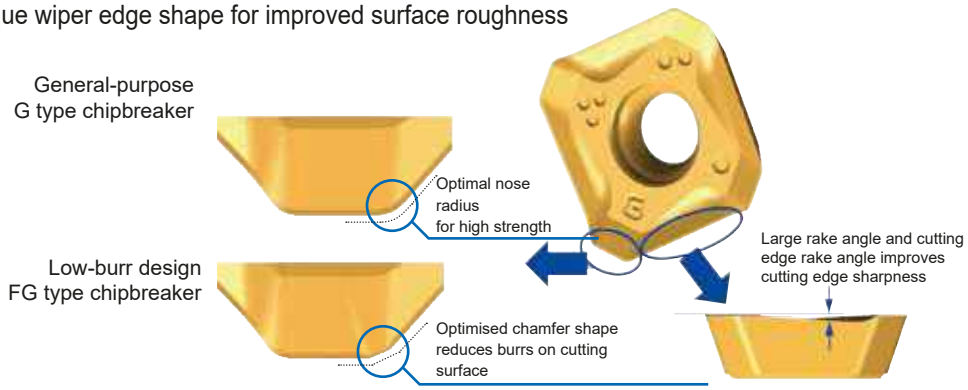
Inserts are not included.
ø32 mm cutters do not have a seat.

### Identification Details

| WGX | 13 | 032 | EW |
|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Endmill Type Weldon |

### Insert Shape Characteristics

Unique wiper edge shape for improved surface roughness




### Inserts

| Application | Coated Carbide | | | | | | | Carb. | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed/Light Cut | P | | | K | | MS | | KN | N | |
| General Purpose | | PM | M | K | | MS | MS | | N | |
| Roughing | | PM | PM | | K | | MS | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Fig. |
| SEET 13T3AGFR-L | | | | | | | | ❍ | ❍ | 1 |
| SEET 13T3AGSR-L | ❍ | ● | ❍ | ❍ | ❍ | ● | ❍ | | | 1 |
| 13T3AGSR-G | ❍ | ● | ● | ● | ❍ | ● | ❍ | | | 1 |
| SEMT 13T3AGSR-L | ● | ● | ● | ● | ❍ | ● | ● | | | 1 |
| 13T3AGSR-G | ● | ● | ● | ● | ● | ● | ● | | | 1 |
| 13T3AGSR-H | ● | ● | ● | ● | ● | ● | ● | | | 1 |
| SEMT 13T3AGSR-FG | ❍ | ● | ● | ❍ | ● | ● | ● | | | 2 |
| XEEW 13T3AGER-WR | | ❍ | | | ❍ | | | | | 3 |

Fig. 1

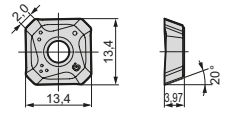



Fig. 2

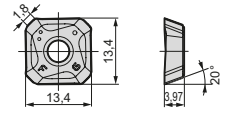
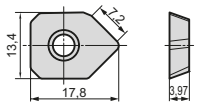
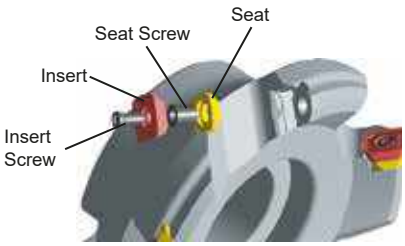



Fig. 3




### Spare Parts

| Applicable Cutters | Seat | Seat Screw | Insert Screw | Insesrt Wrench | N·m | Spanner (for Seat) |
|---|---|---|---|---|---|---|
| WGX 130__EW |  |  |  |  | |  |
| øD = 32 | – | – | BFTX 03512 IP | TRDR 15 IP | 3,0 | – |
| øD = 40–63 | WGCS 13 R | BW 0507 F | BFTX 03512 IP | TRDR 15 IP | 3,0 | LH 035 |

### Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/tooth) | Grade |
|---|---|---|---|---|---|
| P | General Steel | 180–28 | 150–**200**–250 | 0,15–**0,20**–0,25 | ACP200 |
| P | Soft Steel | ≤ 180 | 180–**265**–350 | 0,10–**0,25**–0,40 | ACP200 |
| P | Die Steel | 200–220 | 100–**150**–200 | 0,15–**0,20**–0,25 | ACP200 |
| M | Stainless Steel | - | 160–**205**–250 | 0,15–**0,23**–0,30 | ACM300 |
| K | Cast Iron | 250 | 100–**175**–250 | 0,15–**0,23**–0,30 | ACK200 |
| S | Exotic Alloy | - | 30–**50**–80 | 0,10–**0,20**–0,30 | ACM300 |

Minimum-**Optimum**-Maximum

☞ G10/G11

# MSX Type

Ultra High Feed

Boosts Productivity – Cuts Costs

## Features

The Metal Slash Mill type MSX is a new multi function high shear milling cutter with ultra high feed capability suitable for face milling, slotting, plunging and helical boring. At 50GPa the ultra hard Super ZX coated inserts feature a sharp cutting edge which demonstrates extreme resistance to wear and heat massively boosting productivity and tool life.

The vibration free cutting action ensures accurate sizing, improved surface finish, and protection of the machine tool/workpiece from damage. Inserts are double clamped in wide chip gullets to maximise rigidity and chip evacuation with temperature at the cutting edge being easily controlled via an optional air blast through integral coolant holes.The MSX cutter is readily applied to general purpose machining across the P (steel) M (stainless) and K (cast iron) range of workpiece materials with impressive results.

## Advantages

**Integral Coolant Hole**

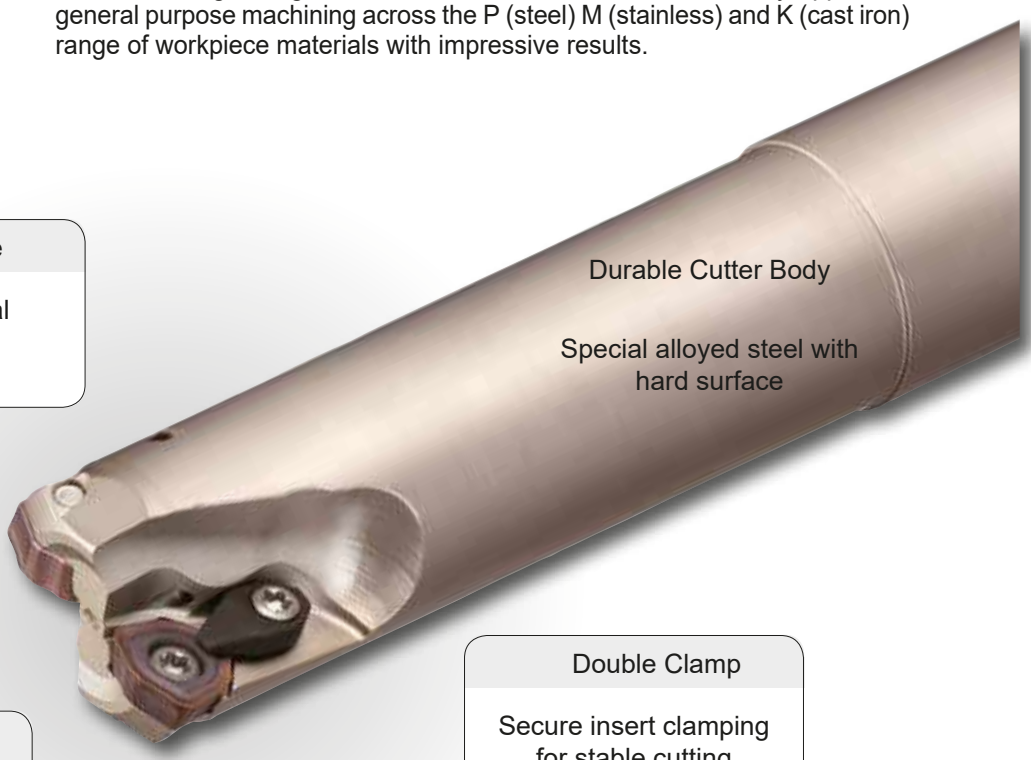
Otimised chip removal – massive chip avacuation pockets

**Wide Application Range**

Face milling, slotting, helical boring and plunging

**Low Cutting Force**

Unique insert shape reduces cutting force

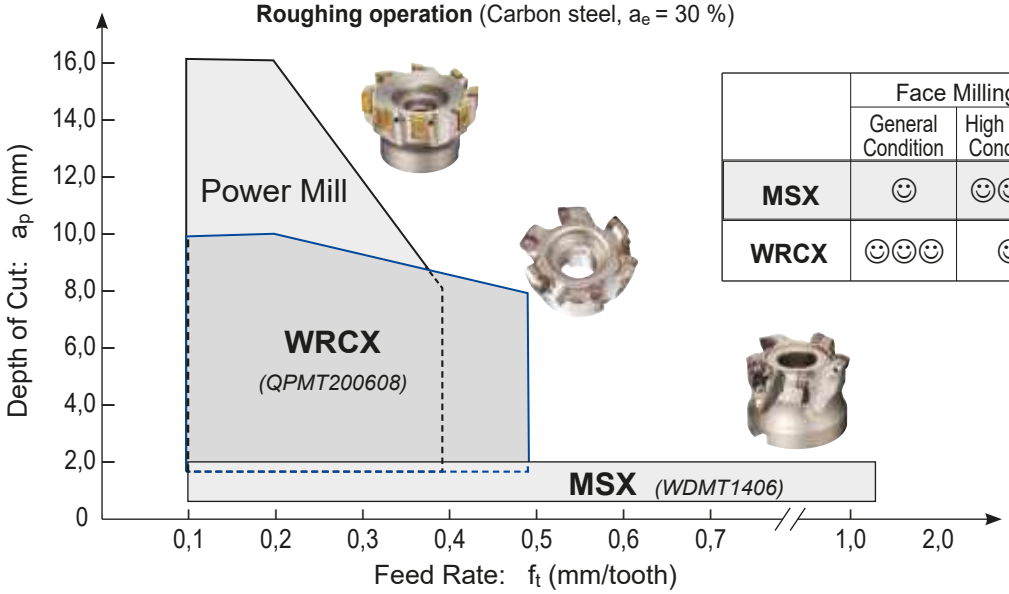



**Double Clamp**

Secure insert clamping for stable cutting

## Application Range

**Roughing operation** (Carbon steel, $a_e$ = 30 %)




| | Face Milling | | Slotting | Helical Boring | Profiling |
|---|---|---|---|---|---|
| | General Condition | High Feed Condition | | | |
| **MSX** | ☺ | ☺☺☺ | ☺ | ☺☺☺ | – |
| **WRCX** | ☺☺☺ | ☺ | ☺ | ☺☺ | ☺☺ |

☺☺☺ excellent
☺☺ very good
☺ good



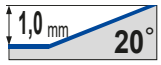
● = Euro stock
❍ = Japan stock

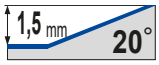
❑ = Delivery on request

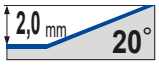
Recommended Tightening Torque (N·m)

# "METAL SLASH MILL"
# MSX 06000/08000 ES/EM/EW

# "METAL SLASH MILL"
# MSX 12000/14000 ES/EM/EW







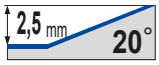



Fig. 1

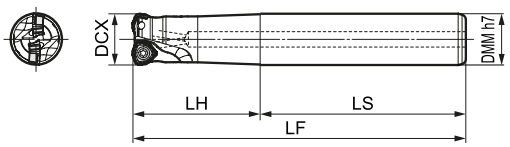
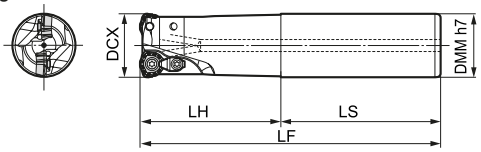



Fig. 2




## Body

For insert type : WDMT 0603 □□□□

| Cat. No. | Stock | Dimensions (mm) DCX | DMM | LH | LS | LF | No.of teeth | Fig. |
|---|---|---|---|---|---|---|---|---|
| MSX 06016 ES | ❑ | 16 | 16 | 30 | 80 | 110 | 2 | 1 |
| 06016 EM | ● | 16 | 16 | 70 | 80 | 150 | 2 | 1 |
| 06016 EM15 | ❑ | 16 | 15 | 30 | 120 | 150 | 2 | 1 |
| MSX 06017 EM | ❑ | 17 | 16 | 20 | 130 | 150 | 2 | 1 |
| MSX 06018 EM | ❑ | 18 | 16 | 20 | 130 | 150 | 2 | 1 |
| MSX 06020 ES | ● | 20 | 20 | 50 | 80 | 130 | 3 | 1 |
| 06020 EM | ● | 20 | 20 | 100 | 80 | 180 | 3 | 1 |
| 06020 EM19 | ❑ | 20 | 19 | 50 | 130 | 180 | 3 | 1 |
| MSX 06022 EM | ❑ | 22 | 20 | 30 | 150 | 180 | 3 | 1 |
| MSX 06025 ES | ● | 25 | 25 | 60 | 80 | 140 | 3 | 1 |
| 06025 ES24 | ❑ | 25 | 24 | 60 | 80 | 140 | 3 | 1 |
| 06025 EM | ● | 25 | 25 | 120 | 130 | 250 | 3 | 1 |
| 06025 EM24 | ❑ | 25 | 24 | 60 | 190 | 250 | 3 | 1 |
| MSX 06020 EW | ● | 20 | 20 | 50 | 80 | 130 | 3 | 1 |
| MSX 06025 EW | ● | 25 | 25 | 60 | 80 | 140 | 3 | 1 |

## Body

For insert type : WDMT 0804 □□□□

| Cat. No. | Stock | Dimensions (mm) DCX | DMM | LH | LS | LF | No.of teeth | Fig. |
|---|---|---|---|---|---|---|---|---|
| MSX 08020 ES | ● | 20 | 20 | 50 | 80 | 130 | 2 | 1 |
| 08020 EM | ● | 20 | 20 | 100 | 80 | 180 | 2 | 1 |
| 08020 EM19 | ❑ | 20 | 19 | 50 | 130 | 180 | 2 | 1 |
| MSX 08022 EM | ❑ | 22 | 20 | 30 | 150 | 180 | 2 | 1 |
| MSX 08025 ES | ● | 25 | 25 | 60 | 80 | 140 | 2 | 2 |
| 08025 EM | ● | 25 | 25 | 120 | 130 | 250 | 2 | 2 |
| 08025 EM24 | ❑ | 25 | 24 | 60 | 190 | 250 | 2 | 2 |
| MSX 08028 EM | ❑ | 28 | 25 | 40 | 210 | 250 | 2 | 2 |
| MSX 08032 ES | ❑ | 32 | 32 | 70 | 80 | 150 | 3 | 2 |
| 08032 EM | ❑ | 32 | 32 | 120 | 130 | 250 | 3 | 2 |
| MSX 08035 EM | ❑ | 35 | 32 | 50 | 200 | 250 | 3 | 2 |
| MSX 08020 EW | ● | 20 | 20 | 50 | 80 | 130 | 2 | 1 |
| MSX 08025 EW | ● | 25 | 25 | 60 | 80 | 140 | 2 | 2 |
| MSX 08032 EW | ● | 32 | 32 | 70 | 80 | 150 | 3 | 2 |

## Identification Details

| MSX | 06 | 016 | E | S |
|---|---|---|---|---|
| Cutter type | Insert size | Cutter Diameter | Shank Type | |

S: Short type with cylindrical shank
M: Long type with cylindrical shank
W: Short type with Weldon shank

## Body

For insert type : WDMT 1205 □□□□

| Cat. No. | Stock | Dimensions (mm) DCX | DMM | LH | LS | LF | No.of teeth | Fig. |
|---|---|---|---|---|---|---|---|---|
| MSX 12032 ES | ● | 32 | 32 | 70 | 80 | 150 | 2 | 2 |
| 12032 EM | ● | 32 | 32 | 120 | 130 | 250 | 2 | 2 |
| MSX 12035 EM | ❑ | 35 | 32 | 50 | 200 | 250 | 2 | 2 |
| MSX 12040 ES | ❑ | 40 | 32 | 50 | 100 | 150 | 3 | 2 |
| 12040 EM | ❑ | 40 | 32 | 50 | 200 | 250 | 3 | 2 |
| MSX 12050 EM | ❑ | 50 | 42 | 50 | 200 | 250 | 4 | 2 |
| MSX 12032 EW | ● | 32 | 32 | 70 | 80 | 150 | 2 | 2 |

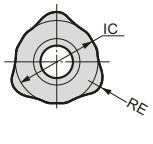
## Body

For insert type : WDMT 1406 □□□□

| Cat. No. | Stock | Dimensions (mm) DCX | DMM | LH | LS | LF | No.of teeth | Fig. |
|---|---|---|---|---|---|---|---|---|
| MSX 14040 ES | ❑ | 40 | 32 | 50 | 100 | 150 | 2 | 2 |
| 14040 EM | ❑ | 40 | 32 | 50 | 200 | 250 | 2 | 2 |
| MSX 14050 ES | ❑ | 50 | 42 | 50 | 100 | 150 | 3 | 2 |
| MSX 14050 EM | ❑ | 50 | 42 | 50 | 200 | 250 | 3 | 2 |
| 14063 ES | ❑ | 63 | 42 | 50 | 100 | 150 | 4 | 2 |
| MSX 14063 EM | ❑ | 63 | 42 | 50 | 200 | 250 | 4 | 2 |

## Inserts

| Application | Coated Carbide | | | |
|---|---|---|---|---|
| High Speed / Light cut | | | K | |
| General Purpose | P M | P M | K | |
| Roughing | P M | P M | | K |




| Cat. No. | ACP200 | ACP300 | ACK200 | ACK300 | Dimensions (mm) IC | S | RE | Applicable Endmill |
|---|---|---|---|---|---|---|---|---|
| WDMT0603 ZDTR | ● | ● | ❍ | ❍ | 6,35 | 3,0 | 1,5 | MSX06000E□ |
| 0603 ZDTR-H | ● | ● | ❍ | ● | | | | |
| WDMT0804 ZDTR | ● | ● | | ❍ | 8,5 | 4,0 | 2,0 | MSX08000E□ |
| 0804 ZDTR-H | ● | ● | | ❍ | | | | |
| WDMT1205 ZDTR | ● | ● | | ● | 12 | 5,0 | 2,0 | MSX12000E□ |
| 1205 ZDTR-H | ● | ● | | ● | | | | |
| WDMT1406 ZDTR | ● | ● | | ● | 14 | 6,0 | 2,0 | MSX14000E□ |
| 1406 ZDTR-H | ● | ● | | ● | | | | |

ZDTR-H : Stronger cutting edge

## Spare Parts

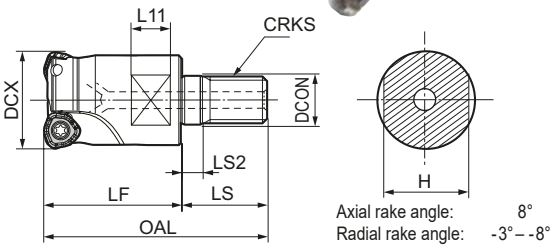
| Insert Screw | | Insert Wrench | Clamp | C Ring | Clamp Screw | Applicable Endmill |
|---|---|---|---|---|---|---|
| | N·m | | | | | MSX - EO |
| BFTX 02505 IP | 1,5 | TRDR 08 IP | – | – | – | MSX 06000E□ |
| BFTX 0306 IP | 2,0 | TRDR 08 IP | – | – | – | MSX 08020E□, MSX 08022E□ |
| BFTX 0306 IP | 2,0 | TRDR 08 IP | CCH 3,5 | CR 03 | BFTX 03510 IP 08 | MSX 08025E□, MSX 08028E□, MSX 08032E□, MSX 08035E□ |
| BFTX 0409 IP | 3,0 | TRDR 15 IP | CCH 3,5 | CR 03 | BFTX 03510 IP 15 | MSX 12000E□ |
| BFTX 0511 IP | 5,0 | TRDR 20 IP | CCH 4,5 | CR 03 | BFTX 04513 IP 20 | MSX 14000E□ |

☞ G53

# Exchangeable Head Endmills
# MSX 06000/08000 M Type

1,0 mm 20°

High feed and high efficiency machining endmills




Axial rake angle: 8°
Radial rake angle: -3°– -8°

## Heads

For insert type : WDMT 0603

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| MSX 06016M08Z2 | ● | 16 | 8,5 | M8 | 42 | 25 | 5 | 17 | 8 | 13 | 2 |
| 06018M08Z2 | ❑ | 18 | 8,5 | M8 | 42 | 25 | 5 | 17 | 8 | 13 | 2 |
| MSX 06020M10Z3 | ● | 20 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 3 |
| 06022M10Z3 | ❑ | 22 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 3 |
| MSX 06025M12Z3 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 3 |

Inserts are not included.

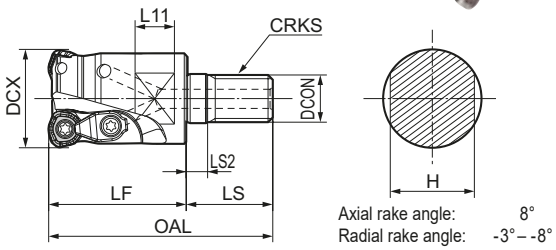
# Exchangeable Head Endmills
# MSX 08000/12000 M Type

Modular Type

1,5 mm 20° (MSX 08000M)

2,0 mm 20° (MSX 12000M)

High feed and high efficiency machining endmills




Axial rake angle: 8°
Radial rake angle: -3°– -8°

## Heads

For insert type : WDMT 0804

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| MSX 08025M12Z2 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 |
| 08028M12Z2 | ❍ | 28 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 |
| MSX 08030M16Z3 | ❍ | 30 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |
| 08032M16Z3 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |
| MSX 08035M16Z3 | ❑ | 35 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |

Inserts are not included.

## Heads

For insert type : WDMT 1205

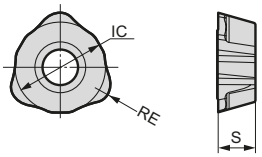
| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| MSX 12032M16Z2 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 2 |
| 12035M16Z2 | ❑ | 35 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 2 |
| MSX 12040M16Z3 | ● | 40 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |

Inserts are not included.

## Inserts

| Application | Coated Carbide | | | |
|---|---|---|---|---|
| General Purpose | PM | PM | K | |
| Roughing | PM | PM | | K |

| Cat. No. | ACP200 | ACP300 | ACK200 | ACK300 | Dimensions (mm) IC | S | RE | Applicable Endmill |
|---|---|---|---|---|---|---|---|---|
| WDMT 0603 ZDTR | ● | ● | ❍ | ❍ | 6,35 | 3,0 | 1,5 | MSX06000M□ |
| 0603 ZDTR-H | ● | ● | ❍ | ● | | | | |
| WDMT 0804 ZDTR | ● | ● | | ❍ | 8,5 | 4,0 | 2,0 | MSX08000M□ |
| 0804 ZDTR-H | ● | ● | | ❍ | | | | |
| WDMT 1205 ZDTR | ● | ● | | ● | 12 | 5,0 | 2,0 | MSX12000M□ |
| 1205 ZDTR-H | ● | ● | | ● | | | | |




H – Strong Cutting Edge

## Identification Details

| MSX | 06 | 016 | M08 | Z2 |
|---|---|---|---|---|
| Cutter type | Insert size | Diameter | Mounting screw | No. of teeth |


## Spare Parts

| Clamp Screw | | Insert Wrench | Clamp | C Ring | Insert Screw | Applicable Endmill |
|---|---|---|---|---|---|---|
| | N·m | | | | | |
| BFTX 02505 IP | 1,5 | TRDR 08 IP | – | – | – | MSX 06016M – MSX 06025M |
| BFTX 0306 IP | 2,0 | TRDR 08 IP | CCH 3,5 | CR 03 | BFTX 03510 IP 08 | MSX 08025M – MSX 08035M |
| BFTX 0409 IP | 3,0 | TRDR 15 IP | CCH 3,5 | CR 03 | BFTX 03510 IP 15 | MSX 12032M – MSX 12040M |





● = Euro stock
❍ = Japan stock
❑ = Delivery on request
N·m Recommended Tightening Torque (N·m)

## ■ Recommended Cutting Conditions

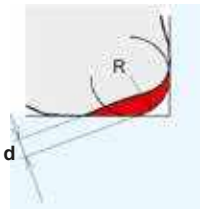
| Work Material | Coated Carbide Grade | Cutting Speed $v_c$ (m/min) | Insert Cat. No. | Endmill Type (Ø DC) 16 $a_p$ (mm) | 16 Feed rate (mm/tooth) | 20 $a_p$ (mm) | 20 Feed rate (mm/tooth) | 25 $a_p$ (mm) | 25 Feed rate (mm/tooth) | 32 $a_p$ (mm) | 32 Feed rate (mm/tooth) | 40 $a_p$ (mm) | 40 Feed rate (mm/tooth) | Shell Type (Ø DC) 50–66 $a_p$ (mm) | 50–66 Feed rate (mm/tooth) | 80–100 $a_p$ (mm) | 80–100 Feed rate (mm/tooth) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General Steel (Below HB200) | ACP200 | 100–**150**–200 | WDMT 0603 | 0,8 | 0,8 | 0,8 | 0,8 | 0,8 | 0,8 | – | – | – | – | – | – | – | – |
| | | | WDMT 0804 | – | – | 1,0 | 1,0 | 1,0 | 1,2 | 1,0 | 1,2 | – | – | – | – | – | – |
| | | | WDMT 1205 | – | – | – | – | – | – | 1,2 | 1,4 | 1,2 | 1,4 | 1,2 | 1,4 | – | – |
| | | | WDMT 1406 | – | – | – | – | – | – | – | – | 1,5 | 1,5 | 1,5 | 1,5 | 1,5 | 1,5 |
| Alloy Steel (Below HRC45) | ACP200 | 80–**130**–180 | WDMT 0603 | 0,7 | 0,8 | 0,7 | 0,8 | 0,7 | 0,8 | – | – | – | – | – | – | – | – |
| | | | WDMT 0804 | – | – | 0,8 | 1,0 | 0,8 | 1,2 | 0,8 | 1,2 | – | – | – | – | – | – |
| | | | WDMT 1205 | – | – | – | – | – | – | 1,0 | 1,4 | 1,0 | 1,4 | 1,0 | 1,4 | – | – |
| | | | WDMT 1406 | – | – | – | – | – | – | – | – | 1,3 | 1,5 | 1,3 | 1,5 | 1,3 | 1,5 |
| Stainless Steel X5CRNI1810, Others | ACP300 | 80–**120**–150 | WDMT 0603 | 0,8 | 0,7 | 0,8 | 0,7 | 0,8 | 0,7 | – | – | – | – | – | – | – | – |
| | | | WDMT 0804 | – | – | 1,0 | 0,8 | 1,0 | 0,8 | 1,0 | 0,8 | – | – | – | – | – | – |
| | | | WDMT 1205 | – | – | – | – | – | – | 1,2 | 1,2 | 1,2 | 1,2 | 1,2 | 1,2 | – | – |
| | | | WDMT 1406 | – | – | – | – | – | – | – | – | 1,5 | 1,3 | 1,5 | 1,3 | 1,5 | 1,3 |
| Cast Iron GG, GGG | ACK300 | 100–**150**–200 | WDMT 0603 | 0,8 | 1,0 | 0,8 | 1,0 | 0,8 | 1,0 | – | – | – | – | – | – | – | – |
| | | | WDMT 0804 | – | – | 1,0 | 1,2 | 1,0 | 1,4 | 1,0 | 1,4 | – | – | – | – | – | – |
| | | | WDMT 1205 | – | – | – | – | – | – | 1,2 | 1,5 | 1,2 | 1,5 | 1,2 | 1,5 | – | – |
| | | | WDMT 1406 | – | – | – | – | – | – | – | – | 1,5 | 1,8 | 1,5 | 1,8 | 1,5 | 1,8 |
| Hardened Steel (Below HRC50) | ACK300 | 40–**80**–100 | WDMT 0603 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | – | – | – | – | – | – | – | – |
| | | | WDMT 0804 | – | – | 0,5 | 0,6 | 0,5 | 0,8 | 0,5 | 0,8 | – | – | – | – | – | – |
| | | | WDMT 1205 | – | – | – | – | – | – | 0,6 | 1,0 | 0,6 | 1,0 | 0,6 | 1,0 | – | – |
| | | | WDMT 1406 | – | – | – | – | – | – | – | – | 1,0 | 1,2 | 1,0 | 1,2 | 1,0 | 1,2 |

| Insert Cat. No. | Max $a_p$ | RE |
|---|---|---|
| WDMT 0603.... | 1,0 | 1,5 |
| WDMT 0804.... | 1,5 | 2,0 |
| WDMT 1205.... | 2,0 | 2,0 |
| WDMT 1406.... | 2,5 | 2,0 |

- The above recommended cutting conditions may require adjustment according to machine rigidity and work rigidity.
  The above figures are guidelines for use with the BT50 machine tool.
- The above cutting conditions assume a tool overhang length of L/D = 3 (i.e. overhang length is 3 times tool diameter) or less.
  When tool overhang is **more than L/D = 3 and less than or equal L/D = 5**, settings should be adjusted to approximately **70 to 80 %** of those indicated in the above cutting conditions (i.e. $a_p$ and Feed Rate).
  When tool overhang is **more than L/D = 5 and less than or equal L/D = 8**, settings should be adjusted to approximately **50 to 60 %** of those indicated in the above cutting conditions (i.e. $a_p$ and Feed Rate).

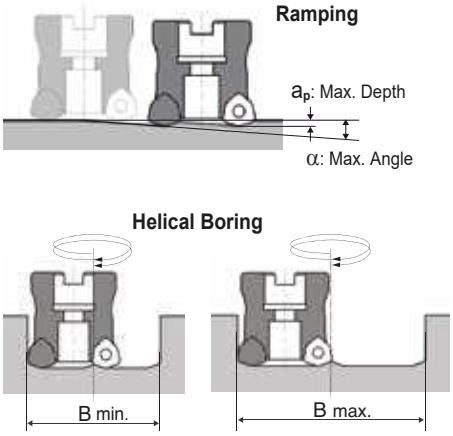
## ■ Information for Programming

For machine programming, please use the theoretical corner radius (R) shown in the list.
Maximum depth (d) between theoretical radius and actual profile will be left on the finished surface, as shown below.




| Body | Insert | Theoretical Radius (R) | Remaining Depth (d) |
|---|---|---|---|
| MSX **06**000 | WDMT **06**03.... | 2,0 | 0,403 |
| MSX **08**000 | WDMT **08**04.... | 2,5 | 0,593 |
| MSX **12**000 | WDMT **12**05.... | 3,0 | 1,030 |
| MSX **14**000 | WDMT **14**06.... | 3,5 | 1,219 |

## ■ Plunging and Helical Boring




| Cutter Ø | WDMT0603ZDTR $a_p$: max 1,0 | | | WDMT0804ZDTR $a_p$: max 1,5 | | | WDMT1205ZDTR $a_p$: max 2,0 | | | WDMT1406ZDTR $a_p$: max 2,5 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ramping | Helical boring | | Ramping | Helical boring | | Ramping | Helical boring | | Ramping | Helical boring | |
| | α max. | min. øB | max. øB | α max. | min. øB | max. øB | α max. | min. øB | max. øB | α max. | min. øB | max. øB |
| **16** | **6°00'** | **21** | **31** | | | | | | | | | |
| 17 | 5°00' | 23 | 33 | | | | | | | | | |
| 18 | 4°30' | 25 | 35 | | | | | | | | | |
| **20** | **3°30'** | **29** | **39** | **7°30'** | **25** | **38** | | | | | | |
| 22 | 3°00' | 33 | 43 | 5°30' | 29 | 42 | | | | | | |
| **25** | **2°00'** | **39** | **48** | **4°00'** | **35** | **48** | | | | | | |
| 28 | | | | 3°00' | 41 | 54 | | | | | | |
| **32** | | | | **2°30'** | **49** | **62** | **6°30'** | **42** | **63** | | | |
| 35 | | | | 2°00' | 55 | 68 | 5°00' | 48 | 69 | | | |
| **40** | | | | **1°30'** | **65** | **78** | **4°00'** | **58** | **79** | **6°00'** | **53** | **78** |
| **50** | | | | | | | **2°30'** | **78** | **99** | **3°30'** | **73** | **98** |
| **63** | | | | | | | **2°00'** | **103** | **124** | **2°00'** | **99** | **124** |
| 66 | | | | | | | 1°30' | 109 | 130 | 1°45' | 105 | 130 |
| **80** | | | | | | | | | | **1°30'** | **133** | **158** |
| **100** | | | | | | | | | | **1°00'** | **173** | **198** |

# WFXH - M Type

## General Features

WaveMill WFXH type is a high efficiency, multi-purpose cutter, that uses the WFX series inserts for high-feed roughing and a variety of processes.

## Characteristics

Stable, high-efficiency milling with superior cutting edge sharpness.
Supports various types of processes (ramping and helical milling).
Able to use the selection of inserts from the WFX series.

## Notes on Corner Finishing - Remaining Material

Actual machined corners will have uncut and overcut portions due to the shape of the inserts.

Fig. 1

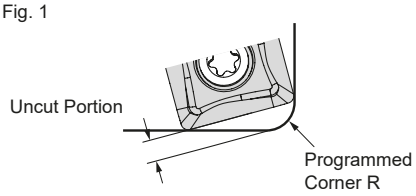
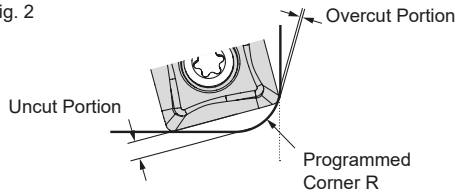



Fig. 2




### WFXH 08000 Type

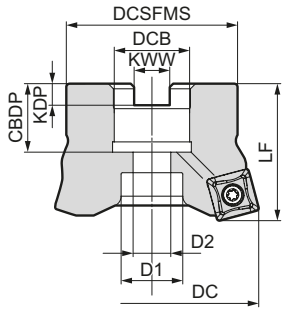
| Programmed Corner R | SOMT 08○○04-□ | | | SOMT 08○○08-□ | | | SOMT 08○○12-□ | | |
|---|---|---|---|---|---|---|---|---|---|
| | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape |
| 2,0 | 1,41 | 0 | Fig. 1 | 1,30 | 0 | Fig. 1 | 1,21 | 0 | Fig. 1 |
| 2,5 | 1,30 | 0,02 | Fig. 2 | 1,19 | 0,01 | Fig. 2 | 1,09 | 0 | Fig. 2 |
| 3,0 | - | - | - | - | - | - | 0,98 | 0,05 | Fig. 2 |

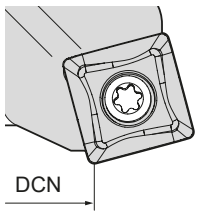
### WFXH 12000 Type

| Programmed Corner R | SOMT 12○○04-□ | | | SOMT 12○○08-□ | | | SOMT 12○○12-□ | | | SOMT 12○○16-□ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape | Uncut Portion | Overcut Portion | Shape |
| 2,0 | 2,58 | 0 | Fig. 1 | 2,48 | 0 | Fig. 1 | 2,37 | 0 | Fig. 1 | 2,25 | 0 | Fig. 1 |
| 2,5 | 2,47 | 0 | Fig. 1 | 2,37 | 0 | Fig. 1 | 2,25 | 0 | Fig. 1 | 2,14 | 0 | Fig. 1 |
| 3,0 | 2,36 | 0 | Fig. 1 | 2,26 | 0 | Fig. 1 | 2,14 | 0 | Fig. 1 | 2,11 | 0 | Fig. 1 |
| 3,5 | 2,24 | 0,01 | Fig. 2 | 2,14 | 0 | Fig. 1 | 2,03 | 0 | Fig. 1 | 1,91 | 0 | Fig. 1 |
| 4,0 | - | - | - | 2,03 | 0,04 | Fig. 2 | 1,91 | 0,03 | Fig. 2 | 1,8 | 0,01 | Fig. 2 |

## Minimum Cutting Diameter

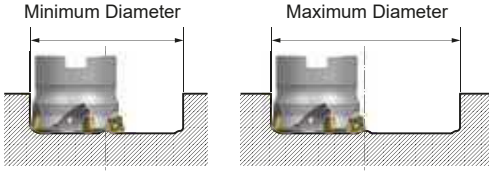
Minimum cutting diameter (DCN) will depend on the insert that is used. Using an insert with a large nose radius is recommended for the WFXH type.



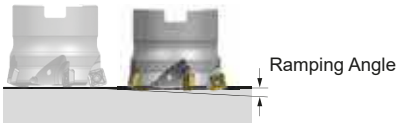




| Body Cat. No. | DC | DCN based on insert nose | | | |
|---|---|---|---|---|---|
| | | R0,4 | R0,8 | R1,2 | R1,6 |
| WFXH 08025 M | 25 | 9,69 | 9,48 | 9,27 | - |
| 08032 M | 32 | 16,6 | 16,4 | 16,2 | - |
| WFXH 12040 M | 40 | 15,8 | 15,5 | 15,3 | 15,1 |

## Taper Cutting and Helical Milling




Minimum and Maximum Diameters




Ramping Angle

| Insert Cat. No. | DC | Helical Millilng | | Taper Cutting |
|---|---|---|---|---|
| | | Min. | Max. | Max. Ramping Angle |
| SOMT 08○○04-□ | 25 | 35 | 49 | 1°30‘ |
| | 32 | 49 | 63 | 0°30‘ |
| SOMT 08○○08-□ | 25 | 35 | 48 | 3° |
| | 32 | 49 | 62 | 1°30‘ |
| SOMT 08○○12-□ | 25 | 34 | 47 | 4°30‘ |
| | 32 | 48 | 61 | 2°30‘ |
| SOMT 12○○04-□ | 40 | 56 | 79 | 1° |
| SOMT 12○○08-□ | 40 | 56 | 78 | 1°30‘ |
| SOMT 12○○12-□ | 40 | 55 | 77 | 2°30‘ |
| SOMT 12○○16-□ | 40 | 55 | 76 | 3°30‘ |





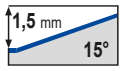
● = Euro stock
❍ = Japan stock

☞ G54

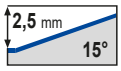
Recommended Tightening Torque (N·m)

## Modular Type

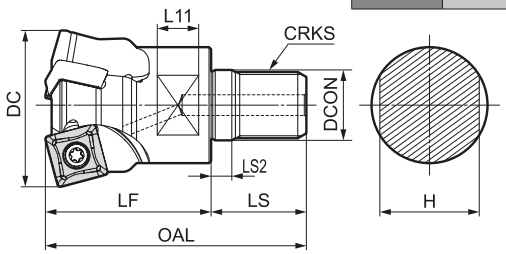
| Rake Angle | | |
|---|---|---|
| | Radial | -6° |
| | Axial | 6° |



(08000M Type)



(12000M Type)




## Head

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | | |
| WFXH08025M12Z2 | ❍ | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 | 0,1 |
| 08032M12Z3 | ❍ | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 | 0,2 |

Inserts are not included.

## Identification Details

| WFX | 08 | 020 | M10 | Z2 |
|---|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Screw Size | No. of Teeth |

## Head

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | | |
| WFXH12040M12Z3 | ❍ | 40 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 | 0,2 |

Inserts are not included.


## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | MS | | KN | | | |
| General Purpose | | PM | PM | K | | MS | MS | | N | | |
| Roughing | | PM | PM | | K | | MS | | N | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius (mm) RE | Fig. |
| SOMT 080304 PZER L | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 1 |
| SOMT 080304 PZER G | ❍ | ● | ● | ● | ❍ | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER G | ❍ | ● | ● | ● | ● | ❍ | ● | – | – | 0,8 | 1 |
| 080312 PZER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOMT 080308 PZER H | ❍ | ● | ● | ❍ | ● | ❍ | ❍ | – | – | 0,8 | 1 |
| 080312 PZER H | ❍ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOET 080304 PZER G | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 0,8 | 1 |
| 080312 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOET 080302 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,2 | 1 |
| 080304 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,4 | 1 |
| 080308 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 1 |
| SOMT 120408 PDER L | ● | ● | ● | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 2 |
| SOMT 120404 PDER G | ❍ | ❍ | ● | ❍ | ● | ❍ | ● | – | – | 0,4 | 2 |
| 120408 PDER G | ● | ● | ● | ● | ❍ | ● | ● | – | – | 0,8 | 2 |
| 120412 PDER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 1,2 | 2 |
| 120416 PDER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,6 | 2 |
| SOMT 120408 PDER H | ❍ | ● | ❍ | ● | ● | ❍ | ❍ | – | – | 0,8 | 2 |
| SOET 120408 PDFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 2 |

Fig. 1

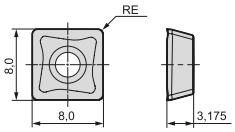
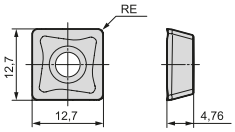



Fig. 2




## Spare Parts

| Applicable Cutter | Screw | | Insert Wrench |
|---|---|---|---|
| | | N·m | |
| WFXH08000M | BFTX0306IP | 2,0 | TRDR08IP |
| WFXH12000M | BFTX03512IP | 3,0 | TRDR15IP |

## Recommended Cutting Conditions

| ISO | Work Material | Grade | Cutting Speed (vc (m/min) | Insert Cat. No. | Ø 25 | | Ø 32 | | Ø 40 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ap (mm) | ft (mm/t) | ap (mm) | ft (mm/t) | ap (mm) | ft (mm/t) |
| P | General Steel <200HB | ACP200 | 100–**150**–200 | SOMT08 | 0,8 | 0,8 | 0,8 | 0,8 | - | - |
| | | | | SOMT12 | - | - | - | - | 1,0 | 1,0 |
| | Alloy Steel <HRC45 | ACP200 | 80–**130**–180 | SOMT08 | 0,7 | 0,8 | 0,7 | 0,8 | - | - |
| | | | | SOMT12 | - | - | - | - | 0,8 | 1,0 |
| M | Stainless Steel (X5CrNiS18 10, other) | ACM300 | 80–**120**–150 | SOMT08 | 0,8 | 0,7 | 0,8 | 0,7 | - | - |
| | | | | SOMT12 | - | - | - | - | 1,0 | 0,8 |
| K | Cast Iron FC, FCD | ACK300 | 100–**150**–200 | SOMT08 | 0,8 | 1,0 | 0,8 | 1,0 | - | - |
| | | | | SOMT12 | - | - | - | - | 1,0 | 1,2 |
| H | Hardened Steel <HRC50 | ACK300 | 40–**80**–100 | SOMT08 | 0,5 | 0,5 | 0,5 | 0,5 | - | - |
| | | | | SOMT12 | - | - | - | - | 0,6 | 0,8 |

The above recommended cutting conditions may require adjustment according to machine rigidity and work rigidity. The above figures are guidelines for use with the BT50 machine tool.
The above conditions assume a tool overhang length of L/D = 3 (i.e. overhang length is 3 times tool diameter) or less.
When tool overhang is more than L/D = 3 and less or equal L/D = 5, settings should be adjusted to approximately 70 % to 80 % of those indicated in the above cutting conditions (i.e. ap and ft).
When tool overhang is more than L/D = 5 and less or equal L/D = 8, settings should be adjusted to approximately 50 % to 60 % of those indicated in the above cutting conditions (i.e. ap and ft).

## General Features

The Sumi Dual Mill DFC type employs cost effective double-sided inserts for high toughness and enhanced accuracy.
The double-side inserts are flexible and reduces costs.

## Large Line-up

- Diameter from Ø 25 mm to Ø 200 mm
- Available as standard, fine and extra-fine pitch
- Bore diameter: metric
- Insert geometry: L, G, H

## Cutter Body

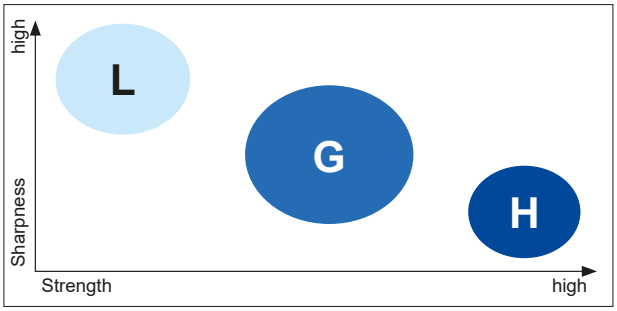
| Type | | Cat. No. | Diameter (mm) | No. of Teeth | Image |
|---|---|---|---|---|---|
| Shank ☞ G24 | Standard Pitch | DFC 09000 E | Ø 25 – Ø 80 | 2–5 |  |
| | Fine Pitch | DFCM 09000 E | Ø 32 – Ø 80 | 3–7 | |
| Shell | Standard Pitch | DFC 09000 RS | Ø 50 – Ø 200 | 4–8 |  |
| | Fine Pitch | DFCM 09000 RS | Ø 50 – Ø 200 | 5–12 | |
| | Extra-Fine Pitch | DFCF 09000 RS | Ø 50 – Ø 200 | 6–16 | |

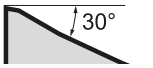
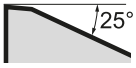
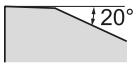
## New Insert Design Provides Excellent Machining Accuracy

### Inserts

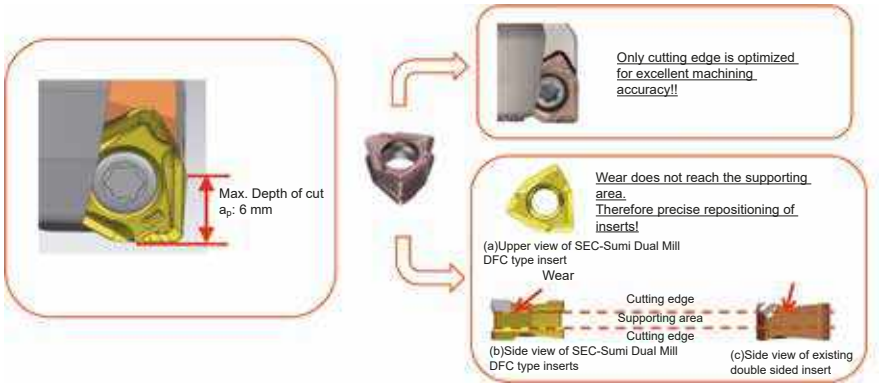
| Cat. No. | RE0,4 | RE0,8 | RE1,2 | RE1,6 |
|---|---|---|---|---|
| XNMU0606__PNER-L | ● | ● | ● | ● |
| XNMU0606__PNER-G | ● | ● | ● | ● |
| XNMU0606__PNER-H | ● | ● | ● | ● |

### Chipbreaker Selection Map




| Work Material | Steel, Cast Iron | | |
|---|---|---|---|
| | L type | G type | H type |
| Chipbreaker |  |  |  |
| Feature | Low cutting force | General purpose | Strong edge |
| Cutting edge geometry |  30° |  25° |  20° |
| Application | Light cut, low rigidity milling and reduced burrs | Main breaker for general purpose applications | Roughing, heavy interrupted and hardness steel milling |

## Stable and High Cutting Performance Combined with High Toughness







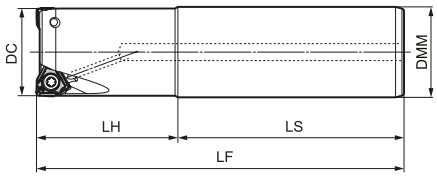

● = Euro stock
❑ = Delivery on request

Recommended Tightening Torque (N·m)

## Body – Shank Type

| Rake Angle | Radial | -9° |
|---|---|---|
| | Axial | -5° |

Max. $a_p$: 6 mm




## Body – Dimensions

### ● DFC type, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | |
| DFC 09025E | ● | 25 | 25 | 40 | 80 | 120 | 2 |
| DFC 09032E | ● | 32 | 32 | 50 | 80 | 130 | 2 |
| 09040E | ● | 40 | 32 | 50 | 80 | 130 | 3 |
| 09050E | ● | 50 | 32 | 50 | 80 | 130 | 3 |
| DFC 09050E-42 | | 50 | 42 | 50 | 100 | 150 | 3 |
| DFC 09063E | ❑ | 63 | 32 | 50 | 80 | 130 | 4 |
| DFC 09063E-42 | | 63 | 42 | 50 | 100 | 150 | 4 |
| DFC 09080E | ❑ | 80 | 32 | 50 | 80 | 130 | 5 |
| DFC 09080E-42 | | 80 | 42 | 50 | 100 | 150 | 5 |

### ● DFCM type, Medium Pitch

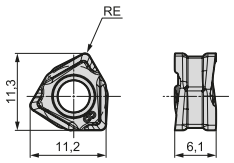
| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | |
| DFCM 09032E | ● | 32 | 32 | 50 | 80 | 130 | 3 |
| 09040E | ● | 40 | 32 | 50 | 80 | 130 | 4 |
| 09050E | ● | 50 | 32 | 50 | 80 | 130 | 5 |
| DFCM 09050E-42 | | 50 | 42 | 50 | 100 | 150 | 5 |
| DFCM 09063E | ❑ | 63 | 32 | 50 | 80 | 130 | 6 |
| DFCM 09063E-42 | | 63 | 42 | 50 | 100 | 150 | 6 |
| DFCM 09080E | ❑ | 80 | 32 | 50 | 80 | 130 | 7 |
| DFCM 09080E-42 | | 80 | 42 | 50 | 100 | 150 | 7 |

## Identification Details

| DFC | M | 09 | 050 | E |
|---|---|---|---|---|
| Cutter Series | M: Medium | Insert Size | Cutter Diameter | Shank Type |

## Inserts

| Application | Coated Carbide | | | | | | |
|---|---|---|---|---|---|---|---|
| High Speed / Light Cutting | PM | | | K | | MS | |
| General Purpose Cutting | | PM | PM | K | | MS | MS |
| Rough Cutting | | PM | PM | | K | | MS |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | Radius RE |
| XNMU 060604 PNER-L | | ● | ● | | ● | | ● | 0,4 |
| 060608 PNER-L | | ● | ● | | ● | | ● | 0,8 |
| XNMU 060604 PNER-G | ● | ● | ● | ● | ● | ● | ● | 0,4 |
| 060608 PNER-G | ● | ● | ● | ● | ● | ● | ● | 0,8 |
| 060612 PNER-G | ● | ● | ● | ● | ● | ● | ● | 1,2 |
| 060616 PNER-G | ● | ● | ● | ● | ● | ● | ● | 1,6 |
| XNMU 060608 PNER-H | ● | ● | ● | ● | ● | ● | ● | 0,8 |
| 060612 PNER-H | ● | ● | ● | ● | ● | ● | ● | 1,2 |
| 060616 PNER-H | ● | ● | ● | ● | ● | ● | ● | 1,6 |




## Spare Parts

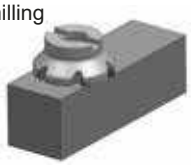
| Screw | Wrench |
|---|---|
| BFTX03512IP | TRDR15IP 5,0 N·m |

## Recommemded Cutting Conditions

| ISO | Work-material | Hardness (HB) | Cutting Speed (m/min) Min. - Optimum - Max. | Feed Rate Min. - Optimum - Max. | Depth of Cut (mm) | Grade |
|---|---|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,10–**0,20**–0,30 | < 6 | ACP200 ACP300 |
| P | Soft Steel | ≤ 180 | 180–**250**–350 | 0,15–**0,25**–0,35 | < 6 | ACP200 ACP300 |
| P | Die Steel | 200–220 | 100–**150**–200 | 0,10–**0,18**–0,25 | < 4 | ACP200 ACP300 |
| M | Stainless Steel | - | 160–**205**–250 | 0,12–**0,18**–0,25 | < 6 | ACM200 ACM300 |
| K | Cast Iron | 250 | 100–**175**–250 | 0,10–**0,20**–0,30 | < 6 | ACK200 ACK300 |

## Suitable Applications

Face milling



Shoulder milling

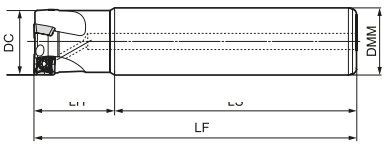
Shot milling

Side face milling

# "Sumi Wave" Shoulder Mill
# WFX (M) 08000 E Type

## Body - Shank Type

WFX08000E




### Body - WFX_E, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | |
| WFX 08020 E-16 | ● | 20 | 16 | 30 | 80 | 110 | 2 |
| WFX 08020 E | ● | 20 | 20 | 30 | 80 | 110 | 2 |
| 08022 E | ● | 22 | 20 | 30 | 90 | 120 | 2 |
| WFX 08025 E-20 | ● | 25 | 20 | 30 | 90 | 120 | 2 |
| WFX 08025 E | ● | 25 | 25 | 30 | 90 | 120 | 2 |
| 08028 E | ● | 28 | 25 | 30 | 90 | 120 | 2 |
| 08030 E | ● | 30 | 25 | 30 | 90 | 120 | 3 |
| WFX 08032 E | ● | 32 | 32 | 30 | 90 | 120 | 3 |
| 08033 E | ● | 33 | 32 | 30 | 90 | 120 | 3 |
| 08040 E | ● | 40 | 32 | 30 | 90 | 120 | 3 |
| 08050 E | ● | 50 | 32 | 30 | 90 | 120 | 4 |
| 08063 E | ● | 63 | 32 | 30 | 90 | 120 | 5 |

Inserts are not included.

### Body - WFXM_E, Medium Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | |
| WFXM 08025 E | ● | 25 | 25 | 30 | 90 | 120 | 3 |
| WFXM 08032 E | ● | 32 | 32 | 30 | 90 | 120 | 4 |
| 08040 E | ● | 40 | 32 | 30 | 90 | 120 | 4 |
| 08050 E | ● | 50 | 32 | 30 | 90 | 120 | 5 |
| 08063 E | ● | 63 | 32 | 30 | 90 | 120 | 6 |

Inserts are not included.

### Identification Details

| WFX | M | 08 | 025 | E |
|---|---|---|---|---|
| Cutter Series | M: Medium | Insert Size | Cutter Diameter | Endmill Type |

### Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed | Feed Rate | DOC | Grades |
|---|---|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,08–**0,12**–0,18 | <6 | ACP200 ACP300 |
| P | Soft Steel | ≤180 | 180–**250**–350 | 0,10–**0,15**–0,20 | <6 | ACP200 ACP300 |
| P | Die Steel | 200–220 | 100–**150**–200 | 0,08–**0,12**–0,18 | <4 | ACP200 ACP300 |
| M | Stainless Steel | - | 160–**200**–250 | 0,10–**0,15**–0,20 | <6 | ACM300 |
| K | Cast Iron | 250 | 100–**175**–250 | 0,10–**0,15**–0,20 | <6 | ACK200 ACK300 |
| N | Non Ferrous Metal | - | 300–**500**–1000 | 0,10–**0,15**–0,20 | <6 | H1 DL1000 |

Min. - **Optimum** - Max.

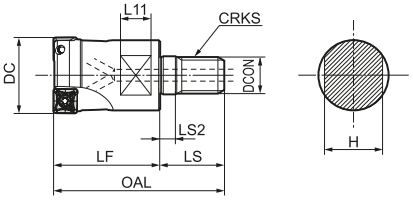
# "Sumi Wave" Shoulder Mill
# WFX 08000 M Type

## Modular Type

| Rake Angle | | |
|---|---|---|
| | Radial | -6° |
| | Axial | 12° |

6 mm, 90°

WFX08000M




### Head

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| WFX 08020 M10Z2 | ● | 20 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 2 |
| 08022 M10Z2 | ● | 22 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 2 |
| WFX 08025 M12Z2 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 |
| 08028 M10Z2 | ● | 28 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 |
| WFX 08030 M16Z3 | ● | 30 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |
| 08032 M16Z3 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |
| 08040 M16Z3 | ● | 40 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |

### Identification Details

| WFX | 08 | 020 | M10 | Z2 |
|---|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Screw Size | No. of Teeth |


### Inserts

Fig. 1

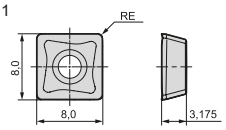
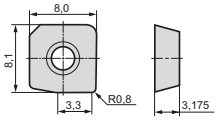



Fig. 2 Wiper Insert




| Application | Coated Carbide | | | | | | | Carbide | DLC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | | |
| General Purpose | | P M | P M | K | | M S | M S | | N | | |
| Roughing | | P M | P M | | K | | M S | | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE | Fig. |
| SOMT 080304 PZER L | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 1 |
| SOMT 080304 PZER G | ❍ | ● | ● | ● | ❍ | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER G | ❍ | ● | ● | ● | ● | ❍ | ● | – | – | 0,8 | 1 |
| 080312 PZER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOMT 080308 PZER H | ❍ | ● | ● | ❍ | ● | ❍ | ❍ | – | – | 0,8 | 1 |
| 080312 PZER H | ❍ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOET 080304 PZER G | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 0,8 | 1 |
| 080312 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOET 080302 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,2 | 1 |
| 080304 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,4 | 1 |
| 080308 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 1 |
| XOEW 080308 PZTR W | – | – | – | – | ❍ | – | – | – | – | – | 2 |

### Spare Parts

| Screw | | Wrench |
|---|---|---|
|  |  |  |
| BFTX0306IP | 2,0 | TRDR08IP |





● = Euro stock
❍ = Japan stock

☞ G30/G31

N·m Recommended Tightening Torque (N·m)

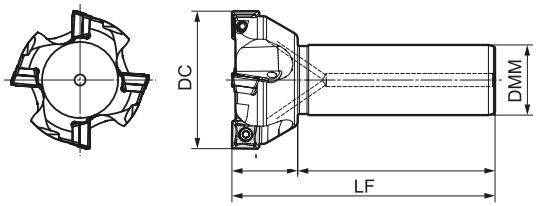
# "Sumi Wave" Shoulder Mill
# WFX (F) 12000 E Type

## Body - Shank Type

| Rake Angle | | |
|---|---|---|
| | Radial | -8° |
| | Axial | 8° |

10 mm, 90°

WFX12000E




## Body - WFX_E, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | |
| WFX 12040 E | ● | 40 | 32 | 30 | 90 | 120 | 3 |
| 12050 E | ● | 50 | 32 | 30 | 90 | 120 | 3 |
| 12063 E | ● | 63 | 32 | 30 | 90 | 120 | 4 |
| 12080 E | ● | 80 | 32 | 30 | 90 | 120 | 4 |

Inserts are not included.

## Body - WFXF_E, Fine Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | |
| WFXF 12050 E | ● | 50 | 32 | 30 | 90 | 120 | 4 |
| 12063 E | ● | 63 | 32 | 30 | 90 | 120 | 5 |
| 12080 E | ● | 80 | 32 | 30 | 90 | 120 | 6 |

Inserts are not included.

## Identification Details

| WFX | F | 12 | 050 | E |
|---|---|---|---|---|
| Cutter Series | F: Fine | Insert Size | Cutter Diameter | Endmill Type |

## Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed | Feed Rate | DOC | Grades |
|---|---|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,10–**0,15**–0,20 | <10 | ACP200 ACP300 |
| P | Soft Steel | ≤180 | 180–**250**–350 | 0,10–**0,15**–0,20 | <10 | ACP200 ACP300 |
| P | Die Steel | 200–220 | 100–**150**–200 | 0,10–**0,15**–0,20 | <6 | ACP200 ACP300 |
| M | Stainless Steel | - | 160–**200**–250 | 0,10–**0,15**–0,20 | <10 | ACM300 |
| K | Cast Iron | 250 | 100–**175**–250 | 0,10–**0,15**–0,20 | <10 | ACK200 ACK300 |
| N | Non Ferrous Metal | - | 300–**500**–1000 | 0,10–**0,15**–0,20 | <10 | H1 DL1000 |

Min. - **Optimum** - Max.

## Inserts

Fig. 1

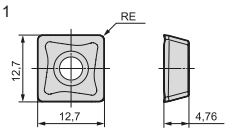
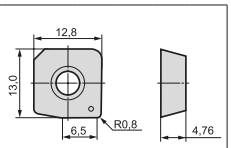


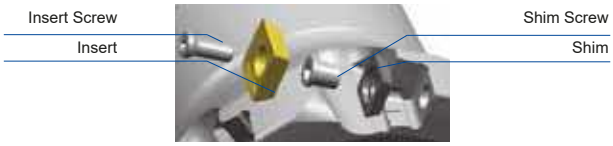

Fig. 2 Wiper Insert




| Application | Coated Carbide | | | | | | | Carbide | DLC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | | |
| General Purpose | | P M | P M | K | | M S | M S | | N | | |
| Roughing | | P M | P M | | K | | M S | | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE | Fig. |
| SOMT 120408 PDER L | ● | ● | ● | ○ | ○ | ○ | ● | – | – | 0,8 | 1 |
| SOMT 120404 PDER G | ○ | ○ | ● | ○ | ● | ○ | ● | – | – | 0,4 | 1 |
| 120408 PDER G | ● | ● | ● | ● | ○ | ● | ● | – | – | 0,8 | 1 |
| 120412 PDER G | ○ | ○ | ○ | ○ | ○ | ○ | ● | – | – | 1,2 | 1 |
| 120416 PDER G | ○ | ● | ○ | ○ | ○ | ○ | ○ | – | – | 1,6 | 1 |
| SOMT 120408 PDER H | ○ | ● | ○ | ● | ● | ○ | ○ | – | – | 0,8 | 1 |
| SOET 120408 PDFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 1 |
| XOEW 120408 PDTR W | – | – | – | – | ○ | – | – | – | – | – | 2 |

## Spare Parts

| Shim | Shim Screw | Insert Screw | | Insert Wrench | Seat Wrench |
|---|---|---|---|---|---|
|  |  |  | N·m |  |  |
| WFXS4R | BW0507F | BFTX03512IP | **3,0** | TRDR15IP | LH035 |



# TSX Type

## General Features

High-efficient and high precision tangential shoulder milling cutter with tangentially mounted carbide inserts.

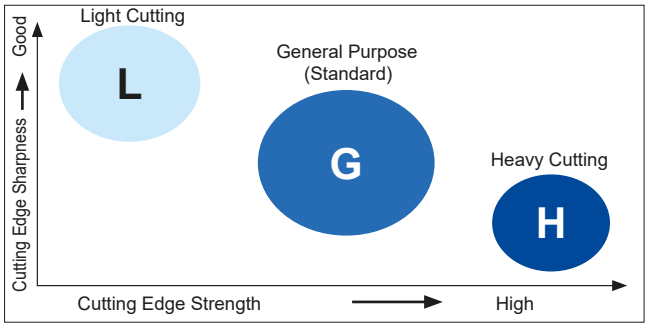
## Characteristics

- Tough & Sharp cutting edge
- Very accurate and excellent surface finish
- Wide product range

## Product Range

| Type | | Cat. No. | Diameter Range | No. of Teeth | Shape |
|---|---|---|---|---|---|
| Shank Type | Standard Pitch | TSX 08000 E | Ø16 – Ø40 | 2–4 |  |
| | Fine Pitch | TSXF 08000 E | Ø20 – Ø40 | 3–6 | |
| | Standard Pitch | TSX 13000 E | Ø25 – Ø50 | 2–4 | |
| | Medium Pitch | TSXM 13000 E | Ø32 – Ø50 | 3–6 | |
| Shell Type | Standard Pitch | TSX 08000 RS | Ø40 – Ø63 | 4–6 |  |
| | Fine Pitch | TSXF 08000 RS | Ø40 – Ø63 | 6–10 | |
| | Standard Pitch | TSX 13000 RS | Ø40 – Ø160 | 2–4 | |
| | Medium Pitch | TSXM 13000 RS | Ø40 – Ø160 | 3–6 | ☞ G32 |

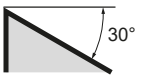
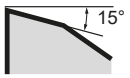
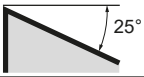
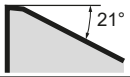
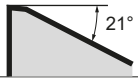
## Chipbreaker Selection




## Inserts

| Cat. No. | RE0,4 | RE0,8 | RE1,2 | RE1,6 | RE2,4 | RE3,2 |
|---|---|---|---|---|---|---|
| LNEX0804__PNER-L | ● | ● | | | | |
| LNEX0804__PNER-G | ● | ● | ● | ● | | |
| LNEX1306__PNER-L | ● | ● | | | | |
| LNEX1306__PNER-G | | ● | | ● | ● | ● |
| LNEX1306__PNER-H | ● | ● | | ● | ● | ● |

## Chipbreaker Lineup

| Work Material | P M K S | | |
|---|---|---|---|
| | L type | G type | H type |
| Chipbreaker |  |  |  |
| Feature | Low cutting force | General purpose | Strong edge |
| LNEX08 Cutting edge geometry |  30° |  15° | – |
| LNEX13 Cutting edge geometry |  25° |  21° |  21° |
| Application | Light cut, low rigidity milling and reduced burrs | Main breaker for general purpose applications | Roughing, heavy interrupted and hardness steel milling |

## Recommended Cutting Conditions

Min. - **Optimum** - Max.

| ISO | Work Material | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/t) | Grade |
|---|---|---|---|---|---|
| P | Carbon Steel | 180–280 | 150–**225**–300 | 0,08–**0,20**–0,30 | ACP100, ACP200, ACP300 |
| | | > 280 | 75–**150**–230 | 0,08–**0,20**–0,30 | |
| | Alloy Steel | 180–280 | 100–**175**–250 | 0,08–**0,15**–0,25 | |
| M | Stainless Steel | 220–280 | 90–**135**–180 | 0,08–**0,15**–0,25 | ACM200, ACM300 |
| | | > 280 | 75–**125**–170 | 0,08–**0,15**–0,25 | |
| K | Cast Iron, Ductile Cast Iron | 250 | 100–**175**– 250 | 0,08–**0,20**–0,30 | ACK200, ACK300 |
| S | Exotic Material | - | 30–**60**–90 | 0,05–**0,10**–0,15 | ACM200, ACM300 |





● = Euro stock

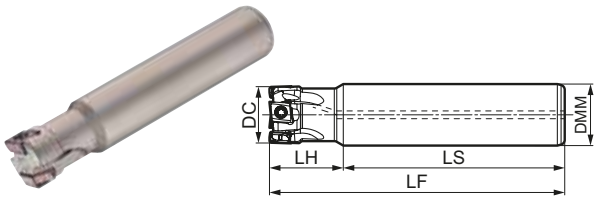
Recommended Tightening Torque (N·m)

# "Sumi Dual Mill" Series
# TSX(F) 08000 E Type

## Shank Type

| Rake Angle | Radial | -20° |
|---|---|---|
| | Axial | -6° |

8 mm 90°




## Body - TSX, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| TSX 08016 E | ● | 16 | 16 | 25 | 75 | 100 | 2 | 0,13 |
| 08020 E | ● | 20 | 20 | 30 | 80 | 110 | 2 | 0,22 |
| 08025 E | ● | 25 | 25 | 30 | 90 | 120 | 3 | 0,40 |
| 08032 E | ● | 32 | 32 | 30 | 90 | 120 | 3 | 0,67 |
| 08040 E | ● | 40 | 32 | 30 | 90 | 120 | 4 | 0,72 |

Inserts are not included.

## Body - TSXF, Fine Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| TSXF 08020 E | ● | 20 | 20 | 30 | 80 | 110 | 3 | 0,22 |
| 08025 E | ● | 25 | 25 | 30 | 90 | 120 | 4 | 0,40 |
| 08032 E | ● | 32 | 32 | 30 | 90 | 120 | 5 | 0,67 |
| 08040 E | ● | 40 | 32 | 30 | 90 | 120 | 6 | 0,73 |

Inserts are not included.

## Spare Parts

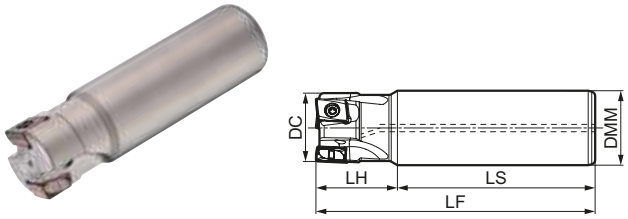
| Insert Screw | | Insert Wrench | Applicable Cutters |
|---|---|---|---|
| BFTX0306IP | 2,0 | TRDR08IP | TSX08016E, TSX08020E, TSXF08020E |
| BFTX0308IP | | | TSX08025E – 40E, TSXF08025E – 40E |
| BFTX03510IP | 3,0 | TRDR15IP | TSX13000E, TSXM13000E |

# "Sumi Dual Mill" Series
# TSX(M) 13000 E Type

## Shank Type

| Rake Angle | Radial | -15° |
|---|---|---|
| | Axial | -6° |

12 mm 90°




## Body - TSX, Standard Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| TSX 13025 E | ● | 25 | 25 | 35 | 85 | 120 | 2 | 0,38 |
| 13032 E | ● | 32 | 32 | 35 | 85 | 120 | 2 | 0,66 |
| 13040 E | ● | 40 | 32 | 30 | 90 | 120 | 3 | 0,71 |
| 13050 E | ● | 50 | 32 | 30 | 90 | 120 | 4 | 0,81 |

Inserts are not included.

## Body - TSXM, Medium Pitch

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| TSXM 13032 E | ● | 32 | 32 | 35 | 85 | 120 | 3 | 0,65 |
| 13040 E | ● | 40 | 32 | 30 | 90 | 120 | 4 | 0,71 |
| 13050 E | ● | 50 | 32 | 30 | 90 | 120 | 5 | 0,80 |

Inserts are not included.

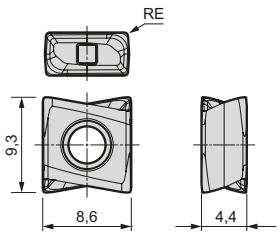
## Identification Details

| TSX | F | 08 | 032 | E |
|---|---|---|---|---|
| Cutter Series | F: Fine Pitch<br>M: Medium Pitch | Insert Size | Cutter Diameter | Endmill Type |

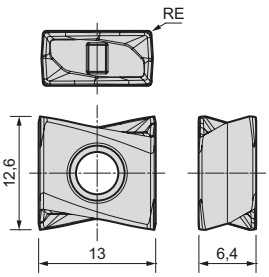
## Inserts

| Grade | | Coated Carbide | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Application | High Speed / Light Cutting | PM | | | K | | MS | |
| | General Purpose Cutting | PM | PM | | K | | MS | MS |
| | Rough Cutting | | PM | PM | | K | | MS |
| Applicable Cutters | Inserts Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 |
| | | | | | | | | Radius RE |
| TSX(F) 08000E | LNEX 080404 PNER-L | ● | ● | ● | ● | ● | ● | ● 0,4 |
| | 080408 PNER-L | ● | ● | ● | ● | ● | ● | ● 0,8 |
| | LNEX 080404 PNER-G | ● | ● | ● | ● | ● | ● | ● 0,4 |
| | 080408 PNER-G | ● | ● | ● | ● | ● | ● | ● 0,8 |
| | 080412 PNER-G | ● | ● | ● | ● | ● | ● | ● 1,2 |
| | 080416 PNER-G | ● | ● | ● | ● | ● | ● | ● 1,6 |
| TSX(M) 13000E | LNEX 130604 PNER-L | ● | ● | ● | ● | ● | ● | ● 0,4 |
| | 130608 PNER-L | ● | ● | ● | ● | ● | ● | ● 0,8 |
| | LNEX 130604 PNER-G | ● | ● | ● | ● | ● | ● | ● 0,4 |
| | 130608 PNER-G | ● | ● | ● | ● | ● | ● | ● 0,8 |
| | 130616 PNER-G | ● | ● | ● | ● | ● | ● | ● 1,6 |
| | 130624 PNER-G | ● | ● | ● | ● | ● | ● | ● 2,4 |
| | 130632 PNER-G | ● | ● | ● | ● | ● | ● | ● 3,2 |
| | LNEX 130608 PNER-H | ● | ● | ● | ● | ● | | 0,8 |
| | 130616 PNER-H | | ● | ● | ● | ● | | 1,6 |
| | 130624 PNER-H | | ● | ● | ● | ● | | 2,4 |
| | 130632 PNER-H | | ● | ● | ● | ● | | 3,2 |

LNEX 08000 type




LNEX 13000 type




## Recommended Cutting Conditions

☞ H18

# "Wave Mill" Series
# WEZ Type

New

## General Features

- Supports various machining operations
- Excellent machining quality
- Excellent sharpness with low resistance
- General-purpose grade applicable to any work material

## Product Range

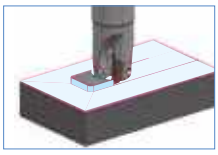
| Type | Cat. No. | Diameter Range (mm) / No of Teeth | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ø14 | Ø16 | Ø18 | Ø20 | Ø22 | Ø25 | Ø28 | Ø30 | Ø32 | Ø35 | Ø40 | Ø50 | Ø63 | Ø80 | Ø100 | Ø125 | Ø160 |
| Shell | WEZ 11000RS ☞ G44 | | | | | | | | | | | 4, 6 | 5,7 | 6, 8 | 7, 10 | 9, 12 | | |
| | WEZ 11000R (Inch) ☞ G44 | | | | | | | | | | | | | | 7, 10 | 9, 12 | | |
| | WEZ 17000RS ☞ G46 | | | | | | | | | | | 3, 4 | 3, 5 | 4, 6 | 4, 7 | 5, 8 | 6, 9, 11 | 8, 10 12 |
| | WEZ 17000R (Inch) ☞ G46 | | | | | | | | | | | | | | 4, 7 | 5, 8 | 6, 9, 11 | 8, 10 12 |
| Shank | WEZ 11000E | 1 | 2* | 2 | 2*, 3* | 3 | 2, 3*, 4* | 4 | 4 | 2, 3, 4, 5* | 5 | 2, 4, 6 | 5, 7 | 8 | 10 | | | |
| | WEZ 11000EL | 1 | 2* | 2 | 2* | 2 | 2*, 3 | 2 | 2 | 2*, 3 | 2, 3 | 2 | 3 | | | | | |
| | WEZ 17000E | | | | | | 2* | 2 | 3 | 2, 3* | 3 | 3, 4 | 3*, 5* | 4*, 6* | 7 | | | |
| | WEZ 17000EL | | | | | | 2 | 2 | 2 | 2*, 3 | 2 | 2, 3, 4 | 3*, 5* | 4*, 6* | | | | |

* Different shank diameters in stock

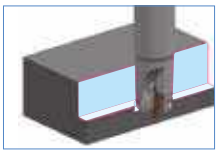
## Suitable Applications

- Supports Ramping, Helical Milling, Plunge Cutting

Face milling



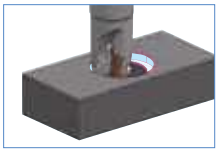
Shoulder milling



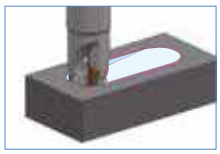
Side face milling

Groove milling

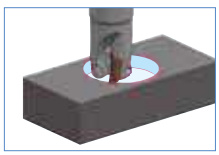
Hole expansion milling



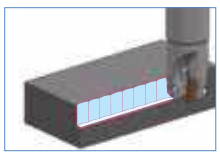
Ramping



Helical milling

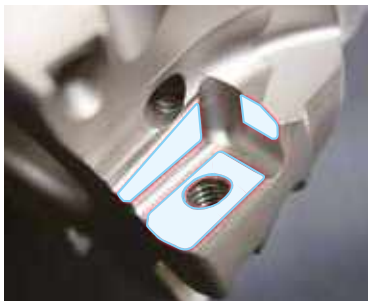


Plunge cutting



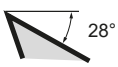
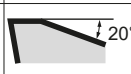
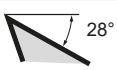
## Optimised Body Design

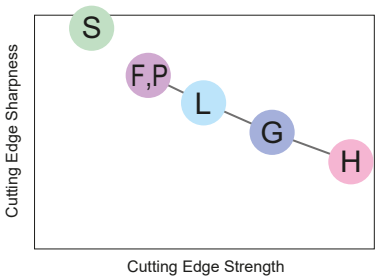
Wide guide face for stable insert clamping.



WEZ11 type

## Chipbreaker Lineup

| Work Material | P M K S H | | | | | N |
|---|---|---|---|---|---|---|
| Chipbreaker | L Type | G Type | H Type | F Type | P Type | S Type |
| |  |  |  |  |  |  |
| **AO_T11** Cutting edge geometry | |  28° |  20° |  28° |  28° |  28° |
| **AO_T17** Cutting edge geometry |  28° |  20° |  10° |  28° |  28° |  28° |
| Applications | Light cut, low rigidity machining | Main breaker for general purpose to interrupted machining | Heavy cut, heavy interrup-ted machining, hardened steel | Light cut, finishing, low-burr design | Light cut, high-precision machining, high surface wall quality | For non-ferrous metals |








● = Euro stock
❍ = Japan stock

## Product Range Inserts

Main Grade: ACU2500

| Cat. No. | Nose Radius (mm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R0,2 | R0,4 | R0,8 | R1,2 | R1,6 | R2,0 | R2,4 | R3,0 | R3,2 | R4,0 | R5,0 | R6,4 |
| AOMT 11T3_ _PEER-G | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| AOMT 11T3_ _PEER-H | | ● | ● | ● | ● | | | | | | | |
| AOET 11T3_ _PEER-F | ❍ | ● | ● | ❍ | | | | | | | | |
| AOET 11T3_ _PEER-P16 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 11T3_ _PEER-P20 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 11T3_ _PEER-P25 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 11T3_ _PEFR-S | ❍ | ● | ● | ❍ | | | | | | | | |
| AOMT 1705_ _PEER-L | ● | ● | ● | ● | ● | | | | | | | |
| AOMT 1705_ _PEER-G | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| AOMT 1705_ _PEER-H | | ● | ● | ❍ | ● | | | | | | | |
| AOET 1705_ _PEER-F | ❍ | ● | ● | ❍ | | | | | | | | |
| AOET 1705_ _PEER-P25 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 1705_ _PEER-P32 | ❍ | ❍ | ❍ | ❍ | | | | | | | | |
| AOET 1705_ _PEFR-S | ❍ | ● | ● | ❍ | | | | | | | | |

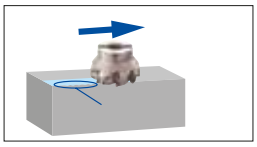
## Lineup of Chipbreakers for Ground Inserts

### F Type

Cutting edge specialized for sharpness and machining accuracy

Sharpness from ground finish enables burr control.

Excellent squareness with all diameters.



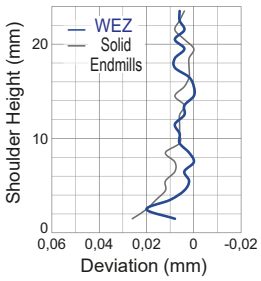
| | |
|---|---|
| Machine: | Vertical Machining Centre BT50, |
| Work Material | X5CrNiS18 9 |
| Tool: | WEZ 11050 RS07 (Ø 50, 7 teeth) |
| Insert: | AOET11T308PEER-F (ACU2500) |
| Cutting Conditions: | $v_c$ = 120 m/min, $f_z$ = 0,12 mm/t, $a_p$ = 1 mm, $a_e$ = 30 mm, dry |

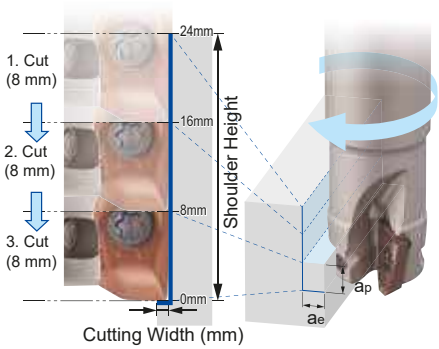
### P Type

Chipbreaker for wall surface squareness equivalent to solid endmills

Premium item with cutting edge shape optimised for each cutter diameter while maintaining the F type chipbreaker's sharpness.

Enables wall surface squareness equal to solid endmills through a blade shape optimised for each tool diameter.




P Type Chipbreaker Selection

| Cat. No. | Cutter Diameter (mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ø14 | Ø16 | Ø18 | Ø20 | Ø22 | Ø25 | Ø28 | Ø30 | Ø32 | Ø35 | => Ø40 |
| AOET11T3_ _PEER-P_ _ | -P16 | | -P20 | | – | -P25 | | – | | | |
| AOET1705_ _PEER-P_ _ | – | | | | | -P25 | | -P32 | | | – |

| | |
|---|---|
| Machine: | Vertical Machining Centre BT50, |
| Work Material: | C50 |
| Tool: | WEZ 11020 E03 (Ø 20, 3 teeth) |
| Insert: | AOET11T308PEER-P20 (ACU2500) |
| Cutting Conditions: | $v_c$ = 150 m/min, $f_z$ = 0,1 mm/t, $a_p$ = 8 mm x 3 passes, $a_e$ = 1 mm, dry |

### S Type

Sharp edge chipbreaker for non-ferrous metals, with excellent adhesion resistance

Suppresses adhesion with rake face lapping.

DLC coat inserts available for further improved adhesion resistance.

WEZ

No Adhesion

Competitor A

Adhesion

Competitor B

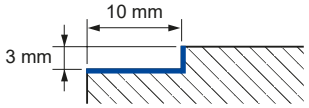
Adhesion

| | |
|---|---|
| Machine: | Vertical Machining Centre BT50, |
| Work Material: | AlSi12Cu |
| Tool: | WEZ 11020 E03 (Ø 20, 3 teeth) |
| Insert: | AOET11T308PEER-S (H20) |
| Cutting Conditions: | $v_c$ = 350 m/min, $f_z$ = 0,1 mm/t, $a_p$ = 3 mm, $a_e$ = 10 mm, dry |

## Recommended Cutting Conditions

### WEZ11 Type

Cutter: WEZ 11020 E03
Insert: AO_T11T3 type
Cutting Data: $a_p$ = 3 mm, $a_e$ = 10 mm, dry



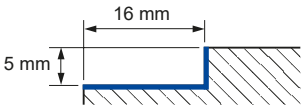

Min. - **Optimum** - Max.

| ISO | Material | HB | Chipbreaker | Grade | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ACU2500 | ACP2000 | ACP3000 | T2500A | ACK2000 | ACK3000 | ACM200 | ACM300 | DL2000 |
| | | | | Feed Rate (mm/tooth) | | | | | | | | |
| | | | | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,18 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,08–**0,15**–0,20 | 0,05–**0,10**–0,15 |
| | | | | Cutting Speed $v_c$ (m/min) | | | | | | | | |
| P | Unalloyed steel, <0, 15%C, annealed | 125 | G | 270–**320**–370 | 300–**350**–400 | 250–**300**–350 | 230–**280**–330 | | | | | |
| | " , <0, 45%C, annealed | 190 | G | 170–**220**–270 | 200–**250**–300 | 150–**200**–250 | 130–**180**–230 | | | | | |
| | " , <0, 45%C, tempered | 250 | G | 140–**180**–220 | 160–**200**–245 | 120–**160**–200 | 105–**145**–185 | | | | | |
| | " , <0, 75%C, annealed | 270 | G | 110–**145**–175 | 130–**165**–195 | 100–**130**–165 | 85–**115**–150 | | | | | |
| | " , <0, 75%C, tempered | 300 | G | 70–**90**–110 | 80–**100**–120 | 60–**80**–100 | 50–**70**–90 | | | | | |
| | Low alloyed steel, annealed | 180 | G | 160–**205**–255 | 190–**235**–280 | 140–**190**–235 | 120–**170**–215 | | | | | |
| | " , tempered | 275 | G | 90–**120**–150 | 110–**135**–165 | 80–**110**–140 | 70–**100**–125 | | | | | |
| | " , tempered | 300 | G | 85–**110**–130 | 100–**125**–150 | 75–**100**–125 | 65–**90**–115 | | | | | |
| | " , tempered | 350 | G | 60–**80**–100 | 70–**90**–110 | 50–**70**–90 | 45–**65**–85 | | | | | |
| | High alloyed and tool steel, annealed | 200 | G | 140–**180**–220 | 160–**200**–245 | 120–**160**–205 | | | | | | |
| | " , tempered | 325 | G | 55–**70**–85 | 60–**80**–100 | 50–**65**–80 | | | | | | |
| M | Stainless steel, ferritic/martensitic, annealed | 200 | G | 110–**140**–170 | | | | | | 140–**170**–190 | 90–**110**–140 | |
| | " , martensitic, tempered | 240 | G | 100–**125**–150 | | | | | | 125–**150**–170 | 80–**100**–125 | |
| | " , austenitic, plunged | 180 | G | 120–**150**–180 | | | | | | 150–**180**–200 | 100–**120**–150 | |
| K | Grey cast iron | | G | 150–**200**–250 | | | | 250–**300**–350 | 170–**220**–270 | | | |
| | Nodular cast iron | | G | 90–**120**–150 | | | | 150–**180**–210 | 100–**130**–160 | | | |
| S | High tempered resist. alloys, Fe based, annealed | | G | 30–**40**–55 | | | | | | 35–**45**–60 | 25–**35**–50 | |
| | " , hardened | | G | 60–**80**–100 | | | | | | 70–**90**–110 | 50–**70**–90 | |
| N | Aluminium alloy, Si < 12,6% | | S | | | | | | | | | 500–**750**–100 |
| | " , Si > 12,6% | | S | | | | | | | | | 170–**200**–250 |
| | Copper alloy | | S | | | | | | | | | 300–**330**–350 |

The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine, work shape and clamping. They will need to be adjusted according to machine rigidity, work clamp rigidity, cutting depth and other factors.
For groove milling, reduce the feed rate approximately 70 % of the corresponding value shown above.

### WEZ17 Type

Cutter: WEZ 17032 E03
Insert: AO_T1705 type
Cutting Data: $a_p$ = 5 mm, $a_e$ = 16 mm, dry



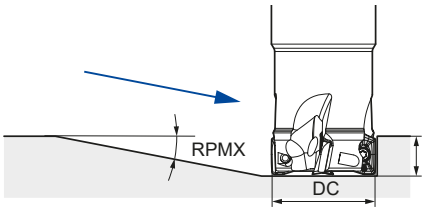

Min. - **Optimum** - Max.

| ISO | Material | | Chipbreaker | Grade | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ACU2500 | ACP2000 | ACP3000 | T2500A | ACK2000 | ACK3000 | ACM200 | ACM300 | DL2000 |
| | | | | Feed Rate (mm/tooth) | | | | | | | | |
| | | | | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,10–**0,15**–0,22 | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,10–**0,20**–0,28 | 0,05–**0,10**–0,15 |
| | | | | Cutting Speed $v_c$ (m/min) | | | | | | | | |
| P | Unalloyed steel, <0, 15%C, annealed | 125 | G | 285–**335**–390 | 315–**360**–420 | 265–**315**–370 | 240–**295**–345 | | | | | |
| | " , <0, 45%C, annealed | 190 | G | 180–**230**–285 | 210–**265**–315 | 160–**210**–265 | 135–**190**–240 | | | | | |
| | " , <0, 45%C, tempered | 250 | G | 145–**190**–230 | 170–**210**–255 | 130–**170**–215 | 110–**155**–195 | | | | | |
| | " , <0, 75%C, annealed | 270 | G | 115–**150**–185 | 135–**170**–205 | 100–**135**–170 | 90–**125**–155 | | | | | |
| | " , <0, 75%C, tempered | 300 | G | 70–**90**–115 | 85–**105**–125 | 65–**85**–105 | 55–**75**–95 | | | | | |
| | Low alloyed steel, annealed | 180 | G | 170–**220**–265 | 200–**245**–295 | 150–**200**–250 | 130–**180**–225 | | | | | |
| | " , tempered | 275 | G | 100–**130**–155 | 115–**145**–175 | 85–**115**–145 | 75–**105**–135 | | | | | |
| | " , tempered | 300 | G | 90–**115**–140 | 105–**130**–155 | 75–**105**–130 | 65–**90**–120 | | | | | |
| | " , tempered | 350 | G | 65–**85**–100 | 75–**95**–115 | 55–**75**–95 | 50–**70**–85 | | | | | |
| | High alloyed and tool steel, annealed | 200 | G | 145–**185**–230 | 170–**215**–255 | 130–**170**–215 | | | | | | |
| | " , tempered | 325 | G | 55–**75**–90 | 65–**85**–100 | 50–**65**–85 | | | | | | |
| M | Stainless steel, ferritic/martensitic, annealed | 200 | G | 115–**145**–175 | | | | | | 145–**175**–195 | 100–**115**–145 | |
| | " , martensitic, tempered | 240 | G | 105–**130**–155 | | | | | | 130–**155**–175 | 85–**105**–130 | |
| | " , austenitic, plunged | 180 | G | 125–**155**–190 | | | | | | 160–**190**–210 | 105–**125**–160 | |
| K | Grey cast iron | | G | 160–**210**–265 | | | | 265–**315**–370 | 180–**230**–285 | | | |
| | Nodular cast iron | | G | 95–**125**–160 | | | | 160–**190**–220 | 105–**140**–170 | | | |
| S | High tempered resist. alloys, Fe based, annealed | | G | 30–**40**–60 | | | | | | 35–**45**–60 | 25–**35**–50 | |
| | " , hardened | | G | 60–**85**–105 | | | | | | 75–**95**–115 | 50–**75**–95 | |
| N | Aluminium alloy, Si < 12,6% | | S | | | | | | | | | 500–**750**–100 |
| | " , Si > 12,6% | | S | | | | | | | | | 170–**200**–250 |
| | Copper alloy | | S | | | | | | | | | 300–**330**–350 |

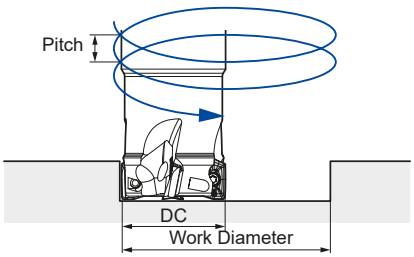
The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine, work shape and clamping. They will need to be adjusted according to machine rigidity, work clamp rigidity, cutting depth and other factors.
For groove milling, reduce the feed rate approximately 70 % of the corresponding value shown above.

## ■ Ramping / Helical Milling Upper Limits

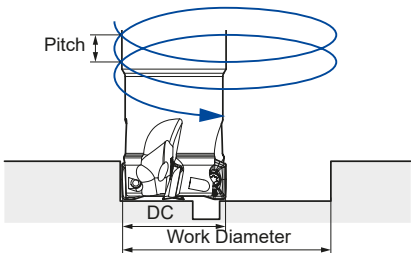
Ramping




Flat Bottom Machining




Machining with Prepared Hole




### ● WEZ11 Type

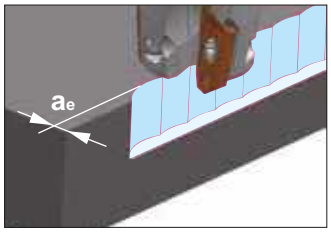
| DC Ø (mm) | Max.Ramping Angle | Flat Bottom Machining | | | | Machining with Prepared Hole | |
|---|---|---|---|---|---|---|---|
| | RPMX (°) | Max. Machining Diam. (mm) | Max. Pitch (mm/rev) | Min. Machining Diam. (mm) | Max. Pitch (mm/rev) | Min. Machining Diam. (mm) | Max. Pitch (mm/rev) |
| 14 | 13,2 | 25,3 | 8,4 | 23,1 | 5,9 | 19,0 | 1,9 |
| 16 | 10,5 | 29,3 | 7,6 | 27,0 | 5,6 | 21,7 | 1,5 |
| 18 | 8,1 | 33,3 | 6,7 | 30,9 | 5,0 | 25,2 | 1,4 |
| 20 | 6,5 | 37,3 | 6,0 | 34,9 | 4,6 | 29,1 | 1,3 |
| 22 | 5,3 | 41,3 | 5,4 | 38,8 | 4,3 | 32,9 | 1,3 |
| 25 | 4,1 | 47,3 | 4,8 | 44,8 | 3,9 | 38,9 | 1,3 |
| 28 | 3,4 | 53,3 | 4,4 | 50,7 | 3,6 | 44,9 | 1,3 |
| 30 | 3,0 | 57,3 | 4,2 | 54,7 | 3,5 | 48,8 | 1,3 |
| 32 | 2,7 | 61,3 | 4,0 | 58,7 | 3,3 | 52,8 | 1,2 |
| 35 | 2,3 | 67,3 | 3,8 | 64,6 | 3,1 | 58,8 | 1,2 |
| 40 | 1,8 | 77,3 | 3,4 | 74,6 | 2,9 | 68,8 | 1,2 |
| 50 | 1,2 | 97,3 | 3,0 | 94,6 | 2,6 | 88,8 | 1,1 |
| 63 | 0,8 | 123,3 | 2,8 | 120,5 | 2,5 | 114,7 | 1,1 |

### ● WEZ17 Type

| DC Ø (mm) | Max.Ramping Angle | Flat Bottom Machining | | | | Machining with Prepared Hole | |
|---|---|---|---|---|---|---|---|
| | RPMX (°) | Max. Machining Diam. (mm) | Max. Pitch (mm/rev) | Min. Machining Diam. (mm) | Max. Pitch (mm/rev) | Min. Machining Diam. (mm) | Max. Pitch (mm/rev) |
| 25 | 10,8 | 47,3 | 13,0 | 41,0 | 8,3 | 33,1 | 1,8 |
| 28 | 8,1 | 53,3 | 11,1 | 46,9 | 7,5 | 39,0 | 1,8 |
| 30 | 7,0 | 57,3 | 10,2 | 50,9 | 7,0 | 43,0 | 1,8 |
| 32 | 6,1 | 61,3 | 9,5 | 54,9 | 6,7 | 47,0 | 1,7 |
| 35 | 5,1 | 67,3 | 8,7 | 60,8 | 6,2 | 53,0 | 1,7 |
| 40 | 4,0 | 77,3 | 7,7 | 70,8 | 5,7 | 63,0 | 1,7 |
| 50 | 2,5 | 97,3 | 6,5 | 90,7 | 5,0 | 83,0 | 1,6 |
| 63 | 1,8 | 123,3 | 5,6 | 116,7 | 4,5 | 109,0 | 1,6 |

* The table above shows values with nose radius 0,8 mm

## ■ Plunge Cutting - Upper Limit for Radial Width $a_e$




| Type | Max. $a_e$ (mm) |
|---|---|
| WEZ11 | 3 |
| WEZ17 | 5 |

# "Wave Mill" Series
# WEZ 11000 E

New

| Rake Angle | | |
|---|---|---|
| | Radial | -7° – -18° |
| | Axial | 6° – 15° |

10 mm 90°

Fig. 1

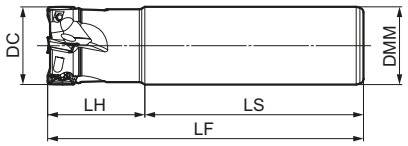
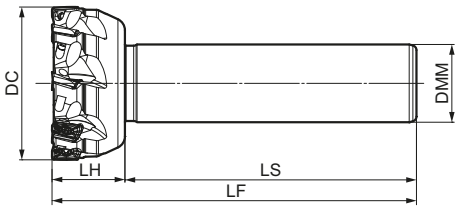



Fig. 2




## Body - WEZ (Shank Type)

Dimensions (mm)

| Cat. No. | Stock | DC | DMM | LH | LS | LF | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|
| WEZ 11014E01 | ● | 14 | 16 | 25 | 55 | 80 | 1 | 0,10 | 1 |
| 11016E02 | ● | 16 | 16 | 25 | 75 | 100 | 2 | 0,13 | 1 |
| 11016E02-12 | ● | 16 | 12 | 25 | 75 | 100 | 2 | 0,07 | 2 |
| 11018E02 | ● | 18 | 16 | 25 | 75 | 100 | 2 | 0,13 | 2 |
| 11020E02 | ● | 20 | 20 | 30 | 80 | 110 | 2 | 0,23 | 1 |
| 11020E02-16 | ● | 20 | 16 | 30 | 80 | 110 | 2 | 0,15 | 2 |
| 11020E03 | ● | 20 | 20 | 30 | 80 | 110 | 3 | 0,22 | 1 |
| 11020E03-16 | ● | 20 | 16 | 30 | 80 | 110 | 3 | 0,14 | 2 |
| 11022E03 | ● | 22 | 20 | 30 | 80 | 110 | 3 | 0,23 | 1 |
| 11025E02 | ● | 25 | 25 | 35 | 85 | 120 | 2 | 0,40 | 1 |
| 11025E03 | ● | 25 | 25 | 35 | 85 | 120 | 3 | 0,40 | 1 |
| 11025E03-20 | ● | 25 | 20 | 35 | 85 | 120 | 3 | 0,26 | 2 |
| 11025E04 | ● | 25 | 25 | 35 | 85 | 120 | 4 | 0,39 | 2 |
| 11025E04-20 | ● | 25 | 20 | 35 | 85 | 120 | 4 | 0,26 | 2 |
| 11028E04 | ● | 28 | 25 | 35 | 85 | 120 | 4 | 0,41 | 1 |
| 11030E04 | ● | 30 | 25 | 40 | 90 | 130 | 4 | 0,46 | 1 |
| 11032E02 | ● | 32 | 32 | 40 | 90 | 130 | 2 | 0,74 | 1 |
| 11032E03 | ● | 32 | 32 | 40 | 90 | 130 | 3 | 0,73 | 1 |
| 11032E04 | ● | 32 | 32 | 40 | 90 | 130 | 4 | 0,73 | 2 |
| 11032E05 | ● | 32 | 32 | 40 | 90 | 130 | 5 | 0,72 | 2 |
| 11032E05-25 | ● | 32 | 25 | 40 | 90 | 130 | 5 | 0,46 | 2 |
| 11035E05 | ● | 35 | 32 | 40 | 90 | 130 | 5 | 0,75 | 2 |
| 11040E02 | ● | 40 | 32 | 30 | 120 | 150 | 2 | 0,96 | 2 |
| 11040E04 | ● | 40 | 32 | 30 | 120 | 150 | 4 | 0,94 | 2 |
| 11040E06 | ● | 40 | 32 | 30 | 120 | 150 | 6 | 0,93 | 2 |
| 11050E05 | ● | 50 | 32 | 30 | 120 | 150 | 5 | 1,04 | 2 |
| 11050E07 | ● | 50 | 32 | 30 | 120 | 150 | 7 | 1,04 | 2 |
| 11063E08 | ● | 63 | 32 | 30 | 120 | 150 | 8 | 1,24 | 2 |
| 11080E10 | ● | 80 | 32 | 30 | 120 | 150 | 10 | 1,52 | 2 |

Inserts are sold separately.

## Spare Parts

| Applicable Cutters | Insert Screw | | Wrench |
|---|---|---|---|
| | | N·m | |
| WEZ 11014E01<br>11016E02(-12)<br>11018E02 | BFTX0305IP | 2,0 | TRDR08IP |
| 11020E02(-16)<br>11020E03(-16)<br>11022E03<br>11025E02<br>11025E03(-20)<br>11025E04(-20)<br>11028E04<br>11030E04<br>11032E02<br>11032E03<br>11032E04<br>11032E05(-25)<br>11035E05<br>11040E02<br>11040E04<br>11040E06<br>11050E05<br>11050E07<br>11063E08<br>11080E10 | BFTX0306IP | 1,5 | |

## Identification Details

| WEZ | 11 | 025 | E | 02 | - | 22 |
|---|---|---|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Round Shank | Number of Teeth | | Shank Diameter |

## Recommended Cutting Conditions

☞ H22

Indexable Endmills

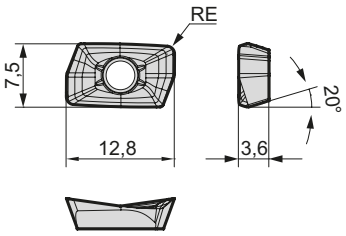


● = Euro stock
❍ = Japan stock

N·m Recommended Tightening Torque (N·m)

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light Cut | | P | | K | | M S | | | N | P | |
| General Purpose | K P M S | | P | | K | M S | M S | N | N | | |
| Roughing | K P M S | | P | | K | | M S | | | | |
| Cat. No. | ACU2500 | ACP2000 | ACP3000 | ACK2000 | ACK3000 | ACM200 | ACM300 | H20 | DL2000 | T2500A | RE (mm) |
| AOMT 11T302PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,2 |
| 11T304PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,4 |
| 11T308PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,8 |
| 11T312PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,2 |
| 11T316PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,6 |
| 11T320PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,0 |
| 11T324PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,4 |
| 11T330PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,0 |
| 11T332PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,2 |
| AOMT 11T304PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,4 |
| 11T308PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,8 |
| 11T312PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,2 |
| 11T316PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,6 |
| AOET 11T302PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 11T302PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 11T302PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 11T302PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 11T302PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 0,2 |
| 11T304PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,4 |
| 11T308PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,8 |
| 11T312PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 1,2 |




L: Low cutting force
G: General purpose
H: Strong edge
F: Finishing
P: High-precision machining
S: Non ferrous metals

*P16 is applicable to cutter diameters Ø 14 mm and Ø 16 mm.
*P20 is applicable to cutter diameters Ø 18 mm, Ø 20 mm.
*P25 is applicable to cutter diameters Ø 25 mm, Ø 28 mm.

– = Not available

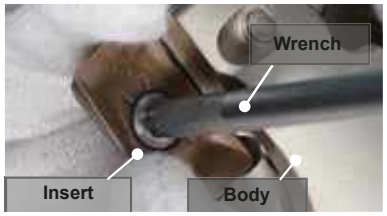
### Precautions for Mounting

(1) Clean the mounting seat and contact parts.

(2) Apply screw lubrication to the screw thread as well as the screw head face to prevent seizure.

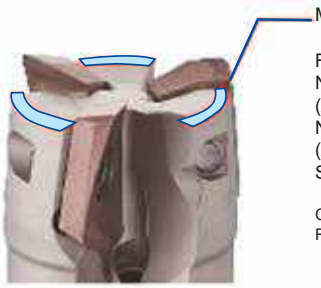
(3) While pressing the insert solidly against the seat surface, tighten at the screws with the included wrench.

(4) After tightening, check that there are no gaps between the surfaces.





*When mounting inserts with nose radius of ≥ 3,0 mm, modification of the body is required.




Reworking guidelines
Nose radius = 3,0 mm: C = 1 mm (AOMT11T330PEER)
Nose radius = 3,2 mm: C = 1 mm (AOMT11T332PEER)
Standard: R = 1 mm

C: Chamfer
R: Radius

# WEZ 11000 EL

New

| Rake Angle | | |
|---|---|---|
| | Radial | -7° – -18° |
| | Axial | 6° – 15° |

10 mm 90°

Fig. 1

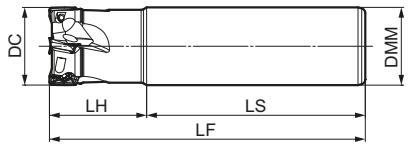
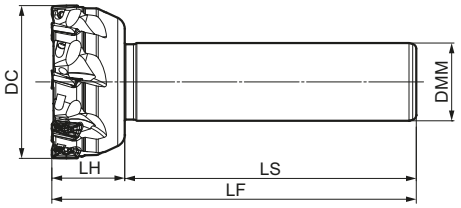



Fig. 2




## Body - WEZ (Long Type)

Dimensions (mm)

| Cat. No. | Stock | DC | DMM | LH | LS | LF | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|
| WEZ 11014EL01 | ● | 14 | 16 | 25 | 95 | 120 | 1 | 0,16 | 1 |
| 11016EL02 | ● | 16 | 16 | 25 | 120 | 145 | 2 | 0,19 | 1 |
| 11016EL02-14 | ● | 16 | 14 | 25 | 120 | 145 | 2 | 0,15 | 2 |
| 11018EL02 | ● | 18 | 16 | 25 | 120 | 145 | 2 | 0,20 | 2 |
| 11020EL02 | ● | 20 | 20 | 40 | 110 | 150 | 2 | 0,31 | 1 |
| 11020EL02-18 | ● | 20 | 18 | 25 | 125 | 150 | 2 | 0,26 | 2 |
| 11022EL02 | ● | 22 | 20 | 30 | 120 | 150 | 2 | 0,32 | 2 |
| 11025EL02 | ● | 25 | 25 | 50 | 120 | 170 | 2 | 0,57 | 1 |
| 11025EL02-22 | ● | 25 | 22 | 30 | 140 | 170 | 2 | 0,46 | 2 |
| 11025EL03 | ● | 25 | 25 | 50 | 120 | 170 | 3 | 0,57 | 1 |
| 11028EL02 | ● | 28 | 25 | 30 | 140 | 170 | 2 | 0,60 | 2 |
| 11030EL02 | ● | 30 | 25 | 30 | 140 | 170 | 2 | 0,62 | 2 |
| 11032EL02 | ● | 32 | 32 | 60 | 110 | 170 | 2 | 0,97 | 1 |
| 11032EL02-30 | ● | 32 | 30 | 30 | 140 | 170 | 2 | 0,88 | 2 |
| 11032EL03 | ● | 32 | 32 | 60 | 110 | 170 | 3 | 0,96 | 1 |
| 11035EL02 | ● | 35 | 32 | 30 | 140 | 170 | 2 | 1,02 | 2 |
| 11035EL03 | ● | 35 | 32 | 30 | 140 | 170 | 3 | 1,00 | 2 |
| 11040EL02 | ● | 40 | 32 | 30 | 140 | 170 | 2 | 1,08 | 2 |
| 11050EL03 | ● | 50 | 32 | 30 | 140 | 170 | 3 | 1,19 | 2 |

Inserts are sold separately.



## Spare Parts

| Applicable Cutters | Insert Screw | N·m | Wrench |
|---|---|---|---|
| WEZ 11014EL01 | | 2,0 | TRDR08IP |
| 11016EL02(-14) | BFTX0305IP | | |
| 11018EL02 | | | |
| 11020EL02(-18) | BFTX0306IP | 1,5 | |
| 11022EL02 | | | |
| 11025EL02(-22) | | | |
| 11025EL03 | | | |
| 11028EL02 | | | |
| 11030EL02 | | | |
| 11032EL02(-30) | | | |
| 11032EL03 | | | |
| 11035EL02 | | | |
| 11035EL03 | | | |
| 11040EL02 | | | |
| 11050EL03 | | | |

## Identification Details

| WEZ | 11 | 025 | E | L | 02 | - | 22 |
|---|---|---|---|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Round Shank | Long Type | Number of Teeth | | Shank Diameter |

## Recommended Cutting Conditions

☞ H22

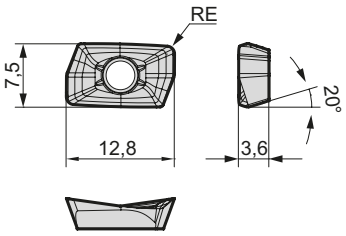


● = Euro stock
❍ = Japan stock

N·m Recommended Tightening Torque (N·m)

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light Cut | | P | | K | | M S | | | N | P | |
| General Purpose | K P M S | | P | | K | M S | M S | N | N | | |
| Roughing | K P M S | | P | | K | | M S | | | | |
| Cat. No. | ACU2500 | ACP2000 | ACP3000 | ACK2000 | ACK3000 | ACM200 | ACM300 | H20 | DL2000 | T2500A | RE (mm) |
| AOMT 11T302PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,2 |
| 11T304PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,4 |
| 11T308PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,8 |
| 11T312PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,2 |
| 11T316PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,6 |
| 11T320PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,0 |
| 11T324PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,4 |
| 11T330PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,0 |
| 11T332PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,2 |
| AOMT 11T304PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,4 |
| 11T308PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,8 |
| 11T312PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,2 |
| 11T316PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,6 |
| AOET 11T302PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 11T302PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P16 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 11T302PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P20 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 11T302PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 11T304PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 11T308PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 11T312PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 11T302PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 0,2 |
| 11T304PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,4 |
| 11T308PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,8 |
| 11T312PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 1,2 |




L: Low cutting force
G: General purpose
H: Strong edge
F: Finishing
P: High-precision machining
S: Non ferrous metals

*P16 is applicable to cutter diameters Ø 14 mm and Ø 16 mm.
*P20 is applicable to cutter diameters Ø 18 mm, Ø 20 mm.
*P25 is applicable to cutter diameters Ø 25 mm, Ø 28 mm.

– = Not available

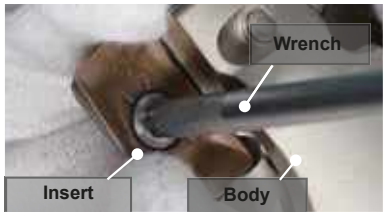
### Precautions for Mounting

(1) Clean the mounting seat and contact parts.

(2) Apply screw lubrication to the screw thread as well as the screw head face to prevent seizure.

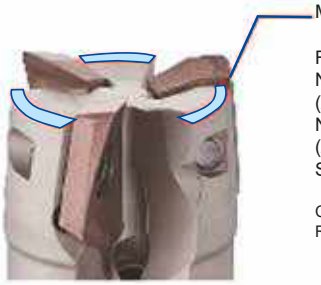
(3) While pressing the insert solidly against the seat surface, tighten at the screws with the included wrench.

(4) After tightening, check that there are no gaps between the surfaces.





*When mounting inserts with nose radius of ≥ 3,0 mm, modification of the body is required.




Reworking guidelines
Nose radius = 3,0 mm: C = 1 mm (AOMT11T330PEER)
Nose radius = 3,2 mm: C = 1 mm (AOMT11T332PEER)
Standard: R = 1 mm

C: Chamfer
R: Radius

# "Wave Mill" Series
# WEZ 17000 E

New

| Rake Angle | | |
|---|---|---|
| | Radial | -6° – -12° |
| | Axial | 6° – 15° |

15 mm 90°

Fig. 1

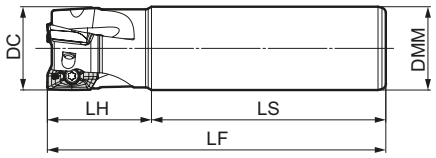
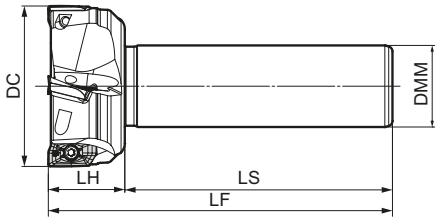



Fig. 2




## Body - WEZ (Shank Type)

Dimensions (mm)

| Cat. No. | Stock | DC | DMM | LH | LS | LF | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|
| WEZ 17025E02 | ● | 25 | 25 | 35 | 85 | 120 | 2 | 0,38 | 1 |
| 17025E02-20 | ● | 25 | 20 | 35 | 85 | 120 | 2 | 0,25 | 2 |
| 17028E02 | ● | 28 | 25 | 35 | 85 | 120 | 2 | 0,40 | 2 |
| 17030E03 | ● | 30 | 25 | 40 | 90 | 130 | 3 | 0,43 | 2 |
| 17032E02 | ● | 32 | 32 | 40 | 90 | 130 | 2 | 0,71 | 1 |
| 17032E03 | ● | 32 | 32 | 40 | 90 | 130 | 3 | 0,69 | 1 |
| 17032E03-25 | ● | 32 | 25 | 40 | 90 | 130 | 3 | 0,44 | 2 |
| 17035E03 | ● | 35 | 32 | 40 | 90 | 130 | 3 | 0,72 | 2 |
| 17040E03 | ● | 40 | 32 | 30 | 105 | 135 | 3 | 0,81 | 2 |
| 17040E04 | ● | 40 | 32 | 30 | 105 | 135 | 4 | 0,79 | 2 |
| 17050E03 | ● | 50 | 32 | 30 | 105 | 135 | 3 | 0,93 | 2 |
| 17050E03-42 | ● | 50 | 42 | 30 | 105 | 135 | 3 | 1,41 | 2 |
| 17050E05 | ● | 50 | 32 | 30 | 105 | 135 | 5 | 0,89 | 2 |
| 17050E05-42 | ● | 50 | 42 | 30 | 105 | 135 | 5 | 1,37 | 2 |
| 17063E04 | ● | 63 | 32 | 30 | 105 | 135 | 4 | 1,10 | 2 |
| 17063E04-42 | ● | 63 | 42 | 30 | 105 | 135 | 4 | 1,58 | 2 |
| 17063E06 | ● | 63 | 32 | 30 | 105 | 135 | 6 | 1,08 | 2 |
| 17063E06-42 | ● | 63 | 42 | 30 | 105 | 135 | 6 | 1,56 | 2 |
| 17080E07 | ● | 63 | 32 | 30 | 105 | 135 | 7 | 1,39 | 2 |

Inserts are sold separately.

## Spare Parts

| Applicable Cutters | Insert Screw | | Wrench |
|---|---|---|---|
| |  |  |  |
| WEZ 17025E02(-20) | BFTX0407IP | 3,0 | TRDR15IP |
| 17028E02 | | | |
| 17030E03 | | | |
| 17032E02 | BFTX0409IP | | |
| 17032E03(-25) | | | |
| 17035E03 | | | |
| 17040E03 | | | |
| 17040E04 | | | |
| 17050E03(-42) | | | |
| 17050E05(-42) | | | |
| 17063E04(-42) | | | |
| 17063E06(-42) | | | |
| 17080E07 | | | |

## Identification Details

| WEZ | 17 | 032 | E | 02 | - | 30 |
|---|---|---|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Round Shank | Number of Teeth | | Shank Diameter |

## Recommended Cutting Conditions

☞ H22



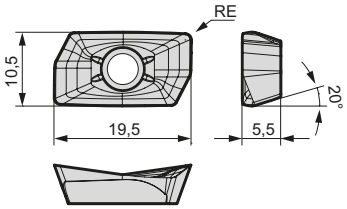


● = Euro stock
❍ = Japan stock

Recommended Tightening Torque (N·m)

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light Cut | | P | | K | | M S | | | N | P | |
| General Purpose | K P M S | | P | | K | M S | M S | N | N | | |
| Roughing | K P M S | | P | | K | | M S | | | | |
| Cat. No. | ACU2500 | ACP2000 | ACP3000 | ACK2000 | ACK3000 | ACM200 | ACM300 | H20 | DL2000 | T2500A | RE (mm) |
| AOMT 170502PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,2 |
| 170504PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,4 |
| 170508PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,8 |
| 170512PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 1,2 |
| 170516PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 1,6 |
| AOMT 170502PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,2 |
| 170504PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,4 |
| 170508PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,8 |
| 170512PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,2 |
| 170516PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,6 |
| 170520PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,0 |
| 170524PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,4 |
| 170530PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,0 |
| 170532PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,2 |
| 170540PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 4,0 |
| 170550PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 5,0 |
| 170564PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 6,4 |
| AOMT 170504PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,4 |
| 170508PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,8 |
| 170512PEER-H | ❍ | ● | ● | ● | ● | ● | ● | – | – | – | 1,2 |
| 170516PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,6 |
| AOET 170502PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 170502PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 170502PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 170502PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 0,2 |
| 170504PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,4 |
| 170508PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,8 |
| 170512PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 1,2 |




L: Low cutting force
G: General purpose
H: Strong edge
F: Finishing
P: High-precision machining
S: Non ferrous metals

*P25 is applicable to cutter diameters Ø 25 mm and Ø 28 mm.
*P32 is applicable to cutter diameters Ø 30 mm, Ø 32 mm and Ø 35 mm.

– = Not available

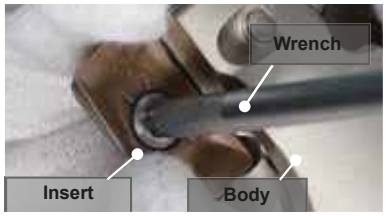
### Precautions for Mounting

(1) Clean the mounting seat and contact parts.

(2) Apply screw lubrication to the screw thread as well as the screw head face to prevent seizure.

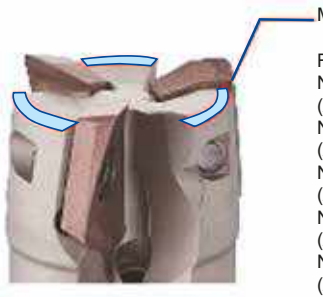
(3) While pressing the insert solidly against the seat surface, tighten at the screws with the included wrench.

(4) After tightening, check that there are no gaps between he surfaces.





*When mounting inserts with nose radius of ≥ 3,0 mm, modification of the body is required.




Reworking guidelines
Nose radius = 3,0 mm: C = 1 mm (AOMT170530PEER)
Nose radius = 3,2 mm: C = 1 mm (AOMT170532PEER)
Nose radius = 4,0 mm: C = 2 mm (AOMT170540PEER)
Nose radius = 5,0 mm: C = 5 mm (AOMT170550PEER)
Nose radius = 6,4 mm: C = 5 mm (AOMT170564PEER)
Standard: R = 1 mm

C: Chamfer
R: Radius

# WEZ 17000 EL

New

| Rake Angle | | |
|---|---|---|
| | Radial | -6° – -12° |
| | Axial | 6° – 15° |

15 mm 90°

Fig. 1

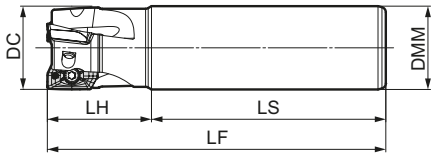
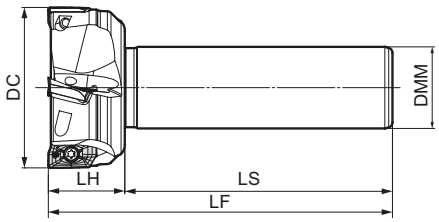



Fig. 2




## Body - WEZ (Long Type)

Dimensions (mm)

| Cat. No. | Stock | DC | DMM | LH | LS | LF | No. of Teeth | Weight (kg) | Fig. |
|---|---|---|---|---|---|---|---|---|---|
| WEZ 17025EL02 | ● | 25 | 25 | 50 | 120 | 170 | 2 | 0,55 | 1 |
| 17028EL02 | ● | 28 | 25 | 50 | 120 | 170 | 2 | 0,57 | 2 |
| 17030EL02 | ● | 30 | 25 | 50 | 120 | 170 | 2 | 0,59 | 2 |
| 17032EL02 | ● | 32 | 32 | 60 | 110 | 170 | 2 | 0,94 | 1 |
| 17032EL02-30 | ● | 32 | 30 | 50 | 120 | 170 | 2 | 0,85 | 2 |
| 17032EL03 | ● | 32 | 32 | 60 | 110 | 170 | 3 | 0,92 | 1 |
| 17035EL02 | ● | 35 | 32 | 50 | 120 | 170 | 2 | 0,98 | 2 |
| 17040EL02 | ● | 40 | 32 | 50 | 120 | 170 | 2 | 1,09 | 2 |
| 17040EL03 | ● | 40 | 32 | 50 | 120 | 170 | 3 | 1,08 | 2 |
| 17040EL04 | ● | 40 | 32 | 50 | 120 | 170 | 4 | 1,05 | 2 |
| 17050EL03 | ● | 50 | 32 | 50 | 120 | 170 | 3 | 1,29 | 2 |
| 17050EL03-42 | ● | 50 | 42 | 50 | 120 | 170 | 3 | 1,83 | 2 |
| 17050EL05 | ● | 50 | 32 | 50 | 120 | 170 | 5 | 1,25 | 2 |
| 17050EL05-42 | ● | 50 | 42 | 50 | 120 | 170 | 5 | 1,79 | 2 |
| 17063EL04 | ● | 63 | 32 | 50 | 120 | 170 | 4 | 1,61 | 2 |
| 17063EL04-42 | ● | 63 | 42 | 50 | 120 | 170 | 4 | 2,16 | 2 |
| 17063EL06 | ● | 63 | 32 | 50 | 120 | 170 | 6 | 1,58 | 2 |
| 17063EL06-42 | ● | 63 | 42 | 50 | 120 | 170 | 6 | 2,13 | 2 |

Inserts are sold separately.



## Spare Parts

| Applicable Cutters | Insert Screw | | Wrench |
|---|---|---|---|
| |  | N·m |  |
| WEZ 17025EL02 | | | |
| 17028EL02 | BFTX0407IP | | |
| 17030EL02 | | | |
| 17032EL02(-30) | | | |
| 17032EL03 | | | |
| 17035EL02 | | | |
| 17040EL02 | | 3,0 | TRDR15IP |
| 17040EL03 | | | |
| 17040EL04 | BFTX0409IP | | |
| 17050EL03(-42) | | | |
| 17050EL05(-42) | | | |
| 17063EL04(-42) | | | |
| 17063EL06(-42) | | | |

## Identification Details

| WEZ | 11 | 025 | E | L | 02 | - | 22 |
|---|---|---|---|---|---|---|---|
| Cutter Series | Insert Size | Cutter Diameter | Round Shank | Long Type | Number of Teeth | | Shank Diameter |

## Recommended Cutting Conditions

☞ H22

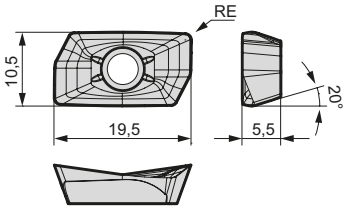


● = Euro stock
❍ = Japan stock

N·m Recommended Tightening Torque (N·m)

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | Cermet | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light Cut | | P | | K | | M S | | | N | P | |
| General Purpose | K P M S | | P | | K | M S | M S | N | N | | |
| Roughing | K P M S | | P | | K | | M S | | | | |
| Cat. No. | ACU2500 | ACP2000 | ACP3000 | ACK2000 | ACK3000 | ACM200 | ACM300 | H20 | DL2000 | T2500A | RE (mm) |
| AOMT 170502PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,2 |
| 170504PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,4 |
| 170508PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 0,8 |
| 170512PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 1,2 |
| 170516PEER-L | ● | – | ● | – | ● | ● | ● | – | – | ● | 1,6 |
| AOMT 170502PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,2 |
| 170504PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,4 |
| 170508PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 0,8 |
| 170512PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,2 |
| 170516PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 1,6 |
| 170520PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,0 |
| 170524PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 2,4 |
| 170530PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,0 |
| 170532PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 3,2 |
| 170540PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 4,0 |
| 170550PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 5,0 |
| 170564PEER-G | ● | ● | ● | ● | ● | ● | ● | – | – | ● | 6,4 |
| AOMT 170504PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,4 |
| 170508PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 0,8 |
| 170512PEER-H | ❍ | ● | ● | ● | ● | ● | ● | – | – | – | 1,2 |
| 170516PEER-H | ● | ● | ● | ● | ● | ● | ● | – | – | – | 1,6 |
| AOET 170502PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-F | ● | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-F | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 170502PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-P25 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| 170502PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,2 |
| 170504PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,4 |
| 170508PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 0,8 |
| 170512PEER-P32 | ❍ | – | – | – | – | – | – | – | – | – | 1,2 |
| AOET 170502PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 0,2 |
| 170504PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,4 |
| 170508PEFR-S | – | – | – | – | – | – | – | ● | ● | – | 0,8 |
| 170512PEFR-S | – | – | – | – | – | – | – | ❍ | ❍ | – | 1,2 |




L: Low cutting force
G: General purpose
H: Strong edge
F: Finishing
P: High-precision machining
S: Non ferrous metals

*P25 is applicable to cutter diameters Ø 25 mm and Ø 28 mm.
*P32 is applicable to cutter diameters Ø 30 mm, Ø 32 mm and Ø 35 mm.

❍ = Available from April 2020

– = Not available

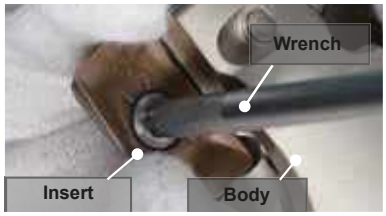
### Precautions for Mounting

(1) Clean the mounting seat and contact parts.

(2) Apply screw lubrication to the screw thread as well as the screw head face to prevent seizure.

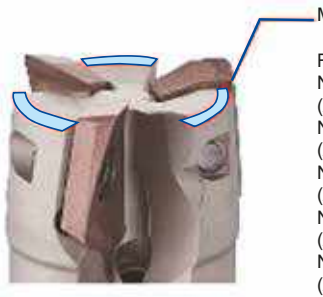
(3) While pressing the insert solidly against the seat surface, tighten at the screws with the included wrench.

(4) After tightening, check that there are no gaps between the surfaces.





*When mounting inserts with nose radius of ≥ 3,0 mm, modification of the body is required.

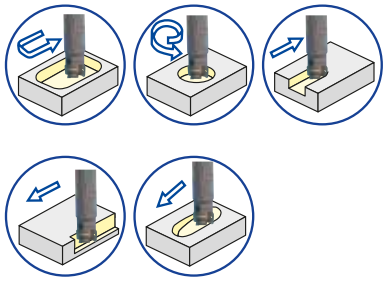



Reworking guidelines
Nose radius = 3,0 mm: C = 1 mm (AOMT170530PEER)
Nose radius = 3,2 mm: C = 1 mm (AOMT170532PEER)
Nose radius = 4,0 mm: C = 2 mm (AOMT170540PEER)
Nose radius = 5,0 mm: C = 5 mm (AOMT170550PEER)
Nose radius = 6,4 mm: C = 5 mm (AOMT170564PEER)
Standard: R = 1 mm

C: Chamfer
R: Radius

## General Features

Wide Application Range



## Ramping (Slant Milling)

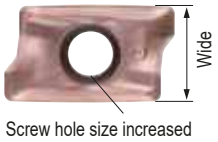
| Tool Diam. Ø D | Max. Ramping Angle | | |
|---|---|---|---|
| | Type 1000 | Type 2000 | Type 3000 |
| 10 | 2°30' | | |
| 12 | 1°45' | | |
| 14 | 1°25' | 1°40' | |
| 16 | 1°00 | 1°20' | |
| 18 | 0°45' | 1°10' | |
| 20 | 0°30' | 1°00' | |
| 25 | 0°30' | 0°45' | 1°30' |
| 32 | 0°25' | 0°35' | 1°00' |
| 40 | 0°20' | 0°25' | 0°45' |
| 50 | 0°15' | 0°20' | 0°30' |
| 63 | 0°10' | 0°15' | 0°20' |
| 80 | | | 0°15' |
| 100 | | | – |

Maximum ramping angle (α max. max.) depends on cutter diameter.

### ● Precision insert with strong cutting edge and low cutting force

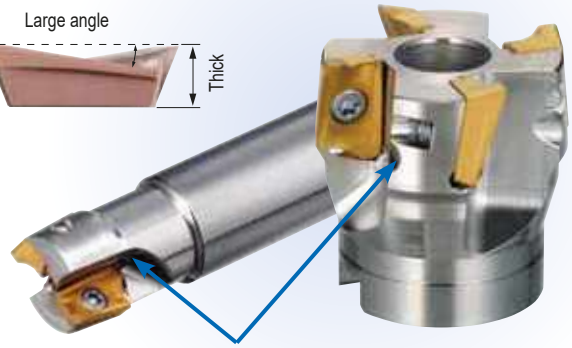
Wave shaped cutting edge design lowers cutting resistance yet improves cutting edge strength.
Achieving high quality finish with high precision cutting edge.
Smooth cutting even for deep grooves and low rigidity machines.

High precision curved cutting edge




High rake wave cutting edge



### ● Internal Coolant Holes

Improved chip evacuation with air or coolant supply.

### ● Wide Variety of Inserts

6 types of chipbreaker design
(L, G, H, E, EH and S)
9 milling grades for a wide range of work materials and applications.
- ACP100, ACP200, ACP300
  (steel milling grades)
- ACK200, ACK300
  (cast iron milling grades)
- ACM200, ACM300
  (stainless steel, exotic alloy milling grades)
- DL1000, H1
  (aluminium milling grades)

### ● High Durable Body

Special surface treatment improves corrosion resistance as well as scratch resistance.
Increased screw size improves clamping force and durability.

## Product Range

| Type | Cat. No. | Series | Diameter Range (mm) Ø 10 Ø 20 Ø 40 Ø 60 | Image |
|---|---|---|---|---|
| Shank | WEX 1000E | Short Type | 10 – 25 |  |
| | WEX 1000EL | Long Type | 10 – 20 | |
| | WEX 2000E | Short Type | 14 – 63 | |
| | WEX 2000EL | Long Type | 14 – 40 | |
| | WEX 2000EW | Weldon Shank Short Type | 16 – 20 | |
| | WEX 3000E | Short Type | 25 – 63 | |
| | WEX 3000EL | Long Type | 25 – 40 | |
| | WEX 3000EW | Weldon Shank Short Type | 25 – 32 | |
| Shell | WEX 1000F | Shell Type | 32 – 63 |   |
| | WEX 2000F | Shell Type | 40 – 63 | |
| | WEX 3000F | Shell Type | 40 – 63 | |
| Modular | WEX 2000M | ModularType | 16 – 40 |  |
| | WEX 3000M | Modular Type | 25 – 40 | |

WEX3000 WEX2000 WEX1000

☞ G48

# Inserts for WEX Type

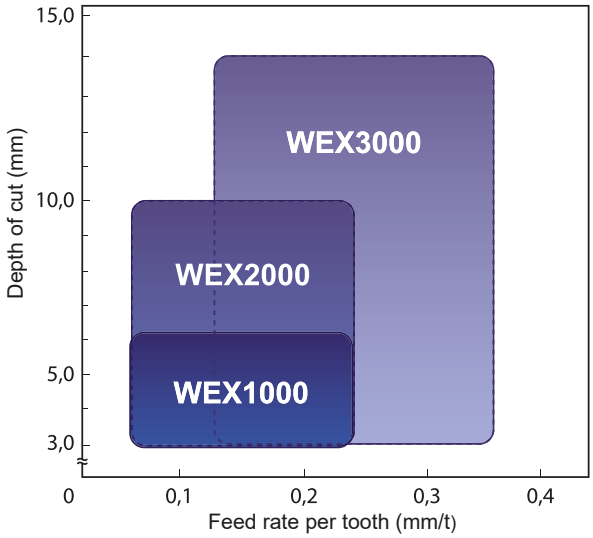
## WEX1000 Type Expansion

- Efficient machining via high number of inserts
- Precise insert change tolerance provides high surface roughness qualitiy
- High shoulder accuracy due to optimized cutting edge
- Stable cutting conditions when utilising low rigidity machines
- Economic advantages using small AXMT06 inserts

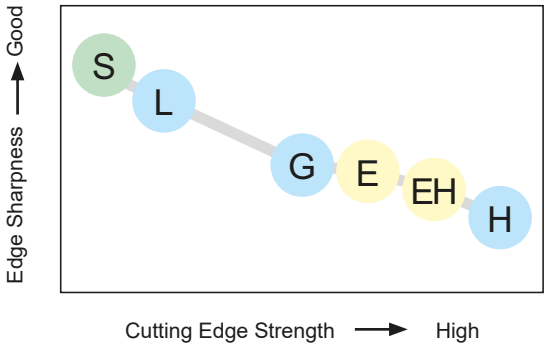
WEX3000 WEX2000 WEX1000

## Application Range

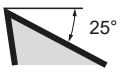
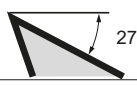
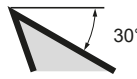
Shoulder Milling




## Chipbreaker Selection

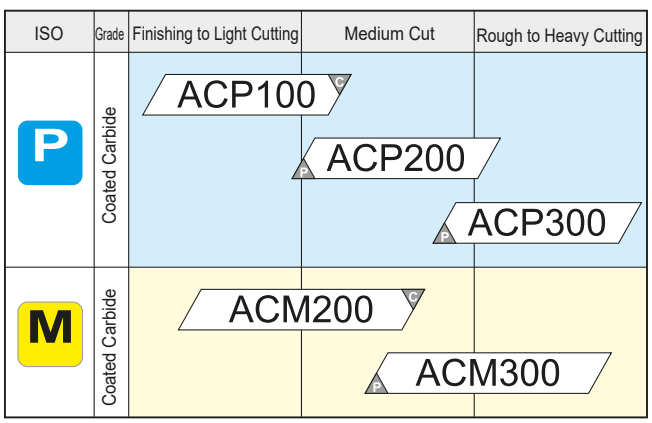


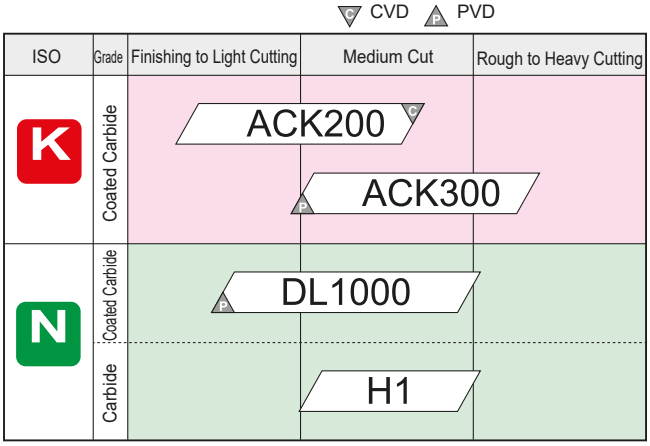

## Characteristics

| Work Material | Steel, Cast Iron | | | Stainless Steel, Exotic Alloy | | Aluminium |
|---|---|---|---|---|---|---|
| | L | G | H | E | EH | S |
| Chipbreaker |  |  |  |  |  |  |
| Features | Low Cutting Force | General Purpose | Strong Edged | General Purpose | Strong Edged | High Rake |
| Chipbreaker Profile for 1000 Series Insert |  |  |  | | | |
| Chipbreaker Profile for 2000 Series Insert | |  |  |  |  |  |
| Chipbreaker Profile for 3000 Series Insert |  |  |  |  |  |  |
| Application | Light cut, low rigidity milling and reduced burrs | **Main chipbreaker** general purpose to interrupted milling | Roughing, heavy interrupted and hardened steel milling | Light cutting to general purpose | Heavy interrupted machining | Aluminium, non-ferrous metal |

## Grade Selection

CVD PVD



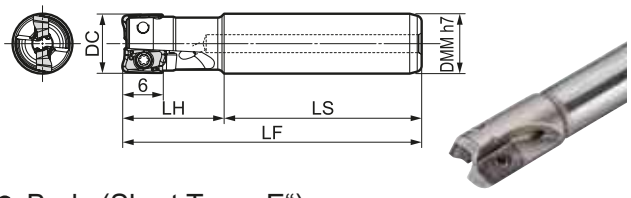



## WEX 1000 E/EL

### Shank Type

| Rake Angle | | |
|---|---|---|
| | Radial | 8°–15° |
| | Axial | 16°–24° |

5 mm, 90°




### ● Body (Short Type „E“)

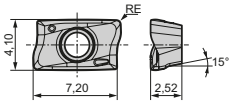
| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 1010 E | ● | 10 | 10 | 17 | 33 | 50 | 2 | 0,03 |
| 1012 E | ● | 12 | 12 | 20 | 60 | 80 | 3 | 0,06 |
| 1014 E | ● | 14 | 16 | 22 | 59 | 80 | 3 | 0,10 |
| 1016 E | ● | 16 | 16 | 20 | 72 | 90 | 4 | 0,12 |
| 1018 E | ● | 18 | 20 | 20 | 80 | 100 | 4 | 0,21 |
| WEX 1020 E | ● | 20 | 20 | 22 | 78 | 100 | 5 | 0,22 |
| 1025 E | ● | 25 | 20 | 25 | 90 | 115 | 7 | 0,27 |

### ● Body (Long Type „EL“)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 1010 EL | ● | 10 | 8 | 17 | 83 | 100 | 2 | 0,03 |
| 1012 EL | ● | 12 | 10 | 20 | 100 | 120 | 2 | 0,06 |
| 1014 EL | ● | 14 | 12 | 20 | 125 | 145 | 3 | 0,11 |
| 1016 EL | ● | 16 | 14 | 20 | 140 | 160 | 3 | 0,17 |
| 1016 EL15 | ● | 16 | 15 | 20 | 140 | 160 | 3 | 0,19 |
| 1018 EL | ● | 18 | 16 | 20 | 160 | 180 | 3 | 0,25 |
| WEX 1020 EL | ● | 20 | 18 | 25 | 175 | 200 | 4 | 0,36 |
| 1020 EL19 | ● | 20 | 19 | 25 | 175 | 200 | 4 | 0,38 |

Inserts are not included.

### Inserts for WEX1000 Type




| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | |
| General Purpose | | P | | K | | M S | M S | | N | |
| Roughing | | P | P | | K | | M S | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
| AXMT 060204 PDER-L | ❍ | ● | ❍ | ❍ | ● | ● | ● | – | – | 0,4 |
| 060208 PDER-L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 0,8 |
| 060212 PDER-L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 |
| AXMT 060204 PDER-G | ❍ | ● | ● | ❍ | ❍ | ❍ | ● | – | – | 0,4 |
| 060208 PDER-G | ❍ | ● | ● | ❍ | ❍ | ● | ● | – | – | 0,8 |
| 060212 PDER-G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ● | – | – | 1,2 |
| AXMT 060204 PDER-H | ❍ | ● | ● | ❍ | ● | ❍ | ● | – | – | 0,4 |
| 060208 PDER-H | ❍ | ● | ● | ❍ | ● | ● | ● | – | – | 0,8 |
| 060212 PDER-H | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 |
| AXMT 060202 PDFR-S | – | – | – | – | – | – | – | ❍ | ❍ | 0,2 |

L - Low cutting force
G - General type
H - Strong cutting edge
S - For aluminium alloy

### Identification Details

| WEX | 1 | 016 | EL | 15 |
|---|---|---|---|---|
| Cutter Series | 1000 Series | Cutter Diameter | Shank Type | Shank Diameter |

### Spare Parts

| Screw | Wrench | Applicable Endmill |
|---|---|---|
| 0,5 N·m | | |
| BFTX 01804 IP | TRX 06 IP | WEX 1000 |



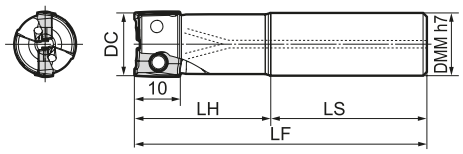
● = Euro stock
❍ = Japan stock
❑ = Delivery on request
▲ = To be replaced by new item
N·m Recommended Tightening Torque (N·m)

## WEX 2000 E/EL

### Shank Type

| Rake Angle | | |
|---|---|---|
| | Radial | 8°–15° |
| | Axial | 16°–24° |

10 mm 90°




### Body (Short Type „E“)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 2014 E | ● | 14 | 16 | 25 | 55 | 80 | 1 | 0,10 |
| 2016 E | ● | 16 | 16 | 25 | 75 | 100 | 2 | 0,13 |
| 2018 E | ● | 18 | 16 | 25 | 75 | 100 | 2 | 0,14 |
| WEX 2020 E | ● | 20 | 20 | 30 | 80 | 110 | 3 | 0,22 |
| 2022 E | ● | 22 | 20 | 30 | 80 | 110 | 3 | 0,23 |
| WEX 2025 E | ● | 25 | 25 | 35 | 85 | 120 | 4 | 0,38 |
| 2028 E | ❑ | 28 | 25 | 35 | 85 | 120 | 4 | 0,39 |
| 2030 E | ● | 30 | 25 | 35 | 85 | 120 | 4 | 0,40 |
| WEX 2032 E | ● | 32 | 32 | 40 | 90 | 130 | 5 | 0,70 |
| 2040 E | ❍ | 40 | 32 | 30 | 120 | 150 | 6 | 0,91 |
| WEX 2050 E | ❍ | 50 | 32 | 30 | 120 | 150 | 7 | 1,02 |
| 2063 E | ❍ | 63 | 32 | 30 | 120 | 150 | 8 | 1,22 |

### Body (Long Type „EL“)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 2014 EL | ● | 14 | 16 | 25 | 95 | 120 | 1 | 0,14 |
| 2016 EL | ● | 16 | 16 | 25 | 120 | 145 | 2 | 0,19 |
| 2018 EL | ❑ | 18 | 16 | 25 | 120 | 145 | 2 | 0,19 |
| WEX 2020 EL | ● | 20 | 20 | 40 | 110 | 150 | 2 | 0,32 |
| 2022 EL | ❑ | 22 | 20 | 30 | 120 | 150 | 2 | 0,33 |
| WEX 2025 EL | ● | 25 | 25 | 50 | 120 | 170 | 2 | 0,55 |
| 2028 EL | ❍ | 28 | 25 | 30 | 140 | 170 | 2 | 0,59 |
| 2030 EL | ❍ | 30 | 25 | 30 | 140 | 170 | 2 | 0,60 |
| WEX 2032 EL | ❍ | 32 | 32 | 60 | 120 | 180 | 2 | 0,99 |
| 2040 EL | ❑ | 40 | 32 | 30 | 150 | 180 | 2 | 1,12 |

### Body (Long Type „E“ + Small Shank)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 2016 EL15 | ❑ | 16 | 15 | 25 | 120 | 145 | 2 | 0,17 |
| 2020 EL19 | ● | 20 | 19 | 40 | 110 | 150 | 2 | 0,30 |
| 2025 EL24 | ● | 25 | 24 | 50 | 120 | 170 | 2 | 0,53 |
| 2025 EL24Z3 | ❑ | 25 | 24 | 50 | 120 | 170 | 3 | 0,50 |
| 2032 EL30Z4 | ❑ | 32 | 30 | 60 | 120 | 180 | 2 | 0,95 |

### Body (Weldon Shank Short Type „EW“)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 2016 EW | ● | 16 | 16 | 25 | 75 | 100 | 2 | 0,12 |
| 2020 EW | ● | 20 | 20 | 30 | 80 | 110 | 3 | 0,21 |

Inserts are not included.

### Identification Details

| WEX | 2 | 016 | EL | 15 |
|---|---|---|---|---|
| Cutter Series | 2000 Series | Cutter Diameter | Shank Type | Shank Diameter |

### Spare Parts

| Screw | Wrench | Applicable Endmill |
|---|---|---|
| 2,0 N·m | | |
| BFTX 0305 IP | TRDR 08 IP | WEX 2014 – WEX 2018 |
| BFTX 0306 IP | | WEX 2020 – WEX 2063 |

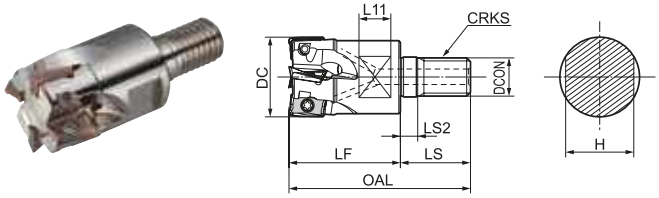


## WEX 2000 M

### Modular Type

| Rake Angle | | |
|---|---|---|
| | Radial | 10°–18° |
| | Axial | 14°–25° |

10mm 90°

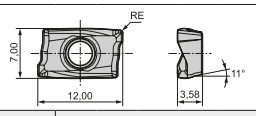



### Head

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| WEX 2016M08Z2 | ● | 16 | 8,5 | M8 | 42 | 25 | 5 | 17 | 8 | 13 | 2 |
| 2018M08Z2 | ❑ | 18 | 8,5 | M8 | 42 | 25 | 5 | 17 | 8 | 13 | 2 |
| WEX 2020M10Z3 | ● | 20 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 3 |
| 2022M10Z3 | ❑ | 22 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 3 |
| WEX 2025M12Z4 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 4 |
| 2028M12Z4 | ❑ | 28 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 4 |
| WEX 2030M16Z4 | ❑ | 30 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 4 |
| 2032M16Z5 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 5 |
| 2040M16Z6 | ❑ | 40 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 6 |

Inserts are not included.

### Inserts for WEX2000 Type




| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | |
| General Purpose | | P | | K | | M S | M S | | N | |
| Roughing | | P | P | | K | | M S | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
| AXMT 123504 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,4 |
| 123508 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 123512 PEER-G | ● | ● | ● | ● | ● | | | – | – | 1,2 |
| AXMT 123504 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,4 |
| 123508 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 123512 PEER-H | ● | ● | ● | ❍ | ● | | | – | – | 1,2 |
| AXMT 123504 PEER-E | | | | | | ● | ● | – | – | 0,4 |
| 123508 PEER-E | | | ▲ | | | ● | ● | – | – | 0,8 |
| 123512 PEER-E | | | | | | ● | ● | – | – | 1,2 |
| AXMT 123508 PEER-EH | | | ▲ | | | ● | ● | – | – | 0,8 |
| AXET 123502 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 123504 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 123508 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,8 |

G - General type
H - Strong cutting edge
E - For stainless steel / exotic alloy
EH - Strong edge for stainless steel / exotic alloy
S - For aluminium alloy

– Unable to produce

### Identification Details

| WEX | 2 | 016 | M08 | Z2 |
|---|---|---|---|---|
| Cutter Series | 2000 Series | Cutter Diameter | Mounting Screw Size | No. of Teeth |


### Spare Parts

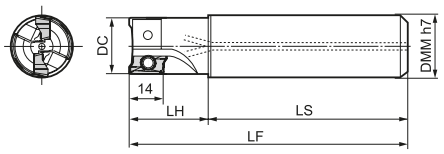
| Screw | Wrench | N·m | Applicable Endmill |
|---|---|---|---|
| BFTX 0305 IP | TRDR 08 IP | 2,0 | WEX 2016M, WEX 2018M |
| BFTX 0306 IP | | 2,0 | WEX 2020M – WEX 2040M |
| BFTX 0407 IP | TRDR 15 IP | 3,0 | WEX 3025M – WEX 3030M |
| BFTX 0409 IP | | 3,0 | WEX 3032M – WEX 3040M |

## WEX 3000 E/EL

### Shank Type

Rake Angle: Radial 8°–15°, Axial 16°–24°

14 mm 90°




### Body (Short Type „E“)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 3025 E | ● | 25 | 25 | 35 | 85 | 120 | 2 | 0,37 |
| 3028 E | ❑ | 28 | 25 | 35 | 85 | 120 | 2 | 0,39 |
| 3030 E | ❑ | 30 | 25 | 40 | 90 | 130 | 3 | 0,42 |
| WEX 3032 E | ● | 32 | 32 | 40 | 90 | 130 | 3 | 0,67 |
| 3035 E | ❑ | 35 | 32 | 40 | 90 | 130 | 3 | 0,69 |
| 3040 E | ● | 40 | 32 | 50 | 120 | 170 | 4 | 1,01 |
| 3050 E | ❑ | 50 | 32 | 50 | 120 | 170 | 5 | 1,23 |
| 3063 E | ❑ | 63 | 32 | 50 | 120 | 170 | 6 | 1,58 |

### Body (Short Type „E“ + Small Shank)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 3025 E20 | ❑ | 25 | 20 | 35 | 85 | 120 | 2 | 0,25 |
| 3032 E25 | ❑ | 32 | 25 | 40 | 90 | 130 | 3 | 0,43 |

### Body (Long Type „EL“)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 3025 EL | ● | 25 | 25 | 50 | 120 | 170 | 2 | 0,54 |
| 3028 EL | ❑ | 28 | 25 | 50 | 120 | 170 | 2 | 0,56 |
| 3030 EL | ❑ | 30 | 25 | 60 | 120 | 180 | 2 | 0,60 |
| WEX 3032 EL | ● | 32 | 32 | 60 | 120 | 180 | 2 | 0,95 |
| 3035 EL | ❑ | 35 | 32 | 60 | 120 | 180 | 2 | 0,98 |
| 3040 EL | ● | 40 | 32 | 80 | 140 | 220 | 2 | 1,38 |

### Body (Weldon Shank Short Type „EW“)

| Cat. No. | Stock | Dimensions (mm) | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LH | LS | LF | | |
| WEX 3025 EW | ● | 25 | 25 | 35 | 85 | 120 | 2 | 0,36 |
| 3032 EW | ● | 32 | 32 | 40 | 90 | 130 | 3 | 0,65 |

Inserts are not included.

✻ **ATTENTION**: If nose radius of inserts is 2,0 mm or more please modify cutter body as indicated.

Standard Chamfer is 0,5 mm by 45 degrees

Increase Chamfer to 1 mm x 45 degrees when using 2,0 mm radius inserts AXMT 170520PEER

Increase chamfer to 1,5 mm x 45 degrees when using 3,0 mm radius inserts AXMT 170530 PEER

### Spare Parts

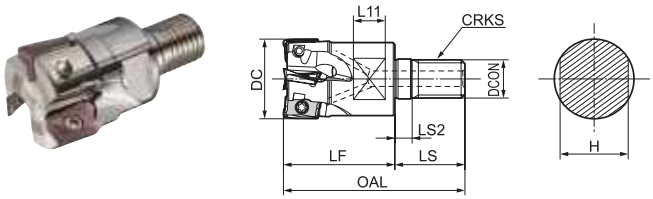
| Screw | Wrench | Applicable Endmill |
|---|---|---|
| 3,0 N·m | | |
| BFTX 0407 IP<br>BFTX 0409 IP | TRDR 15 IP | WEX 3025 – WEX 3030<br>WEX 3032 – WEX 3063 |

## WEX 3000 M

### Modular Type

Rake Angle: Radial 8°–15°, Axial 16°–24°

14 mm 90°

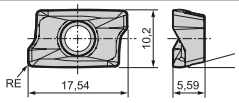



### Head

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| WEX 3025M12Z2 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 |
| 3028M12Z2 | ❑ | 28 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 |
| WEX 3030M16Z3 | ❑ | 30 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |
| 3032M16Z3 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |
| 3035M16Z3 | ❑ | 35 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |
| 3040M16Z4 | ❑ | 40 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 4 |

Inserts are not included.

### Inserts for WEX3000 Type




| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | |
| General Purpose | | P | | K | | M S | M S | | N | |
| Roughing | | P | P | | K | | M S | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
| AXMT 170508 PEER-L | ● | ● | ● | ❍ | ● | | | – | – | 0,8 |
| AXMT 170504 PEER-G | ❍ | ● | ● | ● | ● | | | – | – | 0,4 |
| 170508 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 170512 PEER-G | ❍ | ● | ● | ❍ | ● | | | – | – | 1,2 |
| 170516 PEER-G | ❍ | ● | ● | ❍ | ● | | | – | – | 1,6 |
| 170520 PEER-G* | ❍ | ● | ● | ● | ● | | | – | – | 2,0 |
| 170530 PEER-G* | ● | ● | ● | ● | ● | | | – | – | 3,0 |
| AXMT 170508 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 170512 PEER-H | ● | ● | ● | ● | ● | | | – | – | 1,2 |
| AXMT 170504 PEER-E | | | | | | ● | ● | – | – | 0,4 |
| 170508 PEER-E | | | ▲ | | | ● | ● | – | – | 0,8 |
| 170512 PEER-E | | | | | | ● | ● | – | – | 1,2 |
| 170516 PEER-E | | | | | | ❍ | ● | – | – | 1,6 |
| 170520 PEER-E* | | | | | | ❍ | ● | – | – | 2,0 |
| 170530 PEER-E* | | | | | | ● | ● | – | – | 3,0 |
| AXMT 170508 PEER-EH | | | ▲ | | | ● | ● | – | – | 0,8 |
| AXET 170502 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 170504 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 170508 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,8 |

L - Low cutting force
G - General type
H - Strong cutting edge
E - For stainless steel / exotic alloy
EH - Strong edge for stainless steel / exotic alloy
S - For aluminium alloy

– Unable to produce
✻ Cutter body modification is required

### Identification Details

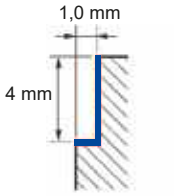
| WEX | 3 | 025 | M12 | Z2 |
|---|---|---|---|---|
| Cutter Series | 3000 Series | Cutter Diameter | Mounting Screw Size | No. of Teeth |






● = Euro stock
❍ = Japan stock
❑ = Delivery on request
▲ = To be replaced by new item
N·m Recommended Tightening Torque (N·m)

## Recommended Cutting Conditions




### WEX1000 Series

Cutter: WEX1012E Insert: AXMT060208PDER - ☐

Cutting Data: $a_p$ = 4 mm, $a_e$ = 1 mm, dry

| ISO | Material | HB | Chipbreaker | Coated Carbide | | | | | | | | | | | | | | | | | | | | | "Diamond like Carbon" Coated Carbide | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ACP100 | | | ACP200 | | | ACP300 | | | ACK200 | | | ACK300 | | | ACM200 | | | ACM300 | | | | | |
| | | | | Feed Rate (mm/tooth) | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 0,08 | 0,12 | 0,16 | 0,08 | 0,12 | 0,16 | 0,08 | 0,12 | 0,16 | 0,10 | 0,15 | 0,20 | 0,10 | 0,15 | 0,20 | 0,08 | 0,10 | 0,12 | 0,08 | 0,10 | 0,12 | | | |
| | | | | Cutting Speed $v_c$ (m/min) | | | | | | | | | | | | | | | | | | | | | | | |
| P | Unalloyed steel, <0, 15%C, annealed | 125 | G | 280 | 240 | 220 | 240 | 220 | 200 | 220 | 200 | 180 | | | | | | | | | | | | | | | |
| | " , <0, 45%C, annealed | 190 | G | 200 | 180 | 160 | 180 | 160 | 140 | 180 | 160 | 140 | | | | | | | | | | | | | | | |
| | " , <0, 45%C, tempered | 250 | G | 180 | 120 | 140 | 160 | 140 | 120 | 150 | 130 | 110 | | | | | | | | | | | | | | | |
| | " , <0, 75%C, annealed | 270 | G | 160 | 140 | 120 | 150 | 130 | 110 | 130 | 110 | 110 | | | | | | | | | | | | | | | |
| | " , <0, 75%C, tempered | 300 | G | 100 | 80 | 70 | 90 | 70 | 60 | 70 | 60 | 50 | | | | | | | | | | | | | | | |
| | Low alloyed steel, annealed | 180 | G | 200 | 180 | 160 | 180 | 160 | 150 | 160 | 150 | 130 | | | | | | | | | | | | | | | |
| | " , tempered | 275 | G | 130 | 110 | 90 | 120 | 100 | 90 | 100 | 90 | 80 | | | | | | | | | | | | | | | |
| | " , tempered | 300 | G | 120 | 100 | 80 | 100 | 90 | 80 | 90 | 80 | 60 | | | | | | | | | | | | | | | |
| | " , tempered | 350 | G | 90 | 80 | 60 | 80 | 70 | 60 | 70 | 60 | 40 | | | | | | | | | | | | | | | |
| | High alloyed and tool steel, annealed | 200 | G | 180 | 170 | 160 | 170 | 160 | 130 | 150 | 140 | 120 | | | | | | | | | | | | | | | |
| | " , tempered | 325 | G | 100 | 80 | 60 | 80 | 60 | 50 | 60 | 50 | 30 | | | | | | | | | | | | | | | |
| M | Stainless steel, ferritic/martensitic, annealed | 200 | E | | | | | | | | | | | | | | | | 175 | 150 | 120 | 140 | 130 | 110 | | | |
| | Martensitic, tempered | 240 | E | | | | | | | | | | | | | | | | 140 | 120 | 100 | 120 | 100 | 90 | | | |
| | Austenitic, plunged | 180 | E | | | | | | | | | | | | | | | | 180 | 160 | 140 | 160 | 140 | 130 | | | |
| K | Grey cast iron | | G | | | | | | | | | | 240 | 220 | 200 | 220 | 200 | 180 | | | | | | | | | |
| | Nodular cast iron | | G | | | | | | | | | | 160 | 140 | 120 | 140 | 120 | 100 | | | | | | | | | |
| S | High tempered resist. alloys, Fe based, annealed | | E | | | | | | | | | | | | | | | | 50 | 35 | | 45 | 25 | | | | |

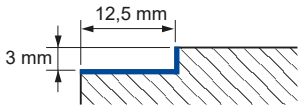
The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine, work shape and clamping. They will need to be adjusted according to machine rigidity, work clamp rigidity, cutting depth and other factors.

For groove milling, reduce the feed rate approximately 70 % of the corresponding value shown above.

### WEX2000 Series

Cutter: WEX2025E Insert: AXMT123508PEER - ☐

Cutting Data: $a_p$ = 3 mm, $a_e$ = 12,5 mm, dry



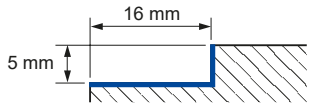

| ISO | Material | HB | Chipbreaker | Coated Carbide | | | | | | | | | | | | | | | | | | | | | | "Diamond like Carbon" Coated Carbide | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ACP100 | | | ACP200 | | | ACP300 | | | ACK200 | | | ACK300 | | | ACM200 | | | ACM300 | | | DL1000 | | |
| | | | | Feed Rate (mm/tooth) | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 0,08 | 0,15 | 0,20 | 0,08 | 0,15 | 0,20 | 0,08 | 0,15 | 0,20 | 0,08 | 0,15 | 0,20 | 0,08 | 0,15 | 0,20 | 0,08 | 0,15 | 0,20 | 0,08 | 0,15 | 0,20 | 0,05 | 0,15 | 0,22 |
| | | | | Cutting Speed $v_c$ (m/min) | | | | | | | | | | | | | | | | | | | | | | | | |
| P | Unalloyed steel, <0, 15%C, annealed | 125 | G | 380 | 350 | 330 | 350 | 330 | 315 | 330 | 315 | 295 | | | | | | | | | | | | | | | | |
| | " , <0, 45%C, annealed | 190 | G | 285 | 255 | 235 | 255 | 235 | 220 | 235 | 220 | 220 | | | | | | | | | | | | | | | | |
| | " , <0, 45%C, tempered | 250 | G | 235 | 210 | 190 | 210 | 190 | 170 | 190 | 170 | 150 | | | | | | | | | | | | | | | | |
| | " , <0, 75%C, annealed | 270 | G | 190 | 162 | 143 | 171 | 152 | 133 | 152 | 133 | 115 | | | | | | | | | | | | | | | | |
| | " , <0, 75%C, tempered | 300 | G | 145 | 115 | 95 | 115 | 95 | 75 | 95 | 75 | 55 | | | | | | | | | | | | | | | | |
| | Low alloyed steel, annealed | 180 | G | 265 | 235 | 220 | 235 | 220 | 200 | 220 | 200 | 180 | | | | | | | | | | | | | | | | |
| | " , tempered | 275 | G | 170 | 145 | 125 | 150 | 130 | 115 | 130 | 115 | 95 | | | | | | | | | | | | | | | | |
| | " , tempered | 300 | G | 150 | 125 | 105 | 135 | 115 | 95 | 115 | 95 | 75 | | | | | | | | | | | | | | | | |
| | " , tempered | 350 | G | 125 | 95 | 75 | 105 | 85 | 65 | 85 | 65 | 45 | | | | | | | | | | | | | | | | |
| | High alloyed and tool steel, annealed | 200 | G | 235 | 210 | 190 | 210 | 190 | 170 | 190 | 170 | 150 | | | | | | | | | | | | | | | | |
| | " , tempered | 325 | G | 125 | 95 | 75 | 95 | 75 | 55 | 75 | 55 | 35 | | | | | | | | | | | | | | | | |
| M | Stainless steel, ferritic/martensitic, annealed | 200 | E | | | | | | | | | | | | | | | | 175 | 155 | 125 | 155 | 140 | 110 | | | |
| | Martensitic, tempered | 240 | EH | | | | | | | | | | | | | | | | 160 | 140 | 110 | 145 | 125 | 100 | | | |
| | Austenitic, plunged | 180 | E | | | | | | | | | | | | | | | | 190 | 170 | 140 | 170 | 150 | 125 | | | |
| K | Grey cast iron | | G | | | | | | | | | | 285 | 255 | 235 | 255 | 235 | 220 | | | | | | | | | |
| | Nodular cast iron | | G | | | | | | | | | | 190 | 160 | 140 | 160 | 140 | 125 | | | | | | | | | |
| S | High tempered resist. alloys, Fe based, annealed | 300 | E | | | | | | | | | | | | | | | | 50 | 40 | | 45 | 35 | | | | |
| | " , hardened | 330 | E | | | | | | | | | | | | | | | | 35 | 25 | | 30 | 20 | | | | |
| N | Aluminium alloy, Si < 13% | | S | | | | | | | | | | | | | | | | | | | | | | 1000 | 750 | 500 |
| | Aluminium alloy, Si > 13% | | S | | | | | | | | | | | | | | | | | | | | | | 250 | 200 | 170 |
| | Copper alloy | | S | | | | | | | | | | | | | | | | | | | | | | 350 | 330 | 300 |

The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine, work shape and clamping. They will need to be adjusted according to machine rigidity, work clamp rigidity, cutting depth and other factors.

For groove milling, reduce the feed rate approximately 70 % of the corresponding value shown above.

## ■ Recommended Cutting Conditions

### ● WEX3000 Series




Cutter: WEX30325E Insert: AXMT170508PEER - □

Cutting Data: $a_p$ = 5 mm, $a_e$ = 16 mm, dry

| ISO | Material | HB | Chipbreaker | Coated Carbide | | | | | | | | | | | | | | | | | | | | | „Diamond like Carbon" Coated Carbide | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ACP100 | | | ACP200 | | | ACP300 | | | ACK200 | | | ACK300 | | | ACM200 | | | ACM300 | | | DL1000 | | |
| | | | | Feed Rate (mm/tooth) | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 0,12 | 0,25 | 0,35 | 0,12 | 0,25 | 0,35 | 0,12 | 0,25 | 0,35 | 0,12 | 0,25 | 0,35 | 0,12 | 0,25 | 0,35 | 0,12 | 0,25 | 0,35 | 0,12 | 0,25 | 0,35 | 0,05 | 0,15 | 0,25 |
| | | | | Cutting Speed $v_c$ (m/min) | | | | | | | | | | | | | | | | | | | | | | | |
| P | Unalloyed steel, <0, 15%C, annealed | 125 | G | 400 | 370 | 350 | 370 | 350 | 330 | 350 | 330 | 310 | | | | | | | | | | | | | | | |
| | " , <0, 45%C, annealed | 190 | G | 300 | 270 | 250 | 270 | 250 | 230 | 250 | 230 | 210 | | | | | | | | | | | | | | | |
| | " , <0, 45%C, tempered | 250 | G | 250 | 220 | 200 | 220 | 200 | 180 | 200 | 180 | 160 | | | | | | | | | | | | | | | |
| | " , <0, 75%C, annealed | 270 | G | 200 | 170 | 150 | 180 | 160 | 140 | 160 | 140 | 120 | | | | | | | | | | | | | | | |
| | " , <0, 75%C, tempered | 300 | G | 150 | 120 | 100 | 120 | 100 | 80 | 100 | 80 | 60 | | | | | | | | | | | | | | | |
| | Low alloyed steel, annealed | 180 | G | 280 | 250 | 230 | 250 | 230 | 210 | 230 | 210 | 190 | | | | | | | | | | | | | | | |
| | " , tempered | 275 | G | 180 | 150 | 130 | 160 | 140 | 120 | 140 | 120 | 100 | | | | | | | | | | | | | | | |
| | " , tempered | 300 | G | 160 | 130 | 110 | 140 | 120 | 100 | 120 | 100 | 80 | | | | | | | | | | | | | | | |
| | " , tempered | 350 | G | 130 | 100 | 80 | 110 | 90 | 70 | 90 | 70 | 50 | | | | | | | | | | | | | | | |
| | High alloyed and tool steel, annealed | 200 | G | 250 | 220 | 200 | 220 | 200 | 180 | 200 | 180 | 160 | | | | | | | | | | | | | | | |
| | " , tempered | 325 | G | 130 | 100 | 80 | 100 | 80 | 60 | 80 | 60 | 40 | | | | | | | | | | | | | | | |
| M | Stainless steel, ferritic/martensitic, annealed | 200 | E | | | | | | | | | | | | | | | | 185 | 165 | 135 | 165 | 150 | 120 | | | |
| | Martensitic, tempered | 240 | EH | | | | | | | | | | | | | | | | 170 | 150 | 120 | 150 | 135 | 110 | | | |
| | Austenitic, plunged | 180 | E | | | | | | | | | | | | | | | | 200 | 180 | 150 | 180 | 160 | 135 | | | |
| K | Grey cast iron | | G | | | | | | | | | | 300 | 270 | 250 | 270 | 250 | 230 | | | | | | | | | |
| | Nodular cast iron | | G | | | | | | | | | | 200 | 170 | 150 | 170 | 150 | 130 | | | | | | | | | |
| S | High tempered resist. alloys, Fe based, annealed | 300 | E | | | | | | | | | | | | | | | | 50 | 30 | | 45 | 25 | | | | |
| | " , hardened | 330 | E | | | | | | | | | | | | | | | | 50 | 30 | | 45 | 25 | | | | |
| N | Aluminium alloy, Si < 13% | | S | | | | | | | | | | | | | | | | | | | | | | 1000 | 750 | 500 |
| | Aluminium alloy, Si > 13% | | S | | | | | | | | | | | | | | | | | | | | | | 250 | 200 | 170 |
| | Copper alloy | | S | | | | | | | | | | | | | | | | | | | | | | 350 | 330 | 300 |

The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine, work shape and clamping. They will need to be adjusted according to machine rigidity, work clamp rigidity, cutting depth and other factors.

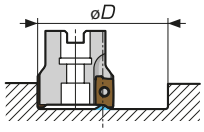
For groove milling, reduce the feed rate approximately 70 % of the corresponding value shown above.



## ■ Recommended Values for Helical Milling and Ramping

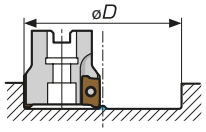
### ● Helical Boring

≤ Min. Diameter




Center uncut portion cannot be removed by traverse cutting with the same cutter.

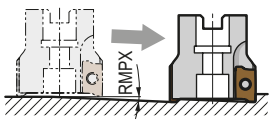
≥ Max. Diameter




Center uncut portion can be removed by traverse cutting with the same cutter.

### ● Plunging

Use at ≤ RMPX




### ● Recommended Values for Helical and Plunging

| Cutter External Diameter DC | WEX1000 (AXMT06...) | | | WEX2000 (AX□T12...) | | | WEX3000 (AX□T17...) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Helical | | Plunging | Helical | | Plunging | Helical | | Plunging |
| | Work Diameter | | Max. Ramping Angle | Work Diameter | | Max. Ramping Angle | Work Diameter | | Max. Ramping Angle |
| | Min. | Max. | | Min. | Max. | | Min. | Max. | |
| 10 | 16,0 | 18,0 | 2°30' | | | | | | |
| 12 | 20,0 | 22,0 | 1°45' | | | | | | |
| 14 | 24,0 | 26,0 | 1°25' | 25,0 | 27,0 | 1°40' | | | |
| 16 | 28,0 | 30,0 | 1°00' | 29,0 | 31,0 | 1°20' | | | |
| 18 | 32,0 | 34,0 | 0°45' | 33,0 | 35,0 | 1°10' | | | |
| 20 | 36,0 | 38,0 | 0°30' | 37,0 | 39,0 | 1°00' | | | |
| 22 | | | | 41,0 | 43,0 | 0°50' | | | |
| 25 | 46,0 | 48,0 | 0°30' | 47,0 | 49,0 | 0°45' | 44,5 | 48,0 | 1°30' |
| 28 | | | | 53,0 | 55,0 | 0°45' | 50,5 | 54,0 | 1°10' |
| 30 | | | | 57,0 | 59,0 | 0°40' | 54,5 | 58,0 | 1°10' |
| 32 | 60,0 | 62,0 | 0°25' | 61,0 | 63,0 | 0°35' | 58,5 | 62,0 | 1°00' |
| 35 | | | | | | | 64,5 | 68,0 | 0°50' |
| 40 | 76,0 | 78,0 | 0°20' | 77,0 | 79,0 | 0°25' | 74,5 | 78,0 | 0°45' |
| 50 | 96,0 | 98,0 | 0°15' | 97,0 | 99,0 | 0°20' | 94,5 | 98,0 | 0°30' |
| 63 | 122,0 | 124,0 | 0°10' | 123,0 | 125,0 | 0°15' | 120,5 | 124,0 | 0°20' |
| 80 | | | | | | | 154,5 | 158,0 | 0°15' |
| 100 | | | | | | | | | |
| 125 | | | | | | | | | |

The above recommended values are for a nose radius of 0,8 mm.

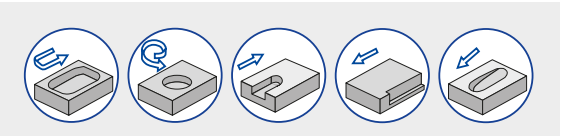
# "Wave Mill" Series
# WAX Type

## Overview

Based on our proven Wavemill design this new range of WAX cutters is capable of rough and finishing Aluminium Alloys and other Non Ferrous Metals. It is ideal for high productivity Aluminium machining to exacting tolerances in the Aircraft, Electronics, and Automotive industries. The award winning Auroracoat DLC (diamond like carbon) inserts resist chip adhesion and substantially increase both tool life and productivity when dry machining Aluminium helping customers boost compliance with ISO14001 accreditation standards

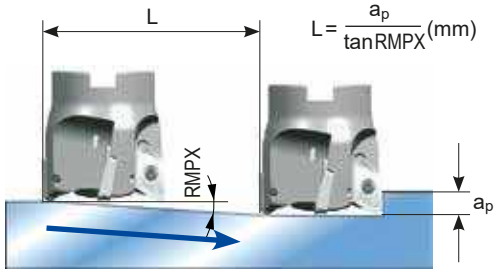
## Advantages

- High Productivity
- Dry machining capability with MQL system
- DLC (diamond like carbon) inserts
- True 90 degree shoulder milling
- Chip adhesion resistance
- Wide range of nose radius



## Ramping (Slant Milling)

Maximum ramping angle ($\alpha$ max. max.) depends on cutter diameter.
Minimum milling length (L min) is the ramping distance required to reach the maximum cutting depth ($a_p$ max) at the maximum ramping angle of that cutter.
Minimum milling length (L) for any depth can be calculated by the equation below:




### WAX3000 E/EL Type

(mm)

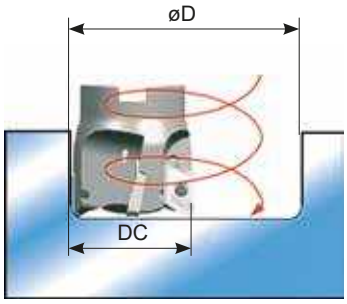
| Cutter Diameter DC | Ramping Angle RMPX max. | Depth- of Cut $a_p$ max. | Milling Distance L min |
|---|---|---|---|
| 20 | 8° | 10 | 72 |
| 25 | 17° | 10 | 33 |
| 32 | 12° | 10 | 47 |
| 40 | 9° | 10 | 64 |

### WAX3000 RS Type

(mm)

| Cutter Diameter DC | Ramping Angle RMPX max. | Depth- of Cut $a_p$ max. | Milling Distance L min |
|---|---|---|---|
| 50 | 7° | 10 | 82 |
| 60 | 5° | 10 | 115 |
| 80 | 3° | 10 | 191 |
| 100 | 3° | 10 | 191 |
| 125 | 2° | 10 | 287 |

## Helical Milling




### Helical Milling Diameter

(mm)

| Cutter Diameter DC | Milling Diameter øD | |
|---|---|---|
| | Min. | Max. |
| 20 | 22 | 33 |
| 25 | 29 | 43 |
| 32 | 43 | 57 |
| 40 | 59 | 73 |
| 50 | 79 | 93 |
| 63 | 105 | 119 |
| 80 | 139 | 153 |
| 100 | 179 | 193 |
| 125 | 229 | 243 |

## Maximum Allowable Spindle Speed

| Cutter Diameter DC | Spindle Revolution n (min$^{-1}$) | Cutting Speed $v_c$ (m/min) |
|---|---|---|
| 20 | 14.000 | 880 |
| 25 | 29.000 | 2.200 |
| 32 | 25.000 | 2.500 |
| 40 | 23.000 | 2.900 |
| 50 | 20.000 | 3.100 |
| 63 | 18.000 | 3.500 |
| 80 | 16.000 | 4.000 |
| 100 | 14.000 | 4.400 |
| 125 | 13.000 | 5.100 |

## Recommended Cutting Conditions

| Work Material | Aluminum Alloy |
|---|---|
| Cutting Speed | 600–1.200 m/min |
| Feed Rate | 0,05–0,25 mm/tooth |

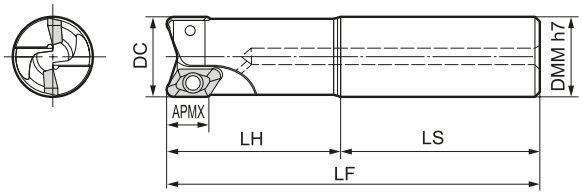
# "Wave Mill" Series
# WAX 3000 E/EL Type

16–18mm | 90°

| | |
|---|---|
| Axial rake angle | 6° |
| Radial rake angle | 19–25° |

**(Endmill)**

Short Type "E"
Long Type "EL"




## Body

(For inserts with nose radius ≤ 3,2 mm)

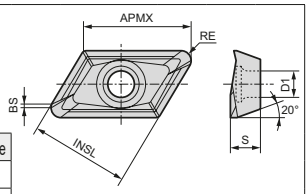
| Cat. No. | Stock | Dimensions (mm) | | | | | No.of teeth | Weight (Kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LF | LH | LS | | |
| WAX 3020 E -3.2 | ● | 20 | 20 | 130 | 60 | 70 | 1 | 0,25 |
| WAX 3025 E -3.2 | ● | 25 | 25 | 140 | 60 | 80 | 2 | 0,42 |
| 3025 EL-3.2 | ● | 25 | 25 | 200 | 60 | 140 | 2 | 0,63 |
| WAX 3032 E -3.2 | ● | 32 | 32 | 150 | 70 | 80 | 2 | 0,75 |
| 3032 EL-3.2 | ● | 32 | 32 | 220 | 70 | 150 | 2 | 1,2 |
| WAX 3040 E -3.2 | ● | 40 | 32 | 160 | 70 | 90 | 3 | 1,0 |
| 3040 EL-3.2 | ● | 40 | 32 | 220 | 70 | 150 | 3 | 1,4 |

## Body

(For inserts with nose radius ≥ 4,0 mm)

| Cat. No. | Stock | Dimensions (mm) | | | | | No.of teeth | Weight (Kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LF | LH | LS | | |
| WAX 3020 E -4.0 | ● | 20 | 20 | 130 | 60 | 70 | 1 | 0,25 |
| WAX 3025 E -4.0 | ● | 25 | 25 | 140 | 60 | 80 | 2 | 0,42 |
| 3025 EL-4.0 | ● | 25 | 25 | 200 | 60 | 140 | 2 | 0,63 |
| WAX 3032 E -4.0 | ● | 32 | 32 | 150 | 70 | 80 | 2 | 0,75 |
| 3032 EL-4.0 | ● | 32 | 32 | 220 | 70 | 150 | 2 | 1,2 |
| WAX 3040 E -4.0 | ● | 40 | 32 | 160 | 70 | 90 | 3 | 1,0 |
| 3040 EL-4.0 | ● | 40 | 32 | 220 | 70 | 150 | 3 | 1,4 |

## Inserts for WAX 3000 Type




| Application | DLC Coated | Carbide |
|---|---|---|
| High Speed / Light cut | K N | N |
| General Purpose | | N |
| Roughing | | |

| Cat. No. | DL1000 | H1 | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | APMX | INSL | BS | RE | S | D1 |
| AECT 160404 PEFRA | ● | ● | 18 | 16,4 | 1,4 | 0,4 | 5 | 4,4 |
| 160408 PEFRA | ● | ● | 18 | 16,4 | 1,0 | 0,8 | 5 | 4,4 |
| 160412 PEFRA | ● | ● | 18 | 16,4 | 0,6 | 1,2 | 5 | 4,4 |
| 160416 PEFRA | ● | ● | 17,5 | 16,4 | 0,5 | 1,6 | 5 | 4,4 |
| 160420 PEFRA | ● | ● | 17,5 | 16,4 | 0,5 | 2,0 | 5 | 4,4 |
| 160430 PEFRA | ● | ● | 17 | 16,4 | 0,7 | 3,0 | 5 | 4,4 |
| 160432 PEFRA | ● | ● | 17 | 16,4 | 0,5 | 3,2 | 5 | 4,4 |
| AECT 160440 PEFRA | ● | ● | 16,5 | 16,4 | 0,5 | 4,0 | 5 | 4,4 |
| 160450 PEFRA | ● | ● | 16 | 16,4 | 0,4 | 5,0 | 5 | 4,4 |

## Spare Parts

| Insert Screw | | Insert Wrench | Applicable Endmill |
|---|---|---|---|
|  | N·m |  | |
| BFTX 0408 | 3,0 | TRD 15 | WAX 3000 E/EL |





● = Euro stock
❑ = Delivery on request

☞ G58

N·m Recommended Tightening Torque (N·m)

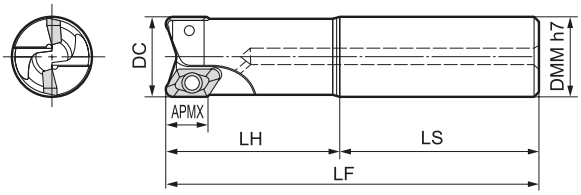
# WAX 4000 E/EL Type

22–24mm 90°

| | |
|---|---|
| Axial rake angle | 6° |
| Radial rake angle | 19–25° |

**(Endmill)**

Short Type "E"
Long Type "EL"




## Body

(For inserts with nose radius ≤ 3,2 mm)

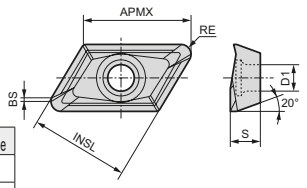
| Cat. No. | Stock | Dimensions (mm) | | | | | No.of teeth | Weight (Kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LF | LH | LS | | |
| WAX 4025E -3.2 | ❑ | 25 | 25 | 140 | 60 | 80 | 1 | 0,41 |
| 4025EL-3.2 | ❑ | 25 | 25 | 200 | 60 | 140 | 1 | 0,63 |
| WAX 4032E -3.2 | ❑ | 32 | 32 | 150 | 70 | 80 | 1 | 0,72 |
| 4032EL-3.2 | ❑ | 32 | 32 | 220 | 70 | 150 | 1 | 1,2 |
| WAX 4040E -3.2 | ❑ | 40 | 32 | 160 | 70 | 90 | 2 | 0,88 |
| 4040EL-3.2 | ❑ | 40 | 32 | 220 | 70 | 150 | 2 | 1,2 |

## Body

(For inserts with nose radius ≥ 4,0 mm)

| Cat. No. | Stock | Dimensions (mm) | | | | | No.of teeth | Weight (Kg) |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | LF | LH | LS | | |
| WAX 4025E -4.0 | ❑ | 25 | 25 | 140 | 60 | 80 | 1 | 0,41 |
| 4025EL-4.0 | ❑ | 25 | 25 | 200 | 60 | 140 | 1 | 0,63 |
| WAX 4032E -4.0 | ❑ | 32 | 32 | 150 | 70 | 80 | 1 | 0,72 |
| 4032EL-4.0 | ❑ | 32 | 32 | 220 | 70 | 150 | 1 | 1,2 |
| WAX 4040E -4.0 | ❑ | 40 | 32 | 160 | 70 | 90 | 2 | 0,88 |
| 4040EL-4.0 | ❑ | 40 | 32 | 220 | 70 | 150 | 2 | 1,2 |

## Inserts for WAX 4000 Type




| Application | DLC Coated | Carbide |
|---|---|---|
| High Speed / Light cut | K N | N |
| General Purpose | | N |
| Roughing | | |

| Cat. No. | DL1000 | H1 | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | APMX | INSL | BS | RE | S | D1 |
| AECT 220604 PEFRA | ❑ | ❑ | 24 | 21,8 | 1,5 | 0,4 | 6,35 | 6,0 |
| 220608 PEFRA | ❑ | ❑ | 24 | 21,8 | 1,2 | 0,8 | 6,35 | 6,0 |
| 220612 PEFRA | ❑ | ❑ | 24 | 21,8 | 0,8 | 1,2 | 6,35 | 6,0 |
| 220616 PEFRA | ❑ | ❑ | 24 | 21,8 | 0,4 | 1,6 | 6,35 | 6,0 |
| 220620 PEFRA | ❑ | ❑ | 24 | 21,8 | 0,5 | 2,0 | 6,35 | 6,0 |
| 220630 PEFRA | ❑ | ❑ | 23 | 21,8 | 0,6 | 3,0 | 6,35 | 6,0 |
| 220632 PEFRA | ❑ | ❑ | 23 | 21,8 | 0,4 | 3,2 | 6,35 | 6,0 |
| AECT 220640 PEFRA | ❑ | ❑ | 22 | 21,8 | 1,2 | 4,0 | 6,35 | 6,0 |
| 220650 PEFRA | ❑ | ❑ | 22 | 21,8 | 0,4 | 5,0 | 6,35 | 6,0 |

## Spare Parts

| Insert Screw | | Insert Wrench | Applicable Endmill |
|---|---|---|---|
|  | N·m |  | |
| BFTX 0509 N | 5,0 | TRD 20 | Ø 25 – Ø 32 |
| BFTX 0511 N | | TRD 20 | Ø 40 – Ø 125 |



☞ G59

# WMM Type

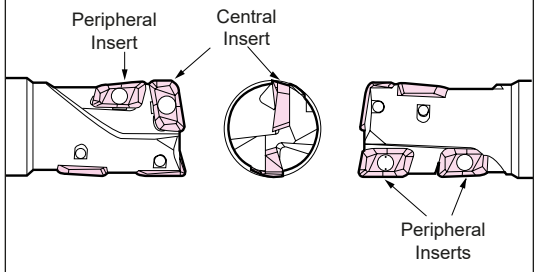
## Features

Utilising some of the design features, which made the Wave-Mill so successful, this multi-functional cutter, which utilizes standard wavy shaped inserts mounted radially and axially, performs a variety of operations.
These include slotting, shoulder milling, ramping, pocketing, drilling, helical cutting etc and eliminates the need to stock a variety of application specific tools.

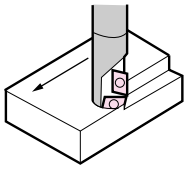
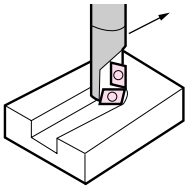
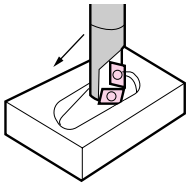
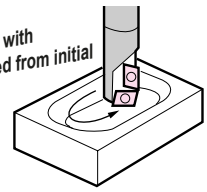
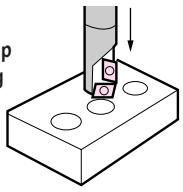
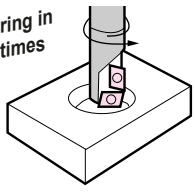
## Advantages

- Multi-functional cutter efficiently performs a number of cutting operations.
- Excellent for ramping, helical cutting, and pocketing.
- Uses standard inserts interchangeable with those used on other Wave-Mill cutters
- Strong high rake inserts gives smooth cutting action.
- Good dimensional stability thanks to long life inserts

● Insert Orientation of WMM Type Cutter




## Multi-purpose Applications

| ● Shoulder Cutting | ● Slotting | ● Ramping (Slant Milling) |
|---|---|---|
| DIN X5CrNi810<br>Cutting of stainless steel tool<br>  | GG25<br>Deep grooving can be performed easily. Easy chip removal<br>  | C50<br>Capable of tapered recess cutting of a prepared hole<br>  |
| Tool Dia. : 25 mm<br>Insert : APMT103504PDER (Grade : ACZ350)<br>$v_c$ = 200 m/min, $f_t$ = 0,1 mm/tooth<br>Axial $a_p$: 15 mm, Radial $a_e$: 25 mm, Air blow | Tool Dia. : 25 mm<br>Insert : APMT 103504PDER (Grade : ACZ310)<br>$v_c$ = 180 m/min, $f_t$ =0,12 mm/tooth<br>Axial $a_p$: 15 mm, R adial $a_e$: 25 mm, Air blow | Tool Dia. : 25 mm<br>Insert : APMT103504PDER (Grade : ACZ310)<br>$v_c$ = 180 m/min, $f_t$ = 0,12 mm/tooth<br>Axial $a_p$: 15 mm, Radial $a_e$: 25 mm, Air blow |
| **● Pocketing** | **● Drilling** | **● Helical Cutting** |
| C50<br>Capable of pocketing with continuous lateral feed from initial drilling or taper cutting process<br>  | C50<br>Capable of easy chip removal and drilling without tool damage<br>  | C50<br>Capable of large boring in diameter of 1,2–1,8 times the cutter diameter without prepared hole<br>  |
| Tool Dia. : 25 mm<br>Insert : APMT103504PDER (Grade : ACZ350)<br>$v_c$ = 200 m/min, $f_t$ = 0.1 mm/tooth<br>Axial $a_p$ : 15 mm, Radial $a_e$ : 2 5mm<br>Air blow | Tool Dia. : 25 mm<br>Insert : APMT103504PDER (Grade : ACZ350)<br>Bore size : 25 mm, Depth : d=15 mm<br>$v_c$ = 200 m/ min, f = 0.1 mm/ rev<br>Step feed : 0,5 mm, Air blow | Tool Dia. : 25 mm<br>Insert : APMT103504PDER (Grade : ACZ350)<br>Bore size : 40 mm, Depth : d=30 mm<br>$v_c$ = 300 m/ min, f = 0.1 mm/ rev<br>Axial feed : t = 15 mm/pitch, Air blow |

## Recommended Cutting Conditions for WMM(H)2000

| øD (mm) \ Material | | Type of milling | Carbon steel (ex. C50) | Stainless steel (ex. 10CrNiS189) | Cast iron (ex. GG20) | Aluminium alloy |
|---|---|---|---|---|---|---|
| 20 ~ 26 | $v_c$ | — | 80-**120**-160 | 80-**100**-120 | 70-**150**-180 | 200-**300**-500 |
| | $f_t$ | Shoulder milling | 0,05-0,20 | 0,05-0,15 | 0,05-0,20 | 0,1-0,15-0,2 |
| | | Slotting | 0,05-0,12 | 0,05-0,10 | 0,05-0,12 | 0,05-0,10 |
| | | Drilling | 0,05-0,18 | 0,05-0,12 | 0,05-0,18 | 0,05-0,10 |
| Grade | | | ACZ330 | ACZ350 | ACZ310 | DL1000 (H1) |

[$v_c$ =m/min, $f_t$ =mm/tooth] [min.– optimum – max.]

## Recommended Cutting Conditions for WMM(H)3000

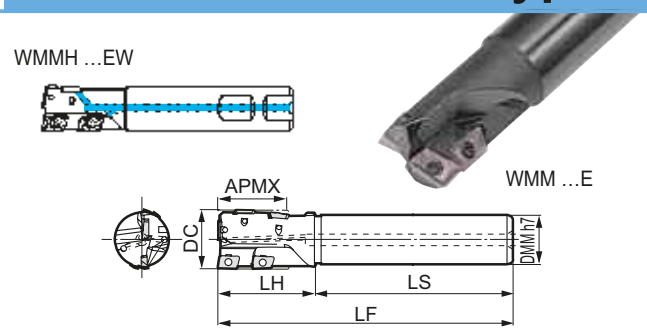
| øD (mm) \ Material | | Type of milling | Carbon steel (ex. C50) | Stainless steel (ex. 10CrNiS189) | Cast iron (ex. GG20) | Aluminium alloy |
|---|---|---|---|---|---|---|
| 32 ~ 40 | $v_c$ | — | 80-**120**-160 | 80-**100**-120 | 70-**150**-180 | 200-**300**-500 |
| | $f_t$ | Shoulder milling | 0,05-0,25 | 0,05-0,20 | 0,05-0,25 | 0,1-0,15-0,2 |
| | | Slotting | 0,05-0,15 | 0,05-0,12 | 0,05-0,15 | 0,05-0,10 |
| | | Drilling | 0,05-0,20 | 0,05-0,18 | 0,05-0,20 | 0,05-0,10 |
| Grade | | | ACZ330 | ACZ350 | ACZ310 | DL1000 (H1) |

[$v_c$ =m/min, $f_t$ =mm/tooth] [min.– optimum – max.]

▲ = To be replaced by new item

Recommended Tightening Torque (N·m)

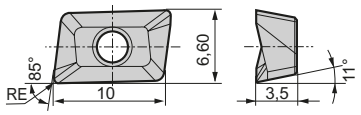
# "Wave Mill" Series
# WMM (H) 2000 E/EL EW/ELW Type




## Body

| Cat. No. | Stock | Dimensions (mm) | | | | | | Total teeth | Effective teeth |
|---|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | APMX | LF | LH | LS | | |
| WMM 2020 E | ▲ | 20 | 20 | 17 | 130 | 35 | 95 | 3 | 1 |
| WMM 2025 E | ▲ | 25 | 25 | 26 | 140 | 40 | 100 | 4 | 1 |
| (Long type) | | | | | | | | | |
| WMM 2020 EL | ▲ | 20 | 20 | 17 | 185 | 60 | 125 | 3 | 1 |
| WMM 2025 EL | ▲ | 25 | 25 | 26 | 220 | 75 | 145 | 4 | 1 |
| (Weldon shank type) | | | | | | | | | |
| WMM 2020 EW | ▲ | 20 | 20 | 17 | 130 | 35 | 95 | 3 | 1 |
| WMM 2025 EW | ▲ | 25 | 25 | 26 | 140 | 40 | 100 | 4 | 1 |
| (Long type with weldon shank) | | | | | | | | | |
| WMM 2020 ELW | ▲ | 20 | 20 | 17 | 185 | 60 | 125 | 3 | 1 |
| WMM 2025 ELW | ▲ | 25 | 25 | 26 | 220 | 75 | 145 | 4 | 1 |
| (**WMMH** Standard type with coolant holes and weldon shank) | | | | | | | | | |
| WMMH 2020 EW | ▲ | 20 | 20 | 17 | 130 | 35 | 95 | 3 | 1 |
| WMMH 2025 EW | ▲ | 25 | 25 | 26 | 140 | 40 | 100 | 4 | 1 |
| (**WMMH** Long type with coolant holes and weldon shank) | | | | | | | | | |
| WMMH 2020 ELW | ▲ | 20 | 20 | 17 | 185 | 60 | 125 | 3 | 1 |
| WMMH 2025 ELW | ▲ | 25 | 25 | 26 | 220 | 75 | 145 | 4 | 1 |

## Inserts for WMM 2000 Series

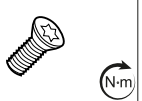



| Application | Coated | | | Diamond coated | Un-coated |
|---|---|---|---|---|---|
| High Speed / Light cut | | | | K N | N |
| General Purpose | M | P | K | | N |
| Roughing | | | | | |

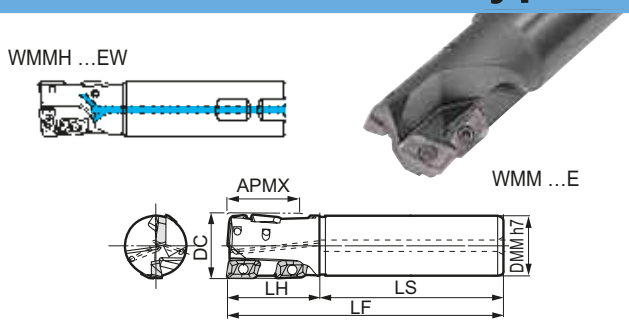
| Cat. No. | ACZ350 | ACZ330 | ACZ310 | DL1000 | H1 | Radius RE |
|---|---|---|---|---|---|---|
| APMT 103504 PDER | ▲ | ▲ | ▲ | – | – | 0,4 |
| 103508 PDER | ▲ | ▲ | ▲ | – | – | 0,8 |
| 103512 PDER | ▲ | ▲ | | – | – | 1,2 |
| APMT 103504 PDER-H | ▲ | ▲ | ▲ | – | – | 0,4 |
| 103508 PDER-H | ▲ | ▲ | ▲ | – | – | 0,8 |
| 103512 PDER-H | ▲ | ▲ | ▲ | – | – | 1,2 |
| APET 103504 PDER-F | ▲ | ▲ | ▲ | – | – | 0,4 |
| APET 103504 PDFR-S | – | – | – | ▲ | ▲ | 0,4 |

PDER-H : Stronger cutting edge
PDER-F : Ground insert for finishing
PDFR-S : Round honed sharp cutting edge for aluminium

## Spare Parts

| Screw | | Wrench |
|---|---|---|
|  | N·m |  |
| BFTX 02506 N | 1,5 | TRD 08 |

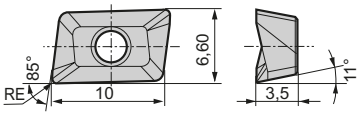
# "Wave Mill" Series
# WMM (H) 3000 E/EL EW/ELW Type




## Body

| Cat. No. | Stock | Dimensions (mm) | | | | | | Total teeth | Effective teeth |
|---|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | APMX | LF | LH | LS | | |
| WMM 3032 E | ▲ | 32 | 32 | 39 | 150 | 50 | 100 | 4 | 1 |
| WMM 3040 E | ▲ | 40 | 32 | 39 | 160 | 55 | 105 | 4 | 1 |
| (Long type) | | | | | | | | | |
| WMM 3032 EL | ▲ | 32 | 32 | 39 | 230 | 90 | 140 | 4 | 1 |
| WMM 3040 EL | ▲ | 40 | 32 | 39 | 230 | 55 | 185 | 4 | 1 |
| (Weldon shank type) | | | | | | | | | |
| WMM 3032 EW | ▲ | 32 | 32 | 39 | 150 | 50 | 100 | 4 | 1 |
| WMM 3040 EW | ▲ | 40 | 32 | 39 | 160 | 55 | 105 | 4 | 1 |
| (Long type with weldon shank) | | | | | | | | | |
| WMM 3032 ELW | ▲ | 32 | 32 | 39 | 230 | 90 | 140 | 4 | 1 |
| WMM 3040 ELW | ▲ | 40 | 32 | 39 | 230 | 55 | 185 | 4 | 1 |
| (**WMMH** Standard type with coolant holes and weldon shank) | | | | | | | | | |
| WMMH 3032 EW | ▲ | 32 | 32 | 39 | 150 | 50 | 100 | 4 | 1 |
| WMMH 3040 EW | ▲ | 40 | 32 | 39 | 160 | 55 | 105 | 4 | 1 |
| (**WMMH** Long type with coolant holes and weldon shank) | | | | | | | | | |
| WMMH 3032 ELW | ▲ | 32 | 32 | 39 | 230 | 90 | 140 | 4 | 1 |
| WMMH 3040 ELW | ▲ | 40 | 32 | 39 | 230 | 55 | 185 | 4 | 1 |

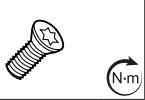
## Inserts for WMM 3000 Series




| Application | Coated | | | Diamond coated | Un-coated |
|---|---|---|---|---|---|
| High Speed / Light cut | | | | K N | N |
| General Purpose | M | P | K | | N |
| Roughing | | | | | |

| Cat. No. | ACZ350 | ACZ330 | ACZ310 | DL1000 | H1 | Radius RE |
|---|---|---|---|---|---|---|
| APMT 160508 PDER | ▲ | ▲ | ▲ | – | – | 0,8 |
| 160512 PDER | | ▲ | | – | – | 1,2 |
| 160516 PDER | ▲ | ▲ | ▲ | – | – | 1,6 |
| APMT 160508 PDER-H | ▲ | ▲ | ▲ | – | – | 0,8 |
| 160512 PDER-H | ▲ | ▲ | ▲ | – | – | 1,2 |
| 160516 PDER-H | ▲ | ▲ | | – | – | 1,6 |
| APMT 160520 PDER-H | ▲ | ▲ | ▲ | – | – | 2,0 |
| 160530 PDER-H | ▲ | ▲ | ▲ | – | – | 3,0 |
| 160540 PDER-H | ▲ | | | – | – | 4,0 |
| 160550 PDER-H | ▲ | | | – | – | 5,0 |
| 160560 PDER-H | ▲ | ▲ | ▲ | – | – | 6,0 |
| APET 160508 PDER-F | ▲ | ▲ | ▲ | – | – | 0,8 |
| APET 160504 PDFR-S | – | – | – | ▲ | ▲ | 0,4 |
| 160508 PDFR-S | – | – | – | ▲ | ▲ | 0,8 |

## Spare Parts

| Screw | | Wrench |
|---|---|---|
|  | N·m |  |
| BFTX 03584 | 3,0 | TRD 15 |

● APET--- S, uncoated grade "H1" for Aluminium

# WRX Type

## General Features

The WRX Wave repeater end mill system features AXMT style inserts vertically mounted and positioned to provide a long continuous cutting edge suitable for deep shoulder milling. Designed to run at elevated feed rates the soft cutting action reduces cutting resistance, vibration and noise to substantially improve tool life and surface finish.

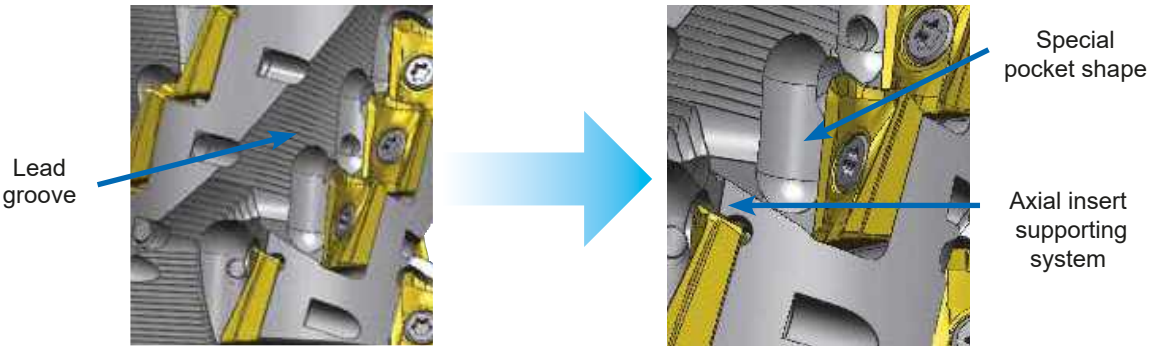
Available with our new generation Super FF and Super ZX coated inserts for unbeatable performance.

## Product Range

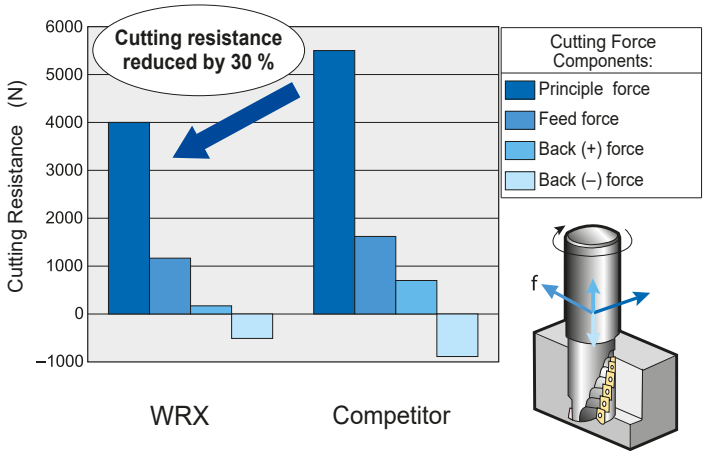
- WRX 2000 series with 12 mm inserts
- WRX 3000 series with 17 mm inserts
- Cutter Diameters - 20 mm ($a_p$ = 18 mm) to 100 mm ($a_p$ = 53 mm)
- Special Order Options – WRX Cutter with integrated arbor
  Shell type with detachable head
- Wide ISO Application Range – P/M/K/N classification

## Advantages

- Optimised insert positions reduce cutting resistance and vibration
- Integral coolant improves chip flow
- Primary chip slot for smooth and fast chip evacuation
- Optimised insert pocket maximises rigidity
- Bottom edge support improves tool life and cutting performance

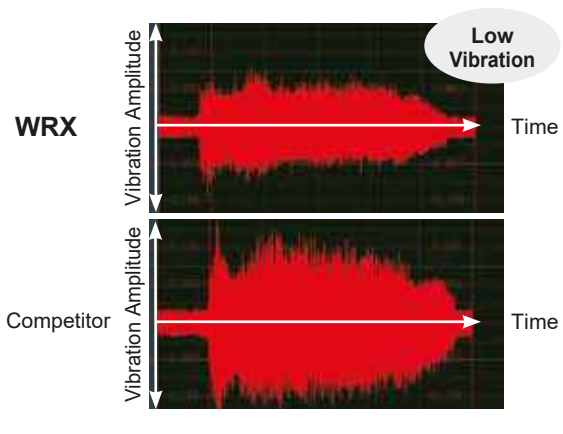



## Cutting Resistance Comparison




| | |
|---|---|
| Work Material: | C50 |
| Tool: | WRX2025RH27E25 |
| Cutting Conditions: | $v_c$ = 100 m/min, $f_t$ = 0,15 mm/tooth |
| | $a_p$ = 25 mm, $a_e$ = 10 mm, Dry |

## Vibration Comparison



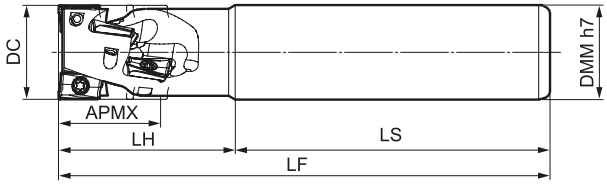

| | |
|---|---|
| Work Material: | C50 |
| Tool: | WRX3080RH53F32 |
| Cutting Conditions: | $v_c$ = 150 m/min, $f_t$ = 0,15 mm/tooth |
| | $a_p$ = 25 mm, $a_e$ = 10 mm, Dry |





● = Euro stock
❍ = Japan stock
❑ = Delivery on request
▲ = To be replaced by new item
Recommended Tightening Torque (N·m)

# WRX 2000 Series with AXMT 12 mm inserts



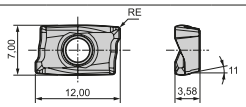

## Body (Cylindrical Shank Type)

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of teeth | No. of rows | Effective teeth |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | APMX | DMM | LF | LH | LS | | | |
| WRX2020RH18E20 | ● | 20 | 18 | 20 | 120 | 40 | 80 | 4 | 2 | 2 |
| WRX2020RH36E20 | ❑ | 20 | 36 | 20 | 130 | 45 | 85 | 4 | 4 | 1 |
| WRX2025RH18E25 | ● | 25 | 18 | 25 | 130 | 45 | 85 | 6 | 2 | 3 |
| WRX2025RH27E25 | ● | 25 | 27 | 25 | 130 | 45 | 85 | 6 | 3 | 2 |
| WRX2032RH18E32 | ● | 32 | 18 | 32 | 140 | 50 | 90 | 8 | 2 | 4 |
| WRX2032RH27E32 | ● | 32 | 27 | 32 | 130 | 45 | 85 | 9 | 3 | 3 |
| WRX2040RH18E40 | ❑ | 40 | 18 | 40 | 160 | 40 | 120 | 10 | 2 | 5 |
| WRX2040RH36E40 | ● | 40 | 36 | 40 | 130 | 45 | 85 | 16 | 4 | 4 |

## Body (Weldon Shank Type)

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of teeth | No. of rows | Effective teeth |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | APMX | DMM | LF | LH | LS | | | |
| WRX2020RH18W20 | ● | 20 | 18 | 20 | 120 | 40 | 80 | 4 | 2 | 2 |
| WRX2020RH36W20 | ❑ | 20 | 36 | 20 | 130 | 45 | 85 | 4 | 4 | 1 |
| WRX2025RH18W25 | ● | 25 | 18 | 25 | 130 | 45 | 85 | 6 | 2 | 3 |
| WRX2025RH27W25 | ● | 25 | 27 | 25 | 130 | 45 | 85 | 6 | 3 | 2 |
| WRX2032RH18W32 | ● | 32 | 18 | 32 | 140 | 50 | 90 | 8 | 2 | 4 |
| WRX2032RH27W32 | ● | 32 | 27 | 32 | 130 | 45 | 85 | 9 | 3 | 3 |
| WRX2040RH18W40 | ❑ | 40 | 18 | 40 | 160 | 40 | 120 | 10 | 2 | 5 |
| WRX2040RH36W40 | ● | 40 | 36 | 40 | 130 | 45 | 85 | 16 | 4 | 4 |

## Inserts (Same as for Wavemill WEX 2000 Type)




| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | |
| General Purpose | | P | | K | | M S | M S | | N | |
| Roughing | | P | P | | K | | M S | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
| AXMT 123504 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,4 |
| 123508 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 123512 PEER-G | ● | ● | ● | ● | ● | | | – | – | 1,2 |
| AXMT 123504 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,4 |
| 123508 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 123512 PEER-H | ● | ● | ● | ❍ | ● | | | – | – | 1,2 |
| AXMT 123504 PEER-E | | | | | | ● | ● | – | – | 0,4 |
| 123508 PEER-E | | | ▲ | | | ● | ● | – | – | 0,8 |
| 123512 PEER-E | | | | | | ● | ● | – | – | 1,2 |
| AXMT 123508 PEER-EH | | | ▲ | | | ● | ● | – | – | 0,8 |
| AXET 123502 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 123504 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 123508 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,8 |

– Unable to produce

G - General type
H - Strong cutting edge
E - For stainless steel / exotic alloy
EH - Strong edge for stainless steel / exotic alloy
S - For aluminium alloy

## Spare Parts (WRX 2000)

| Screw | Wrench |
|---|---|
|  |  |
| BFTX 0306 IP | TRDR 08 IP |

## Identification Details

**WRX 20 25 R H 27 W 25**

- **20** – Insert Size
- **25** – Tool øD
- **R** – Cutting Direction
- **H** – Inner coolant
- **27** – Cutting Edge Lengh
- **W** – Arbor Type
  - **E** - Straight Shank
  - **W** - Weldon Shank
  - **F** - Shell Type
- **25** – Arbor Diameter

## Application Examples

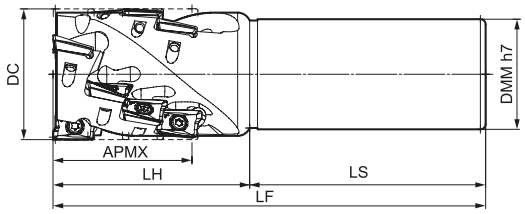
### Example

| Work Material | Construction Machine Parts (USt.42-2) | | |
|---|---|---|---|
| Tool | Body | Sumitomo | Competitor |
| | | WRX2000 Weldon shank | Ø 38,1 |
| | Insert | AXMT | 18 mm |
| | Insert grade | ACP200 | PVD Type |
| | Tool dia. (mm) | 38,1 | 38,1 |
| | Total teeth | 24 | 16 |
| | Effective teeth | 4 | 4 |
| Cutting Data | Cutting speed (m/min) | 180 | 137 |
| | Feed (mm/t) | 0,09 | 0,1 |
| | Axial depth of cut (mm) | 38,1 | 38,1 |
| | Radial width of cut (mm) | 3,2 | 3,2 |
| | Coolant | Wet | Wet |
| Result | Tool life / Cutting edge | 60 | 40 |
| Benefits | 1,5 times longer tool life<br>30 % increased productivity | | |



G49

# WRX 3000 Series with AXMT 17 mm inserts




## Body (Cylindrical Shank Type)

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of teeth | No. of rows | Effective teeth |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | APMX | DMM | LF | LH | LS | | | |
| WRX3032RH40E32 | ● | 32 | 40 | 32 | 150 | 65 | 85 | 6 | 3 | 2 |
| WRX3040RH27E40 | ❑ | 40 | 27 | 40 | 180 | 60 | 120 | 6 | 2 | 3 |
| WRX3040RH40E40 | ● | 40 | 40 | 40 | 150 | 65 | 85 | 9 | 3 | 3 |
| WRX3050RH27E40 | ❑ | 50 | 27 | 40 | 180 | 60 | 120 | 8 | 2 | 4 |
| WRX3050RH53E40 | ● | 50 | 53 | 40 | 165 | 75 | 90 | 12 | 4 | 3 |

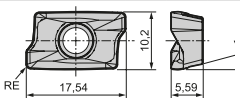
## Body (Weldon Shank Type)

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of teeth | No. of rows | Effective teeth |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DC | APMX | DMM | LF | LH | LS | | | |
| WRX3040RH27W40 | ❑ | 40 | 27 | 40 | 180 | 60 | 120 | 6 | 2 | 3 |
| WRX3040RH40W40 | ● | 40 | 40 | 40 | 150 | 65 | 85 | 9 | 3 | 3 |
| WRX3050RH27W40 | ❑ | 50 | 27 | 40 | 180 | 60 | 120 | 8 | 2 | 4 |
| WRX3050RH53W40 | ● | 50 | 53 | 40 | 165 | 75 | 90 | 12 | 4 | 3 |

## Spare Parts (WRX 3000)

| Screw | Wrench |
|---|---|
|  3,0 |  |
| BFTX 0409 IP | TRDR 15 IP |

## Inserts (Same as for Wavemill WEX 3000 Type)




| Application | Coated Carbide | | | | | | | Carbide | DLC | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | M S | | K N | N | |
| General Purpose | | P | | K | | M S | M S | | N | |
| Roughing | | P | P | | K | | M S | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius RE |
| AXMT 170508 PEER-L | ● | ● | ● | ❍ | ● | | | – | – | 0,8 |
| AXMT 170504 PEER-G | ❍ | ● | ● | ● | ● | | | – | – | 0,4 |
| 170508 PEER-G | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 170512 PEER-G | ❍ | ● | ● | ❍ | ● | | | – | – | 1,2 |
| 170516 PEER-G | ❍ | ● | ● | ❍ | ● | | | – | – | 1,6 |
| 170520 PEER-G* | ❍ | ● | ● | ● | ● | | | – | – | 2,0 |
| 170530 PEER-G* | ● | ● | ● | ● | ● | | | – | – | 3,0 |
| AXMT 170508 PEER-H | ● | ● | ● | ● | ● | | | – | – | 0,8 |
| 170512 PEER-H | ● | ● | ● | ● | ● | | | – | – | 1,2 |
| AXMT 170504 PEER-E | | | | | | ● | ● | – | – | 0,4 |
| 170508 PEER-E | | | ▲ | | | ● | ● | – | – | 0,8 |
| 170512 PEER-E | | | | | | ● | ● | – | – | 1,2 |
| 170516 PEER-E | | | | | | ❍ | ● | – | – | 1,6 |
| 170520 PEER-E* | | | | | | ❍ | ● | – | – | 2,0 |
| 170530 PEER-E* | | | | | | ● | ● | – | – | 3,0 |
| AXMT 170508 PEER-EH | | | ▲ | | | ● | ● | – | – | 0,8 |
| AXET 170502 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,2 |
| 170504 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,4 |
| 170508 PEFR-S | – | – | – | – | – | – | – | ● | ● | 0,8 |

– Unable to produce

L – Low cutting force
G – General type
H – Strong cutting edge
E – For stainless steel
EH– Strong edge for stainless steel
S – For aluminium
* Cutter body modification is required.

## Application Examples

### Example 1

| Work Material | Automotive Component / Cast Iron | | |
|---|---|---|---|
| Tool | Body | Sumitomo | Competitor |
| | | WRX3000 Type Integrated Arbor | Ø 50 |
| | Insert | AXMT | 18 mm |
| | Insert grade | ACK300 | PVD Type |
| | Tool dia. (mm) | 50 | 50 |
| | Total teeth | 15 | 12 |
| | Effective teeth | 3 | 3 |
| Cutting Data | Cutting speed (m/min) | 78 | 78 |
| | Feed (mm/t) | 0,13 | 0,13 |
| | Axial depth of cut (mm) | 45 | 45 |
| | Radial width of cut (mm) | 5 | 5 |
| | Coolant | Dry | Dry |
| Result | Tool life / Cutting edge | 500 min | 300 min |
| Benefits | 1,7 times longer tool life | | |

### Example 2

| Work Material | Machine Parts / Stainless Steel | | |
|---|---|---|---|
| Tool | Body | Sumitomo | Competitor |
| | | WRX3040RH40E40 | Ø 40 |
| | Insert | AXMT | 18 mm |
| | Insert grade | ACP300 | PVD Type |
| | Tool dia. (mm) | 40 | 40 |
| | Total teeth | 9 | 6 |
| | Effective teeth | 3 | 2 |
| Cutting Data | Cutting speed (m/min) | 125 | 125 |
| | Feed (mm/t) | 0,2 | 0,2 |
| | Axial depth of cut (mm) | 40 | 40 |
| | Radial width of cut (mm) | 5 | 5 |
| | Coolant | Wet | Wet |
| Result | Tool life / Cutting edge | 20 | 5 ~ 10 |
| Benefits | Stable machining, double tool life with no breakage | | |



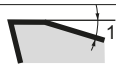
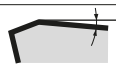
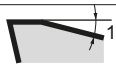


● = Euro stock
❍ = Japan stock
❑ = Delivery on request
▲ = To be replaced by new item

☞ G49

Recommended Tightening Torque (N·m)

## Chipbreaker Selection

| Work Material | Steel, Cast Iron | | | Stainless Steel | | Aluminium |
|---|---|---|---|---|---|---|
| Chipbreaker Type | L | G | H | E | EH | S |
| |  |  |  |  |  |  |
| Feature | Low cutting force | General purpose | Strong cutting edge | E type for smooth cutting | Strong cutting edge | Sharp cutting edge |
| 2000 Type Figure | – |   |   |   |   |   |
| 3000 Type Figure |   |   |   |   |   |   |
| Application | Light cut, low rigidity milling and less burrs | General to Interrupted milling | Roughing, heavy interrupted and hardened steel milling | Light cutting to general purpose | Heavy interrupted machining | Aluminium alloy and non-ferrous metal |

## Ramping (Slant Milling)

| Tool Diameter | Max. Ramping Angle | |
|---|---|---|
| | WRX 2000 Typ | WRX 3000 Typ |
| 20 | 4° | |
| 25 | 2° | |
| 32 | 1°30' | |
| 40 | 1° | 2° |
| 50 | 0°30' | 1° |
| 63 | | 0°30' |
| 80 | | 0°30' |
| 100 | | Not possible |

## Recommended Cutting Conditions

Tool: WRX 3050 RH53 F22, DC = 50 mm, $a_p$ = 50 mm

| ISO | Work Material | Property, Condition | Hardness (HB) | Grades (optimum grade in bold letters) | | | Chip Breaker | Recommended cutting speed and feed / tooth according to width of cut ( $a_e$ /DC ) - must be adjusted to actual machine and workpiece conditions. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 10% | | 25% | | >50% | |
| | | | | | | | | $v_c$ | $f_t$ | $v_c$ | $f_t$ | $v_c$ | $f_t$ |
| | | | | | | | | min. **Optimum** max. | min. **Optimum** max. | min. **Optimum** max. | min. **Optimum** max. | min. **Optimum** max. | min. **Optimum** max. |
| P | **Steel, carbon steel** | < 0,15% C, annealed | 125 | ACP 100 | **ACP 200** | ACP 300 | L - **G** | 170 – **215** – 240 | 0,21 – **0,28** – 0,35 | 160 – **195** – 220 | 0,16 – **0,21** – 0,26 | 130 – **160** – 180 | 0,08 – **0,10** – 0,13 |
| | | < 0,45% C, annealed | 190 | ACP 100 | **ACP 200** | ACP 300 | L - **G** | 160 – **195** – 220 | 0,21 – **0,28** – 0,35 | 140 – **175** – 190 | 0,16 – **0,21** – 0,26 | 110 – **140** – 160 | 0,08 – **0,10** – 0,13 |
| | | < 0,45% C, tempered | 250 | ACP 100 | **ACP 200** | ACP 300 | L - **G** - H | 140 – **180** – 200 | 0,19 – **0,26** – 0,32 | 130 – **165** – 180 | 0,14 – **0,19** – 0,24 | 100 – **130** – 140 | 0,08 – **0,10** – 0,13 |
| | | < 0,75% C, annealed | 270 | ACP 100 | **ACP 200** | ACP 300 | L - **G** - H | 140 – **170** – 190 | 0,19 – **0,26** – 0,32 | 120 – **155** – 170 | 0,14 – **0,19** – 0,24 | 100 – **130** – 140 | 0,07 – **0,10** – 0,12 |
| | | < 0,75% C, tempered | 300 | ACP 100 | **ACP 200** | ACP 300 | L - **G** - H | 130 – **165** – 180 | 0,19 – **0,26** – 0,32 | 120 – **150** – 170 | 0,14 – **0,19** – 0,24 | 100 – **120** – 130 | 0,07 – **0,10** – 0,12 |
| | **Low alloyed steel** | annealed | 180 | ACP 100 | **ACP 200** | ACP 300 | **G** - H | 130 – **165** – 180 | 0,18 – **0,24** – 0,30 | 120 – **150** – 170 | 0,13 – **0,18** – 0,22 | 100 – **120** – 130 | 0,07 – **0,09** – 0,11 |
| | | tempered | 275 | ACP 100 | **ACP 200** | ACP 300 | **G** - H | 130 – **160** – 180 | 0,17 – **0,23** – 0,28 | 120 – **145** – 160 | 0,12 – **0,16** – 0,20 | 100 – **120** – 130 | 0,07 – **0,09** – 0,11 |
| | | tempered | 300 | ACP 100 | **ACP 200** | ACP 300 | **G** - H | 110 – **140** – 160 | 0,16 – **0,22** – 0,27 | 100 – **130** – 140 | 0,11 – **0,15** – 0,19 | 90 – **110** – 120 | 0,07 – **0,09** – 0,11 |
| | | tempered | 350 | ACP 100 | **ACP 200** | ACP 300 | **G** - H | 100 – **130** – 140 | 0,16 – **0,21** – 0,26 | 100 – **120** – 130 | 0,11 – **0,15** – 0,19 | 80 – **100** – 110 | 0,06 – **0,08** – 0,10 |
| | **High alloyed and tool steel** | annealed | 200 | **ACP 100** | ACP 200 | | G - **H** | 70 – **85** – 90 | 0,15 – **0,21** – 0,26 | 60 – **80** – 90 | 0,11 – **0,14** – 0,18 | 60 – **70** – 80 | 0,06 – **0,08** – 0,10 |
| | | tempered | 325 | **ACP 100** | ACP 200 | | G - **H** | 30 – **35** – 40 | 0,14 – **0,19** – 0,24 | 30 – **35** – 40 | 0,10 – **0,14** – 0,17 | 20 – **30** – 30 | 0,06 – **0,08** – 0,10 |
| M | **Stainless steel, ferritic/martensitic** | annealed | 200 | | ACP 200 | **ACP 300** | L - **G** - H | 120 – **150** – 170 | 0,15 – **0,20** – 0,25 | 110 – **135** – 150 | 0,11 – **0,14** – 0,18 | 90 – **110** – 120 | 0,07 – **0,09** – 0,11 |
| | **Stainless, martensitic** | tempered | 240 | | ACP 200 | **ACP 300** | L - **G** - H | 100 – **125** – 140 | 0,16 – **0,22** – 0,27 | 90 – **115** – 130 | 0,12 – **0,16** – 0,20 | 80 – **100** – 110 | 0,07 – **0,10** – 0,12 |
| | **Stainless, austenitic** | plunged | 180 | | ACM 200 | **ACM 300** | L - **G** | 80 – **95** – 110 | 0,15 – **0,20** – 0,25 | 70 – **85** – 90 | 0,11 – **0,14** – 0,18 | 60 – **70** – 80 | 0,06 – **0,08** – 0,10 |
| K | **Gray cast iron** | GG | 180 | **ACK 200** | ACK 300 | | **G** - H | 190 – **240** – 270 | 0,19 – **0,26** – 0,32 | 180 – **220** – 240 | 0,14 – **0,19** – 0,24 | 140 – **170** – 190 | 0,09 – **0,12** – 0,15 |
| | **Nodular cast iron** | GGG | 250 | **ACK 200** | ACK 300 | | **G** - H | 140 – **170** – 190 | 0,16 – **0,21** – 0,26 | 120 – **155** – 170 | 0,12 – **0,16** – 0,20 | 100 – **130** – 140 | 0,07 – **0,10** – 0,12 |
| S | **Exotic alloys (Resistant alloys, Ti + Ni alloys)** | Fe based, annelaed | 200 | ACK 200 | **ACK 300** | | L - **G** | 40 – **45** – 50 | 0,12 – **0,16** – 0,21 | 30 – **40** – 45 | 0,08 – **0,11** – 0,14 | 30 – **35** – 40 | 0,07 – **0,09** – 0,11 |
| | | hardened | 280 | ACK 200 | **ACK 300** | | L - **G** | 15 – **20** – 25 | 0,10 – **0,14** – 0,17 | 10 – **15** – 20 | 0,07 – **0,10** – 0,12 | 10 – **15** – 20 | 0,05 – **0,07** – 0,09 |
| N | **Aluminum alloy** | Si < 13% | | | **DL 1000** | H1 | **S** | 510 – **635** – 710 | 0,23 – **0,31** – 0,38 | 460 – **580** – 640 | 0,17 – **0,22** – 0,28 | 390 – **485** – 540 | 0,08 – **0,12** – 0,14 |
| | | Si ≥ 13% | | | **DL 1000** | H1 | **S** | 150 – **190** – 210 | 0,19 – **0,25** – 0,32 | 140 – **175** – 190 | 0,14 – **0,18** – 0,23 | 130 – **165** – 180 | 0,08 – **0,10** – 0,13 |
| | **Copper alloy** | | | | **DL 1000** | H1 | **S** | 320 – **405** – 450 | 0,15 – **0,21** – 0,26 | 300 – **370** – 410 | 0,13 – **0,16** – 0,22 | 240 – **300** – 330 | 0,07 – **0,10** – 0,12 |

- Dry machining is recommended (air cooling) - if lubricant is used, we recommend CVD coated grades (ACP100 / ACK200) or tough PVD grades (ACP300 / ACK300).
- Insert geometry: L type for low cutting forces, thinly coated components. G type for general application, H type offers high cutting edge stability for rough and heavy cutting conditions.

# WBMR Type

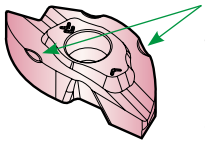
## Features

Particularly suitable for die mold machining the WBMR replaceable insert ball nose endmill efficiently roughs complex profiles.

Its high feed rate capability is a direct result of a sharp cutting edge which is maintained during the cutting cycle by the special cemented carbide substrate working in parallel with the ultra hard ZX coating.

## Advantages

- Wave shaped cutting edge
- Economical M class insert
- Precise clamping
- High feed rate capability

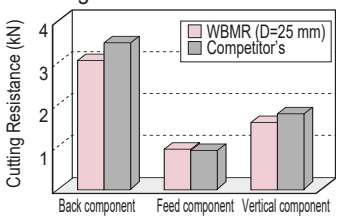


**Chipbreaker**
(Nick type)
for r = 25
radial insert

ZNMT 4310250-N

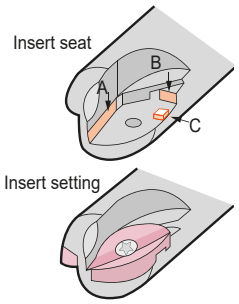
## Performance

● Cutting Resistance



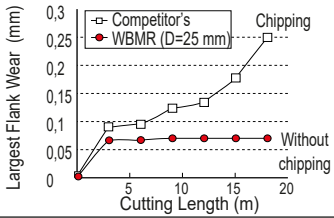

Cutting Conditions (Shoulder milling, downcut)
$v_c$ = 200 m/min, $f_t$ = 0.15 mm/tooth
Axial $a_p$: 5 mm, Radial $a_e$: 5 mm
Work Material : C50

● Anti-Rotational Mechanism




Circumferential movement of the insert caused by cutting forces is controlled by guide faces A, B & C, so as to allow stable cutting.

● Insert Life

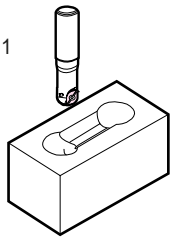



Cutting Conditions (Shoulder milling, downcut)
$v_c$ = 100 m/min, $f_t$ = 0.15 mm/tooth
Axial $a_p$: 5mm, Radial $a_e$: 5 mm
Work Material : X 40 CrMoV 5-1(HRC45)

## Application Example

● Cold Molding Die

Work Material :
X 155 CrVMo 12 1



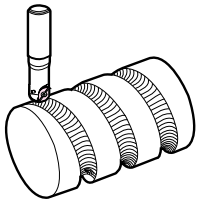
<Results>
Flank wear after continuous cutting for seven hours was less than other manufacturer's product.
Stable cutting was observed.

WBMR 2200S (ø 20 mm)
Insert Grade : ACZ350

Cutting Conditions :
n = 2200 rpm, $v_f$ = 500 mm/min
Depth of Cut : 0,3–2 mm
Non-water soluble cutting oil

● Injection Molded Part

(Cr-Mo steel + Stellite-overlay)



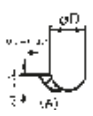
<Results>
Wave ball (ø30mm) could cut without chattering while other manufacturer's products could not cut at all due to chattering.

WBMR 2300M (ø 30 mm)
Insert Grade : ACZ350

Cutting Conditions :
n = 500 rpm, $v_f$ = 35 mm/min
Depth of Cut : 5 mm
Dry cut

## Recommended Cutting Conditions (2 teeth)

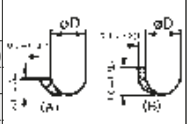
| Condition | Material | Carbon steel (Below HRC25) | Alloy steel (Below HRC45) | Stainless, Die steel etc. | Cast iron |
|---|---|---|---|---|---|
| (A) | $v_c$ | 200-**250**-300 | 100-**150**-200 | 50-**80**-100 | 100-**120**-150 |
| | $f_t$ | 0,1-**0,2**-0,3 | 0,1-**0,2**-0,3 | 0,1-**0,15**-0,2 | 0,2-**0,3**-0,4 |




[$v_c$ =m/min, $f_t$ =mm/tooth] [min.– optimum – max.]

## Recommended Cutting Conditions (4 teeth)

| Condition | Material | Carbon steel (Below HRC25) | Alloy steel (Below HRC45) | Stainless, Die steel etc. | Cast iron |
|---|---|---|---|---|---|
| (A) | $v_c$ | 200-**250**-300 | 100-**150**-200 | 50-**80**-100 | 100-**120**-150 |
| | $f_t$ | 0,1-**0,2**-0,3 | 0,1-**0,2**-0,3 | 0,1-**0,15**-0,2 | 0,2-**0,3**-0,4 |
| (B) | $v_c$ | 160-**200**-240 | 80-**120**-160 | 40-**60**-80 | 80-**100**-120 |
| | $f_t$ | 0,1-**0,2**-0,3 | 0,1-**0,2**-0,3 | 0,1-**0,15**-0,2 | 0,2-**0,3**-0,4 |




[$v_c$ =m/min, $f_t$ =mm/tooth] [min.– optimum – max.]





● = Euro stock
○ = Japan stock

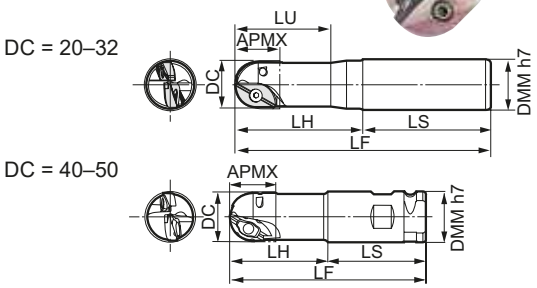
❑ = Delivery on request

Recommended Tightening Torque (N·m)

# Wave Ball Mill" for Roughing
# WBMR 2000 Type

| Rake Angle | | |
|---|---|---|
| | Radial | – |
| | Axial | -10° |

20–47mm




## Body (Short and middle length type, 2 teeth)

| Cat. No. | Stock | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | APMX | LH | LS | LU | LF |
| WBMR 2200 S | ● | 20 | 25 | 20 | 60 | 80 | 40 | 140 |
| 2200 M | ● | 20 | 25 | 20 | 60 | 140 | 40 | 200 |
| 2200 MW | ● | 20 | 25 | 20 | 60 | 140 | 40 | 200 |
| WBMR 2250 S | ● | 25 | 32 | 23 | 70 | 80 | 50 | 150 |
| 2250 M | ● | 25 | 32 | 23 | 73 | 147 | 50 | 220 |
| 2250 MW | ● | 25 | 32 | 23 | 73 | 147 | 50 | 220 |
| WBMR 2320 S | ● | 32 | 32 | 31 | 80 | 80 | 60 | 160 |
| 2320 M | ● | 32 | 32 | 31 | 85 | 155 | 60 | 240 |
| 2320 MW | ● | 32 | 32 | 31 | 85 | 155 | 60 | 240 |
| WBMR 2400 S | ❑ | 40 | 42 | 35 | 100 | 100 | - | 200 |
| 2400 M | ❑ | 40 | 42 | 35 | 180 | 100 | - | 280 |
| WBMR 2500 S | ❑ | 50 | 42 | 47 | 100 | 100 | - | 200 |
| 2500 M | ❑ | 50 | 42 | 47 | 180 | 100 | - | 280 |

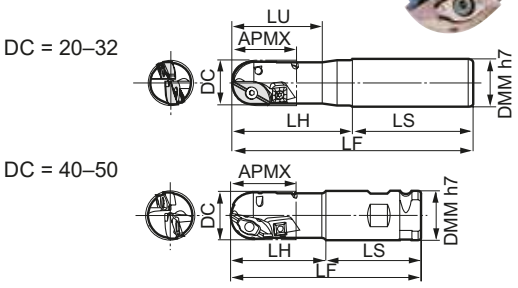
S: **S**hort type with cylindrical shank
M: **M**iddle length type with cylindrical shank

MW: **M**iddle length type with Weldon shank

# Wave Ball Mill" for Roughing
# WBMR 2000 L Type

| Rake Angle | | |
|---|---|---|
| | Radial | – |
| | Axial | -10° |

30–69mm




## Body (Extra long type, 4 teeth)

| Cat. No. | Stock | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | DC | DMM | APMX | LH | LS | LU | LF |
| WBMR 2200 LL | ● | 20 | 25 | 30 | 80 | 170 | 40 | 250 |
| 2200 LLW | ● | 20 | 25 | 30 | 80 | 170 | 40 | 250 |
| WBMR 2250 LL | ● | 25 | 32 | 38 | 100 | 200 | 50 | 300 |
| 2250 LLW | ● | 25 | 32 | 38 | 100 | 200 | 50 | 300 |
| WBMR 2320 LL | ● | 32 | 32 | 44 | 120 | 230 | 60 | 350 |
| 2320 LLW | ● | 32 | 32 | 44 | 120 | 230 | 60 | 350 |
| WBMR 2400 LL | ❑ | 40 | 42 | 50 | 250 | 100 | - | 350 |
| 2400 LLW | | 40 | 42 | 50 | 250 | 100 | - | 350 |
| WBMR 2500 LL | ❑ | 50 | 42 | 69 | 250 | 100 | - | 350 |
| 2500 LLW | | 50 | 42 | 69 | 250 | 100 | - | 350 |

LL: Extra long type with cylindrical shank

LLW: Extra long type with Weldon shank

## Inserts

| Application | Coated Carbide | | |
|---|---|---|---|
| High Speed / Light cut | | | |
| General Purpose | PM | PM | |
| Roughing | PM | PM | K |

| Cat. No. | ACP200 | ACP300 | ACK300 | Dimensions (mm) L | W1 | S | RE | Fig. | No. of teeth | Applicable Endmill |
|---|---|---|---|---|---|---|---|---|---|---|
| ZNMT 1804100-C | ● | ● | ● | 18,00 | 9,76 | 4,76 | 10,0 | 1 | 1 | WBMR 2200 |
| 2004100-S | ● | ● | ● | 20,00 | 7,50 | 4,37 | 10,0 | 2 | 1 | |
| SPMT 070308 | ❍ | ❍ | | 7,94 | - | 3,18 | - | 3 | 2 | |
| ZNMT 2205125-C | ● | ● | ● | 22,50 | 12,20 | 5,70 | 12,5 | 1 | 1 | WBMR 2250 |
| 2305125-S | ● | ● | ● | 23,00 | 9,38 | 5,56 | 12,5 | 2 | 1 | |
| SPMT 09T308 | ● | ● | ● | 9,53 | - | 3,97 | - | 3 | 2 | |
| ZNMT 2907160-C | ● | ● | ● | 29,00 | 15,62 | 7,15 | 16,0 | 1 | 1 | WBMR 2320 |
| 3006160-S | ● | ● | ● | 30,00 | 12,00 | 6,70 | 16,0 | 2 | 1 | |
| SPMT 09T308 | ● | ● | ● | 9,53 | - | 3,97 | - | 3 | 2 | |
| ZNMT 3608200 | ❍ | ❍ | ❍ | 36,00 | 19,50 | 6,70 | 20,0 | 4 | 2 | WBMR 2400 |
| SPMT 09T308 | ● | ● | ● | 9,53 | - | 3,97 | - | 3 | 2 | |
| ZNMT 4310250 | ❍ | | ❍ | 43,00 | 25,70 | 10,15 | 25 | 4 | 2 | WBMR 2500 |
| 4310250-N | ❍ | | ❍ | 43,00 | 25,70 | 10,15 | 25 | 5 | 2 | |
| SPMT 120408 | ❍ | ❍ | ❍ | 12,7 | - | 4,76 | - | 3 | 2 | |

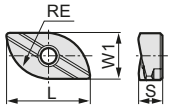
Fig. 1


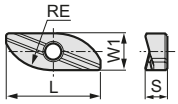

Fig. 2



Fig. 3



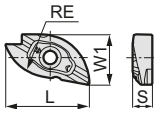
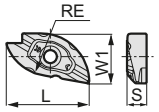
Fig. 4



Fig. 5



## Spare Parts

| Screw | | Wrench | Wrench | Applicable Endmill |
|---|---|---|---|---|
| | (N·m) | | | |
| BFTX 0307N | 2,0 | TRX10 | – | WBMR 2200, WBMR 2200 LL |
| BFTX 0409N | 3,4 | – | TRD15 | WBMR 2250, WBMR 2250LL |
| BFTX 0511N | 5,0 | – | TRD20 | WBMR 2320, WBMR 2320LL |
| BFTX 0407N | 3,0 | – | TRD15 | WBMR 2320LL |
| BFTX0619N | 7,5 | – | TRD25 | WBMR 2400, WBMR 2500, WBMR 2400LL, WBMR 2500LL |
| BFTX 0409N | 3,4 | – | TRD15 | WBMR 2500LL |

# Wave Ball Mill for Finishing
# WBMF Type

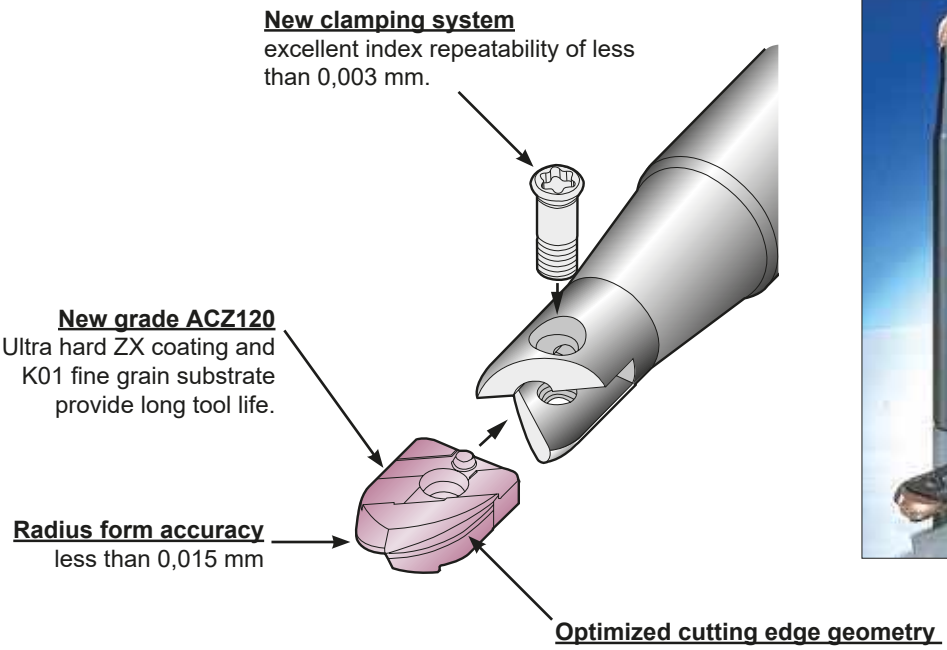
## Features

The outstanding results obtained from this finishing cutter are due to the combination of its large sigmoid blade and precise clamping system making it extremely rigid !

The WBMF achieves an excellent machined finish greatly reducing hand finishing and polishing operations.

## Advantages

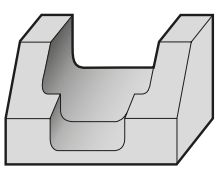
- Unique rigid clamping system
- Large sigmoid blade
- Smooth cutting action
- High quality machined surface
- Ultra hard ZX coated cutting edge




## Application Example

● Bumper Moulding Die

Work Material :
C55

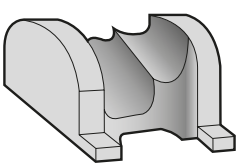


<Results>
Surface roughness after continuous cutting for twelve hours was better than other manufacturer's product.
Less width of flank wear was observed.

| | |
|---|---|
| WBMF1200M (ø20mm)<br>Insert : ZPGU2471100<br>Grade : ACZ120 | Cutting Conditions<br>$v_c$ = 88 m/min<br>$v_f$ = 700 mm/min ( $f_t$ = 0,25 mm/tooth)<br>Width of Cut : 0,5 mm<br>Depth of Cut : 0,5 mm<br>Dry |

● Bumper Moulding Die

Work Material :
C50



<Results>
Smooth cutting and good surface finish after continuous cutting for eight hours

| | |
|---|---|
| WBMF1200M (ø20mm)<br>Insert : ZPGU2471100<br>Grade : ACZ120 | Cutting Conditions<br>$v_c$ = 190 m/min<br>$v_f$ = 1200 mm/min ( $f_t$ = 0,21 mm/tooth)<br>Width of Cut : 0,2 mm<br>Depth of Cut : 0,2 mm<br>Dry |

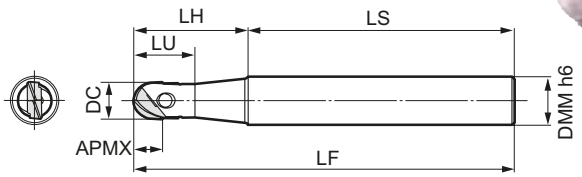




● = Euro stock
❑ = Delivery on request

Recommended Tightening Torque (N·m)

| Rake Angle | | |
|---|---|---|
| | Radial | – |
| | Axial | 0° |

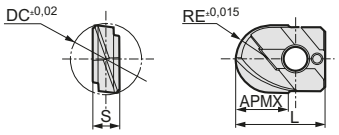

## Body

| Cat. No. | | Stock | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | DC | DMM | APMX | LH | LS | LU | LF |
| WBMF | 1100 S | ❑ | 10 | 16 | 9 | 30 | 70 | 17 | 100 |
| | 1100 M | ● | 10 | 16 | 9 | 35 | 95 | 17 | 130 |
| | 1100 L | ❑ | 10 | 16 | 9 | 50 | 130 | 17 | 180 |
| WBMF | 1120 S | ❑ | 12 | 16 | 10,5 | 40 | 70 | 19,5 | 110 |
| | 1120 M | ● | 12 | 16 | 10,5 | 40 | 110 | 19,5 | 150 |
| | 1120 MM12N | | 12 | 12 | 10,5 | 40 | 110 | 19,5 | 150 |
| | 1120 L | ❑ | 12 | 16 | 10,5 | 60 | 140 | 19,5 | 200 |
| WBMF | 1160 S | ❑ | 16 | 20 | 12 | 50 | 80 | 25,5 | 130 |
| | 1160 M | ● | 16 | 20 | 12 | 50 | 130 | 25,5 | 180 |
| | 1160 MM12N | | 16 | 16 | 12 | 50 | 130 | 25,5 | 180 |
| | 1160 L | ❑ | 16 | 20 | 12 | 70 | 150 | 25,5 | 220 |
| WBMF | 1200 S | ❑ | 20 | 25 | 15 | 60 | 80 | 32 | 140 |
| | 1200 M | ● | 20 | 25 | 15 | 60 | 140 | 32 | 200 |
| | 1200 MM20N | | 20 | 20 | 15 | 60 | 140 | 32 | 200 |
| | 1200 L | ❑ | 20 | 25 | 15 | 80 | 170 | 32 | 250 |
| WBMF | 1250 S | | 25 | 32 | 18,5 | 70 | 80 | 36 | 150 |
| | 1250 M | ● | 25 | 32 | 18,5 | 73 | 147 | 36 | 220 |
| | 1250 L | ❑ | 25 | 32 | 18,5 | 100 | 200 | 36 | 300 |
| WBMF | 1300 S | | 30 | 32 | 22,5 | 80 | 80 | 43 | 160 |
| | 1300 M | ● | 30 | 32 | 22,5 | 85 | 155 | 43 | 240 |
| | 1300 L | | 30 | 32 | 22,5 | 120 | 230 | 43 | 350 |

S : **S**hort type
M : **M**iddle length type
L : **L**ong type

## Inserts

| Application | Coated |
|---|---|
| High Speed / Light cut | P |
| General Purpose | |
| Roughing | |

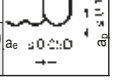



| Cat. No. | ACZ120 | Dimensions (mm) | | | | | Applicable Endmill |
|---|---|---|---|---|---|---|---|
| | | DC | L | APMX | S | RE | |
| ZPGU 1551050 | ● | 10 | 15,6 | 9 | 5,1 | 5,0 | WBMF1100 |
| ZPGU 1856060 | ● | 12 | 18 | 10,5 | 5,6 | 6,0 | WBMF1120 |
| ZPGU 2061080 | ● | 16 | 20,5 | 12 | 6,1 | 8,0 | WBMF1160 |
| ZPGU 2471100 | ● | 20 | 24,5 | 15 | 7,1 | 10,0 | WBMF1200 |
| ZPGU 2876125 | ● | 25 | 28,5 | 18,5 | 7,6 | 12,5 | WBMF1250 |
| ZPGU 3486150 | ● | 30 | 34,4 | 22,5 | 8,6 | 15,0 | WBMF1300 |

## Spare Parts

| Screw | | Wrench | Applicable Endmill |
|---|---|---|---|
|  | |  | |
| BFTG0408F | 3,4 | TRD15 | WBMF1100 |
| BFTG0409F | 3,4 | TRD15 | WBMF1120 |
| BFTG0513F | 5,0 | TRD20 | WBMF1160 |
| BFTG0617F | 7,5 | TRD25 | WBMF1200 |
| BFTG0621F | 7,5 | TRD25 | WBMF1250 |
| BFTG0825F | 7,5 | TRD25 | WBMF1300 |

## Recommended Cutting Conditions

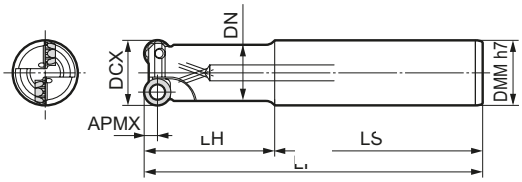
| Material / Condition | | Carbon steel (Below HRC25) | Alloy steel (Below HRC45) | Stainless, Die steel etc. | Cast iron | |
|---|---|---|---|---|---|---|
| øD 10~30 | $v_c$ | 200–**250**–300 | 100–**150**–200 | 50–**80**–100 | 100–**120**–150 |  |
| | $f_t$ | 0,1–**0,2**–0,3 | 0,1–**0,2**–0,3 | 0,1–**0,15**–0,2 | 0,2–**0,3**–0,4 | |

## Shank Type with Small Diameter Inserts

4,0 mm (WRCX 08000) 5,0 mm (WRCX 10000)

E_ : Cylindrical straight shank type

ES : **S**hort type with straight shank
EM : **M**iddle length type with straight shank
EL : **L**ong type with straight shank




Axial rake angle: – 3°
Radial rake angle: 0 – 35°

## Body

## Spare Parts

| Cat. No. | Stock | Dimensions (mm) DCX | DMM | DN | APMX | LF | LH | LS | No. of teeth | Axial Rake | Radial Rake | Helical Boring øB Standard | Plunging α max. | Spare Parts | N·m | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WRCX 08012 ES | ● | 12 | 12 | 9,4 | 4 | 110 | 40 | 70 | 1 | -3° | -35° | - | 0°30' | BFTX 02505 IP | 1,5 | TRDR 08 IP |
| 08012 EM | ● | 12 | 12 | 9,4 | 4 | 150 | 70 | 80 | 1 | | | | | | | |
| WRCX 08016 ES | ● | 16 | 16 | 14 | 4 | 120 | 50 | 70 | 1 | -3° | -10° | $24^{+7}_{-4}$ | 5°30' | BFTX 02506 IP | 1,5 | TRDR 08 IP |
| 08016 EM | ● | 16 | 16 | 14 | 4 | 150 | 70 | 80 | 1 | | | | | | | |
| WRCX 08020 ES | ● | 20 | 20 | 18 | 4 | 130 | 50 | 80 | 2 | -3° | -3° | $32^{\pm7}$ | 13° | | | |
| 08020 EM | ● | 20 | 20 | 18 | 4 | 180 | 100 | 80 | 2 | | | | | | | |
| 08020 EL | ● | 20 | 20 | 18 | 4 | 250 | 130 | 120 | 2 | | | | | | | |
| WRCX 08025 ES | ● | 25 | 25 | 21 | 4 | 130 | 50 | 80 | 3 | -3° | 0° | $42^{\pm7}$ | 8°20' | | | |
| 08025 EM | ● | 25 | 25 | 21 | 4 | 180 | 100 | 80 | 3 | | | | | | | |
| 08025 EL | ● | 25 | 25 | 21 | 4 | 250 | 130 | 120 | 3 | | | | | | | |
| WRCX 10025 ES | ● | 25 | 25 | 21 | 5 | 130 | 50 | 80 | 2 | -3° | 0° | $40^{\pm8}$ | 13°10' | BFTX 03584 IP | 3,0 | TRDR 15 IP |
| 10025 EM | ● | 25 | 25 | 21 | 5 | 180 | 100 | 80 | 2 | | | | | | | |
| 10025 EL | ● | 25 | 25 | 21 | 5 | 250 | 130 | 120 | 2 | | | | | | | |
| WRCX 10032 ES | ● | 32 | 32 | 28 | 5 | 130 | 50 | 80 | 3 | -3° | 0° | $54^{\pm8}$ | 8° | | | |
| 10032 EM | ● | 32 | 32 | 28 | 5 | 200 | 120 | 80 | 3 | | | | | | | |
| 10032 EL | ● | 32 | 32 | 28 | 5 | 300 | 180 | 120 | 3 | | | | | | | |

## Inserts

| Application | Coated Carbide | | | | | Uncoated Carbide | Diamond Coated |
|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | K N | N |
| General Purpose | | P M | P M | K | | | N |
| Roughing | | P M | P M | | K | | |

| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | H1 | DL1000 | Dimensions (mm) IC | RE | S | Fig. | Applicable Endmill |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QPMT 080330 PPEN | ● | ● | ● | ● | ● | | | 8 | 3,0 | 3,18 | 1 | WRCX 08000 E |
| 080330 PPEN-H | ● | ● | ● | ● | ● | | | 8 | 3,0 | 3,18 | 1 | |
| QPMT 10T335 PPEN | ● | ● | ● | ● | ● | | | 10 | 3,5 | 3,97 | 1 | WRCX 10000 E |
| 10T335 PPEN-H | ● | ● | ● | ● | ● | | | 10 | 3,5 | 3,97 | 1 | |
| QPET 10T350 PPFR-S | | | | | | ● | ● | 10 | 5,0 | 3,97 | 2 | |

Fig. 1

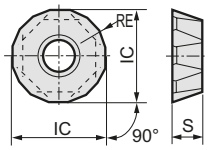
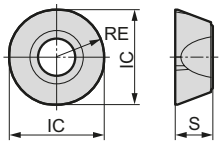



Fig. 2




QPMT... : Standard 16 cornered polygon type
QPMT...-H: Stronger cutting edge type

QPET...-S: Polished round insert for non-ferrous material

## Recommended Cutting Conditions

[$v_c$ = m/min, $f_t$ = mm/tooth] [min.– **optimum** – max.]

| Material / Grade / øD (mm) | | Carbon steel (ex. C40 ~ C50) | Alloy steel (Below HRC40) | Stainless steel (ex. X10CrNiS18-9) | Cast iron (ex. GG20) | Non-ferrous material |
|---|---|---|---|---|---|---|
| | | ACP100, ACP200 | ACP100, ACP200 | ACP200, ACP300 | ACK200, ACK300 | DL1000, H1 |
| 12–32 | $v_c$ | 80–**120**–160 | 60–**100**–140 | 60–**100**–120 | 60–**80**–120 | 200–**500**–1000 |
| | $f_t$ | 0,1–**0,3**–0,4 | 0,1–**0,2**–0,3 | 0,1–**0,15**–0,2 | 0,1–**0,2**–0,3 | 0,1–**0,2**–0,3 |



● = Euro stock
❑ = Delivery on request

☞ G19

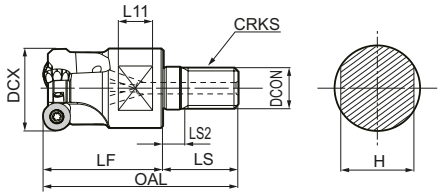
N·m Recommended Tightening Torque (N·m)

# Exchangeable Head Endmills
# WRCX 08000 M Type

4,0 mm (WRCX 08000M)

Modular Type

High efficiency multi purpose endmills




Axial rake angle: 0°
Radial rake angle: -3°

## Heads

For insert type : QPMT 0803

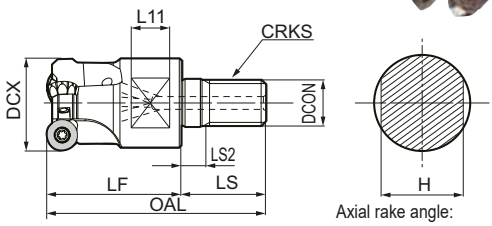
| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| WRCX 08020M10Z2 | ● | 20 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 2 |
| WRCX 08025M12Z3 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 3 |

Inserts are not included.

# Exchangeable Head Endmills
# WRCX 10000/12000 M Type

5,0 mm (WRCX 10000M) 6,0 mm (WRCX 12000M)

High efficiency multi purpose endmills




Axial rake angle: 0°
Radial rake angle: -3°

## Heads

For insert type : QPOT 10T3

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| WRCX 10025M12Z2 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 |
| 10028M12Z3 | | 28 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 |
| WRCX 10030M16Z3 | | 30 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |
| 10032M16Z3 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 |

Inserts are not included.

## Heads

For insert type : QPOT 1204

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | |
| WRCX 12040M16Z4 | ❑ | 40 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 4 |

Inserts are not included.

## Inserts

| Application | Coated Carbide | | | | | Uncoated carbide | Diamond Coated |
|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | K N | N |
| General Purpose | | P M | P M | K | | | N |
| Roughing | | P M | P M | | K | | |

| Cat. No. | | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | H1 | DL1000 | Dimensions (mm) IC | RE | S | Fig. | Applicable Endmill |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QPMT | 080330 PPEN | ● | ● | ● | ● | ● | | | 8 | 3,0 | 3,18 | 1 | WRCX 08000 M |
| | 080330 PPEN-H | ● | ● | ● | ● | ● | | | 8 | 3,0 | 3,18 | 1 | |
| QPMT | 10T335 PPEN | ● | ● | ● | ● | ● | | | 10 | 3,5 | 3,97 | 1 | WRCX 10000 M |
| | 10T335 PPEN-H | ● | ● | ● | ● | ● | | | 10 | 3,5 | 3,97 | 1 | |
| QPET | 10T350 PPFR-S | | | | | | ● | ● | 10 | 5,0 | 3,97 | 2 | |
| QPMT | 120440 PPEN | ● | ● | ● | ● | ● | | | 12 | 4,0 | 4,76 | 1 | WRCX 12000 M |
| | 120440 PPEN-H | ● | ● | ● | ● | ● | | | 12 | 4,0 | 4,76 | 1 | |
| QPET | 120460 PPFR-S | | | | | | ● | ● | 12 | 6,0 | 4,76 | 2 | |

Fig. 1

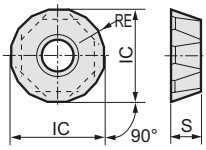
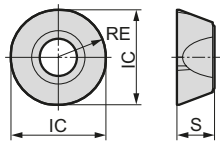



Fig. 2




QPMT... : 16 corner insert for general purpose application
QPMT...-H: 16 corner insert with strong cutting edge

QPET...-S: Round insert with sharp cutting edge for aluminium

## Identification Details

| WRCX | 08 | 020 | M10 | Z2 |
|---|---|---|---|---|
| Cutter Type | Insert Size | Diameter | Mounting Screw | No. of Teeth |


## Spare Parts

| Screw | | Wrench | Applicable Endmill |
|---|---|---|---|
| | N·m | | |
| BFTX 02506 IP | 1,5 | TRDR 08 IP | WRCX 08020M – WRCX 08025M |

## Spare Parts

| Screw | | Wrench | Applicable Endmill |
|---|---|---|---|
| | N·m | | |
| BFTX 03584 IP | 3,0 | TRDR 15 IP | WRCX 10025M – WRCX 10032M |
| BFTX 0409 IP | 3,0 | TRDR 15 IP | WRCX 12040M |

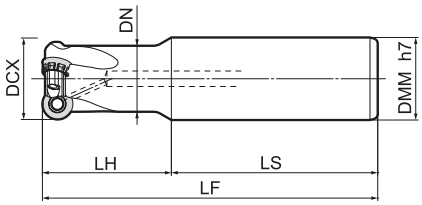
# Wave Radius Mill
# RSX(F)08000/10000/12000ES

Milling of steel, stainless steel, cast iron and exotic alloys

## Shank Type

| Rake Angle | | |
|---|---|---|
| | Radial | -5°– -8° |
| | Axial | 10° |

4,0 mm (08000ES) 5,0 mm (10000ES) 6,0 mm (12000ES)




## Body (RSX...ES, Standard)

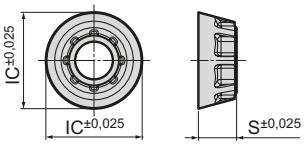
| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DMM | DN | LH | LS | LF | | |
| RSX 08020 ES | ● | 20 | 20 | 16,9 | 30 | 70 | 100 | 2 | 0,3 |
| 08025 ES | ● | 25 | 25 | 21,9 | 40 | 80 | 120 | 3 | 0,4 |
| RSX 10025 ES | ● | 25 | 25 | 20,3 | 50 | 80 | 130 | 2 | 0,4 |
| 10032 ES | ● | 32 | 32 | 27,1 | 50 | 80 | 130 | 3 | 0,7 |
| RSX 12032 ES | ● | 32 | 32 | 25,6 | 50 | 80 | 130 | 2 | 0,7 |

## Body (RSXF...ES, Fine Pitch)

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DMM | DN | LH | LS | LF | | |
| RSXF 08020 ES | ● | 20 | 20 | 16,9 | 30 | 70 | 100 | 3 | 0,3 |
| 08025 ES | ● | 25 | 25 | 21,9 | 40 | 80 | 120 | 4 | 0,4 |
| RSXF 10025 ES | ● | 25 | 25 | 20,3 | 50 | 80 | 130 | 3 | 0,4 |
| 10032 ES | ● | 32 | 32 | 27,1 | 50 | 80 | 130 | 4 | 0,7 |
| RSX 12032 ES | ● | 32 | 32 | 25,6 | 50 | 80 | 130 | 3 | 0,7 |

## Inserts

| Application | Grade | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| High Speed/Light Cut | | | MS | MS | | | | |
| General Purpose | PM | | MS | MS | MS | | | |
| Roughing | PM | K | | | MS | | | |
| Cat. No. | ACP200 | ACK300 | ACM100 | ACM200 | ACM300 | Dimens. IC | Dimens. S | Applicable Cutters |
| RDET 0803M0EN G | ● | ● | ● | ● | ● | 8 | 3,18 | RSX(F) 08000ES |
| 0803M0EN H | ❍ | ● | ● | ● | ● | 8 | 3,18 | |
| RDET 10T3M0EN G | ● | ● | ● | ● | ● | 10 | 3,97 | RSX(F) 10000ES |
| 10T3M0EN H | ● | ● | ● | ● | ● | 10 | 3,97 | |
| RDET 1204M0EN G | ● | ● | ● | ● | ● | 12 | 4,76 | RSX(F) 12000ES |
| 1204M0EN H | ● | ● | ● | ● | ● | 12 | 4,76 | |




Cutting Edge Cross Section

**G** - Type **H** - Type

M0: IC is metric

## Spare Parts

| Applicable Cutters | Wrench | Screw | N·m |
|---|---|---|---|
| RSX(F) 08000ES | TRDR08IP | BFTX02506IP | **1,5** |
| RSX(F) 10000ES | TRDR15IP | BFTX03584IP | **3,0** |
| RSX(F) 12000ES | | BFTX0409IP | **3,0** |

## Identification Details

| RSX | F | 10 | 025 | ES |
|---|---|---|---|---|
| Cutter Series | Fine Pitch Type | Insert Size | Cutter Diameter | Endmill Type |

## Recommended Cutting Conditions

Min.-**Optimum**-Max.

| ISO | Work Material | | | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/t) | Grade |
|---|---|---|---|---|---|---|---|
| P | Carbon Steel | | | 180–280 | 100–**160**–200 | 0,20–**0,40**–0,60 | ACP200 |
| | Alloy Steel | | | 180–280 | 100–**140**–180 | 0,20–**0,30**–0,40 | ACP200 |
| M | Stain-less Steel | Cr Based | Ferritic | 200 | 150–**180**–200 | 0,15–**0,25**–0,35 | ACM300 |
| | | | Martensitic | 200–330 | 80–**120**–180 | 0,15–**0,25**–0,35 | ACM300 |
| | | Cr-Ni Based | Austenitic | 200 | 150–**180**–200 | 0,15–**0,25**–0,35 | ACM300 |
| | | | Austenitic, ferritic | 230–270 | 80–**120**–180 | 0,15–**0,25**–0,35 | ACM200 |
| | | | Precipitation hardening | 330 | 60–**100**–160 | 0,15–**0,25**–0,35 | ACM200 |
| K | Cast Iron | | | 250 | 80–**120**–160 | 0,10–**0,30**–0,40 | ACK300 |
| S | Heat resistant alloy | | Ni based material | 250–350 | 20–**30**– 40 | 0,10–**0,20**–0,30 | ACM100 ACM200 |
| | Titanium | | Pure Titanium | (Rm400) | 60–**80**–100 | 0,10–**0,20**–0,30 | |
| | | | $\alpha + \beta$ alloy system | (Rm1050) | 40–**50**–60 | 0,10–**0,20**–0,30 | |





● = Euro stock
❍ = Japan stock

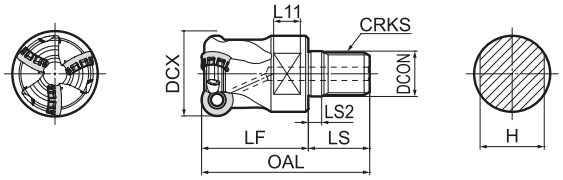
G20/G21

N·m Recommended Tightening Torque (N·m)

## Modular Type

| Rake Angle | | |
|---|---|---|
| | Radial | -5°– -8° |
| | Axial | 10° |

4,0 mm (08000ES) 5,0 mm (10000ES) 6,0 mm (12000ES)





## Body (RSX...M, Standard)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | | |
| RSX 08020M10Z2 | ● | 20 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 2 | 0,1 |
| 08025M12Z3 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 3 | 0,1 |
| 08032M16Z4 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 4 | 0,2 |
| RSX 10025M12Z2 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2 | 0,1 |
| 10032M16Z3 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 | 0,2 |
| RSX 12032M16Z2 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 2 | 0,2 |
| 12040M16Z3 | ● | 40 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 | 0,3 |

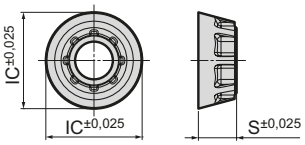
## Body (RSXF...M, Fine Pitch)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DCX | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | | |
| RSXF 08020M10Z3 | ● | 20 | 10,5 | M10 | 49 | 30 | 5 | 19 | 8 | 15 | 3 | 0,1 |
| 08025M12Z4 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 4 | 0,1 |
| 08032M16Z5 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 5 | 0,2 |
| RSXF 10025M12Z3 | ● | 25 | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 3 | 0,1 |
| 10032M16Z4 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 4 | 0,2 |
| RSXF 12032M16Z3 | ● | 32 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 | 0,2 |
| 12040M16Z4 | ● | 40 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 4 | 0,3 |

## Inserts

| Application | Grade | | | | |
|---|---|---|---|---|---|
| High Speed/Light Cut | | | MS | MS | |
| General Purpose | PM | | MS | MS | MS |
| Roughing | PM | K | | | MS |

| Cat. No. | ACP200 | ACK300 | ACM100 | ACM200 | ACM300 | Dimens. IC | Dimens. S | Applicable Cutters |
|---|---|---|---|---|---|---|---|---|
| RDET 0803M0EN G | ● | ● | ● | ● | ● | 8 | 3,18 | RSX(F) 08000ES |
| 0803M0EN H | ○ | ● | ● | ● | ● | 8 | 3,18 | |
| RDET 10T3M0EN G | ● | ● | ● | ● | ● | 10 | 3,97 | RSX(F) 10000ES |
| 10T3M0EN H | ● | ● | ● | ● | ● | 10 | 3,97 | |
| RDET 1204M0EN G | ● | ● | ● | ● | ● | 12 | 4,76 | RSX(F) 12000ES |
| 1204M0EN H | ● | ● | ● | ● | ● | 12 | 4,76 | |




Cutting Edge Cross Section

**G** - Type **H** - Type

M0: IC is metric

## Spare Parts

| Applicable Cutters | Wrench | Screw | N·m |
|---|---|---|---|
| RSX(F) 08000M | TRDR08IP | BFTX02506IP | **1,5** |
| RSX(F) 10000M | TRDR15IP | BFTX03584IP | **3,0** |
| RSX(F) 12000M | | BFTX0409IP | **3,0** |

## Identification Details

| RSX | F | 10 | 025 | M12 | Z3 |
|---|---|---|---|---|---|
| Cutter Series | Fine Pitch Type | Insert Size | Cutter Diameter | Mounting Screw Size | No. of Teeth |

## Recommended Cutting Conditions

Min.-**Optimum**-Max.

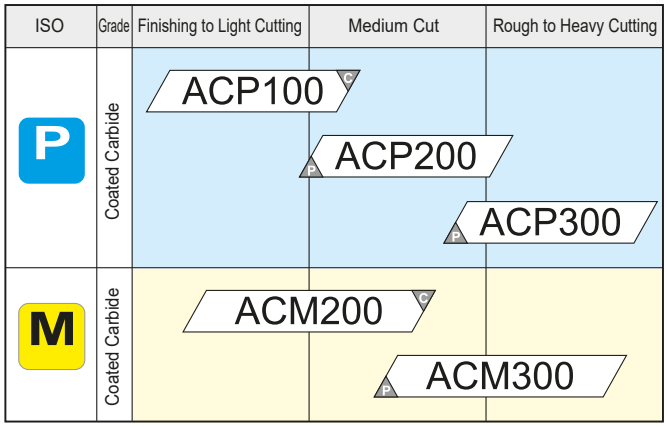
| ISO | Work Material | | | Hardness (HB) | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/t) | Grade |
|---|---|---|---|---|---|---|---|
| P | Carbon Steel | | | 180–280 | 100–**160**–200 | 0,20–**0,40**–0,60 | ACP200 |
| | Alloy Steel | | | 180–280 | 100–**140**–180 | 0,20–**0,30**–0,40 | ACP200 |
| M | Stain-less Steel | Cr Based | Ferritic | 200 | 150–**180**–200 | 0,15–**0,25**–0,35 | ACM300 |
| | | | Martensitic | 200–330 | 80–**120**–180 | 0,15–**0,25**–0,35 | ACM300 |
| | | Cr-Ni Based | Austenitic | 200 | 150–**180**–200 | 0,15–**0,25**–0,35 | ACM300 |
| | | | Austenitic, ferritic | 230–270 | 80–**120**–180 | 0,15–**0,25**–0,35 | ACM200 |
| | | | Precipitation hardening | 330 | 60–**100**–160 | 0,15–**0,25**–0,35 | ACM200 |
| K | Cast Iron | | | 250 | 80–**120**–160 | 0,10–**0,30**–0,40 | ACK300 |
| S | Heat resistant alloy | | Ni based material | 250–350 | 20–**30**–40 | 0,10–**0,20**–0,30 | ACM100 ACM200 |
| | Titanium | | Pure Titanium | (Rm 400) | 60–**80**–100 | 0,10–**0,20**–0,30 | |
| | | | $\alpha + \beta$ alloy system | (Rm 1050) | 40–**50**–60 | 0,10–**0,20**–0,30 | |

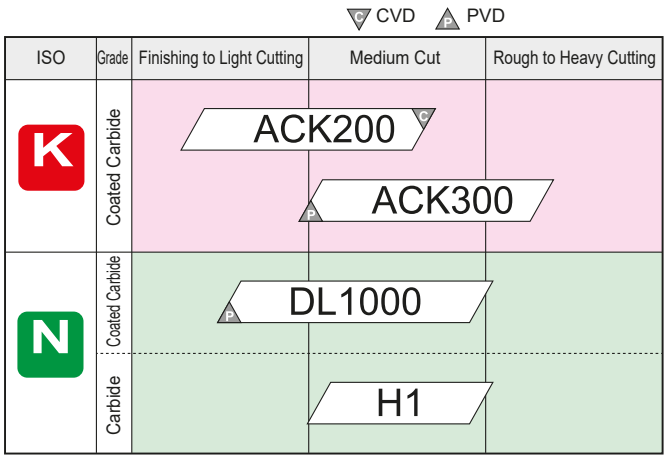
# WFXC Type

## General Features

The WaveMill WFXC type is a chamfering tool that uses inserts for the WFX series. This allows the WFXC type to support many types of work materials using a variety of grades.

## Grade Selection



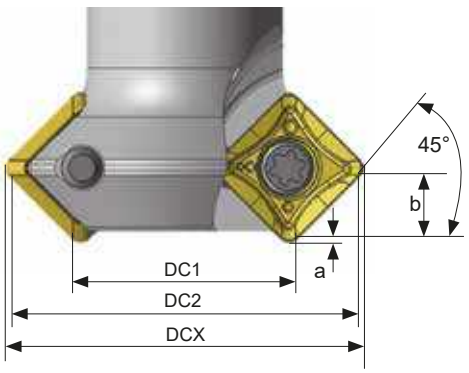




## Application Notes

Since chamfering uses the straight cutting edge portion of the insert, the range that can be chamfered will change depending on the corner radius (RE) of the insert that is attached to the body.
Work diameter: Use in a range grater or equal to DC1 and less than or equal to DC2.
Depth: The workpiece can be chamfered from „a“, which is the distance from the tip of the tool to the straight cutting edge at the depth indicated by „b“.

| Body | Insert | | Min. Work Diameter | Max. Work Diameter | Min. Depth | Max. Depth | Max. Diameter |
|---|---|---|---|---|---|---|---|
| | Cat. No. | RE | DC1 | DC2 | a | b | DCX |
| WFXC 08008E | SOMT 080304 | 0,4 | 7,5 | 15,8 | 0,1 | 4,1 | 17,8 |
| | SOMT 080308 | 0,8 | 8,0 | 15,8 | 0,2 | 3,9 | 17,5 |
| | SOMT 080312 | 1,2 | 8,5 | 15,8 | 0,4 | 3,6 | 17,2 |
| WFXC 08016E | SOMT 080304 | 0,4 | 15,5 | 23,8 | 0,1 | 4,1 | 25,8 |
| | SOMT 080308 | 0,8 | 16,0 | 23,8 | 0,2 | 3,9 | 25,5 |
| | SOMT 080312 | 1,2 | 16,5 | 23,8 | 0,3 | 3,6 | 25,2 |
| WFXC 12025E | SOMT 120404 | 0,4 | 24,6 | 38,3 | 0,1 | 6,8 | 41,3 |
| | SOMT 120408 | 0,8 | 25,0 | 38,3 | 0,2 | 6,6 | 41,0 |
| | SOMT 120412 | 1,2 | 25,6 | 38,3 | 0,4 | 6,3 | 40,7 |
| | SOMT 120416 | 1,6 | 26,1 | 38,3 | 0,5 | 6,1 | 40,4 |
| WFXC 12032E | SOMT 120404 | 0,4 | 31,6 | 45,3 | 0,1 | 6,8 | 48,3 |
| | SOMT 120408 | 0,8 | 32,0 | 45,3 | 0,2 | 6,6 | 48,0 |
| | SOMT 120412 | 1,2 | 32,6 | 45,3 | 0,4 | 6,3 | 47,7 |
| | SOMT 120416 | 1,6 | 33,1 | 45,3 | 0,5 | 6,1 | 47,4 |

Dimensions (mm)





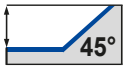


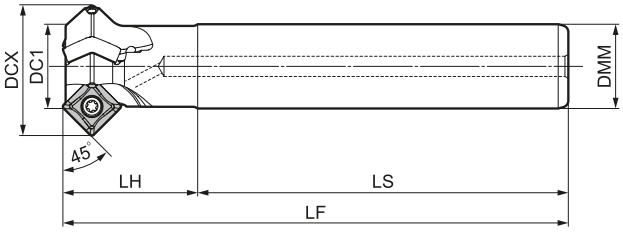

● = Euro stock
❍ = Japan stock

Recommended Tightening Torque (N·m)

# WFXC 08000/12000 E

| Rake Angle | | |
|---|---|---|
| | Radial | 0° |
| | Axial | 0° |




## Body WFXC 08000E (Standard Type)

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|
| | | DC1 | DCX | LF | LH | LS | DMM | | |
| WFXC 08008E | ❍ | 8 | 17,5 | 120 | 30 | 90 | 10 | 1 | 0,1 |
| 08016E | ❍ | 16 | 25,5 | 120 | 30 | 90 | 16 | 2 | 0,2 |

## Body WFXC 12000E (Standard Type)

| Cat. No. | Stock | Dimensions (mm) | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|
| | | DC1 | DCX | LF | LH | LS | DMM | | |
| WFXC 12025E | ❍ | 25 | 41,0 | 150 | 40 | 110 | 25 | 3 | 0,6 |
| 12032E | ❍ | 32 | 48,0 | 150 | 40 | 110 | 32 | 3 | 1,0 |

## Identification Details

| WFX | C | 08 | 016 | E |
|---|---|---|---|---|
| Cutter Series | Chamfering | Insert Size | Cutter Diameter | Endmill Type |

## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | MS | | KN | | | | |
| General Purpose | | PM | PM | K | | MS | MS | | N | | | |
| Roughing | | PM | PM | | K | | MS | | N | | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius (mm) RE | Fig. | Applicable Cutters |
| SOMT 080304 PZER L | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 1 | WFXC08000E |
| 080308 PZER L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 1 | |
| SOMT 080304 PZER G | ❍ | ● | ● | ● | ❍ | ❍ | ❍ | – | – | 0,4 | 1 | |
| 080308 PZER G | ❍ | ● | ● | ● | ● | ❍ | ● | – | – | 0,8 | 1 | |
| 080312 PZER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 | |
| SOMT 080308 PZER H | ❍ | ● | ● | ❍ | ● | ❍ | ❍ | – | – | 0,8 | 1 | |
| 080312 PZER H | ❍ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 | |
| SOET 080304 PZER G | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 1 | |
| 080308 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 0,8 | 1 | |
| 080312 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 | |
| SOET 080302 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,2 | 1 | |
| 080304 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,4 | 1 | |
| 080308 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 1 | |
| SOMT 120408 PDER L | ● | ● | ● | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 2 | WFXC12000E |
| SOMT 120404 PDER G | ❍ | ❍ | ● | ❍ | ● | ❍ | ● | – | – | 0,4 | 2 | |
| 120408 PDER G | ● | ● | ● | ● | ❍ | ● | ● | – | – | 0,8 | 2 | |
| 120412 PDER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 1,2 | 2 | |
| 120416 PDER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,6 | 2 | |
| SOMT 120408 PDER H | ❍ | ● | ❍ | ● | ● | ❍ | ❍ | – | – | 0,8 | 2 | |
| SOET 120408 PDFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 2 | |

Fig. 1

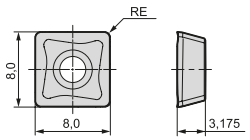
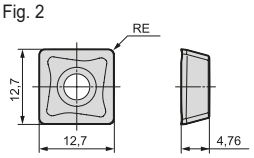



Fig. 2




## Spare Parts

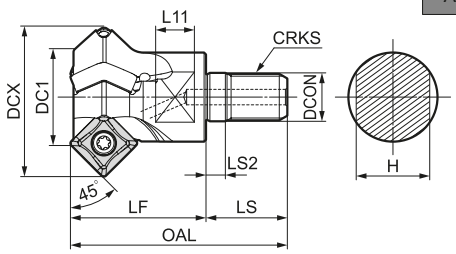
| Applicable Cutter | Screw | | Wrench |
|---|---|---|---|
| | | (N-m) | |
| WFXC08000E | BFTX0306IP | 2,0 | TRDR08IP |
| WFXC12000E | BFTX03512IP | 3,0 | TRDR15IP |

## Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed | Feed Rate |
|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,05–**0,10**–0,15 |
| | Soft Steel | ≤180 | 180–**265**–350 | 0,10–**0,15**–0,20 |
| | Die Steel | 200–220 | 100–**150**–200 | 0,05–**0,10**–0,15 |
| M | Stainless Steel | - | 150–**200**–250 | 0,05–**0,10**–0,15 |
| K | Cast Iron | 250 | 100–**175**–250 | 0,05–**0,10**–0,15 |

Min. - **Optimum** - Max.

## Modular Type




| Rake Angle | | |
|---|---|---|
| | Radial | 0° |
| | Axial | 0° |

45°

## Head (WFXC 08000M)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC1 | DCX | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | | |
| WFXC 08016M08Z2 | ❍ | 16 | 25,5 | 8,5 | M8 | 42 | 25 | 5 | 17 | 8 | 13 | 2 | 0,1 |

## Identification Details

| WFX | C | 08 | 016 | M08 | Z2 |
|---|---|---|---|---|---|
| Cutter Series | Chamfe-ring | Insert Size | Cutter Diameter | Screw Size | No. of Teeth |

## Head (WFXC 12000M)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | | | | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DC1 | DCX | DCON | CRKS | OAL | LF | LS2 | LS | L11 | H | | |
| WFXC 12025M12Z3 | ❍ | 25 | 41,0 | 12,5 | M12 | 56 | 32 | 5 | 21 | 10 | 19 | 3 | 0,1 |
| 12032M16Z3 | ❍ | 32 | 48,0 | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3 | 0,2 |


## Inserts

| Application | Coated Carbide | | | | | | | Carbide | DLC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Speed / Light cut | P | | | K | | MS | | KN | | | |
| General Purpose | | PM | PM | K | | MS | MS | | N | | |
| Roughing | | PM | PM | | K | | MS | | N | | |
| Cat. No. | ACP100 | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000 | Radius (mm) RE | Fig. |
| SOMT 080304 PZER L | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER L | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 1 |
| SOMT 080304 PZER G | ❍ | ● | ● | ● | ❍ | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER G | ❍ | ● | ● | ● | ● | ❍ | ● | – | – | 0,8 | 1 |
| 080312 PZER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOMT 080308 PZER H | ❍ | ● | ● | ❍ | ● | ❍ | ❍ | – | – | 0,8 | 1 |
| 080312 PZER H | ❍ | ❍ | ● | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOET 080304 PZER G | ❍ | ❍ | ❍ | ❍ | ● | ❍ | ❍ | – | – | 0,4 | 1 |
| 080308 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 0,8 | 1 |
| 080312 PZER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,2 | 1 |
| SOET 080302 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,2 | 1 |
| 080304 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,4 | 1 |
| 080308 PZFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 1 |
| SOMT 120408 PDER L | ● | ● | ● | ❍ | ❍ | ❍ | ● | – | – | 0,8 | 2 |
| SOMT 120404 PDER G | ❍ | ❍ | ● | ❍ | ● | ❍ | ● | – | – | 0,4 | 2 |
| 120408 PDER G | ● | ● | ● | ● | ❍ | ● | ● | – | – | 0,8 | 2 |
| 120412 PDER G | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ● | – | – | 1,2 | 2 |
| 120416 PDER G | ❍ | ● | ❍ | ❍ | ❍ | ❍ | ❍ | – | – | 1,6 | 2 |
| SOMT 120408 PDER H | ❍ | ● | ❍ | ● | ● | ❍ | ❍ | – | – | 0,8 | 2 |
| SOET 120408 PDFR S | – | – | – | – | – | – | – | ● | ● | 0,8 | 2 |

Fig. 1

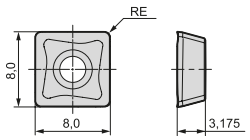
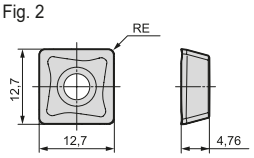



Fig. 2




## Spare Parts

| Applicable Cutter | Screw | | Wrench |
|---|---|---|---|
| |  | N·m |  |
| WFXC08000M | BFTX0306IP | 2,0 | TRDR08IP |
| WFXC12000M | BFTX03512IP | 3,0 | TRDR15IP |

## Recommended Cutting Conditions

| ISO | Work Material | Hardness (HB) | Cutting Speed | Feed Rate |
|---|---|---|---|---|
| P | General Steel | 180–280 | 150–**200**–250 | 0,05–**0,10**–0,15 |
| P | Soft Steel | ≤180 | 180–**265**–350 | 0,10–**0,15**–0,20 |
| P | Die Steel | 200–220 | 100–**150**–200 | 0,05–**0,10**–0,15 |
| M | Stainless Steel | - | 150–**200**–250 | 0,05–**0,10**–0,15 |
| K | Cast Iron | 250HB | 100–**175**–250 | 0,05–**0,10**–0,15 |

Min. - **Optimum** - Max.





● = Euro stock
❍ = Japan stock

N·m Recommended Tightening Torque (N·m)

New

## Features

### Drastically Reduced Runout Adjustment Time
Simple screw-fastening structure enables fine adjustments to be made easily.

### Blade Through Coolant
Secures a supply of coolant to the cutting edge and breaks chips thoroughly.

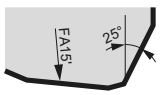
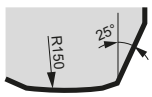
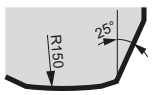
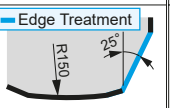
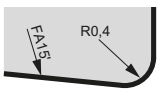
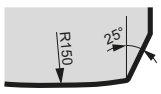
### Lightweight Aluminum Alloy Body
Utilizing aluminum alloy to achieve a total weight of less than 1,3 kg for a Ø 125 mm cutter with 22 teeth.

## Product Range

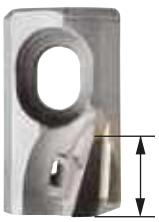
| Type | Cat. No. | Body Material | Diameter Range (mm) / No of Teeth | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ø32 | Ø40 | Ø50 | Ø63 | Ø80 | Ø100 | Ø125 | Ø160 |
| Shell | ANXA 16000RS | Aluminum Alloy | | | | | 10, 14 | 12, 18 | 14, 22 | 20, 28 |
| | ANXA 16000R (Inch) | Aluminum Alloy | | | | | 10, 14 | 12, 18 | 14, 22 | 20, 28 |
| | ANXS 16000RS | Steel | | 6 | 6, 9 | 8, 12 | 10, 14 | 12, 18 | 14, 22 | |
| | ANXS 16000R (Inch) | Steel | | | | 8, 12 | 10, 14 | 12, 18 | 14, 22 | |
| Shank | ANXS 16000E ☞ G60 | Steel | 4 | 6 | | | | | | |

Inch Inch Bore

## Blade Selection Guide

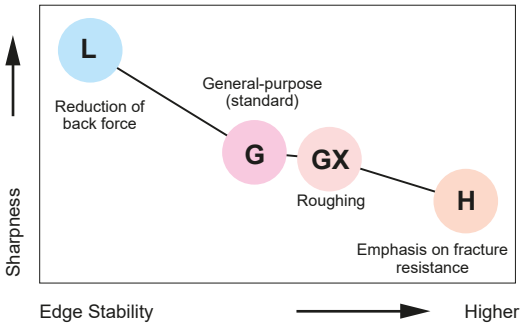
| Work Material | N | | | | | |
|---|---|---|---|---|---|---|
| Type | L | G | GX | H | — | W |
| Cutting Edge Shape |  |  |  |  |  |  |
| Features | Low Cutting Force | Standard | Long Edge | High Strength | Corner Radius | Wiper |
| Applications | Finishing / Light Cutting | General Purpose | Roughing | | | |
| Edge Length* | 6,0 mm | 6,0 mm | 9,0 mm | 6,0 mm | | |





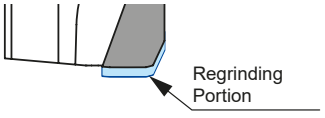
*Edge length
GX type = 9,0 mm

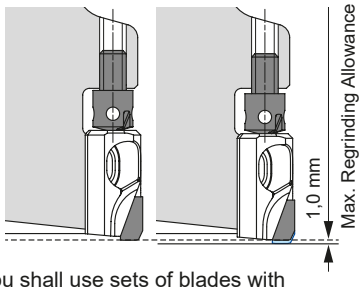
## Edge Selection Guide




## Reduces Running Costs by Drastically Increasing Blade, Insert Regrinding Allowance (to 1,0 mm)

Assuming 0,2 mm of regrinding each time, an edge can be used up to 6 times.
(Peripheral edge cannot be reground.)



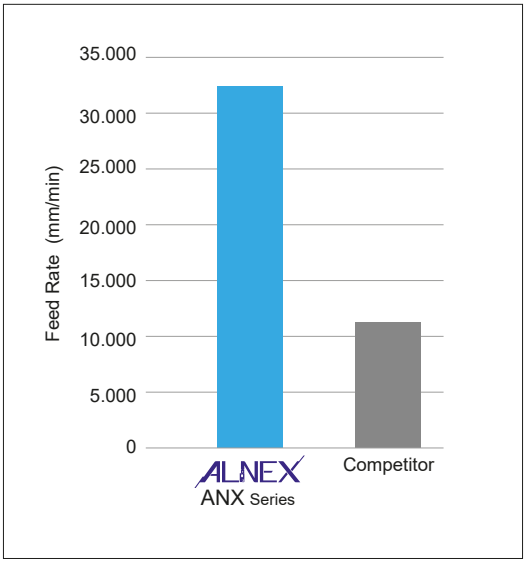




If you wish to use reground blades you shall use sets of blades with matching size of the same level in order to keep the balance.

## Performances

### High-Speed / High-Efficiency Cutting

Realizes ultra-high efficiency machining with $v_f$ = 30.000 mm/min

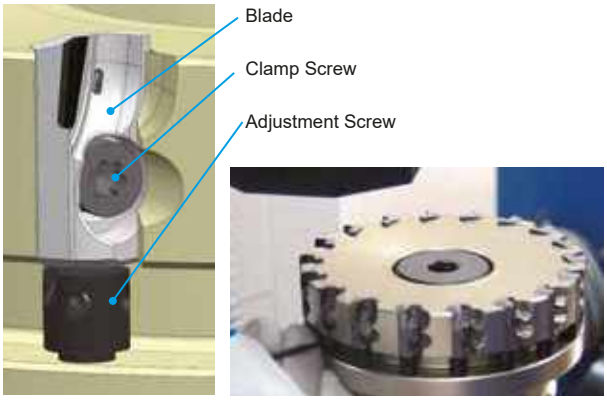


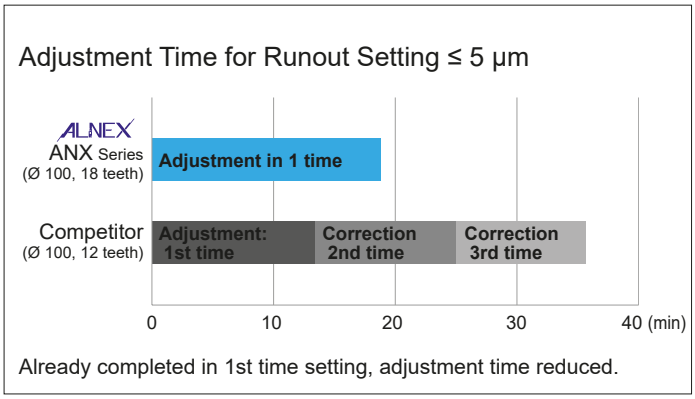

Comparison: Cutter Diameter Ø 100 mm

| | Spindle Speed $min^{-1}$ | Number of Teeth | Feed Rate $v_f$ (mm/min) |
|---|---|---|---|
| ANX Series | 18.000 | 18 | 32.400 |
| Competitor | 9.500 | 12 | 11.400 |

### Drastically Reduces Runout Adjustment Time

– Simple screw-fastening structure
– Enables fine adjustments to be made easily
– High-rigidity body




### Chip Control


Blade-Through Coolant Chip Breaking


ALNEX ANX Series | Competitor

| | |
|---|---|
| Work Material: | G-AlSi12Cu |
| Cutting Conditions: | $v_c$ = 2500 m/min, $f_z$ = 0,05 mm/t, $a_p$ = 0,5 mm, wet |





❍ = Japan stock

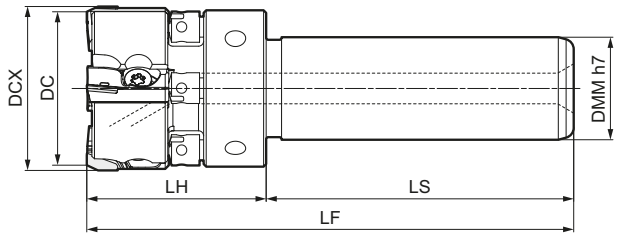
Recommended Tightening Torque (N·m)

# ANXS 16000 E

New

| Rake Angle | Radial | -2 – 0° |
|---|---|---|
| | Axial | +5° |

3 mm | 90°




## Body - ANXS (Steel)

Dimensions (mm)

| Cat. No. | Stock | DC | DCX | DMM | LH | LS | LF | No. of Teeth | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|
| ANXS 16032E04 | ❍ | 30 | 32 | 20 | 35 | 60 | 95 | 4 | 0,3 |
| 16040E06 | ❍ | 38 | 40 | 20 | 40 | 60 | 100 | 6 | 0,5 |

Blades are sold separately.
If using a blade for corner radius machining (ANB1604R), DC = DCX.

## Identification Details

| ANX | S | 16 | 032 | E | 04 |
|---|---|---|---|---|---|
| Cutter Series | Steel Body | Blade Size | Cutter Diameter | Round Shank | Number of Teeth |

## Spare Parts

Sold separately.

| Applicable Cutters | Clamp Screw | | Adjustment Screw | Wrench | Adjustment Wrench | Assembly Wrench |
|---|---|---|---|---|---|---|
| | | N·m | | | | |
| ANXS 16032E04 16040E06 | BXA0310IP | 2,0 | HFJ | TRXW10IP | ANT | HFVT |

## Max. Allowable Spindle Speed

| Cat. No. | n max (min$^{-1}$) |
|---|---|
| ANXS 16032E04 | 10.000 |
| 16040E06 | 10.000 |

## Blades

| Application | SUMIDIA |
|---|---|
| High Speed / Light Cut | N |
| General Purpose | N |
| Roughing | N |

| Cat. No. | DA1000 | Cutting Edge Length | Wiper Edge Shape | Applications | Fig. |
|---|---|---|---|---|---|
| ANB 1600R-L | ❍ | 6,0 | Linear | Low Cutting Force | 1 |
| 1600R-G | ❍ | 6,0 | Arc-Shaped | General Purpose | 1 |
| 1600R-H | ❍ | 6,0 | Arc-Shaped | Strong Edge | 1 |
| 1600R-GX | ❍ | 9,0 | Arc-Shaped | Long Edge | 2 |
| 1604R | ❍ | 6,0 | Linear | Corner Radius | 3 |
| 1600R-W | ❍ | – | Arc-Shaped | Wiper | 4 |

Fig. 1

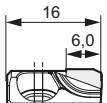



Fig. 2

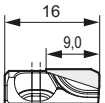



Fig. 3

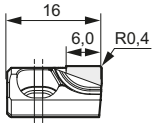
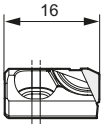



Fig. 4




Wiper Blade

## Recommended Cutting Conditions

Si content ≤ 12,6 %

Min. - **Optimum** - Max.

| ISO | Work Material | Hard-ness | Cutting Speed $v_c$ (m/min) | Feed Rate $f_z$ (mm/t) | Grade |
|---|---|---|---|---|---|
| N | Aluminium Alloy | – | 2.000–**2.500**–3.000 | 0,05–**0,13**–0,20 | DA1000 |

Si content ≥ 12,6 %

Min. - **Optimum** - Max.

| ISO | Work Material | Hard-ness | Cutting Speed $v_c$ (m/min) | Feed Rate $f_z$ (mm/t) | Grade |
|---|---|---|---|---|---|
| N | Aluminium Alloy | – | 400–**600**–800 | 0,05–**0,13**–0,20 | DA1000 |

The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine rigidity, work clamp rigidity, depth of cut and other factors.

## ■ ALNEX Series Usage Manual

### ● Adjustment of the Blades, Runout Alignment

① Before inserting the blade, make sure that the seat and screws are free of debris by cleaning those areas.

② Insert the blade into its seat.

③ While holding the blade against the seat, install the clamping bolt using the provided wrench, pre-tightening the bolt (recommended pre-torque is 1 N·m).

④ Using the provided wrench for the height adjustment screw, set the height to your predetermined value.

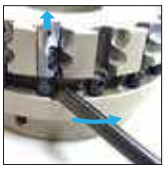
⑤ Fully tighten the clamp bolt (recommended torque is 2 N·m).

⑥ Use 1 blade as a datum point and adjust all blade heights to match.

⑦ After tightening, verify that there is no gap between the seat and blade.

② 

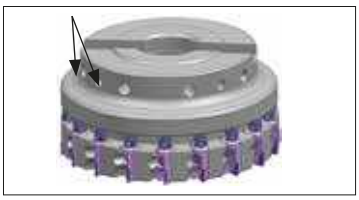
③ 
Pre-tighten (1N·m)

④ 
Adjust height

⑤ 
Final tighten (2N·m)

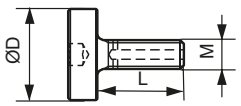
### ● Balance Adjustments

The cutter comes pre-balanced to a G 6,3 specification.
Under normal circumstances, it is not necessary to adjust the balance of the cutter.



### ● Clamp Bolts for Arbor

| Work Material | Dim. | | | Max. Torque | Applicable Cutters |
|---|---|---|---|---|---|
| | M | L | D | | |
| BXH0825-D13 | 8 | 25 | 13 | 15 | ANXS16040RS_ _ |
| BXH1030-D16 | 10 | 30 | 16 | 25 | ANXS16040RS_ _ , ANXS16063RS_ _ |
| BXH1235-D18 | 12 | 35 | 18 | 40 | ANXS16063R_ _ |
| BXH1235-D33 | 12 | 35 | 33 | 50 | ANXS16080R(S)_ _ , ANXA16080/100/125R(S)_ _ |
| BXH1635-D40 | 16 | 35 | 40 | 100 | ANXS16100R(S)_ _ |
| BXH2036-D50 | 20 | 36 | 50 | 200 | ANXS16125R(S)_ _ , ANXA16160R(S)_ _ |




### ● Other Precautions

- Please use only Sumitomo genuine parts.
- Please regularly replace clamp bolts.
- If you wish to reduce the # of effective blades in use, to maintain balance and protect the body, please use dummy blades (set height well below effective blades).
- Please do not operate after releasing the interlock or opening the cover.
- Please avoid use and consult with Sumitomo if you mistakenly crash the body.
- As the blades are very sharp, it is very easy to get hurt when touching the blades with your hands directly, so please wear gloves when taking the blade out of the case to set into the cutter or when setting the cutter into machine tool.

# J

# Coated & Solid Endmills

**J1–J44**

# Selection Guide

## ● According to Work Materials

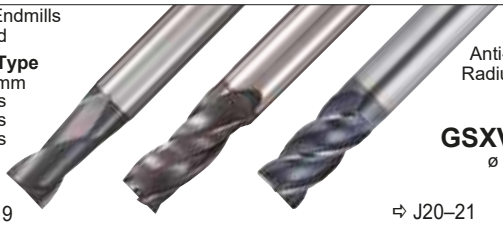
### Square Type

Legend: Grade | Edge Type | Usage

#### General Steel (Common Use)

Coated | Sharp | General

Global Endmills
Standard
**GSX Type**
ø 1–25 mm
•2 Flutes
•3 Flutes
•4 Flutes



⇨ J7–19

Anti-Vibration
Radius Corner
Endmills
**GSXVL Type**
ø 2–25 mm
•4 Flutes

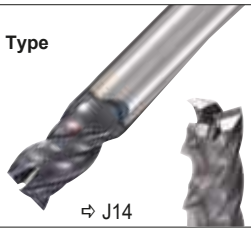
⇨ J20–21

#### General Steel (Special Use)

Plunge Cut
Multi-Purpose

Coated | Sharp | General

GSX MILL
**GSXSLT Type**
ø 1–16 mm
•3 Flutes



⇨ J14

High Efficiency

Coated | Strong | High Efficiency

UPMILL
**SSUP-ZX Type**
ø 2–20 mm
•4 Flutes

⇨ J30–31

High Efficiency

Coated | Strong | High Efficiency

ROUGHING ENDMILL
**GSRE-SFType**
ø 6–20 mm
•4 Flutes

⇨ J25

#### Hardened Steel

High performance Type

Coated | Strong | High Efficiency

GS-MILL-HARD
**GSH-SF Type**
ø 1–20 mm
•4 Flutes
•6 Flutes
•8 Flutes

⇨ J26

High Rigidity Type

Coated | Strong | High Efficiency

HARD ENDMILL
**LHHM...ZX**
**EHHM...ZX**
ø 3–32 mm
•4 Flutes
•6 Flutes
•8 Flutes

⇨ J29

SumiBoron Endmill

CBN

"Helical Master"
**BNES Type**
ø 6–16 mm
•1 Flute

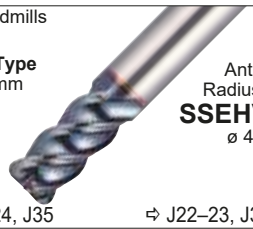
⇨ J40, M50

#### Exotic Metals

For Heat Resistive Steel

Coated | Sharp | General

Radius Endmills
Standard
**SSEH Type**
ø 4,5–25 mm
•4 Flutes



Anti-Vibration
Radius Endmills
**SSEHVL Type**
ø 4,5–25 mm
•4 Flutes

⇨ J22, J24, J35

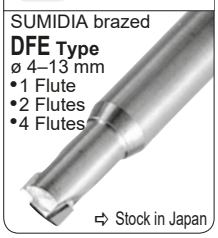
⇨ J22–23, J35

#### Non-ferrous Metal

SumiDia Endmill

PCD

SUMIDIA brazed
**DFE Type**
ø 4–13 mm
•1 Flute
•2 Flutes
•4 Flutes



⇨ Stock in Japan

DLC-Coated Endmill

Coated | Sharp | General

AURORA COATED
**ASM-DL Type**
ø 2–16 mm
•2 Flutes
•4 Flutes

⇨ J27–28

## ● According to Work Materials

### Ballnose Type

#### General Steel (Common Use)

Coated | General

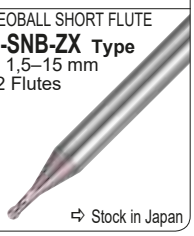
GSX MILL BALL
**GSXB Type**
R 0,2–12,5 mm
•2 Flutes

➪ J32

#### General Steel (Short Series)

Coated | Short | General

NEOBALL SHORT FLUTE
**S-SNB-ZX Type**
R 1,5–15 mm
•2 Flutes



➪ Stock in Japan

Coated | Short | General

ZX-COATED SHORT FLUTE
**S-SSB-ZX Type**
R 1,5–4 mm
•2 Flutes

➪ Stock in Japan

#### Hardened Steel

High Rigidity Type

Coated | Strong | High Efficiency

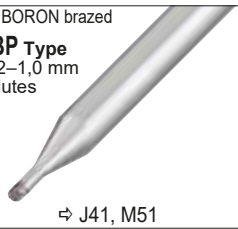
HARDBALL
**SHB-ZX Type**
R 0,5–10 mm
•2 Flutes

➪ Stock in Japan

Hardened Steel

CBN | MOULD FINISH MASTER | PCD

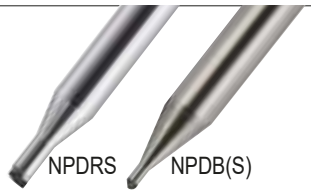
SUMIBORON brazed
**BNBP Type**
R 0,2–1,0 mm
•2 Flutes



➪ J41, M51

SUMIDIA binderless
**NPDRS Type**
R 0,2–2,0 mm
•1 Flute
Radius Endmill

**NPDB(S) Type**
R 0,1–1,0 mm
•1 Flute
Ballnose Endmill



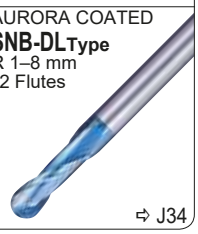

➪ J42–43, M52–53

#### Non-ferrous Metal

DLC-Coated Endmill

Coated | General

AURORA COATED
**SNB-DL Type**
R 1–8 mm
•2 Flutes



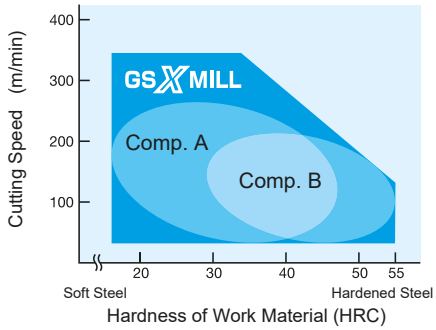
➪ J34

# GSX MILL Series

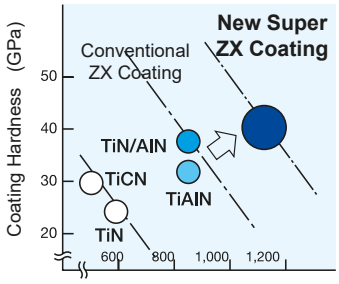
## Characteristics and Applications

- Wide variation of three flute types and four flute lengths enable use in a wide variety of applications.
- Fine carbide substrate provides high transverse rupture strength and excellent thermal shock resistance improving reliability in wet cutting applications.
- GSX Coating provides improved reliability and longer tool life.
- Large rake angle and unique flute design improve sharpness and chip evacuation.
- Cutting teeth with gash land improves corner flute strength.
- Sharper edge S type and fracture resistant C type added to the 2D size series.

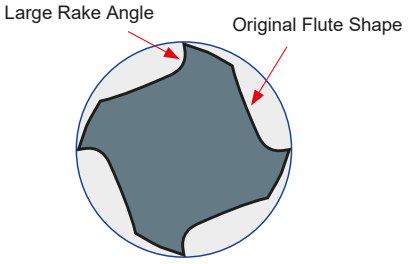
### ● Wear Resistance




### ● Thermal Resistance




### ● Improved Chip Evacuation

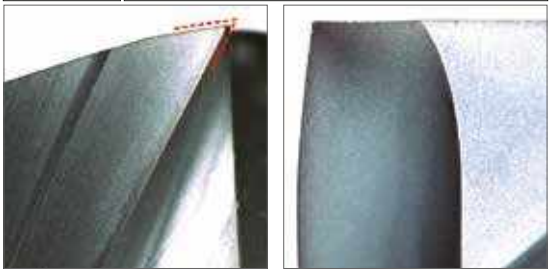



Large rake angle combined with our unique flute design improves sharpness and chip evacuation.

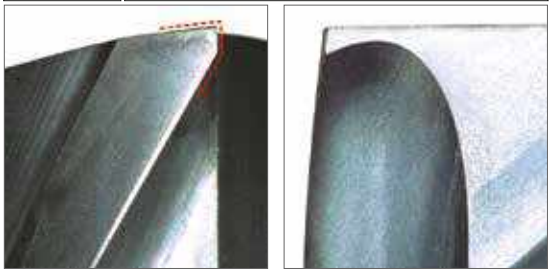
## 2 cutting edge designs expand machining applications

Sharper edge S type and fracture resistant C type added to the 2D size series.

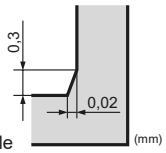
**S Type** Sharp Corner: Sharper Edge Design



**C Type** Gash Land: Fracture Resistant Design



Note: In gash land drilling, some material remains as shown on the right. If you need sharp corners, use the S Type.




Ex.: Corner on a ø 10 mm hole

## Application Range

| P | | | | | H | | | M | S | | K | N | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General Structure Rolled Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45 ~ 55 HRC | Hardened Steel 55 ~ 60 HRC | Hardened Steel 60 ~ 65 HRC | Stainless Steel | Ti Alloy | Heat Resistant Alloy | Cast Iron | Al Alloy | Cu Alloy | Graphite |
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ *1 | | | ◎ | ○ | ○ | ○ | | | |

◎ : Best
○ : Good

Blank : Not recommended
*1: GSXSLT30000C is recommended for 50 HRC or less

## Recommended Milling Examples

| Application | Surface Milling | | Grooving | | Groove Finishing | |
|---|---|---|---|---|---|---|
| Form |  | |  | |  | |
| | Rough | Finishing | Rough | Finishing | Rough | Finishing |
| **S Type** | | ◎ | | ○ | | ◎ |
| **C Type** | ◎ | ○ | ◎ | ◎ | ◎ | ○ |

S Type is best for removing inside corners.

*2: Use with small depth of cut.

# GSX MILL Series

Large rake angle and unique flute design improve sharpness and excellent chip evacuation.

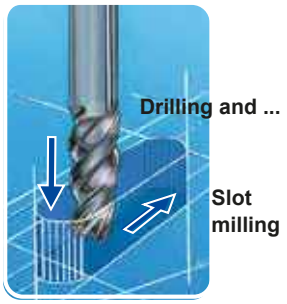
## Product Range

| Application | No. of Teeth | Flute Length | | | | |
|---|---|---|---|---|---|---|
| | | 1,5 D | 2 D | | 3 D | 4 D |
| | | C Type | S Type | C Type | C Type | C Type |
| General Purpose | 2 Flutes | GSX20000C-1.5D ⇨ J 7 | GSX20000S-2D ⇨ J 8 | GSX20000C-2D ⇨ J 9 | GSX20000C-3D ⇨ J 10 | GSX20000C-4D ⇨ J 11 |
| | 3 Flutes | GSX30000C-1.5D ⇨ J 12 | | GSX30000C-2D ⇨ J 13 | | |
| | 4 Flutes | GSX40000C-1.5D ⇨ J 15 | GSX40000S-2D ⇨ J 16 | GSX40000C-2D ⇨ J 17 | GSX40000C-3D ⇨ J 18 | GSX40000C-4D ⇨ J 19 |
| Compound Endmilling | 3 Flutes | GSXSLT30000C-1.5D ⇨ J 14 | | | | |

## Multi-Purpose "GSX-SLT" Slot Type

- Optimized flute design of slotted 3 flute (1.5D) short type reduces cutting resistance.

① Allows drilling and slot milling and other continuous (compound) applications.
② Perfect for use with thin sheets and small machining centres





## Application Examples

### ● Carbon Steel Grooving with GSX20000C

**GSX** 20000C | Competitor


Gash land for stronger cutting edge.

| | |
|---|---|
| Tool dimension | ø 6 (2 Flutes) |
| Work material | C50 |
| Cutting speed | $v_c$ = 87 m/min |
| | n = 4615 rpm |
| Feed rate | $f_t$ = 0,06 mm/teeth |
| | $v_f$ = 553 mm/min |
| Depth of cut | $a_p$ = 3 mm |
| Wide of cut | $a_e$ = 6 mm |
| Cooland | Dry |
| Vertical machining centre (BT50) | |

### ● Cast Iron Grooving with GSX20000C

**GSX** 20000C | Competitor


GSX coating for improved wear resistance.

| | |
|---|---|
| Tool dimension | ø 10 (2 Flutes) |
| Work material | GGG60 |
| Cutting speed | $v_c$ = 66 m/min |
| | n = 2100 rpm |
| Feed rate | $f_t$ = 0,072 mm/teeth |
| | $v_f$ = 302 mm/min |
| Depth of cut | $a_p$ = 5 mm, 5 passes |
| Wide of cut | $a_e$ = 10 mm |
| Cooland | Dry |
| Vertical machining centre (BT40) | |

### ● Stainless Steel Machining with GSX20000C

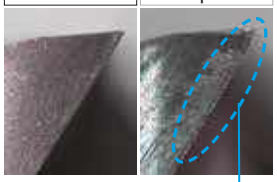
**GSX** 20000C | Competitor


Improved reliability even under wet machining.

| | |
|---|---|
| Tool dimension | ø 10 (2 Flutes) |
| Work material | X5 CrNi 1812 |
| Cutting speed | $v_c$ = 50 m/min |
| | n = 1591 rpm |
| Feed rate | $f_t$ = 0,04 mm/teeth |
| | $v_f$ = 27 mm/min |
| Depth of cut | $a_p$ = 10 mm |
| Wide of cut | $a_e$ = 0,5 mm |
| Cooland | Wet |
| Vertical machining centre (BT50) | |

### ● Surface Milling C50 with GSX20000S

**GSX** 20000S | Competitor




S type delivers optimum cutting performance.

| | |
|---|---|
| Tool dimension | ø 6 (2 Flutes) |
| Work material | C50 |
| Cutting speed | $v_c$ = 87 m/min |
| | n = 4615 rpm |
| Feed rate | $f_t$ = 0,06 mm/teeth |
| | $v_f$ = 553 mm/min |
| Depth of cut | $a_p$ = 10 mm |
| Wide of cut | $a_e$ = 0,3 mm |
| Cooland | Dry |
| Vertical machining centre (BT50) | |

# GSX MILL Series

☞ J 20, J 21

## GSX MILL Anti-vibration Type (Square/Radius)

### ■ Characteristics and Applications

- Optimized irregular pitch and lead affords:
  - Drastically improved chattering and fracture resistance !
  - Less cutting force Allows high-speed, high-feed cutting.
- Rounded lands greatly improve machined surface quality (from ø 4 and up).
- New fine-grained carbide substrate and special coating for better rigidity and thermal and wear resistance.

### ■ Product Range

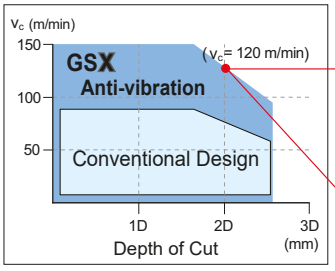
GSX MILL Anti-vibration Square Type

| Series | No. of Teeth | Serie | DC (mm) |
|---|---|---|---|
| **GSXVL4000-2.5D** | 4 Flutes |  ⇨ J 20 | ø 2 – ø 20 |

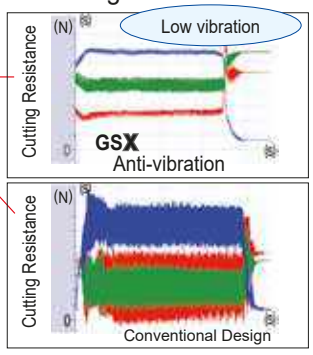
GSX MILL Anti-vibration Corner Radius Type

| Series | No. of Teeth | Serie | DC (mm) |
|---|---|---|---|
| **GSXVL4000-R-2.5D** | 4 Flutes |  ⇨ J 21 | ø 3 – ø 20 |

### ■ Cutting Range



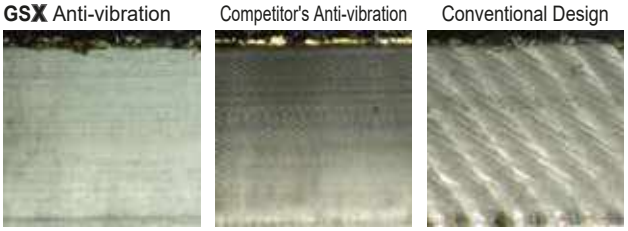

### ■ Cutting Resistance




### ■ Application Range

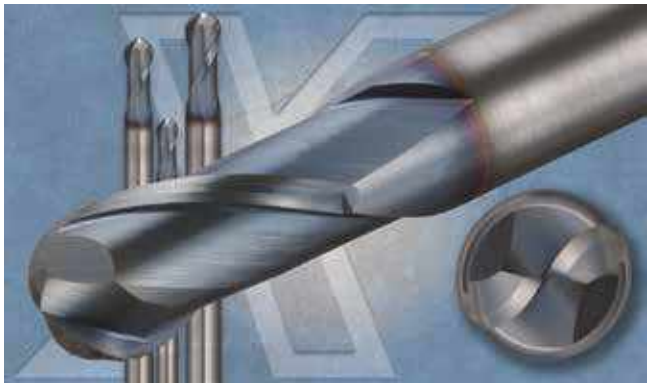
● Surface Finish Quality

GSX Anti-vibration | Competitor's Anti-vibration | Conventional Design



No Chattering Clean Surface | Minute Chattering Poor Surface | Heavy Chattering Poor Surface

| | | | |
|---|---|---|---|
| Work material: | C50 | Cutting Conditions: | n = 4.800 rpm<br>$v_f$ = 800 mm/min |
| Grooving:<br>Tool dimension: | ø 10 | Depth of cut<br>Equipment: | $a_p$ = 10 mm<br>BT50 |



+ J 34

## GSX MILL Ball

### ■ Characteristics and Applications

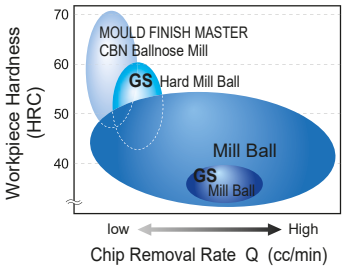
- New coating combined with a fine-grained carbide substrate affords better thermal and wear resistance.
- Large helix angle on cutting edge reduces cutting resistance.
- Unique pocket design and expanded pocket area promotes better chip evacuation.

➡ Expands the range of machineable material from soft to hardened steels, and offers reliability and longer tool life.

### ■ Product Range

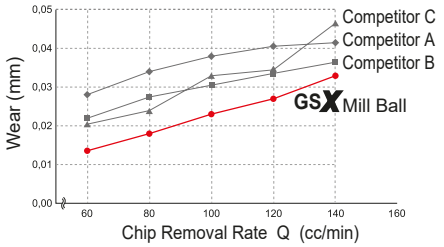
| Series | No. of Teeth | Serie | DC (mm) |
|---|---|---|---|
| **GSX-B 20000** | 2 Flutes |  ⇨ J 36 | R=ø0,2 – ø15 (DC=0,2 – 30) |

### ■ Application Range




### ■ Application Examples

● Flank Wear




**GSX Ball (Cutting Length 140 m)**

Able to continue

Conventional Tool (Cutting Length 80 m)

Unable to continue

| | |
|---|---|
| Work Material : | X40CrVMo5-1 (50HRC) |
| Tool Dimensions : | R3 (2 Flutes) |
| Cutting Conditions : | $v_c$= 179 m/min (n = 9.500 rpm)<br>$v_f$= 2.250 mm/min ($f_t$ = 0,12 mm/t) |

$a_p$ = 0,2 ~ 1,0 mm, $a_e$ =0,3 mm, Wet
Equipment Vertical Machining Centre BT40

Chipping in centre
Heavy wear on flank face



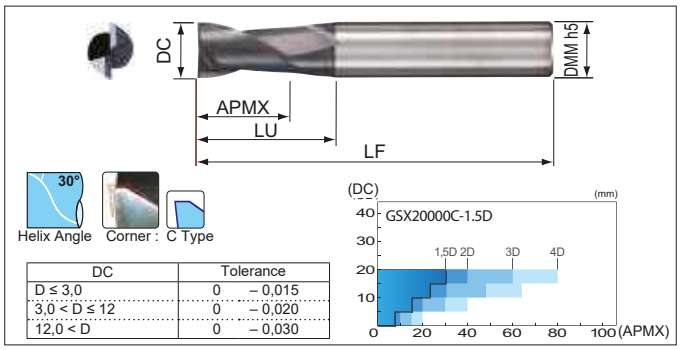


● = Euro stock

# GSX MILL Endmills
# GSX 20000C-1.5D Type

Coated Carbide Grades | GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 20100C-1.5D | ● | 1,0 | 1,5 | 2,5 | 40 | 4 |
| GSX 20150C-1.5D | ● | 1,5 | 2,3 | 3,3 | 40 | 4 |
| GSX 20200C-1.5D | ● | 2,0 | 3,0 | 4,0 | 40 | 4 |
| GSX 20250C-1.5D | ● | 2,5 | 3,8 | 4,8 | 40 | 4 |
| GSX 20300C-1.5D | ● | 3,0 | 4,5 | 6,0 | 45 | 6 |
| GSX 20350C-1.5D | ● | 3,5 | 5,3 | 6,8 | 45 | 6 |
| GSX 20400C-1.5D | ● | 4,0 | 6,0 | 7,5 | 45 | 6 |
| GSX 20450C-1.5D | ● | 4,5 | 6,8 | 8,3 | 50 | 6 |
| GSX 20500C-1.5D | ● | 5,0 | 7,5 | 9,5 | 50 | 6 |
| GSX 20550C-1.5D | ● | 5,5 | 8,3 | 10,3 | 50 | 6 |
| GSX 20600C-1.5D | ● | 6,0 | 9,0 | – | 50 | 6 |
| GSX 20700C-1.5D | ● | 7,0 | 11,0 | 13,0 | 60 | 8 |
| GSX 20800C-1.5D | ● | 8,0 | 12,0 | – | 60 | 8 |
| GSX 20900C-1.5D | ● | 9,0 | 14,0 | 16,0 | 70 | 10 |
| GSX 21000C-1.5D | ● | 10,0 | 15,0 | – | 70 | 10 |
| GSX 21200C-1.5D | ● | 12,0 | 18,0 | – | 75 | 12 |
| GSX 21400C-1.5D | | 14,0 | 21,0 | 24,5 | 90 | 16 |
| GSX 21500C-1.5D | | 15,0 | 23,0 | 26,5 | 90 | 16 |
| GSX 21600C-1.5D | | 16,0 | 24,0 | – | 90 | 16 |
| GSX 22000C-1.5D | | 20,0 | 30,0 | – | 100 | 20 |

## Endmill Identification (GSX MILL Series)

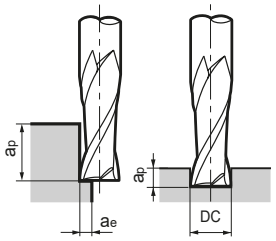
**GSX 2 0100 C - 1.5D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|
| GSX | 2 | 0100 | C | 1.5D |

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### Shoulder Milling

| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 19.600 | 250 | 19.600 | 250 | 19.600 | 250 | 18.300 | 180 | 12.700 | 100 | 9.000 | 60 | 11.000 | 70 | 9.000 | 50 |
| 2,0 | | 11.200 | 340 | 11.200 | 340 | 11.200 | 340 | 10.500 | 240 | 7.300 | 130 | 5.300 | 80 | 6.400 | 90 | 5.300 | 70 |
| 4,0 | | 6.400 | 460 | 6.400 | 460 | 6.400 | 460 | 6.000 | 320 | 4.200 | 180 | 3.000 | 110 | 3.600 | 120 | 3.000 | 90 |
| 6,0 | | 4.600 | 560 | 4.600 | 560 | 4.600 | 560 | 4.300 | 400 | 3.000 | 210 | 2.200 | 130 | 2.700 | 140 | 2.200 | 100 |
| 8,0 | | 3.400 | 560 | 3.400 | 560 | 3.400 | 560 | 3.200 | 400 | 2.200 | 210 | 1.600 | 130 | 2.000 | 140 | 1.600 | 100 |
| 10,0 | | 2.800 | 560 | 2.800 | 560 | 2.800 | 560 | 2.600 | 400 | 1.800 | 210 | 1.300 | 130 | 1.600 | 140 | 1.300 | 100 |
| 12,0 | | 2.300 | 560 | 2.300 | 560 | 2.300 | 560 | 2.200 | 400 | 1.500 | 210 | 1.100 | 130 | 1.300 | 140 | 1.100 | 100 |
| 16,0 | | 1.700 | 450 | 1.700 | 450 | 1.700 | 450 | 1.600 | 320 | 1.100 | 180 | 800 | 100 | 1.000 | 110 | 800 | 85 |
| 20,0 | | 1.350 | 380 | 1.350 | 380 | 1.350 | 380 | 1.300 | 280 | 900 | 160 | 650 | 90 | 800 | 100 | 650 | 75 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | | 1,0 DC | | | | | |
| | $a_e$ | 0,05 DC | | | | | | | | | | 0,02 DC | | | | | |

### Grooving

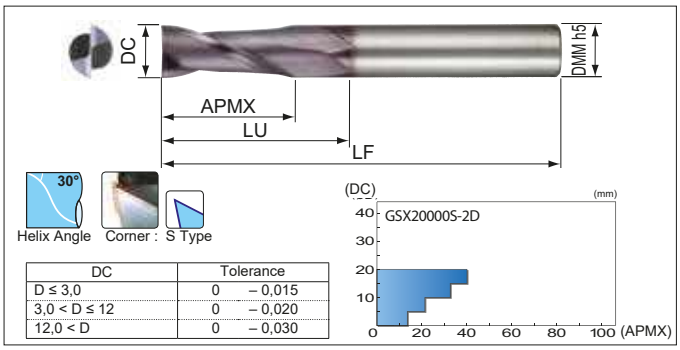
| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 19.600 | 200 | 19.600 | 250 | 19.600 | 250 | 18.300 | 180 | 12.700 | 100 | 9.000 | 60 | 11.000 | 50 | 4.500 | 20 |
| 2,0 | | 11.200 | 270 | 11.200 | 340 | 11.200 | 340 | 10.500 | 240 | 7.300 | 130 | 5.300 | 80 | 6.400 | 65 | 2.650 | 25 |
| 4,0 | | 6.400 | 370 | 6.400 | 460 | 6.400 | 460 | 6.000 | 320 | 4.200 | 180 | 3.000 | 110 | 3.600 | 80 | 1.500 | 35 |
| 6,0 | | 4.600 | 450 | 4.600 | 560 | 4.600 | 560 | 4.300 | 400 | 3.000 | 210 | 2.200 | 130 | 2.700 | 100 | 1.100 | 40 |
| 8,0 | | 3.400 | 450 | 3.400 | 560 | 3.400 | 560 | 3.200 | 400 | 2.200 | 210 | 1.600 | 130 | 2.000 | 100 | 800 | 40 |
| 10,0 | | 2.800 | 450 | 2.800 | 560 | 2.800 | 560 | 2.600 | 400 | 1.800 | 210 | 1.300 | 130 | 1.600 | 100 | 650 | 40 |
| 12,0 | | 2.300 | 450 | 2.300 | 560 | 2.300 | 560 | 2.200 | 400 | 1.500 | 210 | 1.100 | 130 | 1.300 | 100 | 500 | 40 |
| 16,0 | | 1.700 | 360 | 1.700 | 450 | 1.700 | 450 | 1.600 | 320 | 1.100 | 180 | 800 | 100 | 1.000 | 80 | 400 | 35 |
| 20,0 | | 1.350 | 300 | 1.350 | 380 | 1.350 | 380 | 1.300 | 280 | 900 | 160 | 650 | 90 | 800 | 70 | 320 | 30 |
| Grooving | $a_p$ | 0,2 DC | | 0,5 DC | | | | | | 0,2 DC | | 0,05 DC | | 0,2 DC | | | |

# GSX 20000S-2D Type



Coated Carbide Grades | GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 20030S-2D | ❍ | 0,3 | 0,6 | 1,0 | 40 | 4 |
| GSX 20040S-2D | ❍ | 0,4 | 0,8 | 1,2 | 40 | 4 |
| GSX 20050S-2D | ● | 0,5 | 1,3 | 1,7 | 40 | 4 |
| GSX 20080S-2D | ❍ | 0,8 | 1,6 | 2,1 | 40 | 4 |
| GSX 20100S-2D | ● | 1,0 | 2,5 | 3,5 | 40 | 4 |
| GSX 20150S-2D | ● | 1,5 | 3,8 | 4,8 | 40 | 4 |
| GSX 20200S-2D | ● | 2,0 | 5,0 | 6,0 | 40 | 4 |
| GSX 20250S-2D | ● | 2,5 | 6,3 | 7,3 | 40 | 4 |
| GSX 20300S-2D | ● | 3,0 | 7,5 | 9,0 | 45 | 6 |
| GSX 20350S-2D | ● | 3,5 | 8,8 | 10,3 | 45 | 6 |
| GSX 20400S-2D | ● | 4,0 | 11,0 | 14,0 | 45 | 6 |
| GSX 20450S-2D | ● | 4,5 | 11,3 | 12,8 | 50 | 6 |
| GSX 20500S-2D | ● | 5,0 | 13,0 | 19,6 | 50 | 6 |
| GSX 20550S-2D | ● | 5,5 | 13,0 | 19,6 | 50 | 6 |
| GSX 20600S-2D | ● | 6,0 | 13,0 | – | 50 | 6 |
| GSX 20700S-2D | ● | 7,0 | 16,0 | 21,1 | 60 | 8 |
| GSX 20800S-2D | ● | 8,0 | 19,0 | – | 60 | 8 |
| GSX 20900S-2D | ● | 9,0 | 19,0 | 24,1 | 70 | 10 |
| GSX 21000S-2D | ● | 10,0 | 22,0 | – | 70 | 10 |
| GSX 21200S-2D | ● | 12,0 | 26,0 | – | 75 | 12 |
| GSX 21600S-2D | ● | 16,0 | 32,0 | – | 90 | 16 |
| GSX 22000S-2D | ● | 20,0 | 40,0 | – | 100 | 20 |

## Endmill Identification (GSX MILL Series)

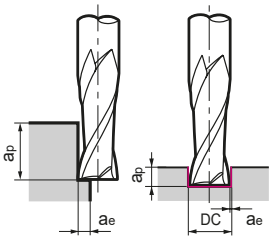
**GSX** **2** **0050** **S** **-** **2D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
5. This series is not recommended for grooving.
6. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### ● Shoulder Milling

| Work Material / Cond. / DC (mm) | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 16.600 | 180 | 16.600 | 180 | 16.600 | 180 | 15.500 | 130 | 10.500 | 70 | 7.500 | 45 | 9.400 | 50 | 7.500 | 35 |
| 2,0 | | 9.500 | 250 | 9.500 | 250 | 9.500 | 250 | 9.000 | 200 | 6.200 | 100 | 4.500 | 60 | 5.400 | 70 | 4.500 | 50 |
| 4,0 | | 5.400 | 330 | 5.400 | 330 | 5.400 | 330 | 5.000 | 250 | 3.400 | 120 | 2.500 | 75 | 3.000 | 90 | 2.500 | 65 |
| 6,0 | | 4.000 | 400 | 4.000 | 400 | 4.000 | 400 | 3.700 | 300 | 2.550 | 150 | 1.900 | 100 | 2.300 | 110 | 1.900 | 80 |
| 8,0 | | 3.000 | 400 | 3.000 | 400 | 3.000 | 400 | 2.800 | 300 | 1.900 | 150 | 1.400 | 100 | 1.700 | 110 | 1.400 | 80 |
| 10,0 | | 2.400 | 400 | 2.400 | 400 | 2.400 | 400 | 2.200 | 300 | 1.500 | 150 | 1.100 | 100 | 1.300 | 110 | 1.100 | 80 |
| 12,0 | | 2.000 | 400 | 2.000 | 400 | 2.000 | 400 | 1.850 | 300 | 1.300 | 150 | 950 | 100 | 1.100 | 110 | 950 | 80 |
| 16,0 | | 1.500 | 330 | 1.500 | 330 | 1.500 | 330 | 1.400 | 250 | 950 | 120 | 700 | 75 | 850 | 85 | 700 | 60 |
| 20,0 | | 1.200 | 280 | 1.200 | 280 | 1.200 | 280 | 1.100 | 220 | 750 | 110 | 550 | 65 | 650 | 75 | 550 | 55 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | | 1,0 DC | | | | | |
| | $a_e$ | 0,05 DC | | | | | | | | | | 0,02 DC | | | | | |

### ● Groove Finishing

| Work Material / Cond. / DC (mm) | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 16.600 | 180 | 16.600 | 180 | 16.600 | 180 | 15.500 | 130 | 10.500 | 70 | 7.500 | 45 | 9.400 | 50 | 7.500 | 35 |
| 2,0 | | 9.500 | 250 | 9.500 | 250 | 9.500 | 250 | 9.000 | 200 | 6.200 | 100 | 4.500 | 60 | 5.400 | 70 | 4.500 | 50 |
| 4,0 | | 5.400 | 330 | 5.400 | 330 | 5.400 | 330 | 5.000 | 250 | 3.400 | 120 | 2.500 | 75 | 3.000 | 90 | 2.500 | 65 |
| 6,0 | | 4.000 | 400 | 4.000 | 400 | 4.000 | 400 | 3.700 | 300 | 2.550 | 150 | 1.900 | 100 | 2.300 | 110 | 1.900 | 80 |
| 8,0 | | 3.000 | 400 | 3.000 | 400 | 3.000 | 400 | 2.800 | 300 | 1.900 | 150 | 1.400 | 100 | 1.700 | 110 | 1.400 | 80 |
| 10,0 | | 2.400 | 400 | 2.400 | 400 | 2.400 | 400 | 2.200 | 300 | 1.500 | 150 | 1.100 | 100 | 1.300 | 110 | 1.100 | 80 |
| 12,0 | | 2.000 | 400 | 2.000 | 400 | 2.000 | 400 | 1.850 | 300 | 1.300 | 150 | 950 | 100 | 1.100 | 110 | 950 | 80 |
| 16,0 | | 1.500 | 330 | 1.500 | 330 | 1.500 | 330 | 1.400 | 250 | 950 | 120 | 700 | 75 | 850 | 85 | 700 | 60 |
| 20,0 | | 1.200 | 280 | 1.200 | 280 | 1.200 | 280 | 1.100 | 220 | 750 | 110 | 550 | 65 | 650 | 75 | 550 | 55 |
| Groove finishing | $a_p$ | 1,5 DC | | | | | | | | | | | | | | | |
| | $a_e$ | –0,02 DC | | | | | | | | | | | | | | | |



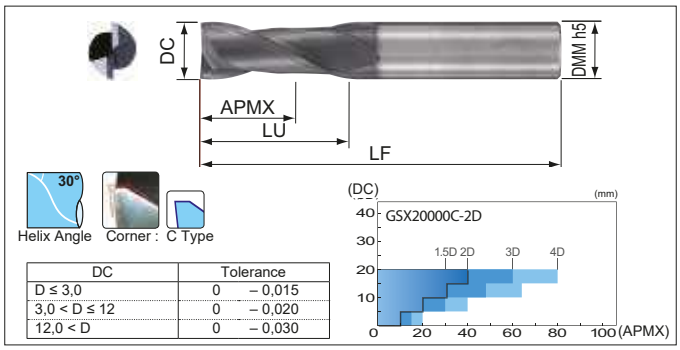


● = Euro stock
❍ = Japan stock

# GSX MILL Endmills
# GSX 20000C-2D Type

Coated Carbide Grades | GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 20050C-2D | ● | 0,5 | 1,0 | 1,4 | 40 | 4 |
| GSX 20100C-2D | ● | 1,0 | 2,0 | 3,0 | 40 | 4 |
| GSX 20150C-2D | ● | 1,5 | 3,0 | 4,0 | 40 | 4 |
| GSX 20200C-2D | ● | 2,0 | 4,0 | 5,0 | 40 | 4 |
| GSX 20250C-2D | ● | 2,5 | 5,0 | 6,0 | 40 | 4 |
| GSX 20300C-2D | ● | 3,0 | 6,0 | 7,5 | 45 | 6 |
| GSX 20350C-2D | ● | 3,5 | 7,0 | 8,5 | 45 | 6 |
| GSX 20400C-2D | ● | 4,0 | 8,0 | 9,5 | 45 | 6 |
| GSX 20450C-2D | ● | 4,5 | 9,0 | 10,5 | 50 | 6 |
| GSX 20500C-2D | ● | 5,0 | 10,0 | 12,0 | 50 | 6 |
| GSX 20550C-2D | ● | 5,5 | 11,0 | 13,0 | 50 | 6 |
| GSX 20600C-2D | ● | 6,0 | 12,0 | — | 50 | 6 |
| GSX 20700C-2D | ● | 7,0 | 14,0 | 16,0 | 60 | 8 |
| GSX 20800C-2D | ● | 8,0 | 16,0 | — | 60 | 8 |
| GSX 20900C-2D | ● | 9,0 | 18,0 | 20,0 | 70 | 10 |
| GSX 21000C-2D | ● | 10,0 | 20,0 | — | 70 | 10 |
| GSX 21200C-2D | ● | 12,0 | 24,0 | — | 75 | 12 |
| GSX 21400C-2D | | 14,0 | 28,0 | 31,5 | 90 | 16 |
| GSX 21500C-2D | | 15,0 | 30,0 | 33,5 | 90 | 16 |
| GSX 21600C-2D | ● | 16,0 | 32,0 | — | 90 | 16 |
| GSX 22000C-2D | ● | 20,0 | 40,0 | — | 100 | 20 |

## Endmill Identification (GSX MILL Series)

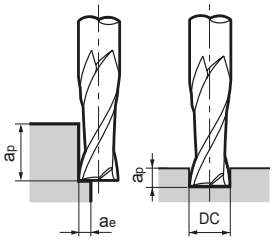
**GSX 2 0050 C - 2D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
5. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### Shoulder Milling

| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 19.600 | 250 | 19.600 | 250 | 19.600 | 250 | 18.300 | 180 | 12.700 | 100 | 9.000 | 60 | 11.000 | 70 | 9.000 | 50 |
| 2,0 | | 11.200 | 340 | 11.200 | 340 | 11.200 | 340 | 10.500 | 240 | 7.300 | 130 | 5.300 | 80 | 6.400 | 90 | 5.300 | 70 |
| 4,0 | | 6.400 | 460 | 6.400 | 460 | 6.400 | 460 | 6.000 | 320 | 4.200 | 180 | 3.000 | 110 | 3.600 | 120 | 3.000 | 90 |
| 6,0 | | 4.600 | 560 | 4.600 | 560 | 4.600 | 560 | 4.300 | 400 | 3.000 | 210 | 2.200 | 130 | 2.700 | 140 | 2.200 | 100 |
| 8,0 | | 3.400 | 560 | 3.400 | 560 | 3.400 | 560 | 3.200 | 400 | 2.200 | 210 | 1.600 | 130 | 2.000 | 140 | 1.600 | 100 |
| 10,0 | | 2.800 | 560 | 2.800 | 560 | 2.800 | 560 | 2.600 | 400 | 1.800 | 210 | 1.300 | 130 | 1.600 | 140 | 1.300 | 100 |
| 12,0 | | 2.300 | 560 | 2.300 | 560 | 2.300 | 560 | 2.200 | 400 | 1.500 | 210 | 1.100 | 130 | 1.300 | 140 | 1.100 | 100 |
| 16,0 | | 1.700 | 450 | 1.700 | 450 | 1.700 | 450 | 1.600 | 320 | 1.100 | 180 | 800 | 100 | 1.000 | 110 | 800 | 85 |
| 20,0 | | 1.350 | 380 | 1.350 | 380 | 1.350 | 380 | 1.300 | 280 | 900 | 160 | 650 | 90 | 800 | 100 | 650 | 75 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | | 1,0 DC | | | | | |
| | $a_e$ | 0,05 DC | | | | | | | | | | 0,02 DC | | | | | |

### Grooving

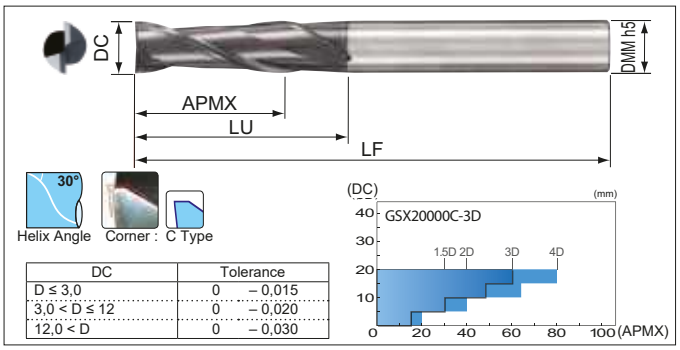
| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 19.600 | 200 | 19.600 | 250 | 19.600 | 250 | 18.300 | 180 | 12.700 | 100 | 9.000 | 60 | 11.000 | 50 | 4.500 | 20 |
| 2,0 | | 11.200 | 270 | 11.200 | 340 | 11.200 | 340 | 10.500 | 240 | 7.300 | 130 | 5.300 | 80 | 6.400 | 65 | 2.650 | 25 |
| 4,0 | | 6.400 | 370 | 6.400 | 460 | 6.400 | 460 | 6.000 | 320 | 4.200 | 180 | 3.000 | 110 | 3.600 | 80 | 1.500 | 35 |
| 6,0 | | 4.600 | 450 | 4.600 | 560 | 4.600 | 560 | 4.300 | 400 | 3.000 | 210 | 2.200 | 130 | 2.700 | 100 | 1.100 | 40 |
| 8,0 | | 3.400 | 450 | 3.400 | 560 | 3.400 | 560 | 3.200 | 400 | 2.200 | 210 | 1.600 | 130 | 2.000 | 100 | 800 | 40 |
| 10,0 | | 2.800 | 450 | 2.800 | 560 | 2.800 | 560 | 2.600 | 400 | 1.800 | 210 | 1.300 | 130 | 1.600 | 100 | 650 | 40 |
| 12,0 | | 2.300 | 450 | 2.300 | 560 | 2.300 | 560 | 2.200 | 400 | 1.500 | 210 | 1.100 | 130 | 1.300 | 100 | 500 | 40 |
| 16,0 | | 1.700 | 360 | 1.700 | 450 | 1.700 | 450 | 1.600 | 320 | 1.100 | 180 | 800 | 100 | 1.000 | 80 | 400 | 35 |
| 20,0 | | 1.350 | 300 | 1.350 | 380 | 1.350 | 380 | 1.300 | 280 | 900 | 160 | 650 | 90 | 800 | 70 | 320 | 30 |
| Grooving | $a_p$ | 0,2 DC | | 0,5 DC | | | | | | 0,2 DC | | 0,05 DC | | 0,2 DC | | | |

# GSX 20000C-3D Type



Coated Carbide Grades | GSX Coating

| Structual Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 20100C-3D | ● | 1,0 | 3,0 | 4,0 | 40 | 4 |
| GSX 20150C-3D | ● | 1,5 | 4,5 | 5,5 | 40 | 4 |
| GSX 20200C-3D | ● | 2,0 | 6,0 | 7,0 | 40 | 4 |
| GSX 20250C-3D | ● | 2,5 | 7,5 | 8,5 | 40 | 4 |
| GSX 20300C-3D | ● | 3,0 | 9,0 | 10,5 | 50 | 6 |
| GSX 20400C-3D | ● | 4,0 | 12,0 | 13,5 | 50 | 6 |
| GSX 20500C-3D | ● | 5,0 | 15,0 | 17,0 | 50 | 6 |
| GSX 20600C-3D | ● | 6,0 | 18,0 | — | 50 | 6 |
| GSX 20800C-3D | ● | 8,0 | 24,0 | — | 70 | 8 |
| GSX 21000C-3D | ● | 10,0 | 30,0 | — | 90 | 10 |
| GSX 21200C-3D | ● | 12,0 | 36,0 | — | 90 | 12 |
| GSX 21600C-3D | ● | 16,0 | 48,0 | — | 110 | 16 |
| GSX 22000C-3D | | 20,0 | 60,0 | — | 120 | 20 |

## Endmill Identification (GSX MILL Series)

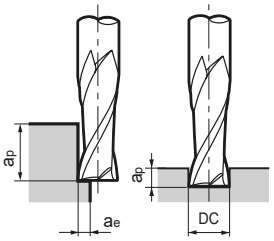
**GSX** **2** **0100** **C** **-** **3D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. In rare cases, chattering may occur in early milling stages, dissipating after 2m of cutting.
5. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
6. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### ● Shoulder Milling

| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 16.600 | 190 | 16.600 | 190 | 16.600 | 190 | 15.500 | 140 | 10.500 | 70 | 7.500 | 45 | 9.400 | 50 | 7.500 | 35 |
| 2,0 | 9.500 | 250 | 9.500 | 250 | 9.500 | 250 | 9.000 | 200 | 6.200 | 120 | 4.500 | 60 | 5.200 | 70 | 4.500 | 50 |
| 4,0 | 5.200 | 330 | 5.200 | 330 | 5.200 | 330 | 4.800 | 200 | 3.400 | 150 | 2.250 | 75 | 2.600 | 90 | 2.250 | 65 |
| 6,0 | 3.500 | 360 | 3.500 | 360 | 3.500 | 360 | 3.200 | 250 | 2.550 | 170 | 1.500 | 90 | 1.700 | 100 | 1.500 | 80 |
| 8,0 | 2.600 | 320 | 2.600 | 320 | 2.600 | 320 | 2.400 | 240 | 1.900 | 170 | 1.100 | 90 | 1.300 | 105 | 1.100 | 80 |
| 10,0 | 2.100 | 300 | 2.100 | 300 | 2.100 | 300 | 1.900 | 230 | 1.500 | 170 | 900 | 90 | 1.000 | 100 | 900 | 80 |
| 12,0 | 1.750 | 280 | 1.750 | 280 | 1.750 | 280 | 1.600 | 230 | 1.250 | 170 | 750 | 90 | 850 | 100 | 750 | 80 |
| 16,0 | 1.300 | 240 | 1.300 | 240 | 1.300 | 240 | 1.200 | 200 | 950 | 150 | 550 | 75 | 650 | 85 | 550 | 65 |
| 20,0 | 1.050 | 220 | 1.050 | 220 | 1.050 | 220 | 950 | 180 | 750 | 140 | 450 | 70 | 500 | 75 | 450 | 60 |
| Shoulder cutting ap | 2,5 DC | | | | | | | | 2,0 DC | | | | | | | |
| Shoulder cutting ae | < ø3: 0,05 DC , ≤ ø3: 0,1 DC | | | | | | | | 0,02 DC | | | | | | | |

### ● Grooving

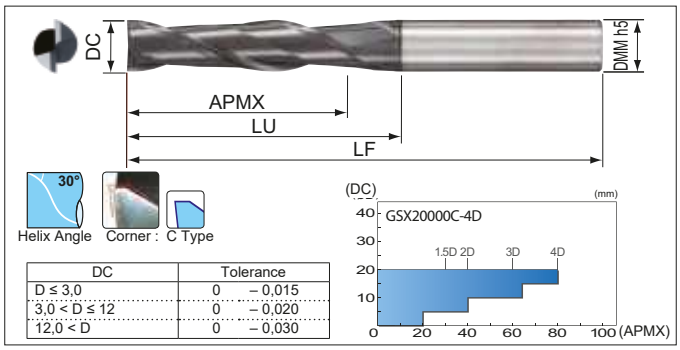
| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 16.600 | 70 | 16.600 | 80 | 16.600 | 80 | 15.500 | 50 | 10.500 | 50 | 7.500 | 35 | 9.400 | 30 | 3.750 | 10 |
| 2,0 | 9.500 | 80 | 9.500 | 100 | 9.500 | 100 | 9.000 | 90 | 6.200 | 60 | 4.500 | 45 | 5.200 | 40 | 2.250 | 15 |
| 4,0 | 5.200 | 120 | 5.200 | 150 | 5.200 | 150 | 4.800 | 120 | 3.400 | 80 | 2.200 | 50 | 2.600 | 50 | 1.250 | 20 |
| 6,0 | 3.500 | 140 | 3.500 | 170 | 3.500 | 170 | 3.200 | 130 | 2.550 | 100 | 1.500 | 50 | 1.700 | 60 | 950 | 25 |
| 8,0 | 2.600 | 140 | 2.600 | 160 | 2.600 | 160 | 2.400 | 130 | 1.900 | 100 | 1.100 | 50 | 1.300 | 60 | 700 | 25 |
| 10,0 | 2.100 | 130 | 2.100 | 150 | 2.100 | 150 | 1.900 | 120 | 1.500 | 90 | 900 | 50 | 1.000 | 60 | 550 | 25 |
| 12,0 | 1.750 | 130 | 1.750 | 150 | 1.750 | 150 | 1.600 | 120 | 1.250 | 90 | 750 | 50 | 850 | 60 | 450 | 25 |
| 16,0 | 1.300 | 110 | 1.300 | 130 | 1.300 | 130 | 1.200 | 110 | 950 | 80 | 550 | 45 | 650 | 50 | 350 | 20 |
| 20,0 | 1.050 | 100 | 1.050 | 120 | 1.050 | 120 | 950 | 100 | 750 | 70 | 450 | 40 | 500 | 40 | 280 | 15 |
| Grooving ap | 0,1 DC | | 0,2 DC | | | | | | | | 0,05 DC | | 0,1 *D* | | | |
| Grooving ae | | | | | | | | | | | | | | | | |

● = Euro stock

# GSX MILL Endmills
# GSX 20000C-4D Type

Coated Carbide Grades — GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 20100C-4D | ● | 1,0 | 4,0 | 5,0 | 40 | 4 |
| GSX 20150C-4D | ● | 1,5 | 6,0 | 7,0 | 40 | 4 |
| GSX 20200C-4D | ● | 2,0 | 8,0 | 9,0 | 40 | 4 |
| GSX 20250C-4D | ● | 2,5 | 10,0 | 11,0 | 50 | 4 |
| GSX 20300C-4D | ● | 3,0 | 12,0 | 13,5 | 50 | 6 |
| GSX 20400C-4D | ● | 4,0 | 16,0 | 17,5 | 50 | 6 |
| GSX 20500C-4D | ● | 5,0 | 20,0 | 22,0 | 60 | 6 |
| GSX 20600C-4D | ● | 6,0 | 24,0 | – | 60 | 6 |
| GSX 20800C-4D | ● | 8,0 | 32,0 | – | 80 | 8 |
| GSX 21000C-4D | ● | 10,0 | 40,0 | – | 90 | 10 |
| GSX 21200C-4D | ● | 12,0 | 48,0 | – | 100 | 12 |
| GSX 21600C-4D | | 16,0 | 64,0 | – | 120 | 16 |
| GSX 22000C-4D | | 20,0 | 80,0 | – | 140 | 20 |

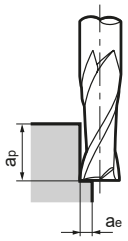
## Endmill Identification (GSX MILL Series)

**GSX 2 0100 C - 4D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|
| | | | S: Sharp Edge<br>C: Gash Land Drilling | |

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. In rear cases, chattering may occur in early milling stages, dissipating after 2 m of cutting.
5. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
6. This series is not recommended for grooving.
7. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### Shoulder Milling

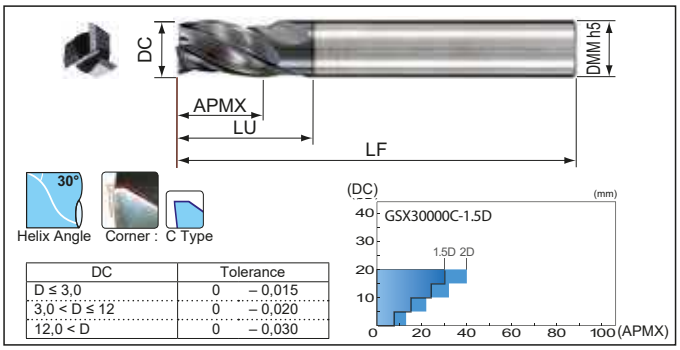
| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 9.000 | 130 | 9.000 | 130 | 9.000 | 130 | 7.000 | 95 | 6.500 | 50 | 4.500 | 30 | 5.400 | 40 | 4.500 | 25 |
| 2,0 | 4.500 | 180 | 4.500 | 180 | 4.500 | 180 | 3.500 | 120 | 3.200 | 70 | 2.300 | 40 | 2.700 | 50 | 2.300 | 35 |
| 4,0 | 2.250 | 240 | 2.250 | 240 | 2.250 | 240 | 1.750 | 160 | 1.600 | 95 | 1.200 | 60 | 1.350 | 65 | 1.200 | 40 |
| 6,0 | 1.500 | 300 | 1.500 | 300 | 1.500 | 300 | 1.150 | 170 | 1.050 | 110 | 800 | 70 | 900 | 70 | 800 | 50 |
| 8,0 | 1.100 | 260 | 1.100 | 260 | 1.100 | 260 | 850 | 170 | 800 | 110 | 600 | 70 | 660 | 70 | 600 | 50 |
| 10,0 | 900 | 250 | 900 | 250 | 900 | 250 | 700 | 160 | 650 | 110 | 460 | 70 | 540 | 70 | 460 | 50 |
| 12,0 | 750 | 240 | 750 | 240 | 750 | 240 | 580 | 160 | 520 | 110 | 400 | 70 | 450 | 70 | 400 | 50 |
| 16,0 | 550 | 200 | 550 | 200 | 550 | 200 | 440 | 140 | 400 | 95 | 300 | 55 | 330 | 60 | 300 | 45 |
| 20,0 | 450 | 180 | 450 | 180 | 450 | 180 | 350 | 120 | 320 | 85 | 240 | 45 | 270 | 50 | 240 | 40 |
| Shoulder cutting $a_p$ | 3,5 DC | | | | | | | | | | 3,0 DC | | | | | |
| Shoulder cutting $a_e$ | 0,08 DC | | | | | | 0,04 DC | | | | | | | | | |

# GSX 30000C-1.5D Type



Coated Carbide Grades | GSX Coating

| Structual Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 30100C-1.5D | ● | 1,0 | 1,5 | 2,5 | 40 | 4 |
| GSX 30150C-1.5D | ● | 1,5 | 2,3 | 3,3 | 40 | 4 |
| GSX 30200C-1.5D | ● | 2,0 | 3,0 | 4,0 | 40 | 4 |
| GSX 30250C-1.5D | ● | 2,5 | 3,8 | 4,8 | 40 | 4 |
| GSX 30300C-1.5D | ● | 3,0 | 4,5 | 6,0 | 45 | 6 |
| GSX 30400C-1.5D | ● | 4,0 | 6,0 | 7,5 | 45 | 6 |
| GSX 30500C-1.5D | ● | 5,0 | 7,5 | 9,5 | 50 | 6 |
| GSX 30600C-1.5D | ● | 6,0 | 9,0 | – | 50 | 6 |
| GSX 30700C-1.5D | ● | 7,0 | 11,0 | 13,0 | 60 | 8 |
| GSX 30800C-1.5D | ● | 8,0 | 12,0 | – | 60 | 8 |
| GSX 30900C-1.5D | ● | 9,0 | 14,0 | 16,0 | 70 | 10 |
| GSX 31000C-1.5D | ● | 10,0 | 15,0 | – | 70 | 10 |
| GSX 31200C-1.5D | ● | 12,0 | 18,0 | – | 75 | 12 |
| GSX 31600C-1.5D | | 16,0 | 24,0 | – | 90 | 16 |
| GSX 32000C-1.5D | | 20,0 | 30,0 | – | 100 | 20 |

## Endmill Identification (GSX MILL Series)

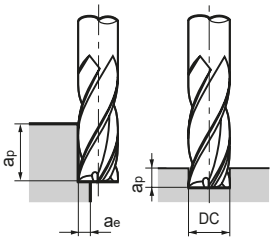
**GSX** **3** **0100** **C** **-** **1.5D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### ● Shoulder Milling

| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 19.600 | 300 | 19.600 | 300 | 19.600 | 300 | 18.300 | 210 | 12.700 | 130 | 9.000 | 80 | 11.000 | 90 | 9.000 | 65 |
| 2,0 | 11.200 | 410 | 11.200 | 410 | 11.200 | 410 | 10.500 | 280 | 7.300 | 170 | 5.300 | 100 | 6.400 | 120 | 5.300 | 90 |
| 4,0 | 6.400 | 550 | 6.400 | 550 | 6.400 | 550 | 6.000 | 370 | 4.200 | 230 | 3.000 | 140 | 3.600 | 150 | 3.000 | 120 |
| 6,0 | 4.600 | 670 | 4.600 | 670 | 4.600 | 670 | 4.300 | 460 | 3.000 | 270 | 2.200 | 170 | 2.700 | 180 | 2.200 | 130 |
| 8,0 | 3.400 | 670 | 3.400 | 670 | 3.400 | 670 | 3.200 | 460 | 2.200 | 270 | 1.600 | 170 | 2.000 | 180 | 1.600 | 130 |
| 10,0 | 2.800 | 670 | 2.800 | 670 | 2.800 | 670 | 2.600 | 460 | 1.800 | 270 | 1.300 | 170 | 1.600 | 180 | 1.300 | 130 |
| 12,0 | 2.300 | 670 | 2.300 | 670 | 2.300 | 670 | 2.200 | 460 | 1.500 | 270 | 1.100 | 170 | 1.300 | 180 | 1.100 | 130 |
| 16,0 | 1.700 | 550 | 1.700 | 550 | 1.700 | 550 | 1.600 | 370 | 1.100 | 230 | 800 | 140 | 1.000 | 150 | 800 | 100 |
| 20,0 | 1.350 | 490 | 1.350 | 490 | 1.350 | 490 | 1.300 | 330 | 900 | 210 | 650 | 120 | 800 | 130 | 650 | 90 |
| Shoulder cutting ap | 1,5 DC | | | | | | | | 1,0 DC | | | | | | | |
| Shoulder cutting ae | 0,05 DC | | | | | | | | 0,02 DC | | | | | | | |

### ● Grooving

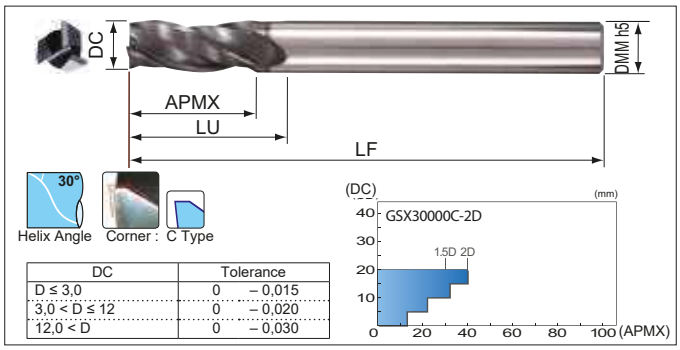
| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 19.600 | 240 | 19.600 | 300 | 19.600 | 300 | 18.300 | 210 | 12.700 | 130 | 9.000 | 80 | 11.000 | 65 | 4.500 | 25 |
| 2,0 | 11.200 | 320 | 11.200 | 410 | 11.200 | 410 | 10.500 | 280 | 7.300 | 170 | 5.300 | 100 | 6.400 | 85 | 2.650 | 35 |
| 4,0 | 6.400 | 450 | 6.400 | 550 | 6.400 | 550 | 6.000 | 370 | 4.200 | 230 | 3.000 | 140 | 3.600 | 100 | 1.500 | 50 |
| 6,0 | 4.600 | 540 | 4.600 | 670 | 4.600 | 670 | 4.300 | 460 | 3.000 | 270 | 2.200 | 170 | 2.650 | 130 | 1.150 | 55 |
| 8,0 | 3.400 | 540 | 3.400 | 670 | 3.400 | 670 | 3.200 | 460 | 2.200 | 270 | 1.600 | 170 | 2.000 | 130 | 800 | 55 |
| 10,0 | 2.800 | 540 | 2.800 | 670 | 2.800 | 670 | 2.600 | 460 | 1.800 | 270 | 1.300 | 170 | 1.600 | 130 | 650 | 55 |
| 12,0 | 2.300 | 540 | 2.300 | 670 | 2.300 | 670 | 2.200 | 460 | 1.500 | 270 | 1.100 | 170 | 1.300 | 130 | 500 | 55 |
| 16,0 | 1.700 | 440 | 1.700 | 550 | 1.700 | 550 | 1.600 | 370 | 1.100 | 230 | 800 | 140 | 1.000 | 110 | 400 | 45 |
| 20,0 | 1.350 | 390 | 1.350 | 490 | 1.350 | 490 | 1.300 | 330 | 900 | 210 | 650 | 120 | 800 | 90 | 320 | 40 |
| Grooving ap | 0,2 DC | | 0,5 DC | | | | | | | | 0,05 DC | | 0,2 DC | | | |
| Grooving ae | | | | | | | | | | | | | | | | |

● = Euro stock

# GSX MILL Endmills
# GSX 30000C-2D Type

Coated Carbide Grades | GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 30100C-2D | ● | 1,0 | 2,5 | 3,5 | 40 | 4 |
| GSX 30150C-2D | ● | 1,5 | 3,8 | 4,8 | 40 | 4 |
| GSX 30200C-2D | ● | 2,0 | 5,0 | 6,0 | 40 | 4 |
| GSX 30250C-2D | ● | 2,5 | 6,3 | 7,3 | 40 | 4 |
| GSX 30300C-2D | ● | 3,0 | 7,5 | 9,0 | 45 | 6 |
| GSX 30400C-2D | ● | 4,0 | 11,0 | 12,5 | 45 | 6 |
| GSX 30500C-2D | ● | 5,0 | 13,0 | 15,0 | 50 | 6 |
| GSX 30600C-2D | ● | 6,0 | 13,0 | – | 50 | 6 |
| GSX 30700C-2D | ● | 7,0 | 16,0 | 18,0 | 60 | 8 |
| GSX 30800C-2D | ● | 8,0 | 19,0 | – | 60 | 8 |
| GSX 30900C-2D | ● | 9,0 | 19,0 | 21,0 | 70 | 10 |
| GSX 31000C-2D | ● | 10,0 | 22,0 | – | 70 | 10 |
| GSX 31200C-2D | ● | 12,0 | 26,0 | – | 75 | 12 |
| GSX 31600C-2D | | 16,0 | 32,0 | – | 90 | 16 |
| GSX 32000C-2D | | 20,0 | 40,0 | – | 100 | 20 |

## Endmill Identification (GSX MILL Series)

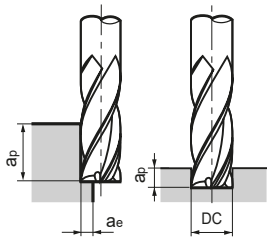
**GSX 3 0100 C - 2D**

| GSX | 3 | 0100 | C | - | 2D |
|---|---|---|---|---|---|
| Series Code | No. of Teeth | Diameter | Cutting Edge | | Cutting Edge Length |

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### Shoulder Milling

| Work Material / Cond. | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 19.600 | 300 | 19.600 | 300 | 19.600 | 300 | 18.300 | 210 | 12.700 | 130 | 9.000 | 80 | 11.000 | 90 | 9.000 | 65 |
| 2,0 | 11.200 | 410 | 11.200 | 410 | 11.200 | 410 | 10.500 | 280 | 7.300 | 170 | 5.300 | 100 | 6.400 | 120 | 5.300 | 90 |
| 4,0 | 6.400 | 550 | 6.400 | 550 | 6.400 | 550 | 6.000 | 370 | 4.200 | 230 | 3.000 | 140 | 3.600 | 150 | 3.000 | 120 |
| 6,0 | 4.600 | 670 | 4.600 | 670 | 4.600 | 670 | 4.300 | 460 | 3.000 | 270 | 2.200 | 170 | 2.700 | 180 | 2.200 | 130 |
| 8,0 | 3.400 | 670 | 3.400 | 670 | 3.400 | 670 | 3.200 | 460 | 2.200 | 270 | 1.600 | 170 | 2.000 | 180 | 1.600 | 130 |
| 10,0 | 2.800 | 670 | 2.800 | 670 | 2.800 | 670 | 2.600 | 460 | 1.800 | 270 | 1.300 | 170 | 1.600 | 180 | 1.300 | 130 |
| 12,0 | 2.300 | 670 | 2.300 | 670 | 2.300 | 670 | 2.200 | 460 | 1.500 | 270 | 1.100 | 170 | 1.300 | 180 | 1.100 | 130 |
| 16,0 | 1.700 | 550 | 1.700 | 550 | 1.700 | 550 | 1.600 | 370 | 1.100 | 230 | 800 | 140 | 1.000 | 150 | 800 | 100 |
| 20,0 | 1.350 | 490 | 1.350 | 490 | 1.350 | 490 | 1.300 | 330 | 900 | 210 | 650 | 120 | 800 | 130 | 650 | 90 |
| Shoulder cutting $a_p$ | 1,5 DC | | | | | | | | | | 1,0 DC | | | | | |
| Shoulder cutting $a_e$ | 0,05 DC | | | | | | | | | | 0,02 DC | | | | | |

### Grooving

| Work Material / Cond. | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 19.600 | 240 | 19.600 | 300 | 19.600 | 300 | 18.300 | 210 | 12.700 | 130 | 9.000 | 80 | 11.000 | 65 | 4.500 | 25 |
| 2,0 | 11.200 | 320 | 11.200 | 410 | 11.200 | 410 | 10.500 | 280 | 7.300 | 170 | 5.300 | 100 | 6.400 | 85 | 2.650 | 35 |
| 4,0 | 6.400 | 450 | 6.400 | 550 | 6.400 | 550 | 6.000 | 370 | 4.200 | 230 | 3.000 | 140 | 3.600 | 100 | 1.500 | 50 |
| 6,0 | 4.600 | 540 | 4.600 | 670 | 4.600 | 670 | 4.300 | 460 | 3.000 | 270 | 2.200 | 170 | 2.650 | 130 | 1.150 | 55 |
| 8,0 | 3.400 | 540 | 3.400 | 670 | 3.400 | 670 | 3.200 | 460 | 2.200 | 270 | 1.600 | 170 | 2.000 | 130 | 800 | 55 |
| 10,0 | 2.800 | 540 | 2.800 | 670 | 2.800 | 670 | 2.600 | 460 | 1.800 | 270 | 1.300 | 170 | 1.600 | 130 | 650 | 55 |
| 12,0 | 2.300 | 540 | 2.300 | 670 | 2.300 | 670 | 2.200 | 460 | 1.500 | 270 | 1.100 | 170 | 1.300 | 130 | 500 | 55 |
| 16,0 | 1.700 | 440 | 1.700 | 550 | 1.700 | 550 | 1.600 | 370 | 1.100 | 230 | 800 | 140 | 1.000 | 110 | 400 | 45 |
| 20,0 | 1.350 | 390 | 1.350 | 490 | 1.350 | 490 | 1.300 | 330 | 900 | 210 | 650 | 120 | 800 | 90 | 320 | 40 |
| Grooving $a_p$ | 0,2 DC | | 0,5 DC | | | | | | 0,2 DC | | 0,05 DC | | 0,2 DC | | | |

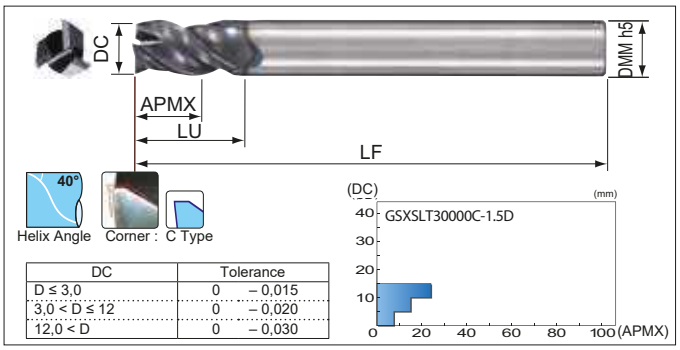
# GSXSLT 30000C-1.5D Type



Coated Carbide — Grades

GSX — Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

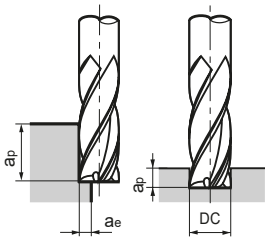
## ■ Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSXSLT 30100C-1.5D | ● | 1,0 | 1,5 | 2,5 | 40 | 4 |
| GSXSLT 30150C-1.5D | ● | 1,5 | 2,3 | 3,3 | 40 | 4 |
| GSXSLT 30200C-1.5D | ❍ | 2,0 | 3,0 | 4,0 | 40 | 4 |
| GSXSLT 30250C-1.5D | ❍ | 2,5 | 3,8 | 4,8 | 40 | 4 |
| GSXSLT 30300C-1.5D | ● | 3,0 | 4,5 | 6,0 | 45 | 6 |
| GSXSLT 30400C-1.5D | ● | 4,0 | 6,0 | 7,5 | 45 | 6 |
| GSXSLT 30500C-1.5D | ● | 5,0 | 7,5 | 9,5 | 50 | 6 |
| GSXSLT 30600C-1.5D | ● | 6,0 | 9,0 | – | 50 | 6 |
| GSXSLT 30700C-1.5D | ● | 7,0 | 11,0 | 13,0 | 60 | 8 |
| GSXSLT 30800C-1.5D | ● | 8,0 | 12,0 | – | 60 | 8 |
| GSXSLT 30900C-1.5D | ● | 9,0 | 14,0 | 16,0 | 70 | 10 |
| GSXSLT 31000C-1.5D | ● | 10,0 | 15,0 | – | 70 | 10 |
| GSXSLT 31200C-1.5D | ● | 12,0 | 18,0 | – | 75 | 12 |
| GSXSLT 31600C-1.5D | | 16,0 | 24,0 | – | 90 | 16 |

## ■ Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. Use step machining of 0.1Dc when drilling stainless steel, heat resistant alloy, and titanium alloy.
5. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### ● Shoulder Milling

| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 19.600 | 300 | 19.600 | 300 | 19.600 | 300 | 18.300 | 210 | 12.700 | 130 | 9.000 | 80 | 11.000 | 90 | 9.000 | 65 |
| 2,0 | 11.200 | 410 | 11.200 | 410 | 11.200 | 410 | 10.500 | 280 | 7.300 | 170 | 5.300 | 100 | 6.400 | 120 | 5.300 | 90 |
| 4,0 | 6.400 | 550 | 6.400 | 550 | 6.400 | 550 | 6.000 | 370 | 4.200 | 230 | 3.000 | 140 | 3.600 | 150 | 3.000 | 120 |
| 6,0 | 4.600 | 670 | 4.600 | 670 | 4.600 | 670 | 4.300 | 460 | 3.000 | 270 | 2.200 | 170 | 2.700 | 180 | 2.200 | 130 |
| 8,0 | 3.400 | 670 | 3.400 | 670 | 3.400 | 670 | 3.200 | 460 | 2.200 | 270 | 1.600 | 170 | 2.000 | 180 | 1.600 | 130 |
| 10,0 | 2.800 | 670 | 2.800 | 670 | 2.800 | 670 | 2.600 | 460 | 1.800 | 270 | 1.300 | 170 | 1.600 | 180 | 1.300 | 130 |
| 12,0 | 2.300 | 670 | 2.300 | 670 | 2.300 | 670 | 2.200 | 460 | 1.500 | 270 | 1.100 | 170 | 1.300 | 180 | 1.100 | 130 |
| 16,0 | 1.700 | 550 | 1.700 | 550 | 1.700 | 550 | 1.600 | 370 | 1.100 | 230 | 800 | 140 | 1.000 | 150 | 800 | 100 |
| Shoulder cutting ap | 1.5 DC | | | | | | | | | | 1.0 DC | | | | | |
| Shoulder cutting ae | 0.05 DC | | | | | | | | | | 0.02 DC | | | | | |

### ● Grooving

| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 19.600 | 240 | 19.600 | 300 | 19.600 | 300 | 18.300 | 210 | 12.700 | 130 | 9.000 | 80 | 11.000 | 65 | 4.500 | 25 |
| 2,0 | 11.200 | 320 | 11.200 | 410 | 11.200 | 410 | 10.500 | 280 | 7.300 | 170 | 5.300 | 100 | 6.400 | 85 | 2.650 | 35 |
| 4,0 | 6.400 | 450 | 6.400 | 550 | 6.400 | 550 | 6.000 | 370 | 4.200 | 230 | 3.000 | 140 | 3.600 | 100 | 1.500 | 50 |
| 6,0 | 4.600 | 540 | 4.600 | 670 | 4.600 | 670 | 4.300 | 460 | 3.000 | 270 | 2.200 | 170 | 2.650 | 130 | 1.150 | 55 |
| 8,0 | 3.400 | 540 | 3.400 | 670 | 3.400 | 670 | 3.200 | 460 | 2.200 | 270 | 1.600 | 170 | 2.000 | 130 | 800 | 55 |
| 10,0 | 2.800 | 540 | 2.800 | 670 | 2.800 | 670 | 2.600 | 460 | 1.800 | 270 | 1.300 | 170 | 1.600 | 130 | 650 | 55 |
| 12,0 | 2.300 | 540 | 2.300 | 670 | 2.300 | 670 | 2.200 | 460 | 1.500 | 270 | 1.100 | 170 | 1.300 | 130 | 500 | 55 |
| 16,0 | 1.700 | 440 | 1.700 | 550 | 1.700 | 550 | 1.600 | 370 | 1.100 | 230 | 800 | 140 | 1.000 | 110 | 400 | 45 |
| Grooving ap | 0,2 DC | | 0,5 DC | | | | | | 0,2 DC | | 0,05 DC | | 0,2 DC | | | |

### ● Drilling

| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 19.600 | 70 | 19.600 | 90 | 19.600 | 90 | 18.300 | 60 | 12.700 | 40 | 9.000 | 25 | 11.000 | 20 | 4.500 | 10 |
| 2,0 | 11.200 | 90 | 11.200 | 120 | 11.200 | 120 | 10.500 | 80 | 7.300 | 50 | 5.300 | 30 | 6.400 | 25 | 2.650 | 15 |
| 4,0 | 6.400 | 130 | 6.400 | 160 | 6.400 | 160 | 6.000 | 110 | 4.200 | 70 | 3.000 | 40 | 3.600 | 30 | 1.500 | 20 |
| 6,0 | 4.600 | 160 | 4.600 | 200 | 4.600 | 200 | 4.300 | 130 | 3.000 | 80 | 2.200 | 50 | 2.650 | 40 | 1.150 | 20 |
| 8,0 | 3.400 | 160 | 3.400 | 200 | 3.400 | 200 | 3.200 | 130 | 2.200 | 80 | 1.600 | 50 | 2.000 | 40 | 800 | 20 |
| 10,0 | 2.800 | 160 | 2.800 | 200 | 2.800 | 200 | 2.600 | 130 | 1.800 | 80 | 1.300 | 50 | 1.600 | 40 | 650 | 20 |
| 12,0 | 2.300 | 160 | 2.300 | 200 | 2.300 | 200 | 2.200 | 130 | 1.500 | 80 | 1.100 | 50 | 1.300 | 40 | 500 | 20 |
| 16,0 | 1.700 | 130 | 1.700 | 160 | 1.700 | 160 | 1.600 | 110 | 1.100 | 70 | 800 | 40 | 1.000 | 35 | 400 | 15 |



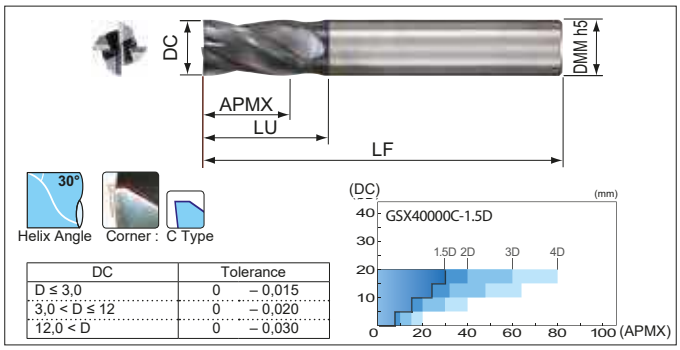


● = Euro stock
❍ = Japan stock

# GSX MILL Endmills
# GSX 40000C-1.5D Type

Coated Carbide Grades — GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

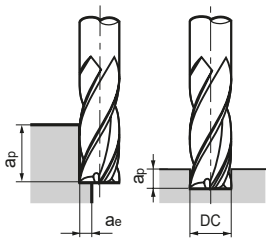
## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 40100C-1.5D | ● | 1,0 | 1,5 | 2,5 | 40 | 4 |
| GSX 40150C-1.5D | ● | 1,5 | 2,3 | 3,3 | 40 | 4 |
| GSX 40200C-1.5D | ● | 2,0 | 3,0 | 4,0 | 40 | 4 |
| GSX 40250C-1.5D | ● | 2,5 | 3,8 | 4,8 | 40 | 4 |
| GSX 40300C-1.5D | ● | 3,0 | 4,5 | 6,0 | 45 | 6 |
| GSX 40350C-1.5D | ● | 3,5 | 5,3 | 6,8 | 45 | 6 |
| GSX 40400C-1.5D | ● | 4,0 | 6,0 | 7,5 | 45 | 6 |
| GSX 40450C-1.5D | ● | 4,5 | 6,8 | 8,3 | 50 | 6 |
| GSX 40500C-1.5D | ● | 5,0 | 7,5 | 9,5 | 50 | 6 |
| GSX 40550C-1.5D | ● | 5,5 | 8,3 | 10,3 | 50 | 6 |
| GSX 40600C-1.5D | ● | 6,0 | 9,0 | – | 50 | 6 |
| GSX 40700C-1.5D | ● | 7,0 | 11,0 | 13,0 | 60 | 8 |
| GSX 40800C-1.5D | ● | 8,0 | 12,0 | – | 60 | 8 |
| GSX 40900C-1.5D | ● | 9,0 | 14,0 | 16,0 | 70 | 10 |
| GSX 41000C-1.5D | ● | 10,0 | 15,0 | – | 70 | 10 |
| GSX 41200C-1.5D | ● | 12,0 | 18,0 | – | 75 | 12 |
| GSX 41400C-1.5D | | 14,0 | 21,0 | 24,5 | 90 | 16 |
| GSX 41500C-1.5D | | 15,0 | 23,0 | 26,5 | 90 | 16 |
| GSX 41600C-1.5D | | 16,0 | 24,0 | – | 90 | 16 |
| GSX 42000C-1.5D | | 20,0 | 30,0 | – | 100 | 20 |

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




## Shoulder Milling

| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 24.000 | 470 | 24.000 | 470 | 24.000 | 470 | 21.000 | 290 | 14.500 | 180 | 10.500 | 120 | 12.600 | 120 | 10.500 | 85 |
| 2,0 | | 12.800 | 570 | 12.800 | 570 | 12.800 | 570 | 12.000 | 380 | 8.300 | 230 | 6.000 | 150 | 7.200 | 160 | 6.000 | 110 |
| 4,0 | | 6.800 | 730 | 6.800 | 730 | 6.800 | 730 | 6.400 | 490 | 4.400 | 300 | 3.200 | 200 | 3.800 | 210 | 3.200 | 130 |
| 6,0 | | 4.600 | 780 | 4.600 | 780 | 4.600 | 780 | 4.300 | 520 | 3.000 | 320 | 2.200 | 210 | 2.650 | 220 | 2.200 | 150 |
| 8,0 | | 3.400 | 780 | 3.400 | 780 | 3.400 | 780 | 3.200 | 520 | 2.200 | 320 | 1.600 | 210 | 2.000 | 220 | 1.600 | 150 |
| 10,0 | | 2.800 | 780 | 2.800 | 780 | 2.800 | 780 | 2.600 | 520 | 1.800 | 320 | 1.300 | 210 | 1.500 | 220 | 1.300 | 150 |
| 12,0 | | 2.300 | 780 | 2.300 | 780 | 2.300 | 780 | 2.200 | 520 | 1.500 | 320 | 1.100 | 210 | 1.300 | 220 | 1.100 | 150 |
| 16,0 | | 1.700 | 650 | 1.700 | 650 | 1.700 | 650 | 1.600 | 420 | 1.100 | 280 | 800 | 170 | 1.000 | 180 | 800 | 120 |
| 20,0 | | 1.350 | 600 | 1.350 | 600 | 1.350 | 600 | 1.300 | 380 | 900 | 260 | 650 | 150 | 800 | 160 | 650 | 100 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | | 1,0 DC | | | | | |
| | $a_e$ | 0,05 DC | | | | | | | | | | 0,02 DC | | | | | |

## Shoulder Milling (High Speed Machining Centre)

| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 60.000 | 1.200 | 60.000 | 1.200 | 60.000 | 1.200 | 60.000 | 850 | 60.000 | 720 | 48.000 | 500 | 32.000 | 300 | – | – |
| 2,0 | | 47.800 | 2.200 | 47.800 | 2.200 | 47.800 | 2.200 | 47.800 | 1.600 | 39.800 | 1.200 | 31.800 | 900 | 15.900 | 400 | – | – |
| 4,0 | | 23.900 | 2.600 | 23.900 | 2.600 | 23.900 | 2.600 | 23.900 | 1.900 | 19.900 | 1.400 | 15.900 | 1.100 | 8.000 | 490 | – | – |
| 6,0 | | 16.000 | 2.700 | 16.000 | 2.700 | 16.000 | 2.700 | 16.000 | 2.000 | 13.300 | 1.500 | 10.600 | 1.200 | 5.300 | 520 | – | – |
| 8,0 | | 12.000 | 2.700 | 12.000 | 2.700 | 12.000 | 2.700 | 12.000 | 2.000 | 10.000 | 1.500 | 8.000 | 1.200 | 4.000 | 520 | – | – |
| 10,0 | | 9.600 | 2.700 | 9.600 | 2.700 | 9.600 | 2.700 | 9.600 | 2.000 | 8.000 | 1.500 | 6.400 | 1.200 | 3.200 | 520 | – | – |
| 12,0 | | 8.000 | 2.700 | 8.000 | 2.700 | 8.000 | 2.700 | 8.000 | 2.000 | 6.700 | 1.500 | 5.300 | 1.200 | 2.700 | 520 | – | – |
| 16,0 | | 6.000 | 2.200 | 6.000 | 2.200 | 6.000 | 2.200 | 6.000 | 1.600 | 5.000 | 1.200 | 4.000 | 900 | 2.000 | 450 | – | – |
| 20,0 | | 4.800 | 2.000 | 4.800 | 2.000 | 4.800 | 2.000 | 4.800 | 1.400 | 4.000 | 1.100 | 3.200 | 750 | 1.600 | 380 | – | – |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | | 1,0 DC | | | | | |
| | $a_e$ | 0,05 DC | | | | | | | | | | 0,02 DC | | | | | |

## Grooving

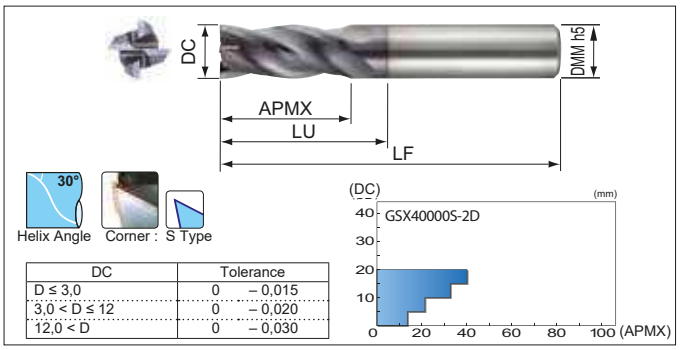
| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 24.000 | 380 | 24.000 | 470 | 24.000 | 470 | 21.000 | 290 | 14.500 | 180 | 10.500 | 120 | 12.600 | 85 | 5.200 | 30 |
| 2,0 | | 12.800 | 460 | 12.800 | 570 | 12.800 | 570 | 12.000 | 380 | 8.300 | 230 | 6.000 | 150 | 7.200 | 110 | 3.000 | 40 |
| 4,0 | | 6.800 | 580 | 6.800 | 730 | 6.800 | 730 | 5.400 | 490 | 4.400 | 300 | 3.200 | 200 | 3.800 | 130 | 1.600 | 55 |
| 6,0 | | 4.600 | 620 | 4.600 | 780 | 4.600 | 780 | 4.300 | 520 | 3.000 | 320 | 2.200 | 210 | 2.650 | 160 | 1.100 | 65 |
| 8,0 | | 3.400 | 620 | 3.400 | 780 | 3.400 | 780 | 3.200 | 520 | 2.200 | 320 | 1.600 | 210 | 2.000 | 160 | 800 | 65 |
| 10,0 | | 2.800 | 620 | 2.800 | 780 | 2.800 | 780 | 2.600 | 520 | 1.800 | 320 | 1.300 | 210 | 1.600 | 160 | 650 | 65 |
| 12,0 | | 2.300 | 620 | 2.300 | 780 | 2.300 | 780 | 2.200 | 520 | 1.500 | 320 | 1.100 | 210 | 1.300 | 160 | 550 | 65 |
| 16,0 | | 1.700 | 520 | 1.700 | 560 | 1.700 | 560 | 1.600 | 420 | 1.100 | 280 | 800 | 170 | 1.000 | 130 | 400 | 55 |
| 20,0 | | 1.350 | 480 | 1.350 | 600 | 1.350 | 600 | 1.300 | 380 | 900 | 260 | 650 | 150 | 800 | 110 | 320 | 50 |
| Grooving | $a_p$ | 0,2 DC | | 0,5 DC | | | | | | 0,2 DC | | 0,05 DC | | 0,2 DC | | | |

# GSX 40000S-2D Type



Coated Carbide Grades | GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 40100S-2D | ● | 1,0 | 2,5 | 3,5 | 40 | 4 |
| GSX 40150S-2D | ● | 1,5 | 3,8 | 4,8 | 40 | 4 |
| GSX 40200S-2D | ● | 2,0 | 5,0 | 6,0 | 40 | 4 |
| GSX 40250S-2D | ● | 2,5 | 6,3 | 7,3 | 40 | 4 |
| GSX 40300S-2D | ● | 3,0 | 7,5 | 9,0 | 45 | 6 |
| GSX 40350S-2D | ● | 3,5 | 8,8 | 10,0 | 45 | 6 |
| GSX 40400S-2D | ● | 4,0 | 11,0 | 14,0 | 45 | 6 |
| GSX 40450S-2D | ● | 4,5 | 11,3 | 12,8 | 50 | 6 |
| GSX 40500S-2D | ● | 5,0 | 13,0 | 19,6 | 50 | 6 |
| GSX 40550S-2D | ● | 5,5 | 13,0 | 19,6 | 50 | 6 |
| GSX 40600S-2D | ● | 6,0 | 13,0 | – | 50 | 6 |
| GSX 40700S-2D | ● | 7,0 | 16,0 | 21,1 | 60 | 8 |
| GSX 40800S-2D | ● | 8,0 | 19,0 | – | 60 | 8 |
| GSX 40900S-2D | ● | 9,0 | 19,0 | 24,1 | 70 | 10 |
| GSX 41000S-2D | ● | 10,0 | 22,0 | – | 70 | 10 |
| GSX 41200S-2D | ● | 12,0 | 26,0 | – | 75 | 12 |
| GSX 41600S-2D | ● | 16,0 | 32,0 | – | 90 | 16 |
| GSX 42000S-2D | ● | 20,0 | 40,0 | – | 100 | 20 |

## Endmill Identification (GSX MILL Series)

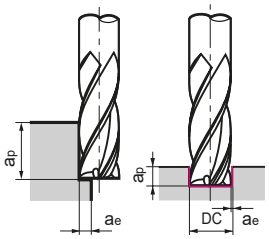
**GSX 4 1000 S - 2D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
5. This series is not recommended for grooving.
6. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### ● Shoulder Milling

| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 22.000 | 360 | 22.000 | 360 | 22.000 | 360 | 19.000 | 220 | 13.000 | 140 | 9.500 | 90 | 11.300 | 90 | 9.500 | 65 |
| 2,0 | 11.500 | 440 | 11.500 | 440 | 11.500 | 440 | 11.000 | 290 | 7.500 | 180 | 5.400 | 110 | 6.500 | 120 | 5.400 | 85 |
| 4,0 | 6.000 | 560 | 6.000 | 560 | 6.000 | 560 | 5.800 | 370 | 4.000 | 230 | 2.900 | 150 | 3.400 | 160 | 2.900 | 100 |
| 6,0 | 4.200 | 600 | 4.200 | 600 | 4.200 | 600 | 4.000 | 400 | 2.700 | 240 | 2.000 | 160 | 2.400 | 170 | 2.000 | 120 |
| 8,0 | 3.000 | 600 | 3.000 | 600 | 3.000 | 600 | 2.800 | 400 | 2.000 | 240 | 1.450 | 160 | 1.800 | 170 | 1.450 | 120 |
| 10,0 | 2.500 | 600 | 2.500 | 600 | 2.500 | 600 | 2.350 | 400 | 1.600 | 240 | 1.200 | 160 | 1.450 | 170 | 1.200 | 120 |
| 12,0 | 2.100 | 600 | 2.100 | 600 | 2.100 | 600 | 2.000 | 400 | 1.350 | 240 | 1.000 | 160 | 1.200 | 170 | 1.000 | 120 |
| 16,0 | 1.500 | 500 | 1.500 | 500 | 1.500 | 500 | 1.450 | 320 | 1.000 | 210 | 750 | 130 | 900 | 140 | 750 | 90 |
| 20,0 | 1.200 | 460 | 1.200 | 460 | 1.200 | 460 | 1.150 | 290 | 800 | 200 | 600 | 110 | 700 | 120 | 600 | 75 |
| Shoulder cutting ap | 2,0 DC | | | | | | | | | | | | | | | |
| Shoulder cutting ae | 0,03 DC | | | | | | | | | | 0,01 DC | | | | | |

### ● Groove Finishing

| Work Material / Cond. / DC (mm) | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | 22.000 | 360 | 22.000 | 360 | 22.000 | 360 | 19.000 | 220 | 13.000 | 140 | 9.500 | 90 | 11.300 | 90 | 9.500 | 65 |
| 2,0 | 11.500 | 440 | 11.500 | 440 | 11.500 | 440 | 11.000 | 290 | 7.500 | 180 | 5.400 | 110 | 6.500 | 120 | 5.400 | 85 |
| 4,0 | 6.000 | 560 | 6.000 | 560 | 6.000 | 560 | 5.800 | 370 | 4.000 | 230 | 2.900 | 150 | 3.400 | 160 | 2.900 | 100 |
| 6,0 | 4.200 | 600 | 4.200 | 600 | 4.200 | 600 | 4.000 | 400 | 2.700 | 240 | 2.000 | 160 | 2.400 | 170 | 2.000 | 120 |
| 8,0 | 3.000 | 600 | 3.000 | 600 | 3.000 | 600 | 2.800 | 400 | 2.000 | 240 | 1.450 | 160 | 1.800 | 170 | 1.450 | 120 |
| 10,0 | 2.500 | 600 | 2.500 | 600 | 2.500 | 600 | 2.350 | 400 | 1.600 | 240 | 1.200 | 160 | 1.450 | 170 | 1.200 | 120 |
| 12,0 | 2.100 | 600 | 2.100 | 600 | 2.100 | 600 | 2.000 | 400 | 1.350 | 240 | 1.000 | 160 | 1.200 | 170 | 1.000 | 120 |
| 16,0 | 1.500 | 500 | 1.500 | 500 | 1.500 | 500 | 1.450 | 320 | 1.000 | 210 | 750 | 130 | 900 | 140 | 750 | 90 |
| 20,0 | 1.200 | 460 | 1.200 | 460 | 1.200 | 460 | 1.150 | 290 | 800 | 200 | 600 | 110 | 700 | 120 | 600 | 75 |
| Groove finishing ap | 1,5 DC | | | | | | | | | | | | | | | |
| Groove finishing ae | –0,02 DC | | | | | | | | | | | | | | | |



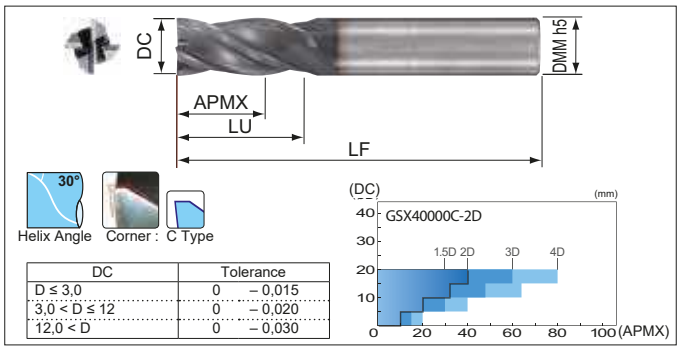


● = Euro stock

# GSX MILL Endmills
# GSX 40000C-2D Type

Coated Carbide Grades — GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

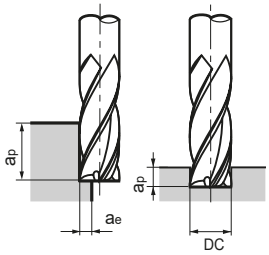
## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 40100C-2D | ● | 1,0 | 2,0 | 3,0 | 40 | 4 |
| GSX 40150C-2D | ● | 1,5 | 3,0 | 4,0 | 40 | 4 |
| GSX 40200C-2D | ● | 2,0 | 4,0 | 5,0 | 40 | 4 |
| GSX 40250C-2D | ● | 2,5 | 5,0 | 6,0 | 40 | 4 |
| GSX 40300C-2D | ● | 3,0 | 6,0 | 7,5 | 45 | 6 |
| GSX 40350C-2D | ● | 3,5 | 7,0 | 8,5 | 45 | 6 |
| GSX 40400C-2D | ● | 4,0 | 8,0 | 9,5 | 45 | 6 |
| GSX 40450C-2D | ● | 4,5 | 9,0 | 10,5 | 50 | 6 |
| GSX 40500C-2D | ● | 5,0 | 10,0 | 12,0 | 50 | 6 |
| GSX 40550C-2D | ● | 5,5 | 11,0 | 13,0 | 50 | 6 |
| GSX 40600C-2D | ● | 6,0 | 12,0 | – | 50 | 6 |
| GSX 40700C-2D | ● | 7,0 | 14,0 | 16,0 | 60 | 8 |
| GSX 40800C-2D | ● | 8,0 | 16,0 | – | 60 | 8 |
| GSX 40900C-2D | ● | 9,0 | 18,0 | 20,0 | 70 | 10 |
| GSX 41000C-2D | ● | 10,0 | 20,0 | – | 70 | 10 |
| GSX 41200C-2D | ● | 12,0 | 24,0 | – | 75 | 12 |
| GSX 41400C-2D | | 14,0 | 28,0 | 31,5 | 90 | 16 |
| GSX 41500C-2D | | 15,0 | 30,0 | 33,5 | 90 | 16 |
| GSX 41600C-2D | ● | 16,0 | 32,0 | – | 90 | 16 |
| GSX 42000C-2D | ● | 20,0 | 40,0 | – | 100 | 20 |

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
5. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




## ● Shoulder Milling

| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 24.000 | 470 | 24.000 | 470 | 24.000 | 470 | 21.000 | 290 | 14.500 | 180 | 10.500 | 120 | 12.600 | 120 | 10.500 | 85 |
| 2,0 | | 12.800 | 570 | 12.800 | 570 | 12.800 | 570 | 12.000 | 380 | 8.300 | 230 | 6.000 | 150 | 7.200 | 160 | 6.000 | 110 |
| 4,0 | | 6.800 | 730 | 6.800 | 730 | 6.800 | 730 | 6.400 | 490 | 4.400 | 300 | 3.200 | 200 | 3.800 | 210 | 3.200 | 130 |
| 6,0 | | 4.600 | 780 | 4.600 | 780 | 4.600 | 780 | 4.300 | 520 | 3.000 | 320 | 2.200 | 210 | 2.650 | 220 | 2.200 | 150 |
| 8,0 | | 3.400 | 780 | 3.400 | 780 | 3.400 | 780 | 3.200 | 520 | 2.200 | 320 | 1.600 | 210 | 2.000 | 220 | 1.600 | 150 |
| 10,0 | | 2.800 | 780 | 2.800 | 780 | 2.800 | 780 | 2.600 | 520 | 1.800 | 320 | 1.300 | 210 | 1.500 | 220 | 1.300 | 150 |
| 12,0 | | 2.300 | 780 | 2.300 | 780 | 2.300 | 780 | 2.200 | 520 | 1.500 | 320 | 1.100 | 210 | 1.300 | 220 | 1.100 | 150 |
| 16,0 | | 1.700 | 650 | 1.700 | 650 | 1.700 | 650 | 1.600 | 420 | 1.100 | 280 | 800 | 170 | 1.000 | 180 | 800 | 120 |
| 20,0 | | 1.350 | 600 | 1.350 | 600 | 1.350 | 600 | 1.300 | 380 | 900 | 260 | 650 | 150 | 800 | 160 | 650 | 100 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | | 1,0 DC | | | | | |
| | $a_e$ | 0,05 DC | | | | | | | | | | 0,02 DC | | | | | |

## ● Shoulder Milling (High Speed Machining Centre)

| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 60.000 | 1.200 | 60.000 | 1.200 | 60.000 | 1.200 | 60.000 | 850 | 60.000 | 720 | 48.000 | 500 | 32.000 | 300 | – | – |
| 2,0 | | 47.800 | 2.200 | 47.800 | 2.200 | 47.800 | 2.200 | 47.800 | 1.600 | 39.800 | 1.200 | 31.800 | 900 | 15.900 | 400 | – | – |
| 4,0 | | 23.900 | 2.600 | 23.900 | 2.600 | 23.900 | 2.600 | 23.900 | 1.900 | 19.900 | 1.400 | 15.900 | 1.100 | 8.000 | 490 | – | – |
| 6,0 | | 16.000 | 2.700 | 16.000 | 2.700 | 16.000 | 2.700 | 16.000 | 2.000 | 13.300 | 1.500 | 10.600 | 1.200 | 5.300 | 520 | – | – |
| 8,0 | | 12.000 | 2.700 | 12.000 | 2.700 | 12.000 | 2.700 | 12.000 | 2.000 | 10.000 | 1.500 | 8.000 | 1.200 | 4.000 | 520 | – | – |
| 10,0 | | 9.600 | 2.700 | 9.600 | 2.700 | 9.600 | 2.700 | 9.600 | 2.000 | 8.000 | 1.500 | 6.400 | 1.200 | 3.200 | 520 | – | – |
| 12,0 | | 8.000 | 2.700 | 8.000 | 2.700 | 8.000 | 2.700 | 8.000 | 2.000 | 6.700 | 1.500 | 5.300 | 1.200 | 2.700 | 520 | – | – |
| 16,0 | | 6.000 | 2.200 | 6.000 | 2.200 | 6.000 | 2.200 | 6.000 | 1.600 | 5.000 | 1.200 | 4.000 | 900 | 2.000 | 450 | – | – |
| 20,0 | | 4.800 | 2.000 | 4.800 | 2.000 | 4.800 | 2.000 | 4.800 | 1.400 | 4.000 | 1.100 | 3.200 | 750 | 1.600 | 380 | – | – |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | | 1,0 DC | | | | | |
| | $a_e$ | 0,05 DC | | | | | | | | | | 0,02 DC | | | | | |

## ● Grooving

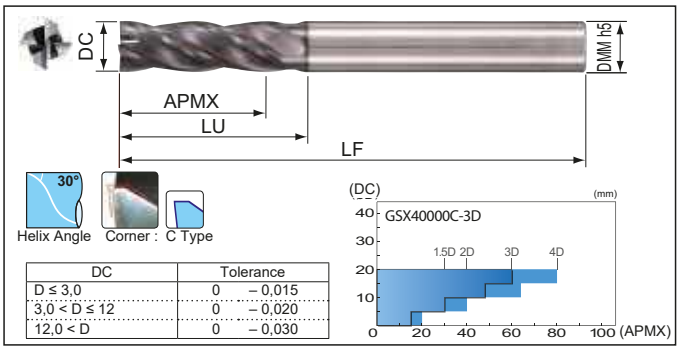
| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 24.000 | 380 | 24.000 | 470 | 24.000 | 470 | 21.000 | 290 | 14.500 | 180 | 10.500 | 120 | 12.600 | 85 | 5.200 | 30 |
| 2,0 | | 12.800 | 460 | 12.800 | 570 | 12.800 | 570 | 12.000 | 380 | 8.300 | 230 | 6.000 | 150 | 7.200 | 110 | 3.000 | 40 |
| 4,0 | | 6.800 | 580 | 6.800 | 730 | 6.800 | 730 | 5.400 | 490 | 4.400 | 300 | 3.200 | 200 | 3.800 | 130 | 1.600 | 55 |
| 6,0 | | 4.600 | 620 | 4.600 | 780 | 4.600 | 780 | 4.300 | 520 | 3.000 | 320 | 2.200 | 210 | 2.650 | 160 | 1.100 | 65 |
| 8,0 | | 3.400 | 620 | 3.400 | 780 | 3.400 | 780 | 3.200 | 520 | 2.200 | 320 | 1.600 | 210 | 2.000 | 160 | 800 | 65 |
| 10,0 | | 2.800 | 620 | 2.800 | 780 | 2.800 | 780 | 2.600 | 520 | 1.800 | 320 | 1.300 | 210 | 1.600 | 160 | 650 | 65 |
| 12,0 | | 2.300 | 620 | 2.300 | 780 | 2.300 | 780 | 2.200 | 520 | 1.500 | 320 | 1.100 | 210 | 1.300 | 160 | 550 | 65 |
| 16,0 | | 1.700 | 520 | 1.700 | 560 | 1.700 | 560 | 1.600 | 420 | 1.100 | 280 | 800 | 170 | 1.000 | 130 | 400 | 55 |
| 20,0 | | 1.350 | 480 | 1.350 | 600 | 1.350 | 600 | 1.300 | 380 | 900 | 260 | 650 | 150 | 800 | 110 | 320 | 50 |
| Grooving | $a_p$ | 0,2 DC | | 0,5 DC | | | | | | 0,2 DC | | 0,05 DC | | 0,2 DC | | | |

# GSX 40000C-3D Type



Coated Carbide Grades | GSX Coating

| Structual Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 40100C-3D | ● | 1,0 | 3,0 | 4,0 | 40 | 4 |
| GSX 40150C-3D | ● | 1,5 | 4,5 | 5,5 | 40 | 4 |
| GSX 40200C-3D | ● | 2,0 | 6,0 | 7,0 | 40 | 4 |
| GSX 40250C-3D | ● | 2,5 | 7,5 | 8,5 | 40 | 4 |
| GSX 40300C-3D | ● | 3,0 | 9,0 | 10,5 | 50 | 6 |
| GSX 40400C-3D | ● | 4,0 | 12,0 | 13,5 | 50 | 6 |
| GSX 40500C-3D | ● | 5,0 | 15,0 | 17,0 | 50 | 6 |
| GSX 40600C-3D | ● | 6,0 | 18,0 | – | 50 | 6 |
| GSX 40800C-3D | ● | 8,0 | 24,0 | – | 70 | 8 |
| GSX 41000C-3D | ● | 10,0 | 30,0 | – | 90 | 10 |
| GSX 41200C-3D | ● | 12,0 | 36,0 | – | 90 | 12 |
| GSX 41600C-3D | ● | 16,0 | 48,0 | – | 110 | 16 |
| GSX 42000C-3D | | 20,0 | 60,0 | – | 120 | 20 |

## Endmill Identification (GSX MILL Series)

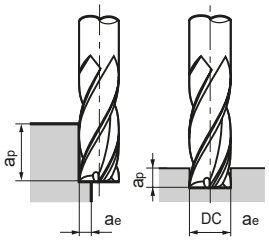
**GSX** **4** **0100** **C** - **2D / 3D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. In rear cases, chattering may occur in early milling stages, dissipating after 2 m of cutting.
5. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
6. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




### ● Shoulder Milling

| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 21.000 | 360 | 21.000 | 360 | 21.000 | 360 | 19.000 | 220 | 13.000 | 140 | 9.000 | 90 | 10.500 | 90 | 9.000 | 65 |
| 2,0 | | 10.500 | 360 | 10.500 | 360 | 10.500 | 360 | 9.600 | 290 | 7.500 | 180 | 4.500 | 110 | 5.200 | 120 | 4.500 | 85 |
| 4,0 | | 5.200 | 500 | 5.200 | 500 | 5.200 | 500 | 4.800 | 370 | 4.000 | 280 | 2.250 | 150 | 2.600 | 160 | 2.250 | 100 |
| 6,0 | | 3.500 | 560 | 3.500 | 560 | 3.500 | 560 | 3.200 | 400 | 2.700 | 300 | 1.500 | 160 | 1.700 | 170 | 1.500 | 120 |
| 8,0 | | 2.600 | 520 | 2.600 | 520 | 2.600 | 520 | 2.400 | 400 | 2.000 | 300 | 1.100 | 160 | 1.300 | 170 | 1.100 | 120 |
| 10,0 | | 2.100 | 500 | 2.100 | 500 | 2.100 | 500 | 1.900 | 400 | 1.600 | 300 | 900 | 160 | 1.000 | 160 | 900 | 120 |
| 12,0 | | 1.750 | 500 | 1.750 | 500 | 1.750 | 500 | 1.600 | 400 | 1.350 | 300 | 750 | 150 | 850 | 160 | 750 | 120 |
| 16,0 | | 1.300 | 420 | 1.300 | 420 | 1.300 | 420 | 1.200 | 330 | 1.000 | 260 | 550 | 120 | 650 | 140 | 550 | 100 |
| 20,0 | | 1.050 | 380 | 1.050 | 380 | 1.050 | 380 | 950 | 290 | 800 | 230 | 450 | 110 | 500 | 120 | 450 | 90 |
| Shoulder cutting | $a_p$ | 2,5 DC | | | | | | | | | | 2,0 DC | | | | | |
| | $a_e$ | < ø3: 0,05 DC , ≤ ø3< ø8: 0,1 DC , ≤ ø8: 0,15 DC | | | | | | | | 0,02 DC | | | | | | | |

### ● Grooving

| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 16.600 | 140 | 16.600 | 140 | 16.600 | 140 | 15.500 | 100 | 10.500 | 100 | 7.500 | 70 | 9.400 | 60 | 3.750 | 20 |
| 2,0 | | 9.500 | 160 | 9.500 | 160 | 9.500 | 160 | 9.000 | 180 | 6.200 | 120 | 4.500 | 90 | 5.200 | 80 | 2.250 | 30 |
| 4,0 | | 5.200 | 160 | 5.200 | 180 | 5.200 | 180 | 4.800 | 160 | 3.400 | 110 | 2.200 | 65 | 2.600 | 70 | 1.250 | 25 |
| 6,0 | | 3.500 | 160 | 3.500 | 200 | 3.500 | 200 | 3.200 | 160 | 2.550 | 120 | 1.500 | 65 | 1.700 | 70 | 950 | 25 |
| 8,0 | | 2.600 | 160 | 2.600 | 200 | 2.600 | 200 | 2.400 | 160 | 1.900 | 120 | 1.100 | 65 | 1.300 | 70 | 700 | 25 |
| 10,0 | | 2.100 | 160 | 2.100 | 200 | 2.100 | 200 | 1.900 | 160 | 1.500 | 120 | 900 | 65 | 1.000 | 70 | 550 | 25 |
| 12,0 | | 1.750 | 160 | 1.750 | 200 | 1.750 | 200 | 1.600 | 160 | 1.250 | 120 | 750 | 65 | 850 | 70 | 450 | 25 |
| 16,0 | | 1.300 | 160 | 1.300 | 200 | 1.300 | 200 | 1.200 | 160 | 950 | 120 | 550 | 65 | 650 | 70 | 350 | 25 |
| 20,0 | | 1.050 | 160 | 1.050 | 200 | 1.050 | 200 | 950 | 160 | 750 | 120 | 450 | 65 | 500 | 70 | 280 | 25 |
| Grooving | $a_p$ | 0,1 DC | | 0,2 DC | | | | | | | | 0,05 DC | | 0,1 DC | | | |



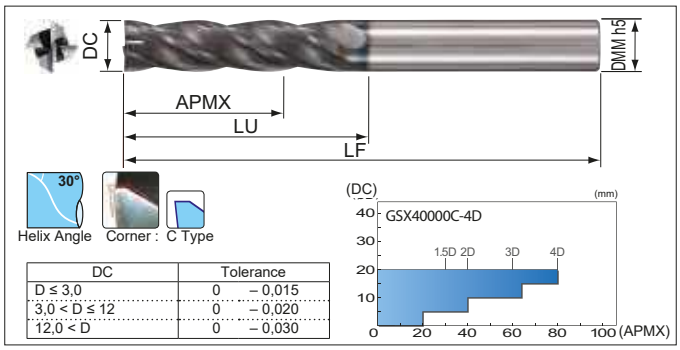


● = Euro stock

# GSX MILL Endmills
# GSX 40000C-4D Type

Coated Carbide Grades | GSX Coating

| Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




| DC | Tolerance |
|---|---|
| D ≤ 3,0 | 0 – 0,015 |
| 3,0 < D ≤ 12 | 0 – 0,020 |
| 12,0 < D | 0 – 0,030 |

Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSX 40100C-4D | ● | 1,0 | 4,0 | 5,0 | 40 | 4 |
| GSX 40150C-4D | ● | 1,5 | 6,0 | 7,0 | 40 | 4 |
| GSX 40200C-4D | ● | 2,0 | 8,0 | 9,0 | 40 | 4 |
| GSX 40250C-4D | ● | 2,5 | 10,0 | 11,0 | 50 | 4 |
| GSX 40300C-4D | ● | 3,0 | 12,0 | 13,5 | 50 | 6 |
| GSX 40400C-4D | ● | 4,0 | 16,0 | 17,5 | 50 | 6 |
| GSX 40500C-4D | ● | 5,0 | 20,0 | 22,0 | 60 | 6 |
| GSX 40600C-4D | ● | 6,0 | 24,0 | – | 60 | 6 |
| GSX 40800C-4D | ● | 8,0 | 32,0 | – | 80 | 8 |
| GSX 41000C-4D | ● | 10,0 | 40,0 | – | 90 | 10 |
| GSX 41200C-4D | ● | 12,0 | 48,0 | – | 100 | 12 |
| GSX 41600C-4D | ● | 16,0 | 64,0 | – | 120 | 16 |
| GSX 42000C-4D | | 20,0 | 80,0 | – | 140 | 20 |

## Endmill Identification (GSX MILL Series)

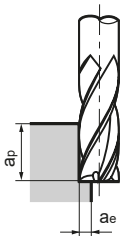
**GSX 4 0100 C - 4D**

| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |
|---|---|---|---|---|

S: Sharp Edge
C: Gash Land Drilling

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. In rear cases, chattering may occur in early milling stages, dissipating after 2m of cutting.
5. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
6. This series is not recommended for grooving.
7. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




## Shoulder Milling

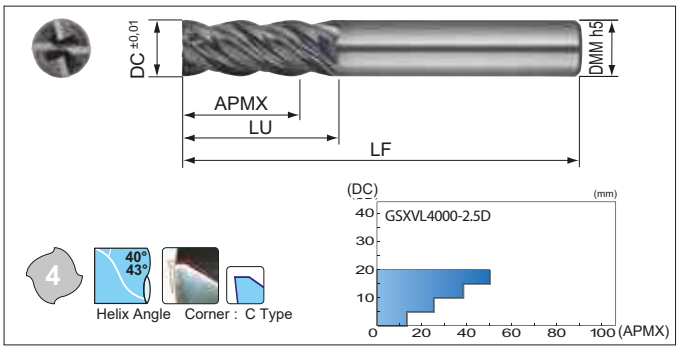
| Work Material / Cond. | | Structural Steel | | Carbon Steel (150 to 250HB) | | Cast Iron | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (35 to 45HRC) | | Hardened Steel (45 to 55HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 1,0 | | 9.000 | 140 | 9.000 | 140 | 9.000 | 140 | 7.000 | 80 | 6.500 | 60 | 4.500 | 40 | 5.400 | 40 | 4.500 | 40 |
| 2,0 | | 4.500 | 140 | 4.500 | 140 | 4.500 | 140 | 3.500 | 100 | 3.200 | 80 | 2.300 | 55 | 2.700 | 55 | 2.300 | 40 |
| 4,0 | | 2.250 | 200 | 2.250 | 200 | 2.250 | 200 | 1.750 | 120 | 1.600 | 100 | 1.200 | 60 | 1.350 | 50 | 1.200 | 35 |
| 6,0 | | 1.500 | 250 | 1.500 | 250 | 1.500 | 250 | 1.150 | 160 | 1.050 | 140 | 800 | 65 | 900 | 45 | 800 | 35 |
| 8,0 | | 1.100 | 220 | 1.100 | 220 | 1.100 | 220 | 850 | 160 | 800 | 130 | 600 | 65 | 660 | 45 | 600 | 35 |
| 10,0 | | 900 | 210 | 900 | 210 | 900 | 210 | 700 | 140 | 650 | 120 | 460 | 65 | 540 | 45 | 460 | 35 |
| 12,0 | | 750 | 200 | 750 | 200 | 750 | 200 | 580 | 140 | 520 | 110 | 400 | 65 | 450 | 45 | 400 | 35 |
| 16,0 | | 550 | 170 | 550 | 170 | 550 | 170 | 440 | 120 | 400 | 95 | 300 | 55 | 330 | 45 | 300 | 35 |
| 20,0 | | 450 | 150 | 450 | 150 | 450 | 150 | 350 | 100 | 320 | 80 | 240 | 50 | 270 | 45 | 240 | 35 |
| Shoulder cutting | $a_p$ | 3,5 DC | | | | | | | | | | 3,0 DC | | | | | |
| | $a_e$ | < ø3: 0,04 DC , 3 ≤ øD< 8: 0,08 DC , 8 ≤ øD: 0,1 DC | | | | | | | | | | 0,02 DC | | | | | |

# GSXVL 4000-2.5D Type



Coated Carbide Grades | GSX Coating

| Structual Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




Grade: ACF20

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSXVL 4020-2.5D | ● | 2,0 | 5 | 6,5 | 50 | 4 |
| GSXVL 4030-2.5D | ● | 3,0 | 8 | 9,5 | 50 | 6 |
| GSXVL 4040-2.5D | ● | 4,0 | 10 | 11,5 | 50 | 6 |
| GSXVL 4050-2.5D | ● | 5,0 | 13 | 14,5 | 60 | 6 |
| GSXVL 4060-2.5D | ● | 6,0 | 15 | – | 60 | 6 |
| GSXVL 4070-2.5D | ❍ | 7,0 | 18 | 20,0 | 70 | 8 |
| GSXVL 4080-2.5D | ● | 8,0 | 20 | – | 80 | 8 |
| GSXVL 4090-2.5D | ● | 9,0 | 23 | 25,0 | 90 | 10 |
| GSXVL 4100-2.5D | ● | 10,0 | 25 | – | 90 | 10 |
| GSXVL 4110-2.5D | ❍ | 11,0 | 28 | 30,5 | 90 | 12 |
| GSXVL 4120-2.5D | ● | 12,0 | 30 | – | 90 | 12 |
| GSXVL 4140-2.5D | ● | 14,0 | 35 | 37,5 | 110 | 16 |
| GSXVL 4150-2.5D | ❍ | 15,0 | 38 | 41,0 | 110 | 16 |
| GSXVL 4160-2.5D | ● | 16,0 | 40 | – | 115 | 16 |
| GSXVL 4180-2.5D | ● | 18,0 | 45 | 48,0 | 120 | 20 |
| GSXVL 4200-2.5D | ● | 20,0 | 50 | – | 125 | 20 |
| GSXVL 4250-2.5D | ❍ | 25,0 | 63 | – | 140 | 25 |

## SAFE-LOCK™ Applicable Endmills

## Endmills

(mm)

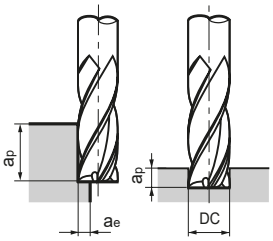
| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| GSXVL 4120S-2.5D | ❍ | 12,0 | 30 | – | 90 | 12 |
| GSXVL 4140S-2.5D | ❍ | 14,0 | 35 | 37,5 | 110 | 16 |
| GSXVL 4150S-2.5D | ❍ | 15,0 | 38 | 41,0 | 110 | 16 |
| GSXVL 4160S-2.5D | ❍ | 16,0 | 40 | – | 115 | 16 |
| GSXVL 4180S-2.5D | ❍ | 18,0 | 45 | 48,0 | 120 | 20 |
| GSXVL 4200S-2.5D | ❑ | 20,0 | 50 | – | 125 | 20 |
| GSXVL 4250S-2.5D | ❑ | 25,0 | 63 | – | 140 | 25 |

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.

### ● Shoulder Milling

| Work Material / Cond. | | Carbon Steel, Cast Iron (150 to 250HB) | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (40 to 50HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy (20 to 45HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 2,0 | | 13.000 | 1.000 | 10.000 | 800 | 8.000 | 700 | 10.000 | 580 | 5.000 | 200 |
| 4,0 | | 9.600 | 1.200 | 8.000 | 1.000 | 6.000 | 800 | 5.500 | 650 | 3.000 | 230 |
| 6,0 | | 6.800 | 1.500 | 5.600 | 1.200 | 4.200 | 900 | 3.800 | 680 | 2.100 | 240 |
| 8,0 | | 5.200 | 1.600 | 4.400 | 1.300 | 3.200 | 950 | 2.800 | 650 | 1.600 | 250 |
| 10,0 | | 4.200 | 1.500 | 3.500 | 1.200 | 2.600 | 800 | 2.300 | 600 | 1.300 | 210 |
| 12,0 | | 3.500 | 1.400 | 3.000 | 1.200 | 2.200 | 700 | 1.900 | 550 | 1.100 | 180 |
| 14,0 | | 3.000 | 1.200 | 2.600 | 1.100 | 1.800 | 600 | 1.600 | 500 | 900 | 150 |
| 16,0 | | 2.700 | 1.100 | 2.200 | 1.000 | 1.600 | 600 | 1.400 | 480 | 760 | 130 |
| 18,0 | | 2.400 | 1.000 | 2.000 | 900 | 1.400 | 570 | 1.300 | 450 | 680 | 120 |
| 20,0 | | 2.200 | 900 | 1.700 | 800 | 1.200 | 550 | 1.100 | 400 | 600 | 100 |
| 25,0 | | 1.700 | 680 | 1.400 | 630 | 1.000 | 450 | 890 | 310 | 480 | 82 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | |
| | $a_e$ | 0,1 DC | | | | 0,05 DC | | 0,1 DC | | 0,05 DC | |




### ● Shoulder Milling

| Work Material / Cond. | | Carbon Steel, Cast Iron (150 to 250HB) | | Alloy Steel (25 to 35HRC) | | Tempered Steel, Hardened Steel (40 to 50HRC) | | Stainless Steel | | Heat Resistive Steel, Titanium Alloy (20 to 45HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 2,0 | | 13.000 | 750 | 10.000 | 550 | 8.400 | 500 | 6.500 | 300 | 4.000 | 140 |
| 4,0 | | 8.200 | 800 | 6.000 | 600 | 5.200 | 500 | 4.000 | 330 | 2.000 | 130 |
| 6,0 | | 6.100 | 1.100 | 4.000 | 600 | 3.500 | 580 | 2.700 | 350 | 1.350 | 150 |
| 8,0 | | 4.600 | 1.000 | 3.000 | 580 | 2.600 | 570 | 2.000 | 330 | 1.000 | 140 |
| 10,0 | | 3.600 | 1.000 | 2.400 | 550 | 2.100 | 510 | 1.600 | 200 | 800 | 130 |
| 12,0 | | 3.100 | 920 | 2.000 | 500 | 1.700 | 450 | 1.300 | 280 | 660 | 110 |
| 14,0 | | 2.600 | 750 | 1.700 | 450 | 1.500 | 400 | 1.100 | 250 | 570 | 100 |
| 16,0 | | 2.300 | 670 | 1.500 | 420 | 1.300 | 350 | 1.000 | 230 | 500 | 90 |
| 18,0 | | 2.000 | 620 | 1.300 | 380 | 1.100 | 330 | 900 | 200 | 430 | 80 |
| 20,0 | | 1.900 | 600 | 1.200 | 360 | 1.000 | 320 | 800 | 180 | 380 | 70 |
| 25,0 | | 1.500 | 470 | 1.000 | 300 | 790 | 250 | 640 | 140 | 300 | 55 |
| Grooving | $a_p$ | 1,0 DC | | | | 0,2 DC | | 0,3 DC | | 0,2 DC | |



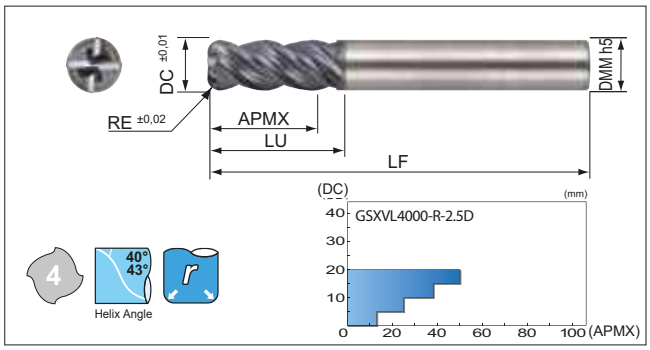


● = Euro stock
❍ = Japan stock
❑ = Delivery on request

# Anti-Vibration MILL with R. Corner
# GSXVL 4000-R-2.5D Type

Coated Carbide Grades | GSX Coating

| Structal Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




## Endmills

(mm)

| Cat. No. | Stock | DC | RE | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|---|
| GSXVL 4030-R02-2.5D | ● | 3,0 | 0,2 | 8 | 9,5 | 50 | 6 |
| GSXVL 4030-R05-2.5D | ❍ | 3,0 | 0,5 | 8 | 9,5 | 50 | 6 |
| GSXVL 4040-R02-2.5D | ❍ | 4,0 | 0,2 | 10 | 11,5 | 50 | 6 |
| GSXVL 4040-R05-2.5D | ● | 4,0 | 0,5 | 10 | 11,5 | 50 | 6 |
| GSXVL 4040-R10-2.5D | ❍ | 4,0 | 1,0 | 10 | 11,5 | 50 | 6 |
| GSXVL 4050-R02-2.5D | ● | 5,0 | 0,2 | 13 | 14,5 | 60 | 6 |
| GSXVL 4050-R05-2.5D | ❍ | 5,0 | 0,5 | 13 | 14,5 | 60 | 6 |
| GSXVL 4050-R10-2.5D | ❍ | 5,0 | 1,0 | 13 | 14,5 | 60 | 6 |
| GSXVL 4060-R03-2.5D | ❍ | 6,0 | 0,3 | 15 | – | 60 | 6 |
| GSXVL 4060-R05-2.5D | ● | 6,0 | 0,5 | 15 | – | 60 | 6 |
| GSXVL 4060-R10-2.5D | ● | 6,0 | 1,0 | 15 | – | 60 | 6 |
| GSXVL 4060-R15-2.5D | ❍ | 6,0 | 1,5 | 15 | – | 60 | 6 |
| GSXVL 4080-R03-2.5D | ❍ | 8,0 | 0,3 | 20 | – | 80 | 8 |
| GSXVL 4080-R05-2.5D | ● | 8,0 | 0,5 | 20 | – | 80 | 8 |
| GSXVL 4080-R10-2.5D | ● | 8,0 | 1,0 | 20 | – | 80 | 8 |
| GSXVL 4080-R15-2.5D | ● | 8,0 | 1,5 | 20 | – | 80 | 8 |
| GSXVL 4080-R20-2.5D | ❍ | 8,0 | 2,0 | 20 | – | 80 | 8 |
| GSXVL 4100-R03-2.5D | ● | 10,0 | 0,3 | 25 | – | 90 | 10 |
| GSXVL 4100-R05-2.5D | ● | 10,0 | 0,5 | 25 | – | 90 | 10 |
| GSXVL 4100-R10-2.5D | ● | 10,0 | 1,0 | 25 | – | 90 | 10 |
| GSXVL 4100-R15-2.5D | ❍ | 10,0 | 1,5 | 25 | – | 90 | 10 |
| GSXVL 4100-R20-2.5D | ❍ | 10,0 | 2,0 | 25 | – | 90 | 10 |
| GSXVL 4120-R05-2.5D | ● | 12,0 | 0,5 | 30 | – | 90 | 12 |
| GSXVL 4120-R10-2.5D | ● | 12,0 | 1,0 | 30 | – | 90 | 12 |
| GSXVL 4120-R15-2.5D | ● | 12,0 | 1,5 | 30 | – | 90 | 12 |
| GSXVL 4120-R20-2.5D | ● | 12,0 | 2,0 | 30 | – | 90 | 12 |
| GSXVL 4120-R30-2.5D | ❍ | 12,0 | 3,0 | 30 | – | 90 | 12 |
| GSXVL 4160-R10-2.5D | ● | 16,0 | 1,0 | 40 | – | 115 | 16 |
| GSXVL 4160-R15-2.5D | ● | 16,0 | 1,5 | 40 | – | 115 | 16 |
| GSXVL 4160-R20-2.5D | ● | 16,0 | 2,0 | 40 | – | 115 | 16 |
| GSXVL 4160-R30-2.5D | ❍ | 16,0 | 3,0 | 40 | – | 115 | 16 |
| GSXVL 4200-R10-2.5D | ● | 20,0 | 1,0 | 50 | – | 125 | 20 |
| GSXVL 4200-R15-2.5D | ❍ | 20,0 | 1,5 | 50 | – | 125 | 20 |
| GSXVL 4200-R20-2.5D | ❍ | 20,0 | 2,0 | 50 | – | 125 | 20 |
| GSXVL 4200-R30-2.5D | ● | 20,0 | 3,0 | 50 | – | 125 | 20 |
| GSXVL 4250-R10-2.5D | ❍ | 25,0 | 1,0 | 63 | – | 140 | 25 |
| GSXVL 4250-R15-2.5D | ❍ | 25,0 | 1,5 | 63 | – | 140 | 25 |
| GSXVL 4250-R20-2.5D | ❍ | 25,0 | 2,0 | 63 | – | 140 | 25 |
| GSXVL 4250-R30-2.5D | ❍ | 25,0 | 3,0 | 63 | – | 140 | 25 |

Grade: ACF20

## Endmills

SAFE-λOCK™

Applicable Endmills

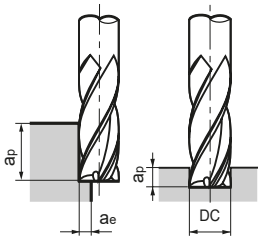
(mm)

| Cat. No. | Stock | DC | RE | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|---|
| GSXVL 4120S-R05-2.5D | ❍ | 12,0 | 0,5 | 30 | – | 90 | 12 |
| GSXVL 4120S-R10-2.5D | ❑ | 12,0 | 1,0 | 30 | – | 90 | 12 |
| GSXVL 4120S-R15-2.5D | ❑ | 12,0 | 1,5 | 30 | – | 90 | 12 |
| GSXVL 4120S-R20-2.5D | ❑ | 12,0 | 2,0 | 30 | – | 90 | 12 |
| GSXVL 4120S-R30-2.5D | ❑ | 12,0 | 3,0 | 30 | – | 90 | 12 |
| GSXVL 4160S-R10-2.5D | ❑ | 16,0 | 1,0 | 40 | – | 115 | 16 |
| GSXVL 4160S-R15-2.5D | ❑ | 16,0 | 1,5 | 40 | – | 115 | 16 |
| GSXVL 4160S-R20-2.5D | ❑ | 16,0 | 2,0 | 40 | – | 115 | 16 |
| GSXVL 4160S-R30-2.5D | ❑ | 16,0 | 3,0 | 40 | – | 115 | 16 |
| GSXVL 4200S-R10-2.5D | ❑ | 20,0 | 1,0 | 50 | – | 125 | 20 |
| GSXVL 4200S-R15-2.5D | ❑ | 20,0 | 1,5 | 50 | – | 125 | 20 |
| GSXVL 4200S-R20-2.5D | ❑ | 20,0 | 2,0 | 50 | – | 125 | 20 |
| GSXVL 4200S-R30-2.5D | ❑ | 20,0 | 3,0 | 50 | – | 125 | 20 |
| GSXVL 4250S-R10-2.5D | ❑ | 25,0 | 1,0 | 63 | – | 140 | 25 |
| GSXVL 4250S-R15-2.5D | ❑ | 25,0 | 1,5 | 63 | – | 140 | 25 |
| GSXVL 4250S-R20-2.5D | ❑ | 25,0 | 2,0 | 63 | – | 140 | 25 |
| GSXVL 4250S-R30-2.5D | ❍ | 25,0 | 3,0 | 63 | – | 140 | 25 |

Grade: ACF20

## Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blowing when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.




## Shoulder Milling and Grooving

| Work Material / Cond. / DC (mm) | | Carbon Steel, Cast Iron (150 to 250HB) Spindle Speed (rpm) | Carbon Steel, Cast Iron (150 to 250HB) Feed Rate (mm/min) | Alloy Steel (25 to 35HRC) Spindle Speed (rpm) | Alloy Steel (25 to 35HRC) Feed Rate (mm/min) | Tempered Steel, Hardened Steel (40 to 50HRC) Spindle Speed (rpm) | Tempered Steel, Hardened Steel (40 to 50HRC) Feed Rate (mm/min) | Stainless Steel Spindle Speed (rpm) | Stainless Steel Feed Rate (mm/min) | Heat Resistive Steel, Titanium Alloy (20 to 45HRC) Spindle Speed (rpm) | Heat Resistive Steel, Titanium Alloy (20 to 45HRC) Feed Rate (mm/min) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2,0 | | 9.000 | 720 | 6.000 | 430 | 4.000 | 320 | 5.500 | 320 | 2.600 | 120 |
| 4,0 | | 6.600 | 800 | 4.500 | 450 | 3.000 | 380 | 4.000 | 320 | 2.000 | 120 |
| 6,0 | | 4.800 | 960 | 3.000 | 480 | 2.500 | 380 | 3.000 | 480 | 1.200 | 120 |
| 8,0 | | 3.600 | 1.000 | 2.200 | 610 | 2.000 | 400 | 2.000 | 520 | 1.000 | 140 |
| 10,0 | | 2.800 | 1.000 | 1.800 | 610 | 1.500 | 400 | 1.700 | 550 | 800 | 160 |
| 12,0 | | 2.400 | 950 | 1.500 | 550 | 1.200 | 380 | 1.500 | 500 | 700 | 140 |
| 14,0 | | 2.200 | 880 | 1.300 | 490 | 1.000 | 360 | 1.200 | 430 | 600 | 130 |
| 16,0 | | 1.800 | 650 | 1.100 | 420 | 800 | 300 | 1.000 | 360 | 500 | 120 |
| 18,0 | | 1.600 | 580 | 1.000 | 360 | 750 | 270 | 900 | 340 | 450 | 110 |
| 20,0 | | 1.400 | 500 | 900 | 330 | 700 | 250 | 820 | 300 | 400 | 100 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | |
| | $a_e$ | 0,1 DC | | | | 0,05 DC | | 0,1 DC | | 0,05 DC | |
| Grooving | $a_p$ | 1,0 DC | | | | 0,2 DC | | 0,3 DC | | 0,2 DC | |

## Corner Radius Selection

| DC | RE0,2 | RE0,3 | RE0,5 | RE1,0 | RE1,5 | RE2,0 | RE3,0 |
|---|---|---|---|---|---|---|---|
| 3 | ❑ | | ❑ | | | | |
| 4 | ❑ | | ❑ | ❑ | | | |
| 5 | ❑ | | ❑ | ❑ | | | |
| 6 | | ❑ | ❑ | ❑ | ❑ | | |
| 8 | | ❑ | ❑ | ❑ | ❑ | ❑ | |
| 10 | | ❑ | ❑ | ❑ | ❑ | ❑ | |
| 12 | | | ❑ | ❑ | ❑ | ❑ | ❑ |
| 16 | | | | ❑ | ❑ | ❑ | ❑ |
| 20 | | | | ❑ | ❑ | ❑ | ❑ |
| 25 | | | | ❑ | ❑ | ❑ | ❑ |

# SSEH Series

☞ J 24, J 39

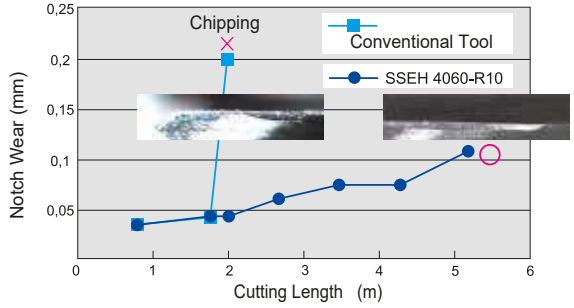
## SSEH Radius

### ■ Characteristics and Applications

- Steep helix (45° helix) improves sharpness.
- Combination of unique flute design and semi-mirrored surface improves chip evacuation and adhesion resistance.
- Ultra-smooth coating with improved hardness and heat resistance combined with tough carbide substrate improves tool life when working with heat resistant alloys.
- Unique, smooth radius shape mitigates cutting impact and improves fracture resistance.
- Both coated and uncoated types are available in stock to meet various conditions.

### ■ Application Examples

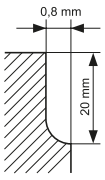
- Inconel 718 (Side Milling)




Tool Diameter: ø 6 × R1
Cutting Conditions: $v_c$ = 20 m/min, $f_t$ = 0,025 mm/t, $a_p$ = 5 mm, $a_e$ = 0,5 mm, wet

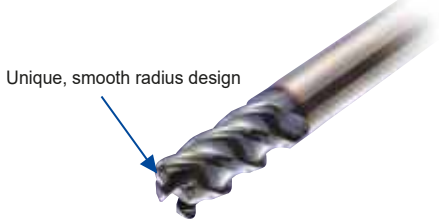
- Inconel 713 (Side Milling)

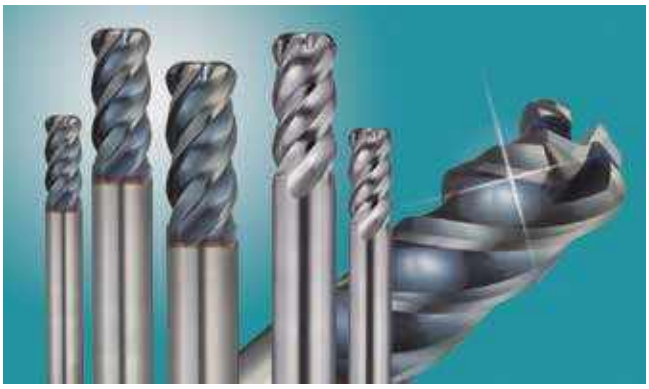
| SSEH 4100W-R10 | Competitor's Product |
|---|---|
|  |  |




Tool Diameter : ø 10 x R1
Cutting Conditions : $v_c$= 32 m/min, $f_t$ = 0,018 mm/t
$a_p$ = 20 mm, $a_e$ = 0,8 m, Dry

In Sumitomo Electric Hardmetal tests, the special coating with excellent adhesion resistance provided less cutting edge adhesion than the competitor's product and enabled fracturefree machining.
The competitor's product suffered from edge adhesion leading to breakage.



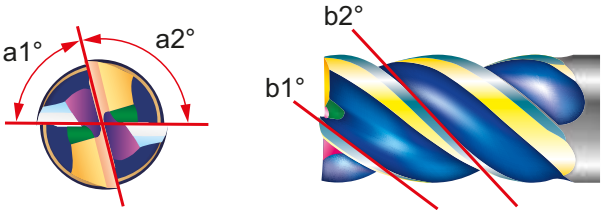
☞ J 23, J 39

## SSEH Radius Anti-vibration Type

### ■ Characteristics and Applications

- New anti-vibration type added to the SSEH type endmill for exotic alloys.
- Builds on the same features of existing endmills by adding an irregular lead for exceptionally good anti-vibration performance.
- Compatible with wide range of milling for exotic alloys including SUS, Inconel, and titanium.
- Reduces chattering for high-speed, high-feed cutting.
- Both coated and uncoated types are available in stock to meet various conditions.

Irregular Pitch + Irregular Lead

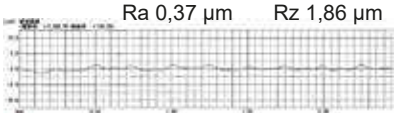



### ■ Application Examples

- Surface Roughness Comparison

**SSEH** Anti-vibration Type

Good Surface Quality
Ra 0,37 µm Rz 1,86 µm



Conventional Tool

Surface shows chattering
Ra 1,52 µm Rz 6,45 µm

Work Material: X5CrNi1810 (Surface Milling)
Tool Diameter: ø 12 mm
Cutting Conditions: n = 1.300 rpm, $v_f$ = 300 mm/min
$a_p$ = 18 mm, $a_e$ = 1,2 mm
Equipment: BT50

Coated Endmills

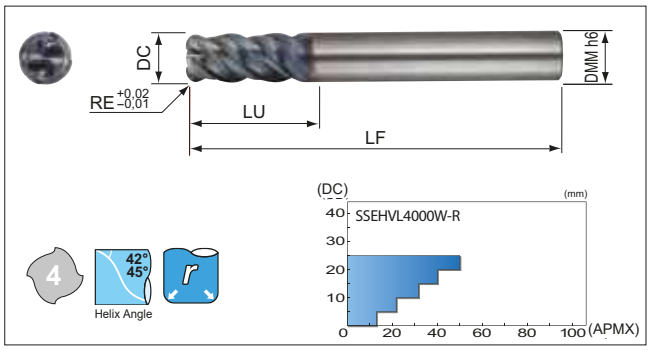


● = Euro stock
❑ = Delivery on request

# Anti-Vibration MILL with R. Corner
# SSEHVL 4000W-R Type

Coated Carbide Grades | GS HARD Coating

| Structual Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | ○ | ○ | ○ | ○ | | | | ◎ | ◎ | | | | |




Grade: ACW52

## ■ Endmills

(mm)

| Cat. No. | Stock | DC | RE | LU | LF | DMM |
|---|---|---|---|---|---|---|
| SSEHVL 4045W-R05 | ● | 4,5 | 0,5 | 12 | 50 | 6 |
| SSEHVL 4045W-R10 | ● | 4,5 | 1,0 | 12 | 50 | 6 |
| SSEHVL 4050W-R05 | ● | 5,0 | 0,5 | 13 | 60 | 6 |
| SSEHVL 4050W-R10 | ● | 5,0 | 1,0 | 13 | 60 | 6 |
| SSEHVL 4060W-R10 | ● | 6,0 | 1,0 | 13 | 60 | 6 |
| SSEHVL 4080W-R10 | ● | 8,0 | 1,0 | 19 | 80 | 8 |
| SSEHVL 4100W-R10 | ● | 10,0 | 1,0 | 22 | 90 | 10 |
| SSEHVL 4100W-R30 | ● | 10,0 | 3,0 | 22 | 90 | 10 |
| SSEHVL 4120W-R10 | ● | 12,0 | 1,0 | 26 | 90 | 12 |
| SSEHVL 4120W-R30 | ● | 12,0 | 3,0 | 26 | 90 | 12 |
| SSEHVL 4160W-R10 | ● | 16,0 | 1,0 | 32 | 115 | 16 |
| SSEHVL 4160W-R30 | ● | 16,0 | 3,0 | 32 | 115 | 16 |
| SSEHVL 4200W-R10 | ❑ | 20,0 | 1,0 | 40 | 125 | 20 |
| SSEHVL 4200W-R30 | ❑ | 20,0 | 3,0 | 40 | 125 | 20 |
| SSEHVL 4250W-R10 | ❑ | 25,0 | 1,0 | 50 | 140 | 25 |
| SSEHVL 4250W-R30 | ❑ | 25,0 | 3,0 | 50 | 140 | 25 |

## SAFE-λOCK™

Applicable Endmills

## ■ Endmills

(mm)

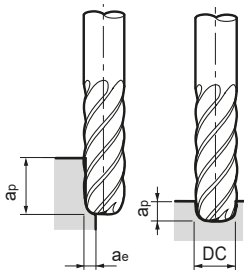
| Cat. No. | Stock | DC | RE | LU | LF | DMM |
|---|---|---|---|---|---|---|
| SSEHVL 4120WS-R10 | ❑ | 12,0 | 1,0 | 26 | 90 | 12 |
| SSEHVL 4120WS-R30 | ❑ | 12,0 | 3,0 | 26 | 90 | 12 |
| SSEHVL 4160WS-R10 | ❑ | 16,0 | 1,0 | 32 | 115 | 16 |
| SSEHVL 4160WS-R30 | ❑ | 16,0 | 3,0 | 32 | 115 | 16 |
| SSEHVL 4200WS-R10 | ❑ | 20,0 | 1,0 | 40 | 125 | 20 |
| SSEHVL 4200WS-R30 | ❑ | 20,0 | 3,0 | 40 | 125 | 20 |
| SSEHVL 4250WS-R10 | ❑ | 25,0 | 1,0 | 50 | 140 | 25 |
| SSEHVL 4250WS-R30 | ❑ | 25,0 | 3,0 | 50 | 140 | 25 |

## ■ Diameter and Corner Radius Selection Range

| DC | RE0,5 | RE1,0 | RE3,0 |
|---|---|---|---|
| 4,5 | ● | ● | |
| 5 | ● | ● | |
| 6 | | ● | |
| 8 | | ● | |
| 10 | | ● | ● |
| 12 | | ● | ● |
| 16 | | ● | ● |
| 20 | | ❑ | ❑ |
| 25 | | ❑ | ❑ |

## ■ Recommended Cutting Conditions

1. For stable machining, a more rigid machine is recommended.
2. Wet machining is recommended for stainless steel and heat resistant alloy applications.
3. If cutting noise and vibration are present, please change the cutting conditions accordingly.




### ● Shoulder Milling

| Work Material / Cond. | | Stainless Steel | | Titanium Alloy | | Heat Resistive Steel | |
|---|---|---|---|---|---|---|---|
| DC (mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 4,5 | | 3.500 | 350 | 3.500 | 280 | 2.100 | 170 |
| 5,0 | | 3.200 | 380 | 3.200 | 320 | 1.900 | 190 |
| 6,0 | | 2.700 | 430 | 2.700 | 320 | 1.600 | 190 |
| 8,0 | | 2.000 | 400 | 2.000 | 280 | 1.200 | 170 |
| 10,0 | | 1.600 | 380 | 1.600 | 260 | 1.000 | 160 |
| 12,0 | | 1.300 | 360 | 1.300 | 230 | 800 | 140 |
| 16,0 | | 1.000 | 320 | 1.000 | 200 | 600 | 120 |
| 20,0 | | 800 | 260 | 800 | 160 | 480 | 100 |
| 25,0 | | 640 | 200 | 640 | 130 | 380 | 80 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | |
| | $a_e$ | 0,1 DC | | 0,05 DC | | 0,05 DC | |

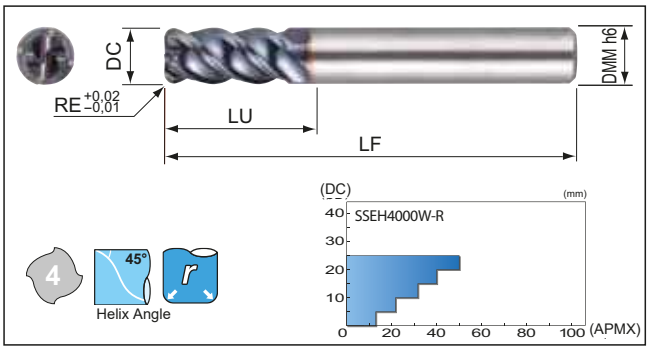
### ● Grooving

| Work Material / Cond. | | Stainless Steel | | Titanium Alloy | | Heat Resistive Steel | |
|---|---|---|---|---|---|---|---|
| DC(mm) | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 4,5 | | 4,200 | 200 | 3,900 | 270 | 1,400 | 100 |
| 5,0 | | 3,800 | 240 | 3,500 | 300 | 1,300 | 120 |
| 6,0 | | 3,200 | 260 | 2,900 | 300 | 1,100 | 140 |
| 8,0 | | 2,400 | 240 | 2,200 | 270 | 800 | 120 |
| 10,0 | | 1,900 | 220 | 1,700 | 250 | 650 | 110 |
| 12,0 | | 1,600 | 200 | 1,400 | 230 | 550 | 100 |
| 16,0 | | 1,200 | 130 | 1,100 | 200 | 400 | 80 |
| 20,0 | | 950 | 95 | 890 | 90 | 320 | 60 |
| 25,0 | | 760 | 75 | 700 | 70 | 250 | 50 |
| Grooving | $a_p$ | 0,3 DC | | 0,2 DC | | 0,15 DC | |

# SSEH 4000W-R Type

4 Flutes Endmills with Radius Corner and HAIMER's SAFE-LOCK™ Applicable Endmills

| Coated Carbide Grades | GS HARD Coating | Structual Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ○ | ○ | ○ | ○ | ○ | | | | ◎ | ◎ | | | | |




Grade: ACW52

## ■ Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| SSEH 4045W-R05 | ● | 4,5 | 0,5 | 12 | 50 | 6 |
| SSEH 4050W-R05 | ● | 5,0 | 0,5 | 13 | 60 | 6 |
| SSEH 4060W-R10 | ● | 6,0 | 1,0 | 13 | 60 | 6 |
| SSEH 4080W-R10 | ● | 8,0 | 1,0 | 19 | 80 | 8 |
| SSEH 4100W-R10 | ● | 10,0 | 1,0 | 22 | 90 | 10 |
| SSEH 4100W-R30 | ● | 10,0 | 3,0 | 22 | 90 | 10 |
| SSEH 4120W-R10 | ● | 12,0 | 1,0 | 26 | 90 | 12 |
| SSEH 4120W-R30 | ● | 12,0 | 3,0 | 26 | 90 | 12 |
| SSEH 4160W-R10 | ● | 16,0 | 1,0 | 32 | 115 | 16 |
| SSEH 4160W-R30 | ● | 16,0 | 3,0 | 32 | 115 | 16 |
| SSEH 4200W-R10 | ❍ | 20,0 | 1,0 | 40 | 125 | 20 |
| SSEH 4200W-R30 | ❍ | 20,0 | 3,0 | 40 | 125 | 20 |
| SSEH 4250W-R10 | ❍ | 25,0 | 1,0 | 50 | 140 | 25 |
| SSEH 4250W-R30 | ❍ | 25,0 | 3,0 | 50 | 140 | 25 |

## SAFE-LOCK™

Applicable Endmills

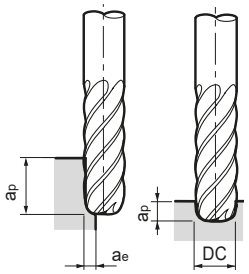
## ■ Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| SSEH 4120WS-R10 | ❍ | 12,0 | 1,0 | 26 | 90 | 12 |
| SSEH 4120WS-R30 | ❍ | 12,0 | 3,0 | 26 | 90 | 12 |
| SSEH 4160WS-R10 | ❍ | 16,0 | 1,0 | 32 | 115 | 16 |
| SSEH 4160WS-R30 | ❍ | 16,0 | 3,0 | 32 | 115 | 16 |
| SSEH 4200WS-R10 | ❍ | 20,0 | 1,0 | 40 | 125 | 20 |
| SSEH 4200WS-R30 | ❍ | 20,0 | 3,0 | 40 | 125 | 20 |
| SSEH 4250WS-R10 | ❍ | 25,0 | 1,0 | 50 | 140 | 25 |
| SSEH 4250WS-R30 | ❍ | 25,0 | 3,0 | 50 | 140 | 25 |

## ■ Diameter and Corner Radius Selection Range

| DC | RE0,5 | RE1,0 | RE3,0 |
|---|---|---|---|
| 4,5 | ● | | |
| 5 | ● | | |
| 6 | | ● | |
| 8 | | ● | |
| 10 | | ● | ● |
| 12 | | ● | ● |
| 16 | | ● | ● |
| 20 | | ❍ | ❍ |
| 25 | | ❍ | ❍ |




## ■ Recommended Cutting Conditions

1. For stable machining, a more rigid machine is recommended.
2. Wet machining is recommended for stainless steel and heat resistant alloy applications.
3. If cutting noise and vibration are present, please change the cutting conditions accordingly.

### ● Shoulder Milling

| Work Material / Cond. / DC (mm) | | Stainless Steel Spindle Speed (rpm) | Stainless Steel Feed Rate (mm/min) | Titanium Alloy Spindle Speed (rpm) | Titanium Alloy Feed Rate (mm/min) | Heat Resistive Steel Spindle Speed (rpm) | Heat Resistive Steel Feed Rate (mm/min) |
|---|---|---|---|---|---|---|---|
| 4,5 | | 3.500 | 350 | 3.500 | 280 | 2.100 | 170 |
| 5,0 | | 3.200 | 380 | 3.200 | 320 | 1.900 | 190 |
| 6,0 | | 2.700 | 430 | 2.700 | 320 | 1.600 | 190 |
| 8,0 | | 2.000 | 400 | 2.000 | 280 | 1.200 | 170 |
| 10,0 | | 1.600 | 380 | 1.600 | 260 | 1.000 | 160 |
| 12,0 | | 1.300 | 360 | 1.300 | 230 | 800 | 140 |
| 16,0 | | 1.000 | 320 | 1.000 | 200 | 600 | 120 |
| 20,0 | | 800 | 260 | 800 | 160 | 480 | 100 |
| 25,0 | | 640 | 200 | 640 | 130 | 380 | 80 |
| Shoulder cutting | ap | 1,5 DC | | | | | |
| | ae | 0,1 DC | | 0,05 DC | | 0,05 DC | |

### ● Grooving

| Work Material / Cond. / DC (mm) | | Stainless Steel Spindle Speed (rpm) | Stainless Steel Feed Rate (mm/min) | Titanium Alloy Spindle Speed (rpm) | Titanium Alloy Feed Rate (mm/min) | Heat Resistive Steel Spindle Speed (rpm) | Heat Resistive Steel Feed Rate (mm/min) |
|---|---|---|---|---|---|---|---|
| 4,5 | | 4,200 | 200 | 3,900 | 270 | 1,400 | 100 |
| 5,0 | | 3,800 | 240 | 3,500 | 300 | 1,300 | 120 |
| 6,0 | | 3,200 | 260 | 2,900 | 300 | 1,100 | 140 |
| 8,0 | | 2,400 | 240 | 2,200 | 270 | 800 | 120 |
| 10,0 | | 1,900 | 220 | 1,700 | 250 | 650 | 110 |
| 12,0 | | 1,600 | 200 | 1,400 | 230 | 550 | 100 |
| 16,0 | | 1,200 | 130 | 1,100 | 200 | 400 | 80 |
| 20,0 | | 950 | 95 | 890 | 90 | 320 | 60 |
| 25,0 | | 760 | 75 | 700 | 70 | 250 | 50 |
| Grooving | ap | 0,3 DC | | 0,2 DC | | 0,15 DC | |

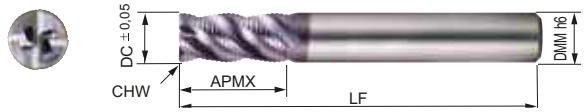




● = Euro stock
❍ = Japan stock

# GS MILL Series
# GSRE 4000SF Type

Coated carbide grade: **ACZ20W**




Helix angle : 40°

4

## Endmills

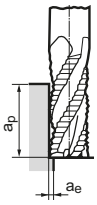
(mm)

| Cat. No. | Stock | DC | APMX | LF | CHW | DMM |
|---|---|---|---|---|---|---|
| GSRE 4060 SF | ● | 6,0 | 13 | 50 | 0,3 | 6 |
| 4070 SF | ● | 7,0 | 16 | 60 | 0,3 | 8 |
| 4080 SF | ● | 8,0 | 19 | 60 | 0,4 | 8 |
| 4090 SF | ● | 9,0 | 19 | 70 | 0,4 | 10 |
| 4100 SF | ● | 10,0 | 22 | 70 | 0,5 | 10 |
| GSRE 4110 SF | ● | 11,0 | 22 | 75 | 0,5 | 12 |
| 4120 SF | ● | 12,0 | 26 | 75 | 0,6 | 12 |
| 4140 SF | ● | 14,0 | 26 | 90 | 0,6 | 16 |
| 4160 SF | ● | 16,0 | 32 | 90 | 0,8 | 16 |
| 4180 SF | ● | 18,0 | 32 | 100 | 0,8 | 20 |
| GSRE 4200 SF | ● | 20,0 | 38 | 100 | 1,0 | 20 |

Recommended :

(1) Cutting performance is improved when using a high rigidity machine.

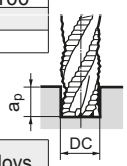
(2) Speeds and feeds should be reduced when there is any excessive vibration or strange noise during the operation.




## Recommended Cutting Conditions

### ● Shoulder cutting

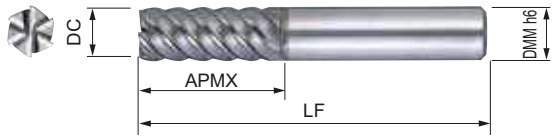
| Material / Cutting data / Tool Dia. (mm) | Carbon steel ( HB150–250) Speed (rpm) | Carbon steel ( HB150–250) Feed (mm/min) | Cast iron Speed (rpm) | Cast iron Feed (mm/min) | Alloy steel, Prehardened steel (HRC25–35) Speed (rpm) | Alloy steel, Prehardened steel (HRC25–35) Feed (mm/min) | Hardened steel (HRC40–50) Speed (rpm) | Hardened steel (HRC40–50) Feed (mm/min) | Stainless steel Speed (rpm) | Stainless steel Feed (mm/min) | Heat resistant alloys Titanium alloy Speed (rpm) | Heat resistant alloys Titanium alloy Feed (mm/min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.800 | 1.200 | 5.800 | 1.500 | 3.200 | 380 | 2.600 | 400 | 4.300 | 250 | 1.600 | 90 |
| 2 | 4.100 | 1.200 | 5.000 | 1.500 | 2.700 | 380 | 2.200 | 400 | 4.500 | 250 | 1.350 | 90 |
| 3 | 3.600 | 1.200 | 4.500 | 1.500 | 2.400 | 380 | 2.000 | 400 | 4.000 | 250 | 1.250 | 90 |
| 4 | 3.200 | 1.200 | 4.000 | 1.500 | 2.100 | 380 | 1.800 | 400 | 3.500 | 250 | 1.050 | 90 |
| 5 | 2.800 | 1.200 | 2.500 | 1.500 | 1.900 | 380 | 1.600 | 400 | 3.200 | 250 | 1.000 | 100 |
| 6 | 2.600 | 1.200 | 3.000 | 1.400 | 1.700 | 380 | 1.500 | 400 | 2.900 | 250 | 900 | 100 |
| 8 | 2.400 | 1.200 | 2.900 | 1.400 | 1.600 | 400 | 1.300 | 400 | 2.600 | 250 | 800 | 100 |
| 10 | 2.200 | 1.100 | 2.600 | 1.300 | 1.300 | 380 | 1.100 | 350 | 2.200 | 200 | 700 | 100 |
| 12 | 1.800 | 900 | 2.200 | 1.100 | 1.200 | 380 | 1.000 | 350 | 2.000 | 180 | 600 | 100 |
| 16 | 1.400 | 700 | 1.800 | 900 | 1.000 | 380 | 900 | 350 | 1.800 | 150 | 550 | 100 |
| 20 | 1.400 | 700 | 1.700 | 800 | 850 | 380 | 800 | 350 | 1.600 | 150 | 500 | 100 |
| Shoulder cutting $a_p$ | 1,5 DC | | | | | | 1,5 DC | | | | | |
| Shoulder cutting $a_e$ | 0,5 DC | | | | | | 0,3 DC | | | | | |




### ● Slotting

| Material / Cutting data / Tool Dia. (mm) | Carbon steel ( HB150–250) Speed (rpm) | Carbon steel ( HB150–250) Feed (mm/min) | Cast iron Speed (rpm) | Cast iron Feed (mm/min) | Alloy steel, Prehardened steel (HRC25–35) Speed (rpm) | Alloy steel, Prehardened steel (HRC25–35) Feed (mm/min) | Hardened steel (HRC40–50) Speed (rpm) | Hardened steel (HRC40–50) Feed (mm/min) | Stainless steel Speed (rpm) | Stainless steel Feed (mm/min) | Heat resistant alloys Titanium alloy Speed (rpm) | Heat resistant alloys Titanium alloy Feed (mm/min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3.600 | 900 | 4.300 | 1.100 | 2.400 | 300 | 1.700 | 260 | 4.200 | 250 | 1.100 | 60 |
| 2 | 3.000 | 900 | 3.700 | 1.100 | 2.000 | 280 | 1.500 | 260 | 3.600 | 250 | 900 | 60 |
| 3 | 2.700 | 900 | 3.400 | 1.100 | 1.800 | 280 | 1.350 | 260 | 3.200 | 250 | 800 | 60 |
| 4 | 2.400 | 900 | 3.000 | 1.100 | 1.600 | 280 | 1.200 | 260 | 2.800 | 250 | 700 | 60 |
| 5 | 2.100 | 900 | 2.600 | 1.100 | 1.400 | 280 | 1.100 | 270 | 2.500 | 250 | 650 | 65 |
| 6 | 2.000 | 900 | 2.300 | 1.100 | 1.300 | 280 | 1.000 | 270 | 2.300 | 250 | 600 | 70 |
| 8 | 1.800 | 900 | 2.200 | 1.100 | 1.200 | 300 | 900 | 270 | 2.100 | 250 | 550 | 70 |
| 10 | 1.600 | 800 | 2.000 | 1.100 | 1.000 | 290 | 750 | 240 | 1.800 | 180 | 450 | 65 |
| 12 | 1.350 | 650 | 1.650 | 850 | 900 | 280 | 700 | 240 | 1.600 | 160 | 400 | 65 |
| 16 | 1.200 | 550 | 1.500 | 750 | 800 | 280 | 600 | 230 | 1.400 | 140 | 350 | 60 |
| 20 | 1.050 | 500 | 1.350 | 700 | 700 | 280 | 550 | 210 | 1.250 | 125 | 300 | 60 |
| Slotting $a_p$ | 1,0 DC | | | | | | 0,5 DC | | | | | |

Coated carbide grade: **ACF07C**




Helix angle : 50˚
Corner : Edge with honing

4 6 8

| DC | Tolerance (mm) |
|---|---|
| D ≤ 3,0 | 0 – - 0,015 |
| 3,0 < D | 0 – - 0,030 |

## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| GSH 4010 SF | ● | 1,0 | 3 | 50 | 6 |
| 4015 SF | ● | 1,5 | 4 | 50 | 6 |
| 4020 SF | ● | 2,0 | 6 | 50 | 6 |
| GSH 6030 SF | ● | 3,0 | 8 | 50 | 6 |
| 6040 SF | ● | 4,0 | 11 | 50 | 6 |
| 6050 SF | ● | 5,0 | 12 | 50 | 6 |
| 6060 SF | ● | 6,0 | 13 | 50 | 6 |
| 6080 SF | ● | 8,0 | 19 | 60 | 8 |
| 6100 SF | ● | 10,0 | 22 | 70 | 10 |
| 6120 SF | ● | 12,0 | 26 | 75 | 12 |
| GSH 8160 SF | ● | 16,0 | 32 | 90 | 16 |
| 8200 SF | ● | 20,0 | 38 | 100 | 20 |

Recommended :
(1) Cutting performance is improved when using a high rigidity machine.
(2) Speeds and feeds should be reduced when there is any excessive vibration or strange noise during the operation.

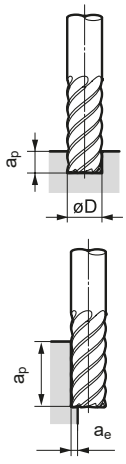
## Recommended Cutting Conditions

### ● Conventional Milling Operations

| Material / Cutting data / Tool Dia. (mm) | Alloy steel, Prehardened steel ( –HRC35) | | Heat treated alloy steel, hardened steel (HRC35–45) | | Hardened steel (HRC45–55) | | Hardened steel (HRC55–60) | | Hardened steel (HRC60–65) | | Hardened steel (HRC65– ) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) |
| 1 | 20.000 | 540 | 20.000 | 390 | 15.600 | 260 | 12.300 | 160 | 11.100 | 140 | 7.800 | 95 |
| 2 | 19.000 | 1.100 | 17.200 | 770 | 13.400 | 530 | 10.500 | 320 | 9.500 | 270 | 6.700 | 190 |
| 3 | 15.000 | 2.150 | 13.400 | 1.540 | 10.400 | 1.050 | 8.200 | 650 | 7.400 | 540 | 5.200 | 380 |
| 4 | 11.200 | 2.400 | 10.000 | 1.740 | 7.800 | 1.180 | 6.100 | 730 | 5.600 | 600 | 3.900 | 420 |
| 5 | 9.000 | 2.700 | 8.000 | 1.930 | 6.200 | 1.300 | 4.900 | 810 | 4.400 | 670 | 3.100 | 470 |
| 6 | 7.500 | 2.700 | 6.700 | 1.930 | 5.200 | 1.300 | 4.100 | 810 | 3.700 | 670 | 2.600 | 470 |
| 8 | 5.600 | 2.700 | 5.000 | 1.930 | 3.900 | 1.300 | 3.050 | 810 | 2.800 | 670 | 1.950 | 470 |
| 10 | 4.500 | 2.700 | 4.000 | 1.930 | 3.100 | 1.300 | 2.450 | 810 | 2.200 | 670 | 1.550 | 470 |
| 12 | 3.750 | 2.700 | 3.350 | 1.930 | 2.600 | 1.300 | 2.050 | 810 | 1.850 | 670 | 1.300 | 470 |
| 16 | 2.800 | 2.500 | 2.500 | 1.800 | 1.950 | 1.220 | 1.530 | 760 | 1.400 | 630 | 980 | 440 |
| 20 | 2.250 | 2.100 | 2.000 | 1.540 | 1.550 | 1.050 | 1.230 | 650 | 1.100 | 540 | 780 | 380 |
| Shoulder cutting $a_p$ | 1–1,5 DC | | | | 1–1,5 DC | | | | 1–1,5 DC | | | |
| Shoulder cutting $a_e$ | 0,1 DC | | | | 0,05 DC | | | | 0,02 DC | | | |
| Slotting $a_p$ | 0,1 DC | | | | 0,05 DC | | | | –0,05 DC (Max 0,5) | | | |

### ● HSC Machining Centre Operations

| Material / Cutting data / Tool Dia. (mm) | Alloy steel, Prehardened steel ( –HRC35) | | Heat treated alloy steel, hardened steel (HRC35–45) | | Hardened steel (HRC45–55) | | Hardened steel (HRC55–60) | | Hardened steel (HRC60–65) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) |
| 1 | 48.000 | 1.250 | 48.000 | 1.250 | 48.000 | 1.250 | 48.000 | 930 | 38.000 | 700 |
| 2 | 48.000 | 2.850 | 48.000 | 2.850 | 48.000 | 2.850 | 36.000 | 1.600 | 24.000 | 1.000 |
| 3 | 32.000 | 4.900 | 32.000 | 4.900 | 32.000 | 4.900 | 24.000 | 2.740 | 16.000 | 1.700 |
| 4 | 24.000 | 5.200 | 24.000 | 5.200 | 24.000 | 5.200 | 18.000 | 2.900 | 12.000 | 1.800 |
| 5 | 19.200 | 5.800 | 19.200 | 5.800 | 19.200 | 5.800 | 14.300 | 3.200 | 9.600 | 2.000 |
| 6 | 16.000 | 5.800 | 16.000 | 5.800 | 16.000 | 5.800 | 12.000 | 3.200 | 8.000 | 2.000 |
| 8 | 12.000 | 5.800 | 12.000 | 5.800 | 12.000 | 5.800 | 9.000 | 3.200 | 6.000 | 2.000 |
| 10 | 9.600 | 5.800 | 9.600 | 5.800 | 9.600 | 5.800 | 7.200 | 3.200 | 4.800 | 2.000 |
| 12 | 8.000 | 5.800 | 8.000 | 5.800 | 8.000 | 5.800 | 6.000 | 3.200 | 4.000 | 2.000 |
| 16 | 6.000 | 5.400 | 6.000 | 5.400 | 6.000 | 5.400 | 4.500 | 3.000 | 3.000 | 1.900 |
| 20 | 4.800 | 4.600 | 4.800 | 4.600 | 4.800 | 4.600 | 3.600 | 2.580 | 2.400 | 1.600 |
| Shoulder cutting $a_p$ | 1–1,5 DC | | 1–1,5 DC | | | | 1–1,5 DC | | 1–1,5 DC | |
| Shoulder cutting $a_e$ | 0,1 DC | | 0,05 DC | | | | 0,02 DC | | 0,12 DC | |

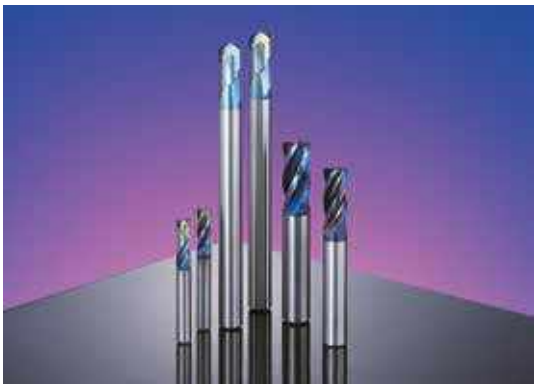







● = Euro stock

# AURORA COAT Series



## Features

Sumitomo Electric's "AURORA" COAT is a high hardness, low coefficient layer of "Diamond Like Carbon" (DLC).

Other than producing excellent surface finish for machining of Aluminium and non-ferrous metals, DLC coat can be used for dry cutting and is environmental friendly.

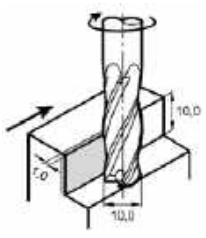
## Characteristics / Application

- Very smooth AURORA COAT results in low adhesion as well as good surface finish
- With lower cutting forces and high rigidity, this series is suitable for low rigidity machine
- Available in 2 and 4 flutes square type as well as ballnose type endmills

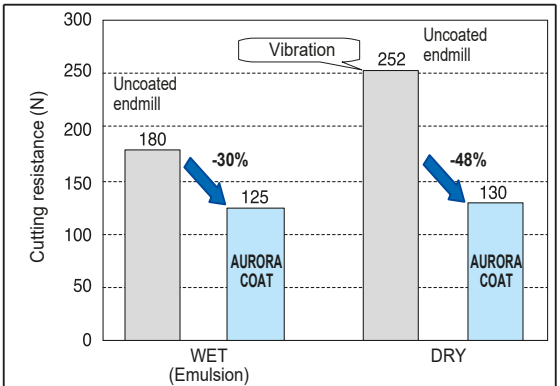
## Product Range

| Series | No. of teeth | Shape | Diameter |
|---|---|---|---|
| ASM2000DL | 2 | Square  | ø 2 – ø 16 |
| ASM4000DL | 4 | Square  | ø 2 – ø 16 |
| SNB2000DL | 2 | Ballnose  | ø 2 – ø 16 (R1 – R8) |

## Efficiency

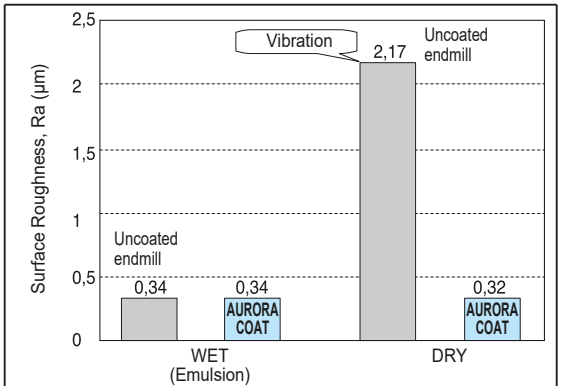


● Performance Comparison




Work Material: A5052
Tool: ASM4100DL, ø 10 mm 4 teeth
Cutting Conditions: $v_c$ = 200 m/min, n = 6,300 rpm, $v_f$ = 1300 mm/min
$f_t$ = 0,05 mm/tooth, $a_p$ = 10 mm, $a_e$ = 1,0 mm
Down Cut

● Surface Finish Comparison

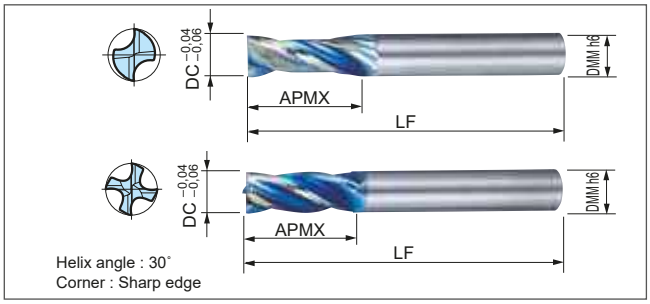



Work Material: A5052
Tool: ASM4100DL, ø 10 mm 4 teeth
Cutting Conditions: $v_c$ = 200 m/min, n = 6,300 rpm, $v_f$ = 1300 mm/min
$f_t$ = 0,05 mm/tooth, $a_p$ = 10 mm, $a_e$ = 1,0 mm
Down Cut

# AURORA Coated Spiral Endmills
# ASM 2000/4000 DL Type

2 4

DLC coated carbide grade: DL1000




## ■ Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| ASM 2020 DL | ● | 2,0 | 6 | 40 | 4 |
| 2030 DL | ● | 3,0 | 10 | 45 | 6 |
| 2040 DL | ● | 4,0 | 12 | 45 | 6 |
| 2050 DL | ● | 5,0 | 15 | 50 | 6 |
| ASM 2060 DL | ● | 6,0 | 15 | 50 | 6 |
| 2080 DL | ● | 8,0 | 18 | 60 | 8 |
| 2100 DL | ● | 10,0 | 22 | 71 | 10 |
| ASM 2120 DL | ● | 12,0 | 25 | 75 | 12 |
| 2160 DL | ● | 16,0 | 32 | 90 | 16 |

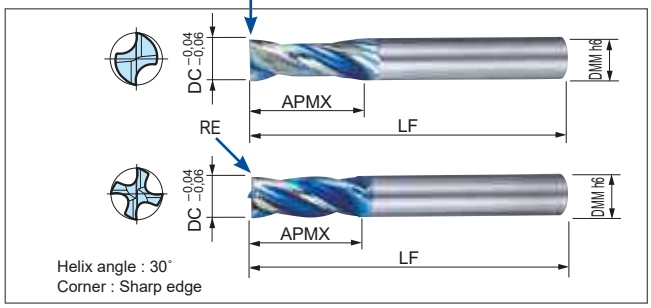
| | | | | | |
|---|---|---|---|---|---|
| ASM 4020 DL | ● | 2,0 | 6 | 40 | 4 |
| 4030 DL | ● | 3,0 | 10 | 45 | 6 |
| 4040 DL | ● | 4,0 | 12 | 45 | 6 |
| 4050 DL | ● | 5,0 | 15 | 50 | 6 |
| ASM 4060 DL | ● | 6,0 | 15 | 50 | 6 |
| 4080 DL | ● | 8,0 | 18 | 60 | 8 |
| 4100 DL | ● | 10,0 | 22 | 71 | 10 |
| ASM 4120 DL | ● | 12,0 | 25 | 75 | 12 |
| 4160 DL | ● | 16,0 | 32 | 90 | 16 |

# AURORA Coated Spiral Endmills
# ASM 2000/4000 DL-R Type

With Radius Corner -R

2 4

DLC coated carbide grade: DL1000

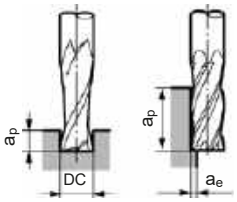



## ■ Endmills

(mm)

| Cat. No. | Stock | DC | RE | APMX | LF | DMM |
|---|---|---|---|---|---|---|
| ASM 2080 DL-R10 | ❑ | 8,0 | 1,0 | 18 | 60 | 8 |
| 2080 DL-R20 | ❑ | 8,0 | 2,0 | 18 | 60 | 8 |
| ASM 2100 DL-R10 | ❑ | 10,0 | 1,0 | 22 | 71 | 10 |
| 2100 DL-R20 | ❑ | 10,0 | 2,0 | 22 | 71 | 10 |
| ASM 2120 DL-R20 | ❑ | 12,0 | 2,0 | 25 | 75 | 12 |
| 2120 DL-R30 | ❑ | 12,0 | 3,0 | 25 | 75 | 12 |
| ASM 2160 DL-R30 | ❑ | 16,0 | 3,0 | 32 | 90 | 16 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ASM 4080 DL-R10 | ❑ | 8,0 | 1,0 | 18 | 60 | 8 |
| 4080 DL-R20 | ❑ | 8,0 | 2,0 | 18 | 60 | 8 |
| ASM 4100 DL-R10 | ❑ | 10,0 | 1,0 | 22 | 71 | 10 |
| 4100 DL-R20 | ❑ | 10,0 | 2,0 | 22 | 71 | 10 |
| ASM 4120 DL-R20 | ❑ | 12,0 | 2,0 | 25 | 75 | 12 |
| 4120 DL-R30 | ❑ | 12,0 | 3,0 | 25 | 75 | 12 |
| ASM 4160 DL-R30 | ❑ | 16,0 | 3,0 | 32 | 90 | 16 |




## ■ Recommended Cutting Conditions

Recommended :

(1) Cutting performance is improved when using a high rigidity machine.

(2) Speeds and feeds should be reduced when there is any excessive vibration or strange noise during the operation.

(3) In case of chatter first check the cutting conditions.

| Work Material | | Aluminium Alloy | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Cutting data / DC (mm) | | Wet (Emulsion) | | | | Dry | | | |
| | | Side Milling (4 teeth) | | Groove Milling (4 teeth) | | Side Milling (4 teeth) | | Groove Milling (4 teeth) | |
| | | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) |
| 2,0 | | 40.000 | 1.400 | 28.000 | 280 | 40.000 | 980 | 28.000 | 200 |
| 3,0 | | 32.000 | 2.000 | 22.000 | 400 | 32.000 | 1.400 | 22.000 | 280 |
| 4,0 | | 26.000 | 2.600 | 18.000 | 520 | 26.000 | 1.800 | 18.000 | 360 |
| 5,0 | | 20.000 | 2.600 | 14.000 | 520 | 20.000 | 1.800 | 14.000 | 360 |
| 6,0 | | 17.000 | 2.700 | 12.000 | 540 | 17.000 | 1.900 | 12.000 | 370 |
| 8,0 | | 13.000 | 2.700 | 9.000 | 540 | 13.000 | 1.900 | 9.000 | 370 |
| 10,0 | | 11.000 | 2.800 | 7.200 | 560 | 11.000 | 2.000 | 7.200 | 390 |
| 12,0 | | 8.500 | 2.800 | 6.000 | 560 | 8.500 | 2.000 | 6.000 | 390 |
| 16,0 | | 6.400 | 2.800 | 4.500 | 560 | 6.400 | 2.000 | 4.500 | 390 |
| Depth and wide of cut | $a_p$ | 1,5 DC | | 1,0 DC | | 1,5 DC | | 0,5 DC | |
| | $a_e$ | 0,2 DC | | (DC) | | 0,2 DC | | (DC) | |

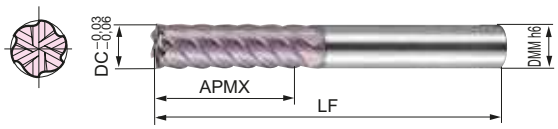
● = Euro stock ❑ = Delivery on request

# ZX Coated Long Fast Helix Endmills
# LHHM 4000/6000/8000 ZX Type

4 6 8

Coated carbide grade: ACZ10M

6 teeth



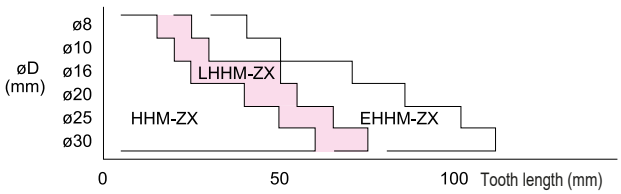

Helix angle : 45°
Corner : Edge with honing

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |
| 6,0 < D ≤ 10,0 | – 0,015 – 0,040 |
| 10,0 < D | – 0,020 – 0,050 |

## ■ Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| LHHM 4030 ZX | ❑ | 3,0 | 12 | 55 | 6 |
| 4040 ZX | ❑ | 4,0 | 15 | 60 | 6 |
| 4050 ZX | ❑ | 5,0 | 18 | 60 | 6 |
| LHHM 6060 ZX | ❑ | 6,0 | 18 | 60 | 6 |
| 6080 ZX | ❑ | 8,0 | 25 | 75 | 8 |
| 6100 ZX | ❑ | 10,0 | 30 | 80 | 10 |
| 6120 ZX | ❑ | 12,0 | 30 | 100 | 12 |
| LHHM 8160 ZX | ❑ | 16,0 | 50 | 105 | 16 |
| 8200 ZX | ❑ | 20,0 | 55 | 120 | 20 |
| 8250 ZX | ❑ | 25,0 | 65 | 140 | 25 |
| 8300 ZX | ❑ | 30,0 | 75 | 160 | 32 |

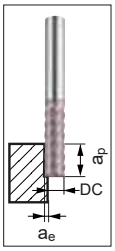



## Recommended conditions

(Shoulder processing) $a_p$ = 1,5 x øD

$a_e$ =0,025(HRC56~65) ~ 0,2(below HRC25) x øD

| DC \ Material | | Carbon steel, Alloy steel (BelowHRC25) | Carbon steel, Alloy steel (BelowHRC45) | Hardened steel (BelowHRC65) | Cast iron |
|---|---|---|---|---|---|
| 3,0–5,0 | $v_c$ | 200–**250**–300 | 100–**150**–200 | 80–**100**–120 | 60–**75**–90 |
| | $f_t$ | 0,030–0,060 | 0,022–0,037 | 0,007–0,015 | 0,030–0,060 |
| 6,0–12,0 | $v_c$ | 200–**250**–300 | 100–**150**–200 | 80–**100**–120 | 40–**50**–60 |
| | $f_t$ | 0,061–0,090 | 0,037–0,067 | 0,015–0,028 | 0,060–0,165 |
| 16,0–32,0 | $v_c$ | 200–**250**–300 | 100–**150**–200 | 80–**100**–120 | 40–**50**–60 |
| | $f_t$ | 0,090–0,098 | 0,067–0,075 | 0,028–0,038 | 0,187–0,262 |



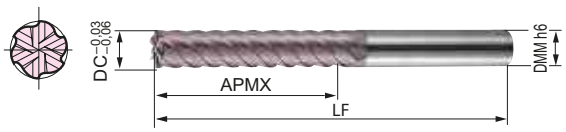

$v_c$ =m/min $f_t$ =mm/tooth

# ZX Coated Extra Long Fast Helix Endmills
# EHHM 4000/6000/8000 ZX Type

4 6 8

Coated carbide grade: ACZ10M

6 teeth



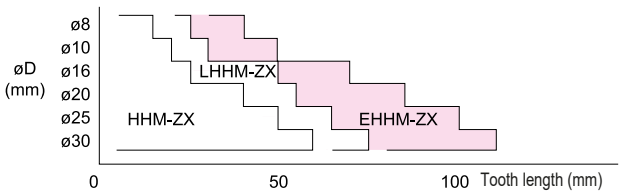

Helix angle : 45°
Corner : Edge with honing

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |
| 6,0 < D ≤ 10,0 | – 0,015 – 0,040 |
| 10,0 < D | – 0,020 – 0,050 |

## ■ Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| EHHM 4030 ZX | ❑ | 3,0 | 20 | 60 | 6 |
| 4040 ZX | ❑ | 4,0 | 25 | 65 | 6 |
| 4050 ZX | ❑ | 5,0 | 30 | 70 | 6 |
| EHHM 6060 ZX | ❑ | 6,0 | 30 | 70 | 6 |
| 6080 ZX | ❑ | 8,0 | 40 | 90 | 8 |
| 6100 ZX | ❑ | 10,0 | 50 | 100 | 10 |
| 6120 ZX | ❑ | 12,0 | 50 | 120 | 12 |
| EHHM 8160 ZX | ❑ | 16,0 | 70 | 140 | 16 |
| 8200 ZX | ❑ | 20,0 | 85 | 165 | 20 |
| 8250 ZX | ❑ | 25,0 | 100 | 185 | 25 |
| 8300 ZX | ❑ | 30,0 | 110 | 205 | 32 |
| 8320 ZX | ❑ | 32,0 | 110 | 205 | 32 |

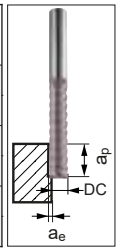



## Recommended conditions

(Shoulder processing) $a_p$ = 1,5 x øD

$a_e$ =0,025(HRC56~65) ~ 0,2(below HRC25) x øD

| DC \ Material | | Carbon steel, Alloy steel (BelowHRC25) | Carbon steel, Alloy steel (BelowHRC45) | Hardened steel (BelowHRC65) | Cast iron |
|---|---|---|---|---|---|
| 3,0–5,0 | $v_c$ | 200–**250**–300 | 100–**150**–200 | 80–**100**–120 | 100–**120**–150 |
| | $f_t$ | 0,020–0,040 | 0,015–0,025 | 0,005–0,010 | 0,020–0,040 |
| 6,0–12,0 | $v_c$ | 200–**250**–300 | 100–**150**–200 | 80–**100**–120 | 100–**120**–150 |
| | $f_t$ | 0,041–0,060 | 0,025–0,045 | 0,01 0–0,019 | 0,040–0,110 |
| 16,0–32,0 | $v_c$ | 200–**250**–300 | 100–**150**–200 | 80–**100**–120 | 100–**120**–150 |
| | $f_t$ | 0,060–0,065 | 0,045–0,050 | 0,019–0,025 | 0,125–0,175 |




$v_c$ =m/min $f_t$ =mm/tooth

# SSUP MILL Series

## Features

ZX coated general use endmill for high efficient slotting and side cutting of steels, stainless steels, high temperature alloys and cast irons.

Unique flute design and strong cutting edge ensure excellent chip control even when rough machining slots.

Feed rate up to 2000 mm/min with and without coolant

## Advantages

- Unique flute design for excellent chip removal
- Extra strong cutting edge
- 40° high helix angle for high feed rates
- New ZX coating for excellent wear resistance
- Smooth cutting
- Excellent rigid wide cutting land

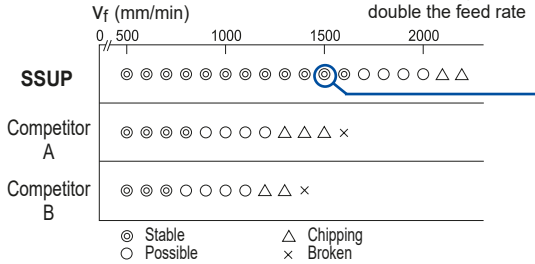

SSUP 4000ZX-R Series
Diameter and Corner Radius Range

| DC \ RE | RE0,2 | RE0,3 | RE0,5 | RE1,0 | RE1,5 | RE2.0 | RE3.0 |
|---|---|---|---|---|---|---|---|
| 3 | ● | | ● | | | | |
| 4 | ● | | ● | ● | | | |
| 5 | ● | | ● | ● | | | |
| 6 | | ● | ● | ● | ● | | |
| 8 | | ● | ● | ● | ● | | |
| 10 | | ● | ● | ● | ● | ● | |
| 12 | | | ● | ● | ● | ● | ● |
| 16 | | | | ● | ● | ● | ● |
| 20 | | | | ● | ● | ● | ● |

## Performance

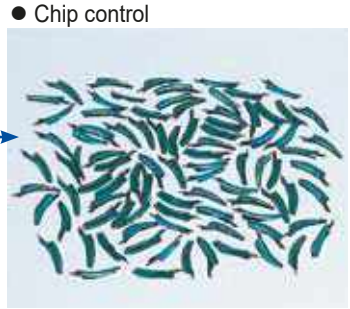
### ● Feed rate comparisons

<Results>
Stable milling at double the feed rate

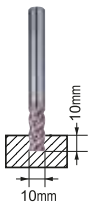



| | |
|---|---|
| Work material:<br>X155CrVMo12 1 (HB220)<br>Tool : ø 10 mm, 4 flute<br>Cutting length: 10m | Cutting conditions :<br>n = 2250 rpm, $v_c$ = 80 m/min<br>$a_p$ =10 mm, $a_e$ =10mm<br>Dry |

### ● Chip control

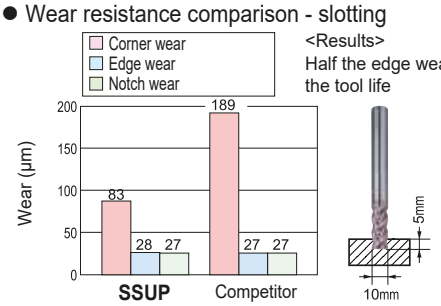


<Results>
Excellent chip control




| | |
|---|---|
| Work material:<br>X155CrVMo12 1 (HB220)<br>Tool : ø 10 mm, 4 flute | Cutting conditions :<br>n = 2250 rpm, $v_c$ = 80 m/min<br>$f_t$ = 0,147 mm/tooth ($v_f$ = 1500 mm/min)<br>$a_p$ = 10 mm, $a_e$ = 10 mm, Dry |

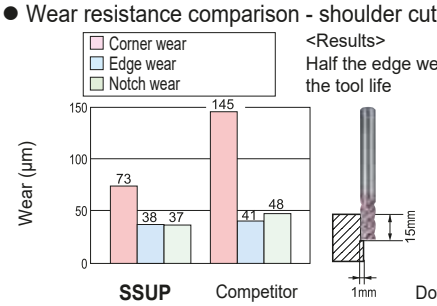
### ● Wear resistance comparison - slotting




<Results>
Half the edge wear - double the tool life

| | |
|---|---|
| Work material: 40CrMoV5 $H_RC40$<br>Tool : ø 10 mm, 4 flute<br>Cutting length: 7,5 m | Cutting conditions :<br>n = 1600 rpm, $v_c$ = 50m/min<br>$f_t$ = 0,04 mm/tooth ($v_f$ = 500 mm/min)<br>$a_p$ = 5mm, $a_e$ = 10 mm, Dry |

### ● Wear resistance comparison - shoulder cutting




<Results>
Half the edge wear - double the tool life

| | |
|---|---|
| Work material:<br>X155CrVMo12 1 (HB220)<br>Tool : ø 10mm, 4 flute<br>Cutting length: 15 m | Cutting conditions :<br>n = 1750 rpm, $v_c$ = 55 m/min<br>$f_t$ = 0,086 mm/tooth ($v_f$ = 600 mm/min)<br>$a_p$ =15 mm, $a_e$ = 1 mm, Dry |

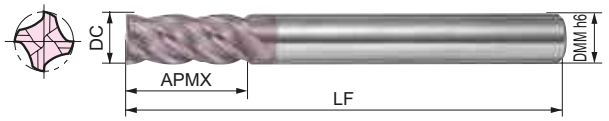




● = Euro stock
❑ = Delivery on request

# ZX Coated SSUP MILL
# SSUP 4000ZX Type

Coated carbide grade: ACZ50M




Helix angle : 40°
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| D ≤ 3,0 | – 0,014 – 0,028 |
| 3,0 < D ≤ 6,0 | – 0,020 – 0,038 |
| 6,0 < D | – 0,025 – 0,047 |

## Endmills

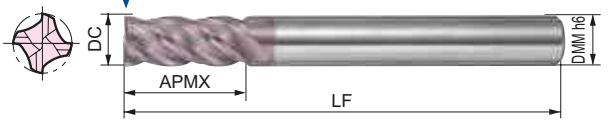
(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| SSUP 4020 ZX | ● | 2,0 | 6 | 50 | 4 |
| 4030 ZX | ● | 3,0 | 8 | 50 | 6 |
| 4040 ZX | ● | 4,0 | 11 | 50 | 6 |
| 4050 ZX | ● | 5,0 | 13 | 60 | 6 |
| SSUP 4060 ZX | ● | 6,0 | 13 | 60 | 6 |
| 4070 ZX | ● | 7,0 | 16 | 70 | 8 |
| 4080 ZX | ● | 8,0 | 19 | 80 | 8 |
| 4090 ZX | ● | 9,0 | 19 | 90 | 10 |
| 4100 ZX | ● | 10,0 | 22 | 90 | 10 |
| SSUP 4110 ZX | ● | 11,0 | 22 | 90 | 12 |
| 4120 ZX | ● | 12,0 | 26 | 90 | 12 |
| 4140 ZX | ● | 14,0 | 26 | 110 | 16 |
| 4150 ZX | ❑ | 15,0 | 26 | 110 | 16 |
| SSUP 4160 ZX | ● | 16,0 | 32 | 115 | 16 |
| 4180 ZX | ❑ | 18,0 | 32 | 120 | 20 |
| 4200 ZX | ● | 20,0 | 38 | 125 | 20 |

# ZX Coated SSUP MILL
# SSUP 4000ZX-R Type

With Radius Corner

Coated carbide grade: ACZ50M




Helix angle : 40°
Corner : Sharp edge

-R

| DC | Tolerance (mm) |
|---|---|
| D ≤ 3,0 | – 0,014 – 0,028 |
| 3,0 < D ≤ 6,0 | – 0,020 – 0,038 |
| 6,0 < D | – 0,025 – 0,047 |

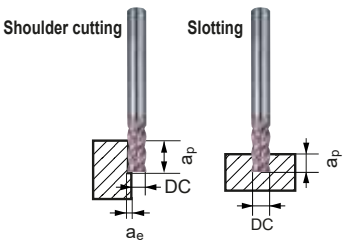
## Endmills

(mm)

| Cat. No. | Stock | DC | RE | APMX | LF | DMM |
|---|---|---|---|---|---|---|
| SSUP 4030 ZX-R02 | ● | 3,0 | 0,2 | 8 | 50 | 6 |
| 4030 ZX-R05 | ❑ | 3,0 | 0,5 | 8 | 50 | 6 |
| SSUP 4040 ZX-R02 | ● | 4,0 | 0,2 | 11 | 50 | 6 |
| 4040 ZX-R05 | ● | 4,0 | 0,5 | 11 | 50 | 6 |
| 4040 ZX-R10 | ❑ | 4,0 | 1,0 | 11 | 50 | 6 |
| SSUP 4050 ZX-R02 | ● | 5,0 | 0,2 | 13 | 60 | 6 |
| 4050 ZX-R05 | ● | 5,0 | 0,5 | 13 | 60 | 6 |
| 4050 ZX-R10 | ❑ | 5,0 | 1,0 | 13 | 60 | 6 |
| SSUP 4060 ZX-R03 | ● | 6,0 | 0,3 | 13 | 60 | 6 |
| 4060 ZX-R05 | ● | 6,0 | 0,5 | 13 | 60 | 6 |
| 4060 ZX-R10 | ● | 6,0 | 1,0 | 13 | 60 | 6 |
| 4060 ZX-R15 | ❑ | 6,0 | 1,5 | 13 | 60 | 6 |
| SSUP 4080 ZX-R03 | ● | 8,0 | 0,3 | 13 | 80 | 8 |
| 4080 ZX-R05 | ● | 8,0 | 0,5 | 13 | 80 | 8 |
| 4080 ZX-R10 | ● | 8,0 | 1,0 | 19 | 80 | 8 |
| 4080 ZX-R15 | ❑ | 8,0 | 1,5 | 19 | 80 | 8 |
| 4080 ZX-R20 | ❑ | 8,0 | 2,0 | 19 | 80 | 8 |
| SSUP 4100 ZX-R03 | ● | 10,0 | 0,3 | 22 | 90 | 10 |
| 4100 ZX-R05 | ● | 10,0 | 0,5 | 22 | 90 | 10 |
| 4100 ZX-R10 | ● | 10,0 | 1,0 | 22 | 90 | 10 |
| 4100 ZX-R15 | ❑ | 10,0 | 1,5 | 22 | 90 | 10 |
| 4100 ZX-R20 | ❑ | 10,0 | 2,0 | 22 | 90 | 10 |
| SSUP 4120 ZX-R05 | ● | 12,0 | 0,5 | 26 | 90 | 12 |
| 4120 ZX-R10 | ● | 12,0 | 1,0 | 26 | 90 | 12 |
| 4120 ZX-R15 | ● | 12,0 | 1,5 | 26 | 90 | 12 |
| 4120 ZX-R20 | ❑ | 12,0 | 2,0 | 26 | 90 | 12 |
| 4120 ZX-R30 | ❑ | 12,0 | 3,0 | 26 | 90 | 12 |
| SSUP 4160 ZX-R10 | ● | 16,0 | 1,0 | 32 | 115 | 16 |
| 4160 ZX-R15 | ● | 16,0 | 1,5 | 32 | 115 | 16 |
| 4160 ZX-R20 | ❑ | 16,0 | 2,0 | 32 | 115 | 16 |
| 4160 ZX-R30 | ❑ | 16,0 | 3,0 | 32 | 115 | 16 |
| SSUP 4200 ZX-R10 | ● | 20,0 | 1,0 | 38 | 125 | 20 |
| 4200 ZX-R15 | ❑ | 20,0 | 1,5 | 38 | 125 | 20 |
| 4200 ZX-R20 | ❑ | 20,0 | 2,0 | 38 | 125 | 20 |
| 4200 ZX-R30 | ❑ | 20,0 | 3,0 | 38 | 125 | 20 |

## Recommended Cutting Conditions

| Material / Cutting data / DC (mm) | | Carbon steel, Cast iron (HB150–250) Speed (rpm) | Feed (mm/min) | Alloy steel, Prehardened steel (HRC25–35) Speed (rpm) | Feed (mm/min) | Hardened steel (HRC40–50) Speed (rpm) | Feed (mm/min) | Stainless steel Speed (rpm) | Feed (mm/min) | Heat resistant alloys Titanium alloy (HRC20–45) Speed (rpm) | Feed (mm/min) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | | 9000 | 720 | 6000 | 430 | 4000 | 320 | 5500 | 320 | 2600 | 120 |
| 4 | | 6600 | 800 | 4500 | 450 | 3000 | 380 | 4000 | 320 | 2000 | 120 |
| 6 | | 4800 | 960 | 3000 | 480 | 2500 | 380 | 3000 | 480 | 1200 | 120 |
| 8 | | 3600 | 1000 | 2200 | 610 | 2000 | 400 | 2000 | 520 | 1000 | 140 |
| 10 | | 2800 | 1000 | 1800 | 610 | 1500 | 400 | 1700 | 550 | 800 | 160 |
| 12 | | 2400 | 950 | 1500 | 550 | 1200 | 380 | 1500 | 500 | 700 | 140 |
| 14 | | 2200 | 880 | 1300 | 490 | 1000 | 360 | 1200 | 430 | 600 | 130 |
| 16 | | 1800 | 650 | 1100 | 420 | 800 | 300 | 1000 | 360 | 500 | 120 |
| 18 | | 1600 | 580 | 1000 | 360 | 750 | 270 | 900 | 340 | 450 | 110 |
| 20 | | 1400 | 500 | 900 | 330 | 700 | 250 | 820 | 300 | 400 | 100 |
| Shoulder cutting | $a_p$ | 1,5 DC | | | | | | | | | |
| | $a_e$ | 0,1 DC | | | | 0,05 DC | | 0,1 DC | | 0,05 DC | |
| Slotting | $a_p$ | 1,0 DC | | | | 0,2 DC | | 0,3 DC | | 0,2 DC | |

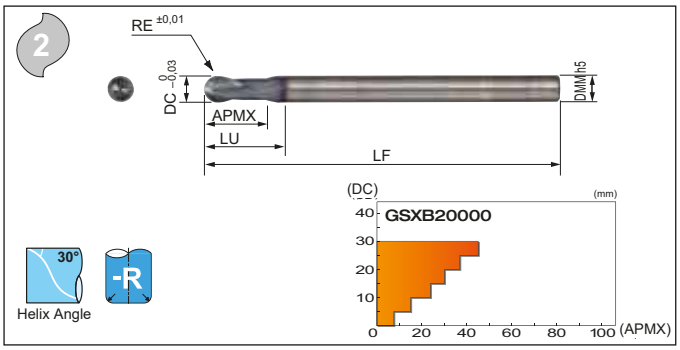



(1) Cutting performance is improved when using a high rigidity machine.
(2) Speeds and feeds should be reduced when slotting some stainless steels.
(3) In case of chatter first check the cutting conditions.

# GSX MILL Ball Endmills
# GSXB 20000 Type

Coated Carbide Grades — GSX Coating

| Structual Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | | ◎ | ○ | ○ | | | |




Coated carbide grade: **ACB20**

## Endmill Identification (GSXB Type)

**GSXB 2 0200**

- GSXB — Series Code
- 2 — No. of Teeth
- 0200 — Radius of Ballnose

## Endmills

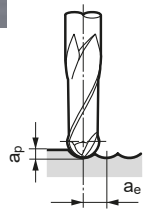
(mm)

| Cat. No. | Stock | RE | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|---|
| GSXB 20020 | ● | 0,20 | 0,4 | 0,6 | 0,8 | 50 | 4 |
| GSXB 20030 | ● | 0,30 | 0,6 | 0,9 | 1,2 | 50 | 4 |
| GSXB 20050 | ● | 0,50 | 1,0 | 1,5 | 2,0 | 50 | 4 |
| GSXB 20075 | ● | 0,75 | 1,5 | 2,5 | 3,0 | 50 | 4 |
| GSXB 20100 | ● | 1,00 | 2,0 | 3,0 | 4,0 | 60 | 6 |
| GSXB 20125 | ● | 1,25 | 2,5 | 4,0 | 5,0 | 60 | 6 |
| GSXB 20150 | ● | 1,50 | 3,0 | 4,5 | 6,0 | 60 | 6 |
| GSXB 20200 | ● | 2,00 | 4,0 | 6,0 | 8,0 | 70 | 6 |
| GSXB 20250 | ● | 2,50 | 5,0 | 7,5 | 10,0 | 80 | 6 |
| GSXB 20300 | ● | 3,00 | 6,0 | 9,0 | – | 80 | 6 |
| GSXB 20350 | ● | 3,50 | 7,0 | 11,0 | 20,0 | 90 | 8 |
| GSXB 20400 | ● | 4,00 | 8,0 | 12,0 | – | 90 | 8 |
| GSXB 20500 | ● | 5,00 | 10,0 | 15,0 | – | 100 | 10 |
| GSXB 20600 | ● | 6,00 | 12,0 | 18,0 | – | 110 | 12 |
| GSXB 20700 | ● | 7,00 | 14,0 | 21,0 | 38,0 | 110 | 16 |
| GSXB 20800 | ● | 8,00 | 16,0 | 24,0 | – | 140 | 16 |
| GSXB 20900 | ● | 9,00 | 18,0 | 27,0 | 50,0 | 140 | 20 |
| GSXB 21000 | ● | 10,00 | 20,0 | 30,0 | – | 160 | 20 |
| GSXB 21250 | | 12,50 | 25,0 | 38,0 | – | 180 | 25 |
| GSXB 21500 | | 15,00 | 30,0 | 45,0 | 80,0 | 180 | 32 |

New "Global Standard" Mills
Ball nose type with 2 teeth

## Recommended Cutting Conditions

(1) If cutting noise and vibration are present, please change the cutting conditions accordingly.
(2) If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.




### ●Radius Milling

| Work Material / Cutting Conditions / RE (mm) | | Carbon Steel, Alloy Steel (Below 25HRC) | | Carbon Steel, Alloy Steel (Below 50HRC) | | Cast Iron Special Cast Iron | | Stainless Steel Titanium Alloy | |
|---|---|---|---|---|---|---|---|---|---|
| | | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) |
| 0,20 | | 50.000 | 2.100 | 35.000 | 1.150 | 50.000 | 2.100 | 50.000 | 1.750 |
| 0,30 | | 50.000 | 2.500 | 35.000 | 1.350 | 50.000 | 2.500 | 50.000 | 2.100 |
| 0,50 | | 50.000 | 3.000 | 35.000 | 1.600 | 50.000 | 3.000 | 50.000 | 2.500 |
| 0,75 | | 35.000 | 3.000 | 24.000 | 1.650 | 35.000 | 3.200 | 34.000 | 2.500 |
| 1,00 | | 27.500 | 3.000 | 19.000 | 1.700 | 35.000 | 3.900 | 26.000 | 2.500 |
| 1,25 | | 22.500 | 3.000 | 15.500 | 1.700 | 28.000 | 3.900 | 21.000 | 2.500 |
| 1,50 | | 19.000 | 3.000 | 13.000 | 1.700 | 24.000 | 3.900 | 17.500 | 2.500 |
| 2,00 | | 17.000 | 3.800 | 12.000 | 2.100 | 20.000 | 4.100 | 15.000 | 2.700 |
| 2,50 | | 15.500 | 4.300 | 11.000 | 2.200 | 18.000 | 4.600 | 12.000 | 2.500 |
| 3,00 | | 14.000 | 4.700 | 10.500 | 2.500 | 16.500 | 5.300 | 10.500 | 2.500 |
| 3,50 | | 12.500 | 4.200 | 9.000 | 2.100 | 14.000 | 4.500 | 9.000 | 2.200 |
| 4,00 | | 11.000 | 3.500 | 7.900 | 1.900 | 12.500 | 4.000 | 7.800 | 1.900 |
| 5,00 | | 9.000 | 2.800 | 6.300 | 1.500 | 10.500 | 3.300 | 6.300 | 1.500 |
| 6,00 | | 7.500 | 2.400 | 5.200 | 1.250 | 8.700 | 2.800 | 5.200 | 1.250 |
| 7,00 | | 6.400 | 2.100 | 4.500 | 1.100 | 7.400 | 2.400 | 4.500 | 1.100 |
| 8,00 | | 5.600 | 1.800 | 3.900 | 950 | 6.500 | 2.100 | 3.900 | 950 |
| 9,00 | | 5.000 | 1.600 | 3.500 | 850 | 5.800 | 1.900 | 3.500 | 850 |
| 10,00 | | 4.500 | 1.450 | 3.100 | 750 | 5.200 | 1.700 | 3.150 | 750 |
| 12,50 | | 3.600 | 1.150 | 2.500 | 600 | 4.200 | 1.350 | 2.500 | 600 |
| 15,00 | | 3.000 | 960 | 2.100 | 500 | 3.500 | 1.150 | 2.100 | 500 |
| Depth and wide of cut | $a_p$ | 0,02 DC | | 0,02 DC | | 0,02 DC | | 0,02 DC | |
| | $a_e$ | 0,05 DC | | 0,05 DC | | 0,05 DC | | 0,05 DC | |



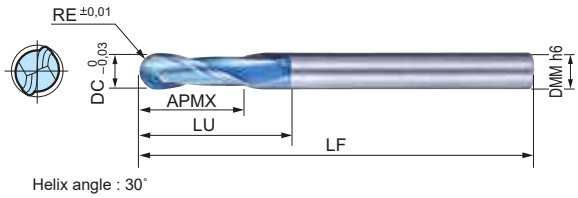


● = Euro stock

## DLC (Diamond Like Carbon) Coating

2

DLC coated carbide grade: DL1200



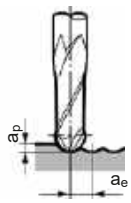

## Endmills

(mm)

| Cat. No. | Stock | RE | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|---|
| SNB 2020 DL | ● | 1,0 | 2,0 | 3 | 5 | 60 | 6 |
| 2030 DL | ● | 1,5 | 3,0 | 4,5 | 8 | 80 | 6 |
| SNB 2040 DL | ● | 2,0 | 4,0 | 6 | 12 | 80 | 6 |
| 2050 DL | ● | 2,5 | 5,0 | 7,5 | 14 | 90 | 6 |
| SNB 2060 DL | ● | 3,0 | 6,0 | 9 | - | 100 | 6 |
| 2080 DL | ● | 4,0 | 8,0 | 12 | - | 100 | 8 |
| 2100 DL | ● | 5,0 | 10,0 | 15 | - | 120 | 10 |
| SNB 2120 DL | ● | 6,0 | 12,0 | 18 | - | 120 | 12 |
| 2160 DL | ● | 8,0 | 16,0 | 24 | - | 160 | 16 |

## Characteristics / Application

- Very smooth AURORA COAT results in low adhesion as well as good surface finish
- With lower cutting forces and high rigidity, this series is suitable for low rigidity machine




## Recommended Cutting Conditions

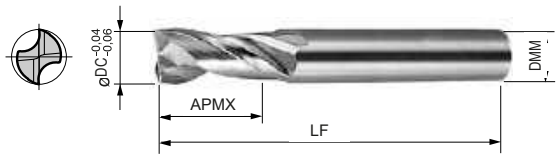
| Work Material | | Aluminum Alloy | | | |
|---|---|---|---|---|---|
| Cutting data / RE (mm) | | Wet (Emulsion) | | Dry | |
| | | Speed (rpm) | Feed (mm/min) | Speed (rpm) | Feed (mm/min) |
| 1,0 | | 48.000 | 1.500 | 48.000 | 1.000 |
| 1,5 | | 48.000 | 2.100 | 48.000 | 1.500 |
| 2,0 | | 31.000 | 2.800 | 31.000 | 2.000 |
| 2,5 | | 24.000 | 2.800 | 24.000 | 2.000 |
| 3,0 | | 20.000 | 2.800 | 20.000 | 2.000 |
| 4,0 | | 15.000 | 2.800 | 15.000 | 2.000 |
| 5,0 | | 13.000 | 3.000 | 13.000 | 2.100 |
| 6,0 | | 10.000 | 3.000 | 10.000 | 2.100 |
| 8,0 | | 7.700 | 3.000 | 7.700 | 2.100 |
| Depth and wide of cut | $a_p$ | 1,5 DC | | 1,0 DC | |
| | $a_e$ | 0,2 DC | | (DC) | |

● = Euro stock

# ASM 2000 Type

2

Carbide grade: H1 (Micrograin)




Helix angle : 30˚
Corner : Sharp edge

## ■ Endmills

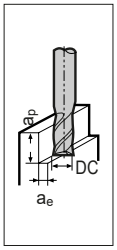
(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| ASM 2020 | ❑ | 2,0 | 6 | 40 | 4 |
| 2030 | ❑ | 3,0 | 10 | 45 | 6 |
| 2040 | ❑ | 4,0 | 12 | 45 | 6 |
| 2050 | ❑ | 5,0 | 15 | 50 | 6 |
| ASM 2060 | ❑ | 6,0 | 15 | 50 | 6 |
| 2080 | ❑ | 8,0 | 18 | 60 | 8 |
| 2100 | ❑ | 10,0 | 22 | 71 | 10 |
| ASM 2120 | ❑ | 12,0 | 25 | 75 | 12 |
| 2160 | | 16,0 | 32 | 90 | 16 |

## Recommended Conditions

(Shoulder processing) $a_p$ =1,5 x DC
$a_e$ =0,1 x DC

| DC \ Material | | Al-alloy | Cast iron |
|---|---|---|---|
| 1 – 2,5 | $v_c$ | 100-**200**-300 | 100-**120**-150 |
| | $f_t$ | 0,004–0,017 | 0,008–0,020 |
| 3 – 5 | $v_c$ | 100-**200**-300 | 100-**120**-150 |
| | $f_t$ | 0,018–0,036 | 0,027–0,060 |
| 6 – 12 | $v_c$ | 100-**200**-300 | 100-**120**-150 |
| | $f_t$ | 0,038–0,070 | 0,065–0,157 |
| 14 – 16 | $v_c$ | 100-**200**-300 | 100-**120**-150 |
| | $f_t$ | 0,075–0,125 | 0,160–0,250 |




$v_c$ =m/min $f_t$ =mm/tooth

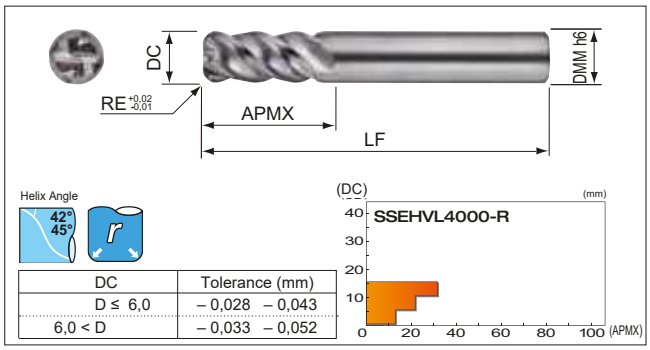
❑ = Delivery on request

## Anti-Vibration Type Radius Endmills for Exotic Alloys

# SSEHVL 4000-R Type

Uncoated Carbide | 4

| Structal Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ○ | ◎ | | | | |




| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,028 – 0,043 |
| 6,0 < D | – 0,033 – 0,052 |

Carbide grade: EH520

## Endmills

(mm)

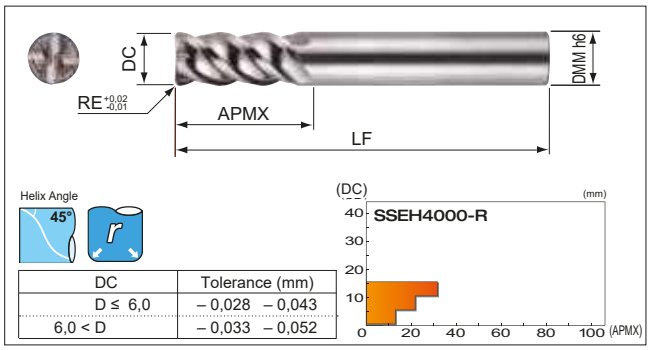
| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| SSEHVL 4045-R05 | ● | 4,5 | 0,5 | 12 | 50 | 6 |
| SSEHVL 4045-R10 | ● | 4,5 | 1,0 | 12 | 50 | 6 |
| SSEHVL 4050-R05 | ● | 5,0 | 0,5 | 13 | 60 | 6 |
| SSEHVL 4050-R10 | ● | 5,0 | 1,0 | 13 | 60 | 6 |
| SSEHVL 4060-R10 | ● | 6,0 | 1,0 | 13 | 60 | 6 |
| SSEHVL 4080-R10 | ● | 8,0 | 1,0 | 19 | 80 | 8 |
| SSEHVL 4100-R10 | ● | 10,0 | 1,0 | 22 | 90 | 10 |
| SSEHVL 4100-R30 | ● | 10,0 | 3,0 | 22 | 90 | 10 |
| SSEHVL 4120-R10 | ● | 12,0 | 1,0 | 26 | 90 | 12 |
| SSEHVL 4120-R30 | ● | 12,0 | 3,0 | 26 | 90 | 12 |
| SSEHVL 4160-R10 | ● | 16,0 | 1,0 | 32 | 115 | 16 |
| SSEHVL 4160-R30 | ● | 16,0 | 3,0 | 32 | 115 | 16 |

## Radius Endmills for Exotic Alloys

# SSEH 4000-R Type

Uncoated Carbide | 4

| Structal Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel 45~55 HRC | Hardened Steel 55~60 HRC | Hardened Steel 60~65 HRC | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast iron | Al Alloy | Cu Alloy | Graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ○ | ◎ | | | | |




| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,028 – 0,043 |
| 6,0 < D | – 0,033 – 0,052 |

Carbide grade: EH520

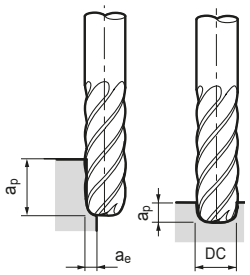
## Endmills

(mm)

| Cat. No. | Stock | DC | APMX | LU | LF | DMM |
|---|---|---|---|---|---|---|
| SSEH 4045-R05 | ● | 4,5 | 0,5 | 12 | 50 | 6 |
| SSEH 4045-R10 | ● | 4,5 | 1,0 | 12 | 50 | 6 |
| SSEH 4050-R05 | ● | 5,0 | 0,5 | 13 | 60 | 6 |
| SSEH 4050-R10 | ● | 5,0 | 1,0 | 13 | 60 | 6 |
| SSEH 4060-R10 | ● | 6,0 | 1,0 | 13 | 60 | 6 |
| SSEH 4080-R10 | ● | 8,0 | 1,0 | 19 | 80 | 8 |
| SSEH 4100-R10 | ● | 10,0 | 1,0 | 22 | 90 | 10 |
| SSEH 4100-R30 | ● | 10,0 | 3,0 | 22 | 90 | 10 |
| SSEH 4120-R10 | ● | 12,0 | 1,0 | 26 | 90 | 12 |
| SSEH 4120-R30 | ● | 12,0 | 3,0 | 26 | 90 | 12 |
| SSEH 4160-R10 | ● | 16,0 | 1,0 | 32 | 115 | 16 |
| SSEH 4160-R30 | ● | 16,0 | 3,0 | 32 | 115 | 16 |

## Characteristics / Application

1. For stable machining, a more rigid machine is recommended.
2. Wet machining is recommended for stainless steel and heat resistant alloy applications.
3. If cutting noise and vibration are present, please change the cutting conditions accordingly.




### ● Shoulder Milling

| Work Material / Cond. / DC (mm) | Stainless Steel Spindle Speed (rpm) | Stainless Steel Feed Rate (mm/min) | Titanium Alloy Spindle Speed (rpm) | Titanium Alloy Feed Rate (mm/min) | Heat Resistive Steel Spindle Speed (rpm) | Heat Resistive Steel Feed Rate (mm/min) |
|---|---|---|---|---|---|---|
| 4.5 | 2.300 | 120 | 4.600 | 370 | 1.600 | 130 |
| 5.0 | 2.000 | 130 | 4.100 | 410 | 1.500 | 150 |
| 6.0 | 1.700 | 130 | 3.400 | 400 | 1.200 | 140 |
| 8.0 | 1.300 | 130 | 2.600 | 360 | 900 | 130 |
| 10.0 | 1.000 | 130 | 2.100 | 340 | 700 | 110 |
| 12.0 | 800 | 110 | 1.700 | 300 | 600 | 100 |
| 16.0 | 600 | 90 | 1.300 | 260 | 500 | 100 |
| Shoulder cutting $a_p$ | 1,5 DC | | | | | |
| Shoulder cutting $a_e$ | 0,1 DC | | 0,05 DC | | 0,05 DC | |

### ● Grooving

| Work Material / Cond. / DC (mm) | Stainless Steel Spindle Speed (rpm) | Stainless Steel Feed Rate (mm/min) | Titanium Alloy Spindle Speed (rpm) | Titanium Alloy Feed Rate (mm/min) | Heat Resistive Steel Spindle Speed (rpm) | Heat Resistive Steel Feed Rate (mm/min) |
|---|---|---|---|---|---|---|
| 4,5 | 1.800 | 50 | 3.200 | 250 | 1.300 | 110 |
| 5,0 | 1.600 | 50 | 2.900 | 290 | 1.200 | 120 |
| 6,0 | 1.400 | 50 | 2.400 | 290 | 1.000 | 120 |
| 8,0 | 1.000 | 50 | 1.800 | 250 | 700 | 90 |
| 10,0 | 800 | 50 | 1.400 | 230 | 600 | 100 |
| 12,0 | 600 | 50 | 1.200 | 210 | 500 | 90 |
| 16,0 | 500 | 40 | 900 | 180 | 400 | 80 |
| Grooving $a_p$ | 0,3 DC | | 0,2 DC | | 0,15 DC | |

### ● Shoulder Milling

| Work Material / Cond. / DC (mm) | Stainless Steel Spindle Speed (rpm) | Stainless Steel Feed Rate (mm/min) | Titanium Alloy Spindle Speed (rpm) | Titanium Alloy Feed Rate (mm/min) | Heat Resistive Steel Spindle Speed (rpm) | Heat Resistive Steel Feed Rate (mm/min) |
|---|---|---|---|---|---|---|
| 4,5 | 1.800 | 90 | 3.500 | 280 | 1.400 | 110 |
| 5,0 | 1.600 | 100 | 3.200 | 320 | 1.300 | 130 |
| 6,0 | 1.300 | 100 | 2.700 | 320 | 1.100 | 130 |
| 8,0 | 1.000 | 100 | 2.000 | 280 | 800 | 110 |
| 10,0 | 800 | 100 | 1.600 | 260 | 600 | 100 |
| 12,0 | 700 | 100 | 1.300 | 230 | 500 | 90 |
| 16,0 | 500 | 80 | 1.000 | 200 | 400 | 80 |
| Shoulder cutting $a_p$ | 1,5 DC | | | | | |
| Shoulder cutting $a_e$ | 0,1 DC | | 0,05 DC | | 0,05 DC | |

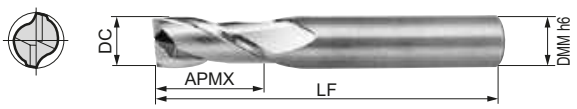
### ● Grooving

| Work Material / Cond. / DC (mm) | Stainless Steel Spindle Speed (rpm) | Stainless Steel Feed Rate (mm/min) | Titanium Alloy Spindle Speed (rpm) | Titanium Alloy Feed Rate (mm/min) | Heat Resistive Steel Spindle Speed (rpm) | Heat Resistive Steel Feed Rate (mm/min) |
|---|---|---|---|---|---|---|
| 4,5 | 1.400 | 40 | 2.500 | 200 | 1.100 | 90 |
| 5,0 | 1.300 | 40 | 2.200 | 220 | 1.000 | 100 |
| 6,0 | 1.100 | 40 | 1.900 | 230 | 800 | 100 |
| 8,0 | 800 | 40 | 1.400 | 200 | 600 | 80 |
| 10,0 | 600 | 40 | 1.100 | 180 | 500 | 80 |
| 12,0 | 500 | 40 | 900 | 160 | 400 | 70 |
| 16,0 | 400 | 30 | 700 | 140 | 300 | 60 |
| Grooving $a_p$ | 0,3 DC | | 0,2 DC | | 0,15 DC | |

# Solid Carbide Spiral Endmills
# SSM 2000 Type (ø0,2–ø4,3)

2

Carbide grade: A1 (Micrograin)




Helix angle : 30˚
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |

## ■ Endmills

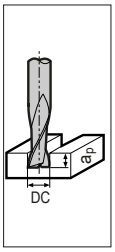
(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| SSM 2002 | ❑ | 0,2 | 0,5 | 40 | 3 |
| 2003 | ● | 0,3 | 1,0 | 40 | 3 |
| 2004 | ● | 0,4 | 1,0 | 40 | 3 |
| 2005 | ❍ | 0,5 | 1,5 | 40 | 3 |
| SSM 2006 | ● | 0,6 | 1,5 | 40 | 3 |
| 2007 | ❍ | 0,7 | 1,5 | 40 | 3 |
| 2008 | ● | 0,8 | 2,0 | 40 | 3 |
| 2009 | ❑ | 0,9 | 2,0 | 40 | 3 |
| 2010 | ● | 1,0 | 3,0 | 40 | 4 |
| SSM 2011 | ❑ | 1,1 | 3,0 | 40 | 4 |
| 2012 | ❑ | 1,2 | 3,0 | 40 | 4 |
| 2013 | | 1,3 | 3,0 | 40 | 4 |
| 2014 | ❑ | 1,4 | 3,0 | 40 | 4 |
| 2015 | ● | 1,5 | 5,0 | 40 | 4 |
| SSM 2016 | | 1,6 | 5,0 | 40 | 4 |
| 2017 | | 1,7 | 5,0 | 40 | 4 |
| 2018 | ❑ | 1,8 | 5,0 | 40 | 4 |
| 2019 | ❑ | 1,9 | 5,0 | 40 | 4 |
| 2020 | ● | 2,0 | 6,0 | 40 | 4 |
| SSM 2021 | | 2,1 | 6,0 | 40 | 4 |
| 2022 | ❑ | 2,2 | 6,0 | 40 | 4 |
| 2023 | ❑ | 2,3 | 6,0 | 40 | 4 |
| 2024 | ❑ | 2,4 | 6,0 | 40 | 4 |
| 2025 | ● | 2,5 | 8,0 | 40 | 4 |
| SSM 2026 | ❑ | 2,6 | 8,0 | 40 | 4 |
| 2027 | ❑ | 2,7 | 8,0 | 40 | 4 |
| 2028 | ❑ | 2,8 | 8,0 | 40 | 4 |
| 2029 | | 2,9 | 8,0 | 40 | 4 |
| 2030 | ● | 3,0 | 8,0 | 45 | 6 |
| SSM 2031 | ❑ | 3,1 | 8,0 | 45 | 6 |
| 2032 | ● | 3,2 | 8,0 | 45 | 6 |
| 2033 | | 3,3 | 8,0 | 45 | 6 |
| 2034 | ❑ | 3,4 | 8,0 | 45 | 6 |
| 2035 | ● | 3,5 | 8,0 | 45 | 6 |
| SSM 2036 | | 3,6 | 10,0 | 45 | 6 |
| 2037 | | 3,7 | 10,0 | 45 | 6 |
| 2038 | ❑ | 3,8 | 10,0 | 45 | 6 |
| 2039 | ❑ | 3,9 | 10,0 | 45 | 6 |
| 2040 | ● | 4,0 | 10,0 | 45 | 6 |
| SSM 2041 | ❑ | 4,1 | 10,0 | 45 | 6 |
| 2042 | ❑ | 4,2 | 10,0 | 45 | 6 |
| 2043 | | 4,3 | 10,0 | 45 | 6 |

## Recommended Conditions

(Slotting) DC < ø 3; $a_p$ =0,5 x DC
DC ≥ ø 3; $a_p$ =1,0 x DC

| DC | Material | Carbon steel, Alloy steel (BelowHRC30) | Carbon steel, Alloy steel (BelowHRC40) | Carbon steel, Alloy steel (BelowHRC45) | Cast iron |
|---|---|---|---|---|---|
| 0,2–0,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | –0,002 | –0,002 | –0,001 | 0,002–0,004 |
| 1,0–2,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,003–0,010 | 0,003–0,010 | 0,002–0,005 | 0,005–0,017 |
| 3,0–4,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,012–0,024 | 0,012–0,024 | 0,006–0,011 | 0,018–0,040 |

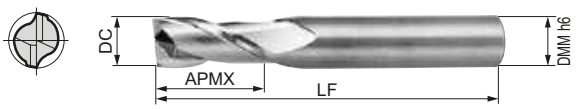



$v_c$ =m/min $f_t$ =mm/tooth

# Solid Carbide Spiral Endmills
# SSM 2000 Type (ø4,4–ø8,5)

2

Carbide grade: A1 (Micrograin)




Helix angle : 30˚
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |

## ■ Endmills

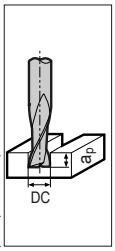
(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| SSM 2044 | ❑ | 4,4 | 10 | 45 | 6 |
| 2045 | ❑ | 4,5 | 10 | 45 | 6 |
| SSM 2046 | | 4,6 | 12 | 50 | 6 |
| 2047 | | 4,7 | 12 | 50 | 6 |
| 2048 | ❑ | 4,8 | 12 | 50 | 6 |
| 2049 | ❑ | 4,9 | 12 | 50 | 6 |
| 2050 | ● | 5,0 | 12 | 50 | 6 |
| SSM 2051 | ❑ | 5,1 | 12 | 50 | 6 |
| 2052 | ❑ | 5,2 | 12 | 50 | |
| 2053 | | 5,3 | | 50 | |
| 2054 | | 5,4 | 12 | 50 | 6 |
| 2055 | ❑ | 5,5 | 12 | 50 | 6 |
| SSM 2056 | | 5,6 | 12 | 50 | 6 |
| 2057 | | 5,7 | 12 | 50 | 6 |
| 2058 | | 5,8 | 12 | 50 | 6 |
| 2059 | | 5,9 | 12 | 50 | 6 |
| 2060 | ● | 6,0 | 12 | 50 | 6 |
| SSM 2061 | | 6,1 | 12 | 50 | 6 |
| 2062 | ❍ | 6,2 | 12 | 50 | 6 |
| 2063 | ❑ | 6,3 | 12 | 50 | 6 |
| 2064 | ❑ | 6,4 | 12 | | 6 |
| 2065 | ❑ | 6,5 | 12 | 50 | 8 |
| SSM 2066 | ❑ | 6,6 | | 55 | 8 |
| 2067 | | 6,7 | 15 | 55 | 8 |
| 2068 | | 6,8 | 15 | 55 | 8 |
| 2069 | | 6,9 | 15 | 55 | 8 |
| 2070 | ● | 7,0 | 15 | 55 | 8 |
| SSM 2071 | ❑ | 7,1 | 15 | 55 | 8 |
| 2072 | | 7,2 | 15 | 55 | 8 |
| 2073 | | 7,3 | 15 | 55 | 8 |
| 2074 | | 7,4 | 15 | 55 | 8 |
| 2075 | ❍ | 7,5 | 15 | 55 | 8 |
| SSM 2076 | | 7,6 | 15 | 55 | 8 |
| 2077 | | 7,7 | 15 | 55 | 8 |
| 2078 | ❑ | 7,8 | 15 | 55 | 8 |
| 2079 | | 7,9 | 15 | 55 | 8 |
| 2080 | ● | 8,0 | 15 | 55 | 8 |
| SSM 2081 | ❑ | 8,1 | 15 | 55 | 8 |
| 2082 | ❍ | 8,2 | 15 | 55 | 8 |
| 2083 | | 8,3 | 15 | 55 | 8 |
| 2084 | | 8,4 | 15 | 55 | 8 |
| 2085 | ❍ | 8,5 | 15 | 55 | 10 |

## Recommended Conditions

(Slotting) DC ≥ ø3; $a_p$ =1,0 x DC

| DC | Material | Carbon steel, Alloy steel (BelowHRC30) | Carbon steel, Alloy steel (BelowHRC40) | Carbon steel, Alloy steel (BelowHRC45) | Cast iron |
|---|---|---|---|---|---|
| 5–5,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,012–0,024 | 0,012–0,024 | 0,006–0,011 | 0,018–0,040 |
| 6–8,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,025–0,050 | 0,025–0,050 | 0,013–0,025 | 0,045–0,105 |



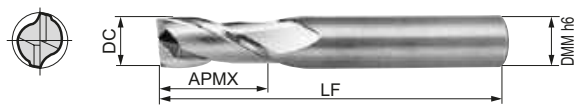

$v_c$ =m/min $f_t$ =mm/tooth

● = Euro stock
❍ = Japan stock
❑ = Delivery on request

# Solid Carbide Spiral Endmills
# SSM 2000 Type (ø8,6–ø30)

2

Carbide grade: A1 (Micrograin)




Helix angle : 30°
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| 6,0 < D ≤ 10,0 | – 0,015 – 0,040 |
| 10,0 < D | – 0,020 – 0,050 |

## ■ Endmills

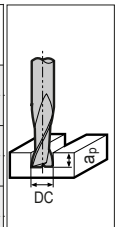
(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| SSM 2086 | ❍ | 8,6 | 15 | 55 | 10 |
| 2087 | | 8,7 | 15 | 55 | 10 |
| 2088 | ❑ | 8,8 | 15 | 55 | 10 |
| 2089 | | 8,9 | 15 | 55 | 10 |
| 2090 | ❑ | 9,0 | 15 | 55 | 10 |
| SSM 2091 | | 9,1 | 15 | 55 | 10 |
| 2092 | | 9,2 | 15 | 55 | 10 |
| 2093 | | 9,3 | 15 | 55 | 10 |
| 2094 | | 9,4 | 15 | 55 | 10 |
| 2095 | | 9,5 | 15 | 55 | 10 |
| SSM 2096 | | 9,6 | 18 | 65 | 10 |
| 2097 | | 9,7 | 18 | 65 | 10 |
| 2098 | | 9,8 | 18 | 65 | 10 |
| 2099 | | 9,9 | 18 | 65 | 10 |
| 2100 | ● | 10,0 | 18 | 65 | 10 |
| SSM 2105 | | 10,5 | 18 | 70 | 12 |
| 2110 | ❑ | 11,0 | 18 | 70 | 12 |
| 2115 | ❑ | 11,5 | 18 | 70 | 12 |
| 2120 | ● | 12,0 | 18 | 70 | 12 |
| 2125 | | 12,5 | 20 | 80 | 16 |
| SSM 2130 | ❑ | 13,0 | 20 | 80 | 16 |
| 2135 | | 13,5 | | 80 | 16 |
| 2140 | ❍ | 14,0 | 20 | 80 | 16 |
| 2145 | | 14,5 | 25 | 80 | 16 |
| 2150 | ❑ | 15,0 | 25 | 80 | 16 |
| SSM 2155 | | 15,5 | 35 | 90 | 16 |
| 2160 | ❍ | 16,0 | 35 | 90 | 16 |
| 2165 | | 16,5 | 35 | 90 | 20 |
| 2170 | ❍ | 17,0 | 35 | 90 | 20 |
| 2175 | ❑ | 17,5 | 40 | 105 | 20 |
| SSM 2180 | ❑ | 18,0 | 40 | 105 | 20 |
| 2185 | | 18,5 | 40 | 105 | 20 |
| 2190 | | 19,0 | 40 | 105 | 20 |
| 2195 | | 19,5 | 40 | 105 | 20 |
| 2200 | ❍ | 20,0 | 40 | 105 | 20 |
| SSM 2210 | ❑ | 21,0 | 40 | 105 | 25 |
| 2220 | ❑ | 22,0 | 40 | | 25 |
| 2230 | ❑ | | 45 | 115 | 25 |
| 2240 | | 24,0 | 45 | 115 | 25 |
| 2250 | ❑ | | 50 | | 25 |
| SSM 2300 | | | 55 | 130 | 32 |

## Recommended Conditions

(Slotting) DC ≥ ø3; $a_p$ =1,0 x DC

| DC | | Carbon steel, Alloy steel (BelowHRC30) | Carbon steel, Alloy steel (BelowHRC40) | Carbon steel, Alloy steel (BelowHRC45) | Cast iron |
|---|---|---|---|---|---|
| 9–12,5 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,025–0,050 | 0,025–0,050 | 0,013–0,025 | 0,045–0,105 |
| 13–19,5 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,055–0,085 | 0,055–0,085 | 0,030–0,050 | 0,110–0,170 |
| 20–30 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,095–0,120 | 0,095–0,120 | 0,055–0,070 | 0,185–0,260 |

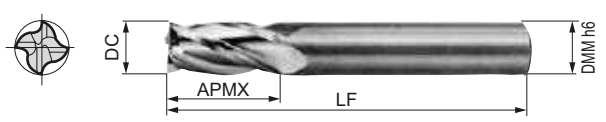



$v_c$ =m/min $f_t$ =mm/tooth

# Solid Carbide Spiral Endmills
# SSM 4000 Type (ø1,5–ø25)

4

Carbide grade: A1 (Micrograin)




Helix angle : 30°
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |
| 6,0 < D ≤ 10,0 | – 0,015 – 0,040 |
| 10,0 < D | – 0,020 – 0,050 |

## ■ Endmills

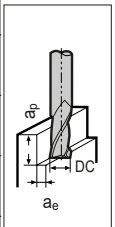
(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| SSM 4015 | ❍ | 1,5 | 5 | 40 | 4 |
| 4020 | ● | 2,0 | 6 | 40 | 4 |
| 4025 | ❑ | 2,5 | 8 | 40 | 4 |
| 4030 | ● | 3,0 | 8 | 45 | 6 |
| 4035 | ❑ | 3,5 | 8 | 45 | 6 |
| SSM 4040 | ● | 4,0 | 10 | 45 | 6 |
| 4045 | ❑ | 4,5 | 10 | 45 | 6 |
| 4050 | ● | 5,0 | 12 | 50 | 6 |
| 4055 | ❑ | 5,5 | 12 | 50 | 6 |
| 4060 | ● | 6,0 | 12 | 50 | 6 |
| SSM 4065 | ❑ | 6,5 | 12 | 50 | 8 |
| 4070 | ❑ | 7,0 | 15 | 55 | 8 |
| 4075 | ❍ | 7,5 | 15 | 55 | 8 |
| 4080 | ● | 8,0 | 15 | 55 | 8 |
| 4085 | ❑ | 8,5 | 15 | 55 | 10 |
| SSM 4090 | ❍ | 9,0 | 15 | 55 | 10 |
| 4095 | ❍ | 9,5 | 15 | 55 | 10 |
| 4100 | ● | 10,0 | 18 | 65 | 10 |
| 4105 | | 10,5 | 18 | 65 | 12 |
| 4110 | ❑ | 11,0 | 18 | 70 | 12 |
| SSM 4120 | ● | 12,0 | 18 | 70 | 12 |
| 4130 | | 13,0 | 20 | 80 | 16 |
| 4140 | ❍ | 14,0 | 20 | 80 | 16 |
| 4150 | ❑ | 15,0 | 25 | 80 | 16 |
| 4160 | ● | 16,0 | 35 | 90 | 16 |
| SSM 4170 | ❑ | 17,0 | 35 | 90 | 20 |
| 4180 | ❑ | 18,0 | 40 | 105 | 20 |
| 4190 | | 19,0 | 40 | 105 | 20 |
| 4200 | ● | 20,0 | 40 | 105 | 20 |
| 4210 | | 21,0 | 40 | 105 | 25 |
| SSM 4220 | | 22,0 | 40 | 105 | 25 |
| 4230 | | 23,0 | 45 | 115 | 25 |
| 4240 | | 24,0 | 45 | 115 | 25 |
| 4250 | ❑ | 25,0 | 50 | 120 | 25 |

## Recommended Conditions

(Shoulder processing) $a_p$ =1,5 x DC
$a_e$ =0,1 x DC

| DC | | Carbon steel, Alloy steel (BelowHRC30) | Carbon steel, Alloy steel (BelowHRC40) | Carbon steel, Alloy steel (BelowHRC45) | Cast iron |
|---|---|---|---|---|---|
| 1 ~ 2,9 | $v_c$ | 40–**50**–60 | 30–**0**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,004–0,017 | 0,004–0,017 | 0,002–0,008 | 0,008–0,020 |
| 3 ~ 5,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,018–0,036 | 0,018–0,036 | 0,009–0,018 | 0,027–0,060 |
| 6 ~ 12,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,038–0,070 | 0,038–0,070 | 0,019–0,035 | 0,065–0,157 |
| 13 ~ 19,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,075–0,125 | 0,075–0,125 | 0,040–0,075 | 0,160–0,250 |
| 20 ~ | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,135–0,170 | 0,135–0,170 | 0,085–0,110 | 0,257–0,390 |

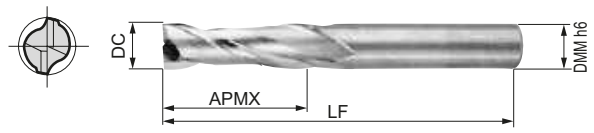



$v_c$ =m/min $f_t$ =mm/tooth

# Long Spiral Endmills
# LSM 2000 Type

2

Carbide grade: A1 (Micrograin)




Helix angle : 30˚
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |
| 6,0 < D ≤ 10,0 | – 0,015 – 0,040 |
| 10,0 < D | – 0,020 – 0,050 |

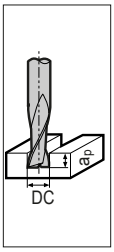
## ■ Endmills

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| LSM 2030 | ▲ | 3,0 | 12 | 50 | 6 |
| 2035 | ▲ | 3,5 | 12 | 50 | 6 |
| 2040 | ▲ | 4,0 | 15 | 50 | 6 |
| 2045 | ▲ | 4,5 | 15 | 50 | 6 |
| 2050 | ▲ | 5,0 | 18 | 55 | 6 |
| LSM 2055 | ▲ | 5,5 | 18 | 55 | 6 |
| 2060 | ▲ | 6,0 | 18 | 55 | 6 |
| 2065 | ▲ | 6,5 | 18 | 55 | 8 |
| 2070 | ▲ | 7,0 | 25 | 65 | 8 |
| 2075 | ▲ | 7,5 | 25 | 65 | 8 |
| LSM 2080 | ▲ | 8,0 | 25 | 65 | 8 |
| 2085 | ▲ | 8,5 | 25 | 65 | 10 |
| 2090 | ▲ | 9,0 | 25 | 65 | 10 |
| 2095 | ▲ | 9,5 | 25 | 65 | 10 |
| 2100 | ▲ | 10,0 | 30 | 75 | 10 |
| LSM 2105 | | 10,5 | 30 | 80 | 12 |
| 2110 | ▲ | 11,0 | 30 | 80 | 12 |
| 2120 | ▲ | 12,0 | 30 | 80 | 12 |
| 2130 | ▲ | 13,0 | 35 | 95 | 16 |
| 2140 | ▲ | 14,0 | 40 | 95 | 16 |
| LSM 2150 | ▲ | 15,0 | 40 | 95 | 16 |
| 2160 | ▲ | 16,0 | 50 | 105 | 16 |
| 2170 | | 17,0 | 50 | 105 | 20 |
| 2180 | ▲ | 18,0 | 50 | 115 | 20 |
| 2190 | | 19,0 | 55 | 120 | 20 |
| LSM 2200 | ▲ | 20,0 | 55 | 120 | 20 |
| 2210 | | 21,0 | 60 | 125 | 25 |
| 2220 | | 22,0 | 60 | 135 | 25 |
| 2230 | | 23,0 | 60 | 135 | 25 |
| 2240 | | 24,0 | 65 | 140 | 25 |

## Recommended Conditions

(Slotting) DC ≥ ø3; $a_p$ =1,0 x DC

| DC | Material | Carbon steel, Alloy steel (BelowHRC30) | Carbon steel, Alloy steel (BelowHRC40) | Carbon steel, Alloy steel (BelowHRC45) | Cast iron |
|---|---|---|---|---|---|
| 3–5,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,009–0,018 | 0,009–0,018 | 0,005–0,008 | 0,014–0,030 |
| 6–12,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,019–0,038 | 0,019–0,038 | 0,009–0,019 | 0,034–0,079 |
| 13–19,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,041–0,064 | 0,041–0,064 | 0,023–0,038 | 0,083–0,128 |
| 20– | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,071–0,090 | 0,071–0,090 | 0,041–0,052 | 0,139–0,195 |



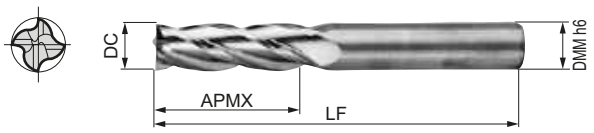

$v_c$ =m/min $f_t$ =mm/tooth

▲ = To be replaced by new item

# Long Spiral Endmills
# LSM 4000 Type

4

Carbide grade: A1 (Micrograin)




Helix angle : 30˚
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |
| 6,0 < D ≤ 10,0 | – 0,015 – 0,040 |
| 10,0 < D | – 0,020 – 0,050 |

## ■ Endmills

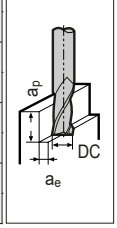
(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| LSM 4030 | ▲ | 3,0 | 12 | 50 | 6 |
| 4035 | ▲ | 3,5 | 12 | 50 | 6 |
| 4040 | ▲ | 4,0 | 15 | 50 | 6 |
| 4045 | | 4,5 | 15 | 50 | 6 |
| 4050 | ▲ | 5,0 | 18 | 55 | 6 |
| LSM 4055 | ▲ | 5,5 | 18 | 55 | 6 |
| 4060 | ▲ | 6,0 | 18 | 55 | 6 |
| 4065 | ▲ | 6,5 | 18 | 55 | 8 |
| 4070 | ▲ | 7,0 | 25 | 65 | 8 |
| 4075 | ▲ | 7,5 | 25 | 65 | 8 |
| LSM 4080 | ▲ | 8,0 | 25 | 65 | 8 |
| 4085 | ▲ | 8,5 | 25 | 65 | 10 |
| 4090 | ▲ | 9,0 | 25 | 65 | 10 |
| 4095 | ▲ | 9,5 | 25 | 65 | 10 |
| 4100 | ▲ | 10,0 | 30 | 75 | 10 |
| LSM 4105 | | 10,5 | 30 | 80 | 12 |
| 4110 | ▲ | 11,0 | 30 | 80 | 12 |
| 4120 | ▲ | 12,0 | 30 | 80 | 12 |
| 4130 | ▲ | 13,0 | 35 | 95 | 16 |
| 4140 | ▲ | 14,0 | 40 | 95 | 16 |
| LSM 4150 | ▲ | 15,0 | 40 | 95 | 16 |
| 4160 | ▲ | 16,0 | 50 | 105 | 16 |
| 4170 | | 17,0 | 50 | 105 | 20 |
| 4180 | ▲ | 18,0 | 50 | 115 | 20 |
| 4190 | | 19,0 | 55 | 120 | 20 |
| LSM 4200 | ▲ | 20,0 | 55 | 120 | 20 |
| 4210 | | 21,0 | 60 | 125 | 25 |
| 4220 | | 22,0 | 60 | 135 | 25 |
| 4230 | | 23,0 | 60 | 135 | 25 |
| 4240 | | 24,0 | 65 | 140 | 25 |
| 4250 | ▲ | 25,0 | 65 | 140 | 25 |

## Recommended Conditions

(Shoulder processing) $a_p$ =1,5 x DC
$a_e$ = 0,1 x DC

| DC | Material | Carbon steel, Alloy steel (BelowHRC30) | Carbon steel, Alloy steel (BelowHRC40) | Carbon steel, Alloy steel (BelowHRC45) | Cast iron |
|---|---|---|---|---|---|
| 3–5,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,014–0,027 | 0,014–0,027 | 0,007–0,014 | 0,020–0,045 |
| 6–12,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,028–0,053 | 0,028–0,053 | 0,014–0,026 | 0,048–0,118 |
| 13–19,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,056–0,094 | 0,056–0,094 | 0,030–0,056 | 0,120–0,188 |
| 20– | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,101–0,127 | 0,101–0,127 | 0,064–0,082 | 0,193–0,292 |

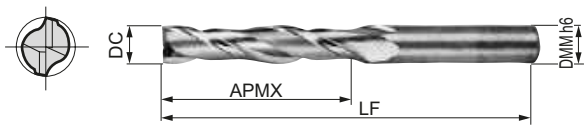



$v_c$ =m/min $f_t$ =mm/tooth

# Extra Long Spiral Endmills
# ELSM 2000 Type

2

Carbide grade: A1 (Micrograin)




Helix angle : 30°
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |
| 6,0 < D ≤ 10,0 | – 0,015 – 0,040 |
| 10,0 < D | – 0,020 – 0,050 |

## ■ Endmills

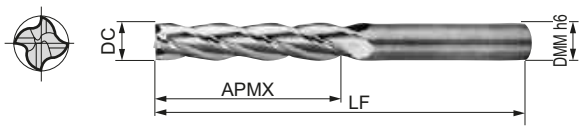
(mm)

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| ELSM 2030 | ▲ | 3,0 | 20 | 55 | 6 |
| 2040 | ▲ | 4,0 | 25 | 60 | 6 |
| 2050 | ▲ | 5,0 | 30 | 65 | 6 |
| 2060 | ▲ | 6,0 | 30 | 65 | 6 |
| 2070 | ▲ | 7,0 | 40 | 85 | 8 |
| ELSM 2080 | ▲ | 8,0 | 40 | 85 | 8 |
| 2090 | ▲ | 9,0 | 40 | 85 | 10 |
| 2100 | ▲ | 10,0 | 50 | 100 | 10 |
| 2110 | ▲ | 11,0 | 50 | 100 | 12 |
| 2120 | ▲ | 12,0 | 50 | 100 | 12 |
| ELSM 2130 | | 13,0 | 70 | 140 | 16 |
| 2140 | ▲ | 14,0 | 70 | 140 | 16 |
| 2150 | | 15,0 | 70 | 140 | 16 |
| 2160 | ▲ | 16,0 | 70 | 140 | 16 |
| 2180 | ▲ | 18,0 | 80 | 160 | 20 |
| ELSM 2200 | ▲ | 20,0 | 85 | 165 | 20 |
| 2220 | | 22,0 | 95 | 180 | 25 |
| 2250 | | 25,0 | 100 | 185 | 25 |

# Extra Long Spiral Endmills
# ELSM 4000 Type

4

Carbide grade: A1 (Micrograin)




Helix angle : 30°
Corner : Sharp edge

| DC | Tolerance (mm) |
|---|---|
| D ≤ 6,0 | – 0,010 – 0,030 |
| 6,0 < D ≤ 10,0 | – 0,015 – 0,040 |
| 10,0 < D | – 0,020 – 0,050 |

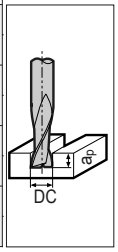
## ■ Endmills

| Cat. No. | Stock | DC | APMX | LF | DMM |
|---|---|---|---|---|---|
| ELSM 4030 | ▲ | 3,0 | 20 | 55 | 6 |
| 4040 | ▲ | 4,0 | 25 | 60 | 6 |
| 4050 | ▲ | 5,0 | 30 | 65 | 6 |
| 4060 | ▲ | 6,0 | 30 | 65 | 6 |
| 4070 | ▲ | 7,0 | 40 | 85 | 8 |
| ELSM 4080 | ▲ | 8,0 | 40 | 85 | 8 |
| 4090 | ▲ | 9,0 | 40 | 85 | 10 |
| 4100 | ▲ | 10,0 | 50 | 100 | 10 |
| 4110 | | 11,0 | 50 | 100 | 12 |
| 4120 | ▲ | 12,0 | 50 | 100 | 12 |
| ELSM 4130 | | 13,0 | 70 | 140 | 16 |
| 4140 | ▲ | 14,0 | 70 | 140 | 16 |
| 4150 | | 15,0 | 70 | 140 | 16 |
| 4160 | ▲ | 16,0 | 70 | 140 | 16 |
| 4170 | | 17,0 | 80 | 160 | 20 |
| ELSM 4180 | ▲ | 18,0 | 80 | 160 | 20 |
| 4190 | | 19,0 | 85 | 165 | 20 |
| 4200 | ▲ | 20,0 | 85 | 165 | 20 |
| 4210 | | 21,0 | 95 | 180 | 25 |
| 4220 | | 22,0 | 95 | 180 | 25 |
| ELSM 4230 | | 23,0 | 95 | 180 | 25 |
| 4240 | | 24,0 | 100 | 180 | 25 |
| 4250 | ▲ | 25,0 | 100 | 180 | 25 |

## Recommended Conditions

(Slotting) DC ≥ ø3; $a_p$ =1,0 x DC

| DC \ Material | | Carbon steel, Alloy steel (BelowHRC30) | Carbon steel, Alloy steel (BelowHRC40) | Carbon steel, Alloy steel (BelowHRC45) | Cast iron |
|---|---|---|---|---|---|
| 3–5,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,006–0,012 | 0,006–0,012 | 0,003–0,006 | 0,009–0,020 |
| 6–12,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,013–0,025 | 0,013–0,025 | 0,006–0,013 | 0,023–0,053 |
| 13–19,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,028–0,043 | 0,028–0,043 | 0,015–0,025 | 0,055–0,085 |
| 20– | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40-**50**-60 |
| | $f_t$ | 0,048–0,060 | 0,048–0,060 | 0,027–0,035 | 0,092–0,130 |

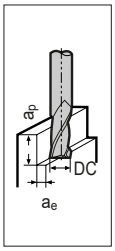



$v_c$ =m/min $f_t$ =mm/tooth

## Recommended Conditions

(Shoulder processing) $a_p$ =1,5 x DC
$a_e$ =0,05 x DC

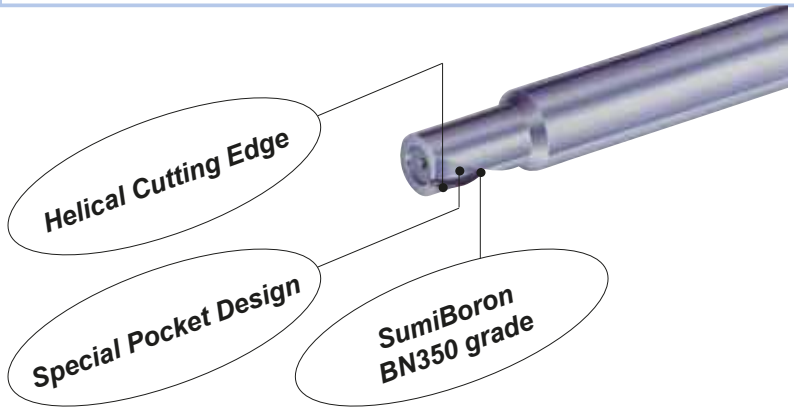
| DC \ Material | | Carbon steel, Alloy steel (BelowHRC30) | Carbon steel, Alloy steel (BelowHRC40) | Carbon steel, Alloy steel (BelowHRC45) | Cast iron |
|---|---|---|---|---|---|
| 3–5,9 | $v_c$ | 40–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,009–0,018 | 0,009–0,018 | 0,005–0,009 | 0,014–0,030 |
| 6–12,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,019–0,035 | 0,019–0,035 | 0,010–0,018 | 0,033–0,079 |
| 13–19,9 | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,038–0,063 | 0,038–0,063 | 0,020–0,038 | 0,080–0,125 |
| 20– | $v_c$ | 40–**50**–60 | 30–**40**–50 | 20–**30**–40 | 40–**50**–60 |
| | $f_t$ | 0,067–0,085 | 0,067–0,085 | 0,042–0,055 | 0,128–0,195 |



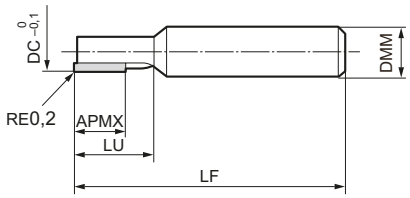

$v_c$ =m/min $f_t$ =mm/tooth

# BNES Type

Spiral CBN Endmill for Hardened Steel




## ■ Endmills BNES Type with 1 Spiral Flute

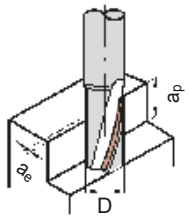



Helix angle : 15°
right-hand cut, right-hand helix

| Cat. No. | Stock | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|
| | BN350 | DC | DMM | APMX | LU | LF |
| BNES 1060 | ❍ | 6,0 | 10 | 7,0 | 11 | 60 |
| 1080 | ❍ | 8,0 | 10 | 10,0 | 14 | 70 |
| 1100 | ❍ | 10,0 | 12 | 12,0 | 17 | 75 |
| 1120 | ❍ | 12,0 | 12 | 14,0 | 20 | 80 |
| 1140 | ❍ | 14,0 | 16 | 16,0 | 21,5 | 80 |

## ■ Recommended Cutting Conditions

Cutting speed: $v_c$ (m/min), Spindle revolutions: n (rpm), Feed per tooth: $f_t$ (mm/tooth), Feed speed: $v_f$ (mm/min)

| Tooling example | DC | Hardened steel ($H_RC$ 50–57) $v_c$ = 100–170 m/min | | | Hardened steel ($H_RC$ 58–65) $v_c$ = 80–150 m/min | | |
|---|---|---|---|---|---|---|---|
|  | 6–8 | $a_e \leq$ 0,1 mm | n = 4000–9000 | $v_f$ (mm/min) = 240–540 | $a_e \leq$ 0,08 mm | n = 3200–8000 | $v_f$ (mm/min) = 150–370 |
| | 10–12 | $a_e \leq$ 0,15 mm | n = 2700–5400 | $v_f$ (mm/min) = 180–360 | $a_e \leq$ 0,12 mm | n = 2100–4800 | $v_f$ (mm/min) 120–270 |
| | 14–16 | $a_e \leq$ 0,2 mm | n = 2000–3800 | $v_f$ (mm/min) = 140–260 | $a_e \leq$ 0,15 mm | n = 1600–3400 | $v_f$ (mm/min) = 110–230 |

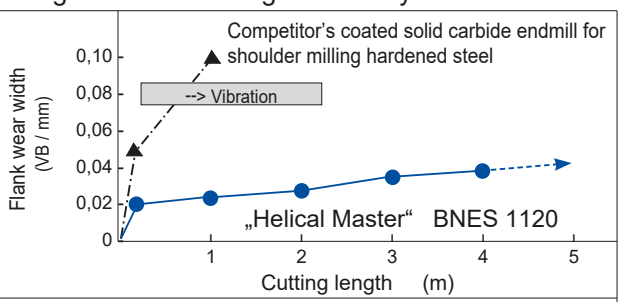


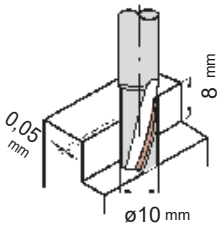
Depth of cut : $a_p \leq$ D

Recommendation: Dry cutting (Air coolant)
Down-cut milling
Minimise the overhang
Use a rigid machine

## ■ Performance

### ● Long Tool Life and High Efficiency



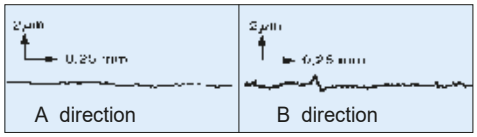

Work material: X155CrVMo12-1
Hardness: $H_RC$ 60

Cutting data:
$v_c$ = 100 m/min (**Helical Master**)
$v_c$ = 40 m/min (Competitor's coated solid carbide endmill)
$v_f$ = 186 mm/min

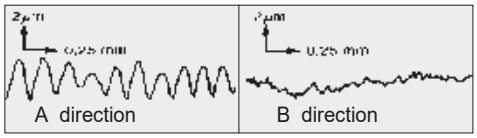
Down-cut milling
Dry cutting

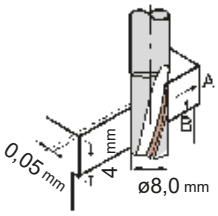
### ● Excellent Surface Roughness

"Helical Master" BNES 1080 ø 8,0




Conventional straight flute CBN endmill, ø 8,0




Work material: 15Cr3
Hardness: $H_RC$ 55–58
Cutting data: $v_c$ = 130 m/min
$v_f$ = 310 mm/min

Down-cut milling
Dry cutting





● = Euro stock
❍ = Japan stock

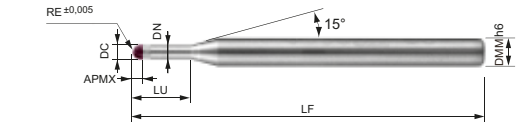
SUMIBORON "MOULD Finish Master"

# BNBP Type

## Characteristics / Application

- High precision machining of hardened steels < HRC70 with long tool life
- Super tough grade SUMIBORON BN350 prevents chipping of the cutting edge
- RE accuracy : ±0,005 mm

## Endmills




※ Endmill Identification

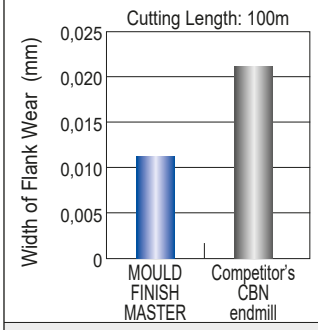
**BNBP 2 R020 - 012 4**

- Shank Diam.
- Neck length (LU)
- Number of teeth
- Radius of ball nose

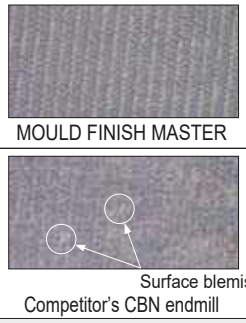
| Cat. No. | Stock | Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | BN350 | RE | DC | LF | DN | DMM | APMX | LU |
| BNBP 2 R020-012 4 | ● | 0,2 | 0,4 | 50 | 0,37 | 4 | 0,3 | 1,2 |
| 2 R030-015 4 | ● | 0,3 | 0,6 | 50 | 0,57 | 4 | 0,4 | 1,5 |
| 2 R050-025 4 | ● | 0,5 | 1,0 | 50 | 0,97 | 4 | 0,6 | 2,5 |
| 2 R075-040 4 | ● | 0,75 | 1,5 | 50 | 1,47 | 4 | 0,9 | 4,0 |
| 2 R100-055 4 | ● | 1,0 | 2,0 | 50 | 1,97 | 4 | 1,4 | 5,5 |
| BNBP 2 R020-012 6 | ● | 0,2 | 0,4 | 50 | 0,37 | 6 | 0,3 | 1,2 |
| 2 R030-015 6 | ● | 0,3 | 0,6 | 50 | 0,57 | 6 | 0,4 | 1,5 |
| 2 R050-025 6 | ● | 0,5 | 1,0 | 50 | 0,97 | 6 | 0,6 | 2,5 |
| 2 R075-040 6 | ● | 0,75 | 1,5 | 50 | 1,47 | 6 | 0,9 | 4,0 |
| 2 R100-055 6 | ● | 1,0 | 2,0 | 50 | 1,97 | 6 | 1,4 | 5,5 |

## Performance

### Wear Resistance

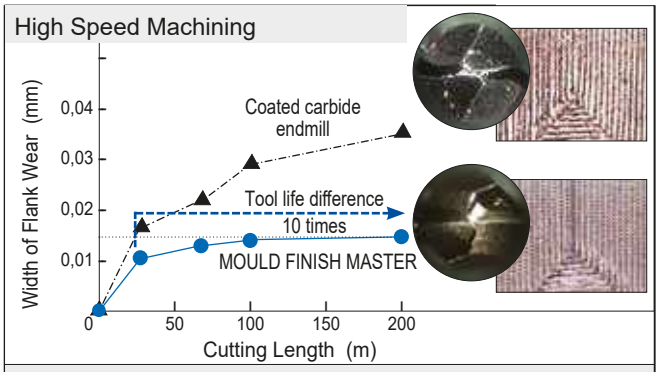



### Machined Surface




R1,0 Ball endmill, Work material: X155CrVMo12-1 ($H_RC60$)
Cutting data: n = 20.000 rpm, $f_t$ = 0,05 mm/tooth ($v_f$ = 2.000 mm/min)
$a_p$ = 0,05 mm, $a_e$ = 0,05 mm, Air blast

### High Speed Machining




R1,0 Ball endmill, Work material: X155CrVMo12-1 ($H_RC60$)
Cutting data: n = 40.000 rpm, $f_t$ = 0,05 mm/tooth ($v_f$ = 4.000 mm/min)
$a_p$ = 0,05 mm, $a_e$ = 0,05 mm, Oil mist

Excellent surface finish compared with competitor's CBN and coated carbide endmills

## Recommended Cutting Conditions

Spindle revolutions: n (rpm), Feed rate per tooth: $f_t$ (mm/tooth), Depth of cut: $a_p$ (mm), Wide of cut: $a_e$ (mm)

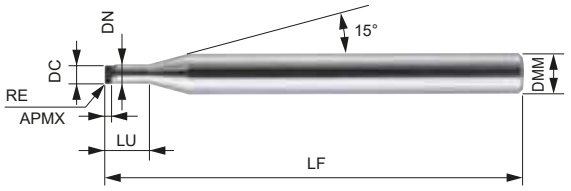
| Material / Cutting data / Radius (mm) | Pre-hardened steel, Die steel ( –HRC52) | | | | Die steel ( –HRC62) | | | | High speed tool steel ( –HRC70) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n (rpm) | $f_t$ (mm/tooth) | $a_p$ (mm) | $a_e$ (mm) | n (rpm) | $f_t$ (mm/tooth) | $a_p$ (mm) | $a_e$ (mm) | n (rpm) | $f_t$ (mm/tooth) | $a_p$ (mm) | $a_e$ (mm) |
| 0,2 | 20.000–50.000 | 0,02 | 0,03 | 0,03 | 20.000–50.000 | 0,02 | 0,01 | 0,02 | 20.000–50.000 | 0,015 | 0,01 | 0,02 |
| 0,3 | 20.000–50.000 | 0,02 | 0,03 | 0,03 | 20.000–50.000 | 0,02 | 0,01 | 0,02 | 20.000–50.000 | 0,015 | 0,01 | 0,02 |
| 0,5 | 20.000–50.000 | 0,03 | 0,05 | 0,05 | 20.000–50.000 | 0,03 | 0,03 | 0,04 | 20.000–50.000 | 0,02 | 0,02 | 0,03 |
| 0,75 | 20.000–50.000 | 0,04 | 0,08 | 0,1 | 20.000–50.000 | 0,04 | 0,05 | 0,05 | 20.000–50.000 | 0,03 | 0,02 | 0,05 |
| 1,0 | 20.000–50.000 | 0,05 | 0,1 | 0,1 | 17.000–50.000 | 0,05 | 0,05 | 0,05 | 17.000–50.000 | 0,03 | 0,03 | 0,05 |

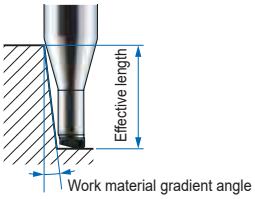

## Important Notes

(1) For stable machining, a more rigid machine is recommended.
(2) Air blast or oil mist coolant is recommended.
(3) Shorten overhang as much as possible.

# NPDRS Type

## SUMIDIA Binderless Radius Endmill **NPDRS** Type




### NPDRS Type Body (for Standard Finishing)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | Real effective length with respect to work material gradient angle | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NPD10 | DC | RE | APMX | LU | LF | DN | DMM | 0,5° | 1° | 1,5° | 2° | 3° |
| NPDRS 1020 R002-006 | ❍ | 0,2 | 0,02 | 0,10 | 0,6 | 40 | 0,175 | 4 | 0,61 | 0,62 | 0,63 | 0,64 | 0,66 |
| 1020 R005-006 | ❍ | 0,2 | 0,05 | 0,10 | 0,6 | 40 | 0,175 | 4 | 0,61 | 0,62 | 0,63 | 0,64 | 0,66 |
| 1030 R002-010 | ❍ | 0,3 | 0,02 | 0,15 | 1,0 | 40 | 0,27 | 4 | 1,01 | 1,03 | 1,04 | 1,06 | 1,09 |
| 1030 R005-010 | ❍ | 0,3 | 0,05 | 0,15 | 1,0 | 40 | 0,27 | 4 | 1,01 | 1,03 | 1,04 | 1,06 | 1,09 |
| 1050 R005-015 | ❍ | 0,5 | 0,05 | 0,25 | 1,5 | 40 | 0,47 | 4 | 1,61 | 1,66 | 1,72 | 1,78 | 1,92 |
| NPDRS 1050 R010-015 | ❍ | 0,5 | 0,10 | 0,25 | 1,5 | 40 | 0,47 | 4 | 1,61 | 1,66 | 1,71 | 1,77 | 1,91 |
| 1100 R005-030 | ❍ | 1,0 | 0,05 | 0,55 | 3,0 | 40 | 0,95 | 4 | 3,40 | 3,52 | 3,65 | 3,78 | 4,08 |
| 1100 R010-030 | ❍ | 1,0 | 0,10 | 0,55 | 3,0 | 40 | 0,95 | 4 | 3,40 | 3,52 | 3,64 | 3,77 | 4,07 |
| 1100 R020-030 | ❍ | 1,0 | 0,20 | 0,55 | 3,0 | 40 | 0,95 | 4 | 3,40 | 3,51 | 3,63 | 3,76 | 4,05 |
| 1200 R005-040 | ❍ | 2,0 | 0,05 | 0,55 | 4,0 | 40 | 1,95 | 4 | 4,44 | 4,59 | 4,75 | 4,93 | 5,33 |
| NPDRS 1200 R010-040 | ❍ | 2,0 | 0,10 | 0,55 | 4,0 | 40 | 1,95 | 4 | 4,43 | 4,59 | 4,75 | 4,92 | 5,31 |
| 1200 R020-040 | ❍ | 2,0 | 0,20 | 0,55 | 4,0 | 40 | 1,95 | 4 | 4,43 | 4,58 | 4,74 | 4,91 | 5,29 |

### Identification Details

| NPDR | S | 1 | 020 | R002 | - | 006 |
|---|---|---|---|---|---|---|
| Series Code | For standard finishing | No. of flutes | Cutting diameter | Corner radius | | Length below neck |

### Cutting Diameter and Nose Radius Combinations

| DC | RE 0,02 | RE 0,05 | RE 0,1 | RE 0,2 |
|---|---|---|---|---|
| 0,2 | ❍ | ❍ | | |
| 0,3 | ❍ | ❍ | | |
| 0,5 | | ❍ | ❍ | |
| 1,0 | | ❍ | ❍ | ❍ |
| 2,0 | | ❍ | ❍ | ❍ |

### Recommended Cutting Conditions

- Use a machine with high rigidity for stable cutting.
- Non-water soluble coolant recommended. Supply as a mist or external coolant.
  Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
- Shorten overhang as much as possible.
- Adjust cutting conditions as necessary as machine rigidity and other conditions may vary.
- Depth of cut shown in the table of conditions are maximum depths. Adjust the actual depth of cut to the desired machined surface finish.

| Work Material | | Carbide | | | |
|---|---|---|---|---|---|
| DC (mm) | LU (mm) | Spindle Speed ($min^{-1}$) | Feed Rate (mm/min) | $a_p$ (mm) | $p_f$ (mm) |
| 0,2 | 0,10 | 40.000 | 100 | 0,001 | 0,001 |
| 0,3 | 0,15 | 40.000 | 150 | 0,002 | 0,001 |
| 0,5 | 0,25 | 40.000 | 200 | 0,003 | 0,001 |
| 1,0 | 0,55 | 40.000 | 400 | 0,005 | 0,003 |
| 2,0 | 0,55 | 40.000 | 600 | 0,010 | 0,005 |

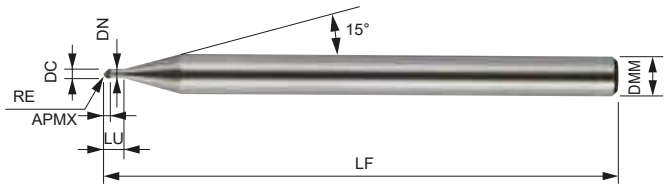


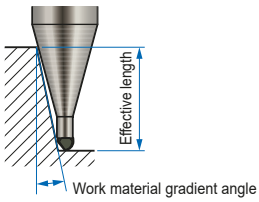



❍ = Japan stock

# NPDB(S) Type

## SUMIDIA Binderless Ballnose Endmill **NPDBS** Type / **NPDB** Type




### ■ NPDBS Type Body (for Standard Finishing)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | Real effective length with respect to work material gradient angle | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NPD10 | RE | DC | APMX | LU | LF | DN | DMM | 0,5° | 1° | 1,5° | 2° | 3° |
| NPDBS 1010-004 | ❍ | 0,1 | 0,2 | 0,1 | 0,4 | 40 | 0,18 | 4 | 0,44 | 0,45 | 0,46 | 0,47 | 0,49 |
| 1020-008 | ❍ | 0,2 | 0,4 | 0,2 | 0,8 | 40 | 0,38 | 4 | 0,83 | 0,84 | 0,85 | 0,86 | 0,89 |
| 1030-010 | ❍ | 0,3 | 0,6 | 0,3 | 1,0 | 40 | 0,58 | 4 | 1,05 | 1,08 | 1,10 | 1,13 | 1,20 |
| 1050-020 | ❍ | 0,5 | 1,0 | 0,5 | 2,0 | 40 | 0,95 | 4 | 2,08 | 2,13 | 2,19 | 2,24 | 2,38 |
| 1100-030 | ❍ | 1,0 | 2,0 | 1,0 | 3,0 | 40 | 1,95 | 4 | 3,13 | 3,20 | 3,27 | 3,35 | 3,53 |

### ■ NPDB Type Body (for Precision Finishing)

| Cat. No. | Stock | Dimensions (mm) | | | | | | | Real effective length with respect to work material gradient angle | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NPD10 | RE | DC | APMX | LU | LF | DN | DMM | 0,5° | 1° | 1,5° | 2° | 3° |
| NPDB 1010-004 | ❍ | 0,1 | 0,2 | 0,1 | 0,4 | 40 | 0,18 | 4 | 0,44 | 0,45 | 0,46 | 0,47 | 0,49 |
| 1020-008 | ❍ | 0,2 | 0,4 | 0,2 | 0,8 | 40 | 0,38 | 4 | 0,83 | 0,84 | 0,85 | 0,86 | 0,89 |
| 1030-010 | ❍ | 0,3 | 0,6 | 0,3 | 1,0 | 40 | 0,58 | 4 | 1,05 | 1,08 | 1,10 | 1,13 | 1,20 |
| 1050-020 | ❍ | 0,5 | 1,0 | 0,5 | 2,0 | 40 | 0,95 | 4 | 2,08 | 2,13 | 2,19 | 2,24 | 2,38 |
| 1100-030 | ❍ | 1,0 | 2,0 | 1,0 | 3,0 | 40 | 1,95 | 4 | 3,13 | 3,20 | 3,27 | 3,35 | 3,53 |

### ■ Identification Details

| **NPDB** | **(S)** | **1** | **030** | **-** | **010** |
|---|---|---|---|---|---|
| Series Code | For standard finishing | No. of flutes | Ballnose radius | | Length below neck |

### ■ Recommended Cutting Conditions

- Use a machine with high rigidity for stable cutting.
- Non-water soluble coolant recommended. Supply as a mist or external coolant.
  Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
- Shorten overhang as much as possible.
- Adjust cutting conditions as necessary as machine rigidity and other conditions may vary.
- Depth of cut shown in the table of conditions are maximum depths. Adjust the actual depth of cut to the desired machined surface finish.

● Flat Surface Finishing

| Work Material | | Carbide | | | |
|---|---|---|---|---|---|
| RE (mm) | LU (mm) | Spindle Speed ($min^{-1}$) | Feed Rate (mm/min) | $a_p$ (mm) | $p_f$ (mm) |
| 0,1 | 0,4 | 40.000 | 100 | 0,001 | 0,001 |
| 0,2 | 0,8 | 40.000 | 150 | 0,001 | 0,001 |
| 0,3 | 1,0 | 40.000 | 200 | 0,001 | 0,001 |
| 0,5 | 2,0 | 40.000 | 400 | 0,001 | 0,003 |
| 1,0 | 3,0 | 40.000 | 600 | 0,001 | 0,005 |

● Copy Finishing

| Work Material | | Carbide | | | |
|---|---|---|---|---|---|
| RE (mm) | LU (mm) | Spindle Speed ($min^{-1}$) | Feed Rate (mm/min) | $a_p$ (mm) | $p_f$ (mm) |
| 0,1 | 0,4 | 40.000 | 100 | 0,001 | 0,001 |
| 0,2 | 0,8 | 40.000 | 150 | 0,002 | 0,001 |
| 0,3 | 1,0 | 40.000 | 200 | 0,003 | 0,001 |
| 0,5 | 2,0 | 40.000 | 400 | 0,005 | 0,003 |
| 1,0 | 3,0 | 40.000 | 600 | 0,010 | 0,005 |