



SUMITOMO

CARBIDE - CBN - DIAMOND

G-J

# 2018-2019 Milling Tools

Milling Cutters // Indexable Endmills // Solid Carbide Endmills

SUMITOMO  
ELECTRIC  
GROUP

# Milling Cutters

**G1 ~ G54**



Selection Guide  
ISO

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"Sumi Dual Mill", tangential

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High Feed Milling

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Aluminium Milling

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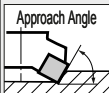
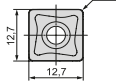
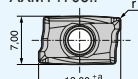
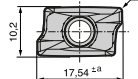
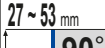
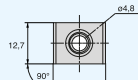
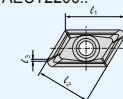
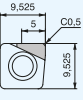
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# Face Mill and Shoulder Mill Selection Guide

| Application       | Cutter Type     | Series                                                                                  | Insert Type                                                                                                                                                                                              | Approach Angle<br>Max. Depth of Cut (mm) | Cutter Diameter (mm)                                | Application  |                  |              |         |         |            |        |           |                            |                            | Work Material   |                               |                   |                 |                                 |                            | Ref. Page  |
|-------------------|-----------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------|--------------|------------------|--------------|---------|---------|------------|--------|-----------|----------------------------|----------------------------|-----------------|-------------------------------|-------------------|-----------------|---------------------------------|----------------------------|------------|
|                   |                 |                                                                                         |                                                                                                                                                                                                          |                                          |                                                     | Face Milling | Shoulder Milling | Slot Milling | Ramping | Copying | Chamfering | Boring | Finishing | Carbon Steel / Alloy Steel | Tempered Steel / Die Steel | Stainless Steel | Cast Iron / Ductile Cast Iron | Non-Ferrous Metal | Aluminium Alloy | Ti Alloy / Heat Resistant Alloy | Hardened Steel HRC 45 ~ 55 |            |
| Face Milling      | DGC             | DGC (-M/F) 13000RS                                                                      | SNM/EU 13T6..<br><br>ONM/EU 13T6..<br> | SNMU<br>6 mm 45°<br>ONMU<br>3 mm 45°     | ø40 ~ ø250<br>ø42,9 ~ ø252,9                        | ○            |                  | ○            |         |         |            |        |           | ○                          | ○                          | ○               | ○                             | ○                 | ○               | ○                               |                            | G8         |
|                   | WGX             | WGX (-M/F) 13000RS                                                                      | SEE/MT 13T3..<br>                                                                                                       | 6 mm 45°                                 | ø40 ~ ø250                                          | ○            |                  | ○            |         |         |            |        |           | ○                          | ○                          | ○               | ○                             | ○                 | ○               | ○                               |                            | G10        |
|                   | WGC             | WGC 3000 RS 4000 RS<br>WGC (-M/F) 4000 RS                                               | SEE/MT0903.. (IC/I = 9,525)<br>SEE/MT13T3.. (IC/I = 13,4)<br>                                                           | 4 mm 45°<br>6 mm 45°                     | ø32 ~ ø100<br>ø40 ~ ø200                            | ○            |                  | ○            |         |         |            |        |           | ○                          | ○                          | ○               | ○                             | ○                 | ○               | ○                               |                            | G12        |
|                   | UFO             | UFO (-F) 4000 RS<br>UFO 5000 RS                                                         | SFK-NR12T3.. (IC/I = 12,7)<br>SFK-N1504.. (IC/I = 15,875)<br>                                                         | 5 mm 45°<br>7 mm 45°                     | ø50 ~ ø315<br>ø80 ~ ø315                            | ○            |                  | ○            |         |         |            |        |           | ○                          | ○                          | ○               | ○                             | ○                 | ○               | ○                               |                            | G14<br>G15 |
|                   | DNX             | DNX (-F) 12000RS                                                                        | SNMT1205..<br>                                                                                                        | 8 mm 65°                                 | ø80 ~ ø250                                          | ○            |                  |              |         |         |            |        |           | ○                          |                            |                 | ○                             |                   |                 |                                 |                            | G16        |
| Radius Milling    | RSX             | RSX (-F) 10000RS<br>RSX (-F) 12000RS<br>RSX (-F) 16000RS<br>RSX (-F) 20000RS <b>New</b> | RDET10T3..<br>RDET1204..<br><br>RDET1606..<br>RDET2006..                                                              | 5 mm<br>6 mm<br>8 mm<br>10 mm            | ø40 ~ ø52<br>ø40 ~ ø100<br>ø63 ~ ø160<br>ø80 ~ ø160 | ○            |                  | ○            | ○       | ○       |            |        |           | ○                          | ○                          | ○               |                               |                   |                 | ○                               |                            | G22        |
| Multi-Purpose     | WRCX            | WRCX (-F/X) 12000RS 16000RS 20000RS                                                     | QPMT1204../1606../2006..<br>QPET1204../1606..<br>                                                                     | 6 ~ 10 mm                                | ø40 ~ ø160                                          | ○            |                  | ○            | ○       | ○       |            |        |           | ○                          | ○                          | ○               |                               | ○                 |                 |                                 | ○                          | G19        |
| High Feed Milling | MSX             | MSX 08000RS 12000RS 14000RS                                                             | WDMT0603../0804../1205../1406..<br>                                                                                   | 1,5 ~ 2,5 mm 20°                         | ø40 ~ ø100                                          |              |                  | ○            | ○       |         |            |        |           | ○                          | ○                          | ○               |                               |                   |                 | ○                               |                            | G43        |
|                   | WFXH <b>New</b> | WFXH 08000RS<br>WFXH 12000RS                                                            | SOMT0803..<br>SOMT1204..<br>                                                                                          | 1,5 mm 15°<br>2,5 mm 15°                 | ø40 ~ ø63<br>ø50 ~ ø63                              |              |                  | ○            | ○       |         |            |        |           | ○                          | ○                          | ○               | ○                             | ○                 |                 |                                 | ○                          | G46<br>G47 |
| Shoulder Milling  | DFC             | DFC (-M/F) 09000RS                                                                      | XNMTU0606..<br>                                                                                                       | 6 mm 90°                                 | ø50 ~ ø200                                          | ○            |                  | ○            | ○       | ○       |            |        |           | ○                          | ○                          | ○               |                               |                   |                 | ○                               |                            | G26        |

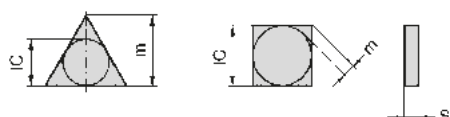
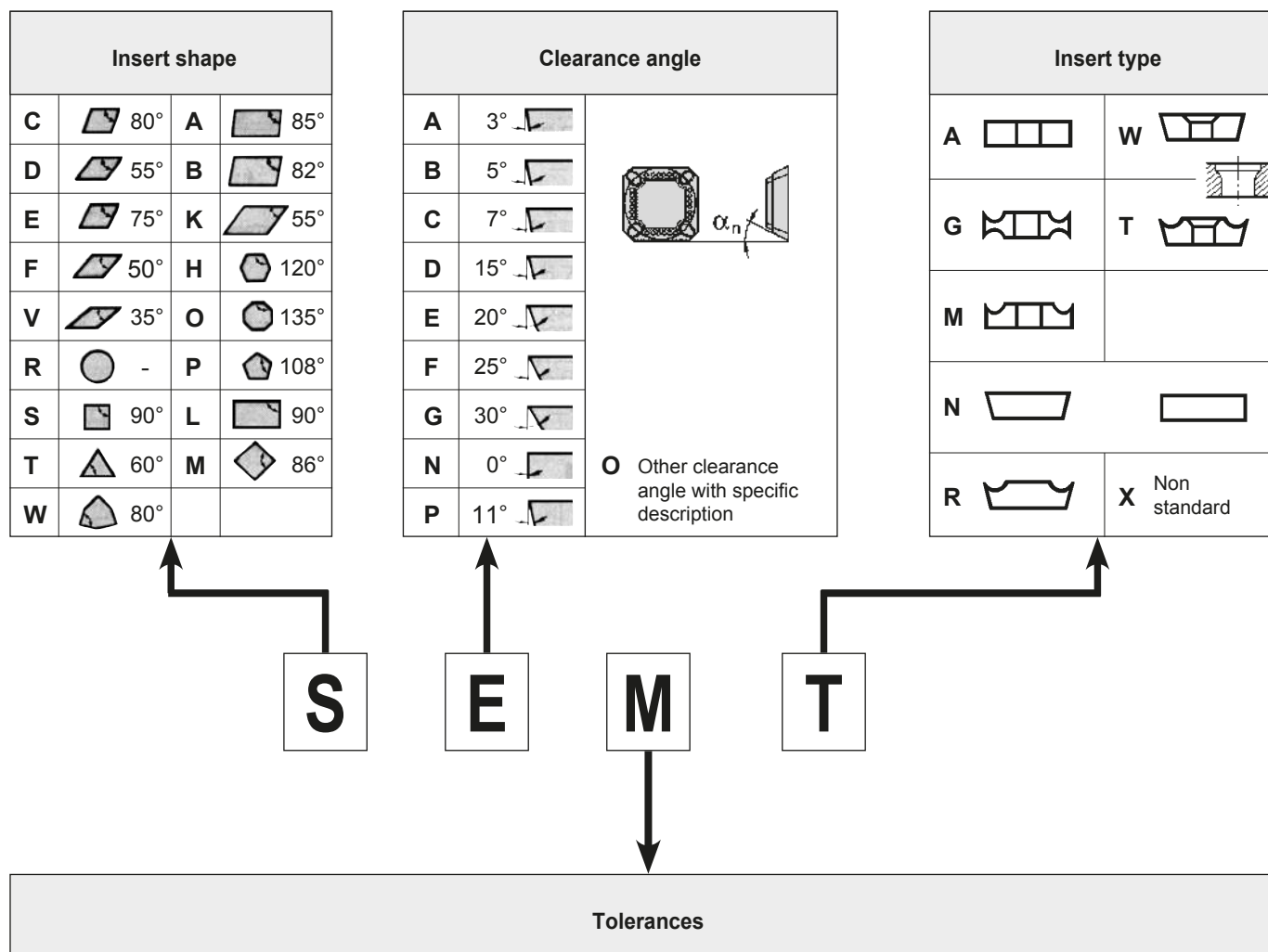
○ : Best  
○ : Suitable

# Face Mill and Shoulder Mill Selection Guide

| Application                            | Cutter Type                                                                                | Series                                   | Insert Type                                                                                                                   | Approach Angle<br><br>Max. Depth of Cut (mm)<br>                                                                                                                                | Cutter Diameter (mm)                | Application                   |                   |                  |              |         |         |            |        |           |                 | Work Material                   |                |             |   |            |     | Ref. Page |
|----------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------|-------------------|------------------|--------------|---------|---------|------------|--------|-----------|-----------------|---------------------------------|----------------|-------------|---|------------|-----|-----------|
|                                        |                                                                                            |                                          |                                                                                                                               |                                                                                                                                                                                                                                                                  |                                     | Face Milling                  |                   | Shoulder Milling | Slot Milling | Ramping | Copying | Chamfering | Boring | Finishing | P               | M                               | K              | N           | S | H          |     |           |
| General Purpose                        | Finishing                                                                                  | High Feed                                | Carbon Steel / Alloy Steel                                                                                                    | Tempered Steel / Die Steel                                                                                                                                                                                                                                       | Stainless Steel                     | Cast Iron / Ductile Cast Iron | Non-Ferrous Metal |                  |              |         |         |            |        |           | Aluminium Alloy | Ti Alloy / Heat Resistant Alloy | Hardened Steel | HRC 45 ~ 55 |   |            |     |           |
| Shoulder Milling                       | WFX<br>   | WFX (-F/-M) 08000RS<br>WFX (-F) 12000 RS | SOMT080..<br>SOMT1204..<br>                  | <br>                                                                                           | ø50<br>~<br>ø160                    | ○                             |                   |                  | ○            | ○       |         |            |        |           | ○               | ○                               | ○              | ○           | ○ | G30<br>G31 |     |           |
|                                        | TSX<br>   | TSX (-F) 08000RS<br>TSX (-M) 13000 RS    | LNEX0804..<br>LNEX1306..<br>                 | <br>                                                                                           | ø40<br>~<br>ø63<br>ø40<br>~<br>ø160 | ○                             |                   |                  | ○            | ○       |         |            |        |           | ○               | ○                               | ○              | ○           | ○ | G34<br>G35 |     |           |
|                                        | PWS<br>   | PWS (-F) 4000 RS                         | LNMX1708..<br>                               |                                                                                                                                                                                 | ø80<br>~<br>ø250                    | ○                             |                   | ○                | ○            | ○       |         |            |        |           | ○               | ○                               | ○              | ○           | ○ | G37        |     |           |
|                                        | WEX<br>  | WEX 1000F<br>WEX 2000F<br>WEX 3000F      | AXMT0602..<br>AXMT1235..<br>AXMT1705..<br> | <br><br> | ø10<br>~<br>ø100                    | ○                             |                   |                  | ○            | ○       | ○       |            |        |           | ○               | ○                               | ○              | ○           | ○ | ○          | G38 |           |
|                                        | WRX<br> | WRX 2000F<br>WRX 3000F                   | AXMT12350../1705..<br>                     | <br>                                                                                       | ø40<br>~<br>ø50<br>ø50<br>~<br>ø100 | ○                             |                   |                  | ○            | ○       | ○       |            |        |           | ○               | ○                               | ○              | ○           | ○ | ○          | G39 |           |
|                                        | PWC<br> | PWC (-F) 4000 RS                         | LNMX1606..<br>                             |                                                                                                                                                                               | ø80<br>~<br>ø200                    | ○                             |                   | ○                | ○            | ○       |         |            |        |           |                 |                                 | ○              |             |   |            | G40 |           |
|                                        | CNP<br> | CNP (-F) 13000 RS                        | CNMU1306..<br>CNMQ1306..<br>               |                                                                                                                                                                               | ø40<br>~<br>ø200                    |                               |                   |                  | ○            |         |         |            |        |           | ○               | ○                               | ○              | ○           |   |            | G42 |           |
| Aluminium Alloy and Non-Ferrous Metals | WAX<br> | WAX 3000 RS<br>WAX 4000 RS               | AECT1604..<br>AECT2206..<br>               | <br>                                                                                       | ø50<br>~<br>ø125                    | ○                             |                   |                  | ○            | ○       | ○       | ○          |        |           |                 |                                 |                | ○           | ○ | G48<br>G49 |     |           |
|                                        | RF<br>  | RF 4000 RS                               | SNEW1204..<br>SDET1204..<br>               |                                                                                                                                                                               | ø80<br>~<br>ø315                    | ○                             | ○                 |                  |              |         |         |            |        |           |                 |                                 |                | ○           | ○ | G50        |     |           |
|                                        | SRF<br> | SRF 50/63 RS                             | SNEW09T3..<br>                             |                                                                                                                                                                               | ø30<br>~<br>ø63                     | ○                             | ○                 |                  |              |         |         |            |        |           |                 |                                 |                | ○           | ○ | G51        |     |           |
| High Speed Finishing of Cast Iron      | FMU<br> | FMU 4000 RS                              | SNEW1204..<br>                             |                                                                                                                                                                               | ø80<br>~<br>ø315                    |                               | ○                 |                  |              |         |         |            |        |           |                 |                                 | ○              |             |   | G53        |     |           |



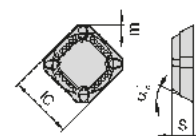
# Milling Insert ISO Identification Table



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  |

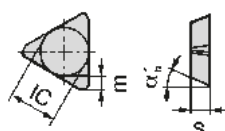
| Class | Tolerances (mm) |              |        |
|-------|-----------------|--------------|--------|
|       | m               | IC           | s      |
| J     | ±0,005          | ±0,05~±0,13* | ±0,025 |
| K     | ±0,013          | ±0,05~±0,13* | ±0,025 |
| L     | ±0,025          | ±0,05~±0,13* | ±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

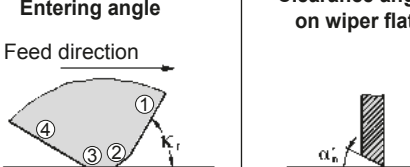
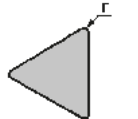
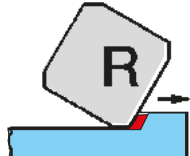
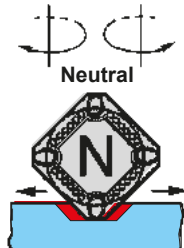
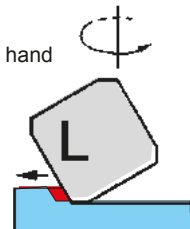
| m      | S | T     | C | W | V     | D     |
|--------|---|-------|---|---|-------|-------|
|        |   |       |   |   |       |       |
| 6,35   |   | ±0,08 |   |   | -     | ±0,11 |
| 9,525  |   | ±0,08 |   |   | ±0,13 | ±0,11 |
| 12,7   |   | ±0,13 |   |   |       | ±0,15 |
| 15,875 |   | ±0,15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

# Milling Insert ISO Identification Table

| Thickness                                                                                                                                                                                            |                                                                                     | Corner geometry with wiper flat                                                                                                                                                                               |                                                                                     | Radius                                                                                                                                                                        |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                                                                                                                     |                                                                                     |                                                                                                                             |                                                                                     |                                                                                            |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| <p><b>02</b> s = 2,38 mm<br/><b>03</b> s = 3,18<br/><b>T3</b> s = <b>3,97</b><br/><b>04</b> s = 4,76<br/><b>05</b> s = 5,56<br/><b>06</b> s = 6,35<br/><b>07</b> s = 7,94<br/><b>09</b> s = 9,52</p> |                                                                                     | <p><b>A</b> 45°<br/><b>D</b> 60°<br/><b>E</b> 75°<br/><b>F</b> 85°<br/><b>P</b> 90°<br/><b>Z</b> - Others</p> <p>1. Major cutting edge<br/>2. Chamfered corner<br/>3. Wiper flat<br/>4. Side cutting edge</p> |                                                                                     | <p><b>A</b> 3°<br/><b>B</b> 5°<br/><b>C</b> 7°<br/><b>D</b> 15°<br/><b>E</b> 20°<br/><b>F</b> 25°<br/><b>G</b> 30°<br/><b>N</b> 0°<br/><b>P</b> 11°<br/><b>Z</b> - Others</p> |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               |                                                                                     | <p><b>M0</b> - Round insert (metric)<br/><b>00</b> - Round insert (inch)</p>                                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| <div>13T3</div>                                                                                                                                                                                      |                                                                                     | <div>AGS</div>                                                                                                                                                                                                |                                                                                     | <div>R</div>                                                                                                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| Insert size                                                                                                                                                                                          |                                                                                     |                                                                                                                                                                                                               |                                                                                     |                                                                                                                                                                               |                                                                                     |                                                                                     | Cutting edge condition                                                              |                                                                                      | Feed direction                                                                       |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| Symbol and cutting edge length (mm)                                                                                                                                                                  |                                                                                     |                                                                                                                                                                                                               |                                                                                     |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| Insert type                                                                                                                                                                                          | C                                                                                   | D                                                                                                                                                                                                             | R                                                                                   | S                                                                                                                                                                             | T                                                                                   | V                                                                                   | W                                                                                   | F                                                                                    | E                                                                                    | T                                                                                    | S                                                                                    | Right hand                                                                            | Neutral                                                                               | Left hand                                                                             |
|                                                                                                                                                                                                      |  |                                                                                                                            |  |                                                                                            |  |  |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               |                                                                                     |                                                                                                                                                                               | 06 (6,9)                                                                            |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               |                                                                                     |                                                                                                                                                                               | 08 (8,2)                                                                            |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 05 (5,0)                                                                            |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               |                                                                                     |                                                                                                                                                                               | 09 (9,6)                                                                            | 09 (9,7)                                                                            | 03 (3,8)                                                                            |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 06 (6,0)                                                                            |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| 5                                                                                                                                                                                                    | 06 (6,4)                                                                            | 07 (7,7)                                                                                                                                                                                                      |                                                                                     | 06 (6,35)                                                                                                                                                                     | 11 (11,0)                                                                           | 11 (11,1)                                                                           | 04 (4,3)                                                                            |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| 4                                                                                                                                                                                                    | 08 (8,0)                                                                            |                                                                                                                                                                                                               |                                                                                     | 07 (7,94)                                                                                                                                                                     |                                                                                     |                                                                                     | 05 (5,4)                                                                            |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 08 (8,0)                                                                            |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| 25                                                                                                                                                                                                   | 09 (9,7)                                                                            | 11 (11,6)                                                                                                                                                                                                     | 09 (9,525)                                                                          | 09 (9,525)                                                                                                                                                                    | 16 (16,5)                                                                           | 16 (16,6)                                                                           | 06 (6,5)                                                                            |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 10 (10,0)                                                                           |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 12 (12,0)                                                                           |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      | 12 (12,9)                                                                           | 15 (15,5)                                                                                                                                                                                                     | 12 (12,7)                                                                           | 12 (12,7)                                                                                                                                                                     | 22 (22,0)                                                                           |                                                                                     | 08 (8,7)                                                                            |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| 75                                                                                                                                                                                                   | 16 (16,1)                                                                           | 19 (19,4)                                                                                                                                                                                                     | 15 (15,875)                                                                         | 15 (15,875)                                                                                                                                                                   | 27 (27,5)                                                                           |                                                                                     | 10 (10,9)                                                                           |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 16 (16,0)                                                                           |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
| 5                                                                                                                                                                                                    | 19 (19,3)                                                                           |                                                                                                                                                                                                               | 19 (19,05)                                                                          | 19 (19,05)                                                                                                                                                                    | 33 (33,0)                                                                           |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 20 (20,0)                                                                           |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 25 (25,0)                                                                           |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 25 (25,4)                                                                           | 25 (25,4)                                                                                                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 31 (31,75)                                                                          | 31 (31,75)                                                                                                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |
|                                                                                                                                                                                                      |                                                                                     |                                                                                                                                                                                                               | 32 (32,0)                                                                           |                                                                                                                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                       |                                                                                       |                                                                                       |

# "Sumi Dual Mill" 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 quality machined surface.

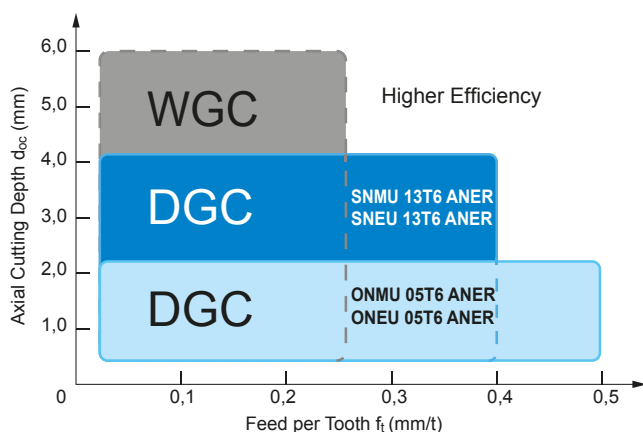
The DGC type insert lineup includes double-sided SNMU / SNEU and ONMU / ONEU types. Up to 16 corners can be used for improved economy.



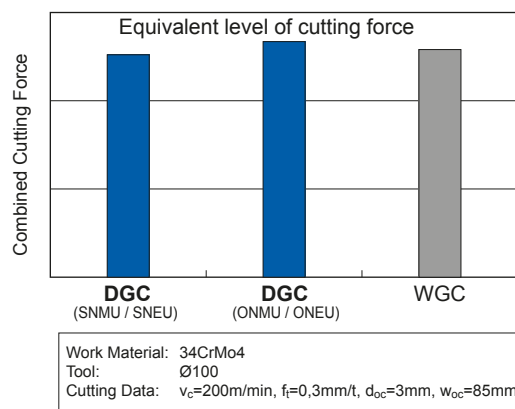
## Characteristics

- 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  $d_{oc} \leq 3\text{mm}$ .

## Recommended Cutting Conditions for General Steel Milling



## Cutting Force Comparison



## 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:  $d_{oc} = 6\text{mm}$

shim to protect cutter body

+



+



- double-sided design with 16 corners for improved economy
- maximum depth of cut:  $d_{oc} = 3\text{mm}$



max.  $d_{oc} = 6\text{mm}$   
8 corners use

Use two types of inserts for different applications.



max.  $d_{oc} = 3\text{mm}$   
16 corners use

# "Sumi Dual Mill" DGC (M/F) Type

## Line-up

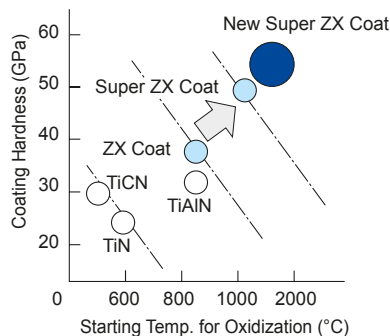
Choose a tool that fits your application from a comprehensive line-up

| 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 | Ø40mm ~ Ø250mm                                                                    | Ø50mm ~ Ø250mm                                                                    | Ø50mm ~ Ø250mm                                                                     | Ø40mm ~ Ø63mm                                                                       |
| Cutting Edges   | 3 ~ 10                                                                            | 4 ~ 14                                                                            | 5 ~ 18                                                                             | 3 ~ 4                                                                               |
| Shape           |  |  |  |  |

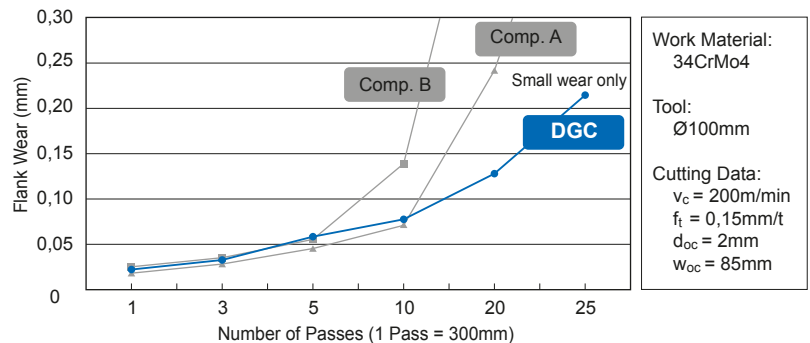
## High Reliability

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



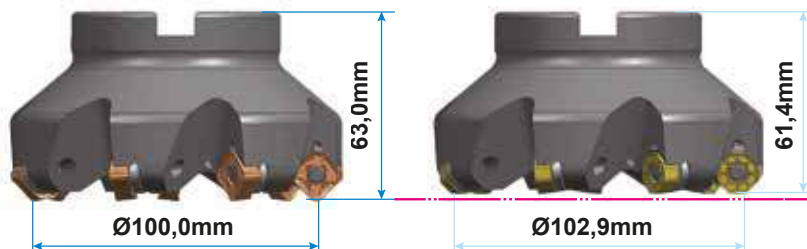
## Wear Resistance



## Cutter Diameter and Cutter Body Height

Insert: SN\_U 13T6 ANER (square)

Insert: ON\_U 05T6 ANER (octagonal)



| Example:<br>$D_c = 100\text{mm}$                                                                | Number of<br>Cutting Edges | Tool Diameter<br>(mm) | Cutter Height<br>(mm) | Max. Depth<br>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.

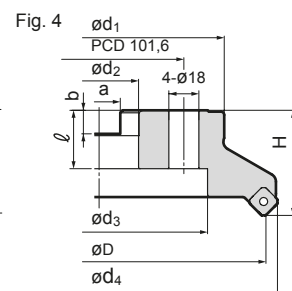
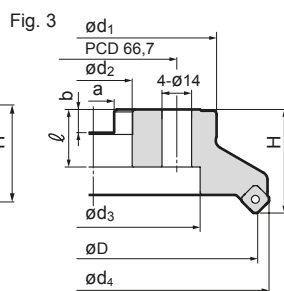
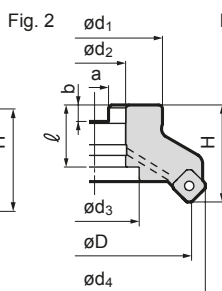
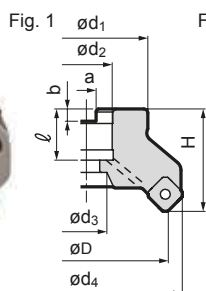
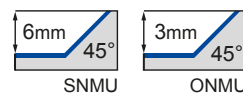


# "Sumi Dual Mill" DGC (M/F) Type

## General Milling of Steel and Cast Iron

### ■ Body – Shell type

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



Cutter body  $\phi D \geq 160\text{mm}$ : no inner coolant

### ■ Body

#### ● Type: DGC, Standard Pitch

| Cat. No.     | Stock | Dimension (mm) |            |            |            | Mounting   |            |      |      |        | No. of Teeth | Weight (kg) | Fig. |
|--------------|-------|----------------|------------|------------|------------|------------|------------|------|------|--------|--------------|-------------|------|
|              |       | $\phi D$       | $\phi d_4$ | $\phi d_1$ | H          | $\phi d_2$ | $\phi d_3$ | a    | b    | $\ell$ |              |             |      |
| DGC 13040 RS | ●     | 40 (42,90)     | 54         | 36         | 40 (38,44) | 16         | 13,5       | 8,4  | 5,6  | 18     | 3            | 0,3         | 1    |
| DGC 13050 RS | ●     | 50 (52,90)     | 64         | 40         | 40 (38,44) | 22         | 18,0       | 10,4 | 6,3  | 20     | 3            | 0,4         | 1    |
| DGC 13063 RS | ●     | 63 (65,90)     | 77         | 50         | 40 (38,44) | 22         | 18,0       | 10,4 | 6,3  | 20     | 4            | 0,5         | 1    |
| DGC 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    |
| DGC 13125 RS | ●     | 125 (127,90)   | 139        | 80         | 63 (61,44) | 40         | 52,0       | 16,4 | 9,5  | 29     | 6            | 2,8         | 1    |
| DGC 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    |
| DGC 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) |            |            |            | Mounting   |            |      |      |        | No. of Teeth | Weight (kg) | Fig. |
|---------------|-------|----------------|------------|------------|------------|------------|------------|------|------|--------|--------------|-------------|------|
|               |       | $\phi D$       | $\phi d_4$ | $\phi d_1$ | H          | $\phi d_2$ | $\phi d_3$ | a    | b    | $\ell$ |              |             |      |
| DGCM 13050 RS | ●     | 50 (52,90)     | 64         | 40         | 40 (38,44) | 22         | 18         | 10,4 | 6,3  | 20     | 4            | 0,3         | 1    |
| DGCM 13063 RS | ●     | 63 (65,90)     | 77         | 50         | 40 (38,44) | 22         | 18         | 10,4 | 6,3  | 20     | 5            | 0,5         | 1    |
| DGCM 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    |
| DGCM 13125 RS | ●     | 125 (127,90)   | 139        | 80         | 63 (61,44) | 40         | 52         | 16,4 | 9,5  | 29     | 8            | 2,8         | 1    |
| DGCM 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    |
| DGCM 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) |            |            |            | Mounting   |            |      |      |        | No. of Teeth | Weight (kg) | Fig. |
|---------------|-------|----------------|------------|------------|------------|------------|------------|------|------|--------|--------------|-------------|------|
|               |       | $\phi D$       | $\phi d_4$ | $\phi d_1$ | H          | $\phi d_2$ | $\phi d_3$ | a    | b    | $\ell$ |              |             |      |
| DGCF 13050 RS | ●     | 50 (52,90)     | 64         | 40         | 40 (38,44) | 22         | 18         | 10,4 | 6,3  | 20     | 5            | 0,3         | 1    |
| DGCF 13063 RS | ●     | 63 (65,90)     | 77         | 50         | 40 (38,44) | 22         | 18         | 10,4 | 6,3  | 20     | 6            | 0,5         | 1    |
| DGCF 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    |
| DGCF 13125 RS | ●     | 125 (127,90)   | 139        | 80         | 63 (61,44) | 40         | 52         | 16,4 | 9,5  | 29     | 12           | 2,7         | 1    |
| DGCF 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    |
| DGCF 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

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

● = Euro stock  
□ = Delivery on request

⌚ Recommended Tightening Torque (N·m)

# "Sumi Dual Mill" DGC Type

## Inserts

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

Fig. 1

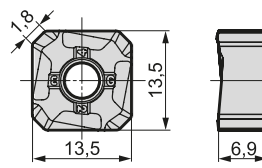


Fig. 2

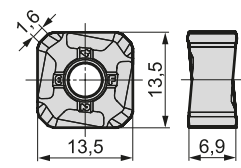


Fig. 3

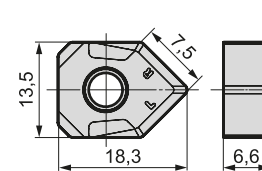
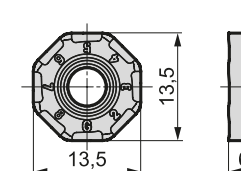
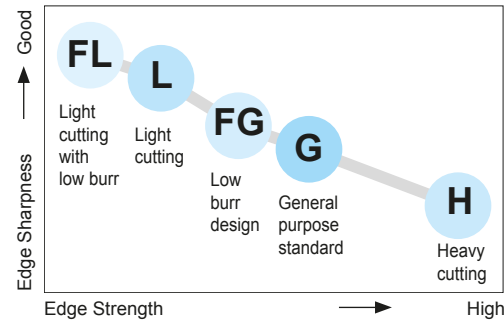


Fig. 4

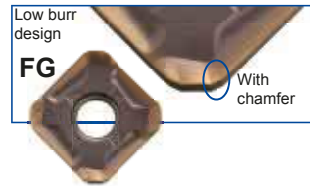


## Chipbreaker



### Improved Milling Quality

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



FG



No burrs

Competitor



Burrs

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

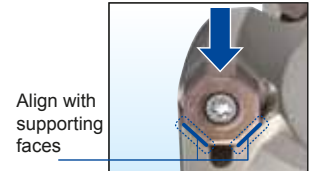
## Attaching Inserts



### Octagonal Inserts

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

Press down firmly from above



## Spare Parts

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

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

### Optional

| Insert Screw (*) |
|------------------|
|                  |
| BFTX0418IP       |

## 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<br>ACP300           |
|     | Alloyed Steel   | ◎        | 180-250-350                 | 0,10-0,30-0,45          | <4                | ACP200<br>ACP300           |
|     | Die Steel       | ◎        | 100-150-200                 | 0,15-0,25-0,35          | <4                | ACP200<br>ACP300           |
| M   | Stainless Steel | ○        | 160-200-250                 | 0,15-0,23-0,30          | <3                | ACM200<br>ACM300<br>ACP300 |
| K   | GG+GGG          | ◎        | 100-200-250                 | 0,10-0,25-0,40          | <5                | ACK200<br>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<br>ACP300           |
|     | Alloyed Steel   | ◎        | 180-250-350                 | 0,10-0,50-0,50          | <2                | ACP200<br>ACP300           |
|     | Die Steel       | ◎        | 100-150-200                 | 0,15-0,25-0,30          | <2                | ACP200<br>ACP300           |
| M   | Stainless Steel | ○        | 160-200-250                 | 0,15-0,23-0,30          | <2                | ACM200<br>ACM300<br>ACP300 |
| K   | GG+GGG          | ◎        | 100-200-250                 | 0,10-0,30-0,50          | <2                | ACK200<br>ACK300           |

◎ Preferred choice

○ Suitable

# "Wave Face Mill" WGX (M/F) Type

## General Milling of Steel and Cast Iron

### ■ Body – Shell type

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



Fig. 1

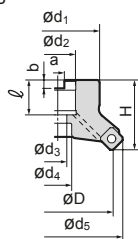


Fig. 2

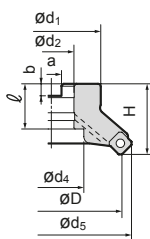


Fig. 3

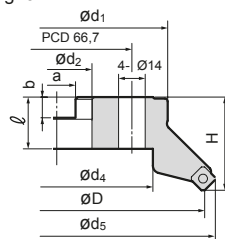
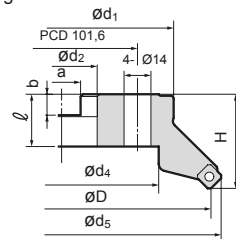


Fig. 4



Cutter body  $\phi D \geq 160\text{mm}$ : no inner coolant

### ■ Body

#### ● Type: WGX, Standard Pitch

Inner coolant available for  $D_c \leq \phi 125\text{mm}$

| Cat. No.     | Stock | Dimension (mm) |            |            |    | Mounting   |            |            |      |      |        | No. of Teeth | Weight (kg) | Fig. |
|--------------|-------|----------------|------------|------------|----|------------|------------|------------|------|------|--------|--------------|-------------|------|
|              |       | $\phi D$       | $\phi d_5$ | $\phi d_1$ | H  | $\phi d_2$ | $\phi d_4$ | $\phi d_3$ | a    | b    | $\ell$ |              |             |      |
| WGX 13040 RS | ●     | 40             | 52         | 32         | 40 | 16         | 14,0       | 9,0        | 8,4  | 5,6  | 18     | 3            | 0,3         | 1    |
| WGX 13050 RS | ●     | 50             | 62         | 40         | 40 | 22         | 18,0       | 11,0       | 10,4 | 6,3  | 20     | 3            | 0,4         | 1    |
| WGX 13063 RS | ●     | 63             | 76         | 50         | 40 | 22         | 18,0       | 11,0       | 10,4 | 6,3  | 20     | 4            | 0,6         | 1    |
| WGX 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    |
| WGX 13125 RS | ●     | 125            | 138        | 80         | 63 | 40         | 52,0       | 29,0       | 16,4 | 9,5  | 29     | 6            | 2,8         | 1    |
| WGX 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    |
| WGX 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) |            |            |    | Mounting   |            |            |      |      |        | No. of Teeth | Weight (kg) | Fig. |
|---------------|-------|----------------|------------|------------|----|------------|------------|------------|------|------|--------|--------------|-------------|------|
|               |       | $\phi D$       | $\phi d_5$ | $\phi d_1$ | H  | $\phi d_2$ | $\phi d_4$ | $\phi d_3$ | a    | b    | $\ell$ |              |             |      |
| WGXM 13050 RS | ●     | 50             | 62         | 40         | 40 | 22         | 18,0       | 11,0       | 10,4 | 6,3  | 20     | 4            | 0,4         | 1    |
| WGXM 13063 RS | ●     | 63             | 77         | 50         | 40 | 22         | 18,0       | 11,0       | 10,4 | 6,3  | 20     | 5            | 0,6         | 1    |
| WGXM 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    |
| WGXM 13125 RS | ●     | 125            | 139        | 80         | 63 | 40         | 52,0       | 29,0       | 16,4 | 9,5  | 29     | 8            | 2,8         | 1    |
| WGXM 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    |
| WGXM 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) |            |            |    | Mounting   |            |            |      |      |        | No. of Teeth | Weight (kg) | Fig. |
|---------------|-------|----------------|------------|------------|----|------------|------------|------------|------|------|--------|--------------|-------------|------|
|               |       | $\phi D$       | $\phi d_5$ | $\phi d_1$ | H  | $\phi d_2$ | $\phi d_4$ | $\phi d_3$ | a    | b    | $\ell$ |              |             |      |
| WGXF 13050 RS | ●     | 50             | 62         | 40         | 40 | 22         | 18,0       | 11,0       | 10,4 | 6,3  | 20     | 5            | 0,4         | 1    |
| WGXF 13063 RS | ●     | 63             | 77         | 50         | 40 | 22         | 18,0       | 11,0       | 10,4 | 6,3  | 20     | 6            | 0,6         | 1    |
| WGXF 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    |
| WGXF 13125 RS | ●     | 125            | 139        | 80         | 63 | 40         | 52,0       | 29,0       | 16,4 | 9,5  | 29     | 12           | 2,7         | 1    |
| WGXF 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    |
| WGXF 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**

Cutter Series

**M**

M: Medium  
F: Fine

**13**

Insert Size

**050**

Cutter Diameter

**R**

Direction

**S**

Metric

# "Wave Face Mill" 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  | Ø40 ~ Ø250 | 3 ~ 10       |
| Medium Pitch   | WGXM 13000RS | Ø50 ~ Ø250 | 4 ~ 14       |
| Fine Pitch     | WGXF 13000RS | Ø50 ~ Ø250 | 5 ~ 24       |
| Endmill Type   | WGX 13000EW  | Ø32 ~ Ø63  | 3 ~ 5        |

Inner coolant available for  $D_c \leq \text{Ø}125\text{mm}$



## Characteristics

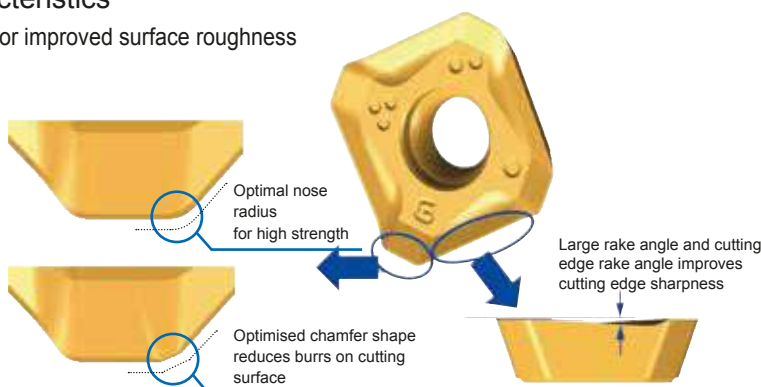
- **Stable Cutting**  
Special chipbreaker designed for WGX enables lower cutting forces.
- **High Quality**  
Improved run-out precision and unique wiper edge shape ensure excellent surface finish quality.  
Optimised chamfer edge reduces burr and edge chipping.
- **Long Tool Life**  
Features high 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

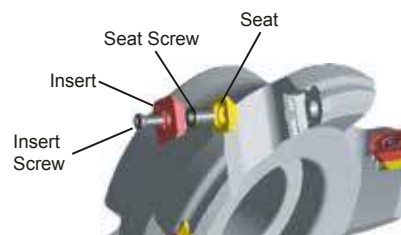
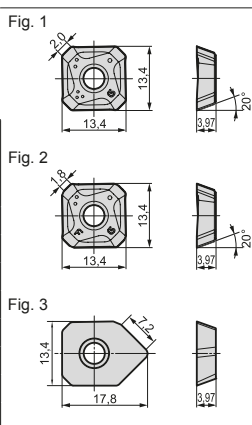
General-purpose  
G type chipbreaker

Low-burr design  
FG type chipbreaker



## Inserts

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



## Recommended Cutting Conditions

| ISO | Work Material     | Hardness  | Cutting Speed<br>$v_c$ (m/min) | Feed Rate<br>$f_t$ (mm/tooth) | Grade  |
|-----|-------------------|-----------|--------------------------------|-------------------------------|--------|
| P   | General Steel     | 180~280HB | 150-200-250                    | 0,15-0,20-0,25                | ACP200 |
|     | Soft Steel        | ≤180HB    | 180-265-350                    | 0,10-0,25-0,40                | ACP200 |
|     | Die Steel         | 200~220HB | 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         | 250HB     | 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

## Spare Parts

| Applicable Cutters | Seat      | Seat Screw | Insert Screw  | Insert Wrench | Seat Wrench |
|--------------------|-----------|------------|---------------|---------------|-------------|
|                    |           |            |               |               |             |
| WGX (-M/F)         | WGCS 13 R | BW 0507 F  | BFTX 03512 IP | TRDR 15 IP    | LH 035      |

# Face Mill

## WGC (M/F) Type

General Milling for Steel, Cast Iron & Exotic Material



Fig. 1

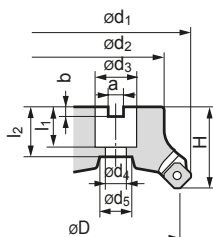


Fig. 2

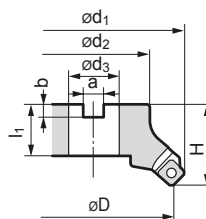
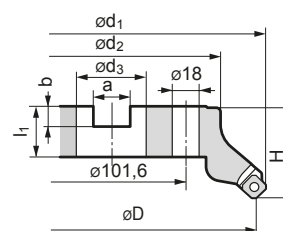


Fig. 3



### ■ Body

### ● Standard WGC - Type

| Type     | Cat. No.    | Stock | Dimensions (mm) |     |     |    | Mounting |      |     |      |     |    |    | No. of teeth | Weight (Kg) | Fig. |
|----------|-------------|-------|-----------------|-----|-----|----|----------|------|-----|------|-----|----|----|--------------|-------------|------|
|          |             |       | ø D             | ød1 | ød2 | H  | a        | b    | ød3 | ød4  | ød5 | l1 | l2 |              |             |      |
| WGC 3000 | WGC 3032 RS | □     | 32              | 41  | 32  | 40 | 8,4      | 5,6  | 16  | 9    | 14  | 18 | 28 | 4            | 0,2         | 1.   |
|          | WGC 3040 RS | ●     | 40              | 49  | 32  | 40 | 8,4      | 5,6  | 16  | 9    | 14  | 18 | 28 | 4            | 0,3         |      |
|          | WGC 3050 RS | ●     | 50              | 59  | 40  | 40 | 10,4     | 6,3  | 22  | 11   | 18  | 20 | 26 | 5            | 0,4         |      |
|          | WGC 3063 RS | □     | 63              | 72  | 50  | 40 | 10,4     | 6,3  | 22  | 11   | 18  | 20 | 26 | 6            | 0,6         |      |
|          | WGC 3080 RS | ●     | 80              | 89  | 60  | 50 | 12,4     | 7,0  | 27  | 13,5 | 20  | 25 | 31 | 6            | 1,1         |      |
|          | WGC 3100 RS | □     | 100             | 109 | 70  | 50 | 14,4     | 8,5  | 32  | -    | -   | 32 | -  | 7            | 1,5         | 2.   |
| WGC 4000 | WGC 4040 RS | □     | 40              | 52  | 32  | 40 | 8,4      | 5,6  | 16  | 9    | 14  | 18 | 28 | 3            | 0,4         | 1.   |
|          | WGC 4050 RS | ●     | 50              | 63  | 40  | 40 | 10,4     | 6,3  | 22  | 11   | 18  | 20 | 26 | 3            | 0,5         |      |
|          | WGC 4063 RS | ●     | 63              | 76  | 50  | 40 | 10,4     | 6,3  | 22  | 11   | 18  | 20 | 26 | 4            | 0,6         |      |
|          | WGC 4080 RS | ●     | 80              | 93  | 60  | 50 | 12,4     | 7,0  | 27  | 13,5 | 20  | 25 | 31 | 4            | 1,0         |      |
|          | WGC 4100 RS | ●     | 100             | 113 | 70  | 50 | 14,4     | 8,5  | 32  | -    | -   | 32 | -  | 5            | 1,5         | 2.   |
|          | WGC 4125 RS | ●     | 125             | 138 | 80  | 63 | 16,4     | 9,5  | 40  | -    | -   | 38 | -  | 6            | 2,6         |      |
|          | WGC 4160 RS | ●     | 160             | 173 | 100 | 63 | 16,4     | 9,5  | 40  | -    | -   | 38 | -  | 7            | 4,0         |      |
|          | WGC 4200 RS | ●     | 200             | 213 | 130 | 63 | 25,7     | 14,0 | 60  | -    | -   | 35 | -  | 8            | 6,6         | 3.   |

### ● Medium Pitch WGCM - Type

| Type      | Cat. No.     | Stock | Dimensions (mm) |     |     |    | Mounting |      |     |      |     |    |    | No. of teeth | Weight (Kg) | Fig. |
|-----------|--------------|-------|-----------------|-----|-----|----|----------|------|-----|------|-----|----|----|--------------|-------------|------|
|           |              |       | ø D             | ød1 | ød2 | H  | a        | b    | ød3 | ød4  | ød5 | l1 | l2 |              |             |      |
| WGCM 4000 | WGCM 4050 RS | ●     | 50              | 63  | 40  | 40 | 10,4     | 6,3  | 22  | 11   | 18  | 20 | 26 | 4            | 0,5         | 1.   |
|           | WGCM 4063 RS | ●     | 63              | 76  | 50  | 40 | 10,4     | 6,3  | 22  | 11   | 18  | 20 | 26 | 5            | 0,6         |      |
|           | WGCM 4080 RS | ●     | 80              | 93  | 60  | 50 | 12,4     | 7,0  | 27  | 13,5 | 20  | 25 | 31 | 6            | 1,0         |      |
|           | WGCM 4100 RS | ●     | 100             | 113 | 70  | 50 | 14,4     | 8,5  | 32  | -    | -   | 32 | -  | 7            | 1,5         | 2.   |
|           | WGCM 4125 RS | ●     | 125             | 138 | 80  | 63 | 16,4     | 9,5  | 40  | -    | -   | 38 | -  | 8            | 2,6         |      |
|           | WGCM 4160 RS | ●     | 160             | 173 | 100 | 63 | 16,4     | 9,5  | 40  | -    | -   | 38 | -  | 10           | 4,0         |      |
|           | WGCM 4200 RS | □     | 200             | 213 | 130 | 63 | 25,7     | 14,0 | 60  | -    | -   | 35 | -  | 12           | 6,6         | 3.   |

### ● Fine Pitch WGCF - Type

| Type      | Cat. No.     | Stock | Dimensions (mm) |     |     |    | Mounting |      |     |      |     |    |    | No. of teeth | Weight (Kg) | Fig. |
|-----------|--------------|-------|-----------------|-----|-----|----|----------|------|-----|------|-----|----|----|--------------|-------------|------|
|           |              |       | ø D             | ød1 | ød2 | H  | a        | b    | ød3 | ød4  | ød5 | l1 | l2 |              |             |      |
| WGCF 4000 | WGCF 4050 RS | ●     | 50              | 63  | 40  | 40 | 10,4     | 6,3  | 22  | 11   | 18  | 20 | 26 | 5            | 0,5         | 1.   |
|           | WGCF 4063 RS | ●     | 63              | 76  | 50  | 40 | 10,4     | 6,3  | 22  | 11   | 18  | 20 | 26 | 6            | 0,6         |      |
|           | WGCF 4080 RS | ●     | 80              | 93  | 60  | 50 | 12,4     | 7,0  | 27  | 13,5 | 20  | 25 | 31 | 8            | 1,0         |      |
|           | WGCF 4100 RS | ●     | 100             | 113 | 70  | 50 | 14,4     | 8,5  | 32  | -    | -   | 32 | -  | 10           | 1,5         | 2.   |
|           | WGCF 4125 RS | ●     | 125             | 138 | 80  | 63 | 16,4     | 9,5  | 40  | -    | -   | 38 | -  | 12           | 2,6         |      |
|           | WGCF 4160 RS | ●     | 160             | 173 | 100 | 63 | 16,4     | 9,5  | 40  | -    | -   | 38 | -  | 16           | 4,0         |      |
|           | WGCF 4200 RS | □     | 200             | 213 | 130 | 63 | 25,7     | 14,0 | 60  | -    | -   | 35 | -  | 20           | 6,6         |      |

### ■ 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





### Features

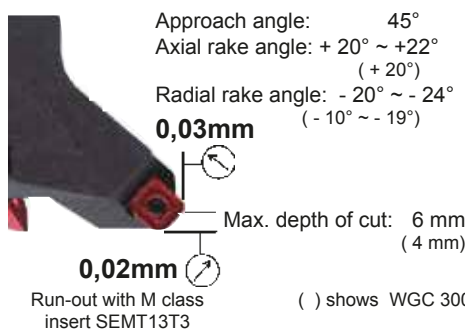
- Suitable for high speed machining  $v_c < 400\text{m/min}$ .
- Tough lightweight cutter body with wide chip pockets for fast metal removal.
- Low cost precision moulded inserts give G class performance at greatly reduced cost.
- Wide range of grades for most workpiece materials - including steels,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



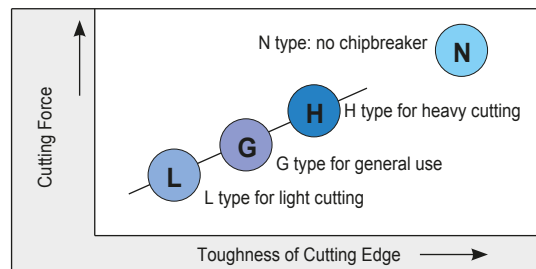
### Insert

| For WGC 3000 series               | Cat. No.            | Coated Carbide |        |        |        |        | DLC    | Cermet | Uncoated Carbide |    | PCD    | Dimensions (mm) |             |                 | Fig. |
|-----------------------------------|---------------------|----------------|--------|--------|--------|--------|--------|--------|------------------|----|--------|-----------------|-------------|-----------------|------|
|                                   |                     | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | DL1000 | T250A  | EH520            | H1 | DA2200 | I               | IC          | s <sup>±t</sup> |      |
|                                   |                     |                |        |        |        |        |        |        |                  |    |        |                 |             |                 |      |
| <br>For WGC, WGC M/-F 4000 series | SEET, SEMT          |                |        |        |        |        |        |        |                  |    |        |                 |             |                 |      |
|                                   | SEEW                |                |        |        |        |        |        |        |                  |    |        |                 |             |                 |      |
|                                   | SEET 0903 AGFN-L    | ●              | ●      | ●      | ●      | ●      |        |        |                  |    |        | 9,525 ±0,025    | 3,18 ±0,025 |                 | 1.   |
|                                   | SEET 0903 AGSN-G    | ●              | ●      | ●      | ●      | ●      |        |        |                  |    |        |                 |             |                 |      |
|                                   | SEET 0903 AGSN-N    | ●              | ●      | ●      | ●      | ●      |        |        |                  |    |        |                 |             |                 | 1.   |
|                                   | SEMT 0903 AGSN-L    | ○              | ●      | ●      | ○      | ○      |        |        |                  |    |        | 9,525 ±0,05     | 3,18 ±0,13  |                 |      |
|                                   | SEMT 0903 AGSN-G    | ●              | ●      | ●      | ●      | ●      |        |        |                  |    |        |                 |             |                 | 1.   |
|                                   | SEET 13T3 AGFN-L    | ●              | ●      | ●      | ●      | ●      | ●      |        | ●                | ●  |        | 13,4 ±0,025     | 3,97 ±0,025 |                 |      |
|                                   | SEET 13T3 AGSN-G    | ●              | ●      | ●      | ●      | ●      |        | ●      |                  |    |        |                 |             |                 | 1.   |
|                                   | SEET 13T3 AGSN-N    | ●              | ●      | ●      | ●      | ●      |        | ●      |                  |    |        |                 |             |                 |      |
|                                   | SEMT 13T3 AGSN-L    | ●              | ●      | ●      | ●      | ●      |        |        |                  |    |        | 13,4 ±0,08      | 3,97 ±0,13  |                 | 1.   |
|                                   | SEMT 13T3 AGSN-G    | ●              | ●      | ●      | ●      | ●      |        |        |                  |    |        |                 |             |                 |      |
|                                   | SEMT 13T3 AGSN-H    | ●              | ●      | ●      | ●      | ●      |        |        |                  |    |        |                 |             |                 | 2.   |
|                                   | SEEW 13T3 AGFR-W-NF |                |        |        |        |        |        |        |                  |    |        | 18              | 13,4        | 3,97 ±0,025     |      |
|                                   | SEEW 13T3 AGER-W    |                |        |        |        | ○      |        |        |                  |    |        |                 |             |                 | 3.   |

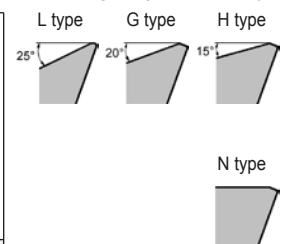
### Specifications



### Chip Breaker System



### Cutting Edge Geometry



### Recommended Cutting Conditions

( $v_c = \text{m/min}$ ,  $f_t = \text{mm/tooth}$ ) (min. – optimum – max.)

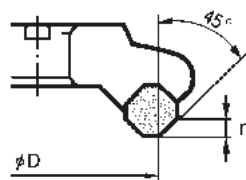
| Insert Type                |                 | SEMT 13T3 AGSN-G |              |             |                  |              |             |                 |             |              |                   |              |                   |
|----------------------------|-----------------|------------------|--------------|-------------|------------------|--------------|-------------|-----------------|-------------|--------------|-------------------|--------------|-------------------|
|                            |                 | ACP100           |              |             | ACP200           |              |             | ACP300          |             | ACK200       |                   | ACK300       |                   |
| Type                       | Work Material   | 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 |              |                   |              |                   |
| WGC (-M/-F)<br>4040 ~ 4200 | V <sub>c</sub>  | 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 <sub>t</sub>  | 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      |
|                            | d <sub>oc</sub> | 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  |                   |

# Face Mill 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

| Type     | Cat. No.       | Stock |   | Dimensions (mm) |                  |                  |    | Mounting         |      |      |                | No. of teeth | max. depth of cut | Weight (Kg) | Fig. |
|----------|----------------|-------|---|-----------------|------------------|------------------|----|------------------|------|------|----------------|--------------|-------------------|-------------|------|
|          |                | R     | L | Ø D             | Ø d <sub>1</sub> | Ø d <sub>2</sub> | H  | Ø d <sub>3</sub> | a    | b    | l <sub>1</sub> |              |                   |             |      |
| UFO 4000 | UFO 4050 R/L-S | ●     |   | 50              | 74               | 45               | 50 | 22               | 10,4 | 6,3  | 20             | 4            | 5,0               | 1,3         | 1.   |
|          | UFO 4063 R/L-S | ●     |   | 63              | 86               | 50               | 50 | 22               | 10,4 | 6,3  | 20             | 5            |                   | 1,6         |      |
|          | UFO 4080 R/L-S | ●     |   | 80              | 103              | 60               | 50 | 27               | 12,4 | 7,0  | 25             | 5            |                   | 2,1         | 2.   |
|          | UFO 4100 R/L-S | ●     |   | 100             | 122              | 75               | 50 | 32               | 14,4 | 8,5  | 29             | 6            |                   | 2,9         |      |
|          | UFO 4125 R/L-S | ●     |   | 125             | 146              | 75               | 63 | 40               | 16,4 | 9,5  | 29             | 7            |                   | 4,2         | 3.   |
|          | UFO 4160 R/L-S | ●     |   | 160             | 180              | 100              | 63 | 40               | 16,4 | 9,5  | 29             | 9            |                   | 6,6         |      |
|          | UFO 4200 R/L-S | ●     |   | 200             | 220              | 130              | 63 | 60               | 25,7 | 14,0 | 32             | 11           |                   | 9,5         | 4.   |
|          | UFO 4250 R/L-S | □     |   | 250             | 270              | 300              | 63 | 60               | 25,7 | 14,0 | 40             | 13           |                   | 14,8        |      |
|          | UFO 4315 R/L-S | □     |   | 315             | 335              | 240              | 80 | 60               | 25,7 | 14,0 | 40             | 15           |                   | 26,6        | 5.   |
| UFO 5000 | UFO 5080 R/L-S | ●     |   | 80              | 102              | 60               | 50 | 27               | 12,4 | 7,0  | 25             | 5            | 7,0               | 2,1         | 1.   |
|          | UFO 5100 R/L-S | ●     |   | 100             | 119              | 75               | 50 | 32               | 14,4 | 8,5  | 29             | 6            |                   | 2,9         | 2.   |
|          | UFO 5125 R/L-S | ●     |   | 125             | 143              | 75               | 63 | 40               | 16,4 | 9,5  | 29             | 7            |                   | 4,2         |      |
|          | UFO 5160 R/L-S | ●     |   | 160             | 177              | 100              | 63 | 40               | 16,4 | 9,5  | 29             | 9            |                   | 6,6         | 3.   |
|          | UFO 5200 R/L-S | ●     |   | 200             | 217              | 130              | 63 | 60               | 25,7 | 14,0 | 32             | 11           |                   | 9,5         | 4.   |
|          | UFO 5250 R/L-S | □     |   | 250             | 267              | 200              | 63 | 60               | 25,7 | 14,0 | 40             | 13           |                   | 14,8        |      |
|          | UFO 5315 R/L-S | □     |   | 315             | 332              | 240              | 80 | 60               | 25,7 | 14,0 | 40             | 15           |                   | 26,6        | 5.   |

Fig. 1

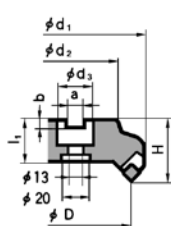


Fig. 2

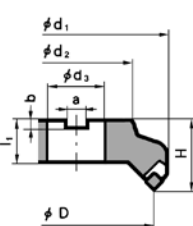


Fig. 3

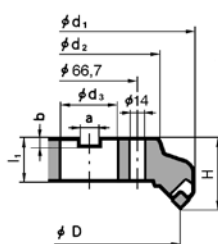


Fig. 4

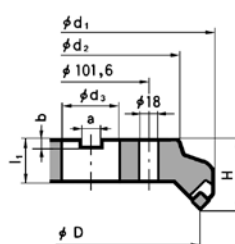
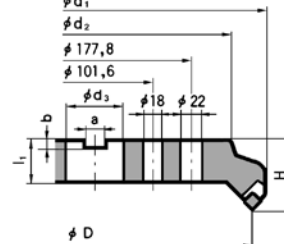


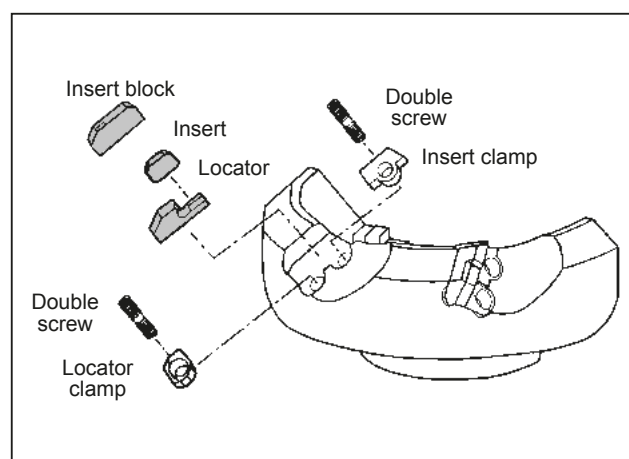
Fig. 5



## 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 | UFWK R/L      | WB 7-15 T    | TT 25        |
| 4080 - 4315 |               |              |              |
| 5080 - 5315 |               |              |              |

## Structure



### ■ Features

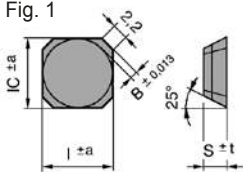
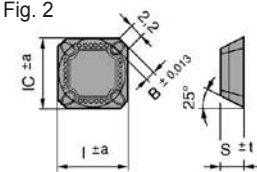
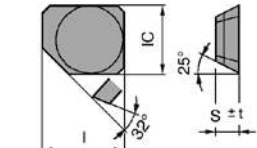
- 45° approach face mills
- 27° super high rake multi purpose cutter for outstanding productivity milling steels, irons and alloys
- Substantially improves metal removal rates on low powered machines
- Differential pitched inserts guarantee smooth cutting action
- Rigid body incorporates carbide locators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



### ■ Body (Fine Pitch Type)

| Type      | Cat. No.        | Stock |   | Dimensions (mm) |                  |                  |    | Mounting         |      |      |                | No. of teeth | Max. depth of cut | Weight (Kg) | Fig. |
|-----------|-----------------|-------|---|-----------------|------------------|------------------|----|------------------|------|------|----------------|--------------|-------------------|-------------|------|
|           |                 | R     | L | ø D             | ø d <sub>1</sub> | ø d <sub>2</sub> | H  | ø d <sub>3</sub> | a    | b    | l <sub>1</sub> |              |                   |             |      |
| UFOF 4000 | UFOF 4080 R/L-S | ●     |   | 80              | 103              | 60               | 50 | 27               | 12,4 | 7,0  | 25             | 6            | 5,0               | 2,1         | 1.   |
|           | UFOF 4100 R/L-S | ●     |   | 100             | 122              | 75               | 50 | 32               | 14,4 | 8,5  | 29             | 8            |                   | 2,9         | 2.   |
|           | UFOF 4125 R/L-S | ●     |   | 125             | 146              | 75               | 63 | 40               | 16,4 | 9,5  | 29             | 10           |                   | 4,2         |      |
|           | UFOF 4160 R/L-S | ●     |   | 160             | 180              | 100              | 63 | 40               | 16,4 | 9,5  | 29             | 12           |                   | 6,6         | 3.   |
|           | UFOF 4200 R/L-S | □     |   | 200             | 220              | 130              | 63 | 60               | 25,7 | 14,0 | 32             | 16           |                   | 9,5         | 4.   |
|           | UFOF 4250 R/L-S | □     |   | 250             | 270              | 300              | 63 | 60               | 25,7 | 14,0 | 40             | 20           |                   | 14,8        |      |
|           | UFOF 4315 R/L-S | □     |   | 315             | 335              | 240              | 80 | 60               | 25,7 | 14,0 | 40             | 24           |                   | 26,6        |      |

### ■ Insert

|                                                                                                                                                                                                                                                                                                        |                                                                                                                 |                |                                                                                     |        |        |                                                                                      |        |        |                                                                                       |      |    |      |                          |                 |                        |    |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------|--------|--------|--------------------------------------------------------------------------------------|--------|--------|---------------------------------------------------------------------------------------|------|----|------|--------------------------|-----------------|------------------------|----|------|
| <div>SFKN</div> <div>SFKR</div> <div>UW</div> |                                                                                                                 |                |  |        |        |  |        |        |  |      |    |      |                          |                 |                        |    |      |
| <div>UFO 4000</div> <div>UFOF 4000</div> <div></div>                                                                                                                                                                | <div></div> <div>12 T3</div> | Cat. No.       | Coated Carbide                                                                      |        |        |                                                                                      |        | Cermet | Uncoated Carbide                                                                      |      |    |      |                          | Dimensions (mm) |                        |    | Fig. |
|                                                                                                                                                                                                                                                                                                        |                                                                                                                 |                | ACP100                                                                              | ACP200 | ACP300 | ACK200                                                                               | ACK300 | T250A  | A30N                                                                                  | G10E | H1 | H10E | I                        | IC              | s ± t                  |    |      |
|                                                                                                                                                                                                                                                                                                        |                                                                                                                 | SFKN 12T3 AZFN |                                                                                     |        |        | ●                                                                                    | ●      |        |                                                                                       | ○    | ○  |      | 12,7 <sup>±0,075</sup>   |                 | 3,97 <sup>±0,025</sup> | 1. |      |
|                                                                                                                                                                                                                                                                                                        |                                                                                                                 | SFKN 12T3 AZTN | ●                                                                                   | ●      | ●      |                                                                                      |        | ○      | ○                                                                                     |      |    |      | 12,7 <sup>±0,05</sup>    |                 |                        | 2. |      |
|                                                                                                                                                                                                                                                                                                        | SFKR 12T3 AZTN                                                                                                  | ○              | ○                                                                                   |        |        |                                                                                      |        |        |                                                                                       |      |    |      |                          |                 | 3.                     |    |      |
| <div>UFO 5000</div>                                                                                                                                                                                                                                                                                    | <div></div> <div>15 04</div> | UW 12500 R     |                                                                                     |        |        |                                                                                      |        |        |                                                                                       |      | ○  | 16   | 12,2                     |                 |                        |    |      |
|                                                                                                                                                                                                                                                                                                        |                                                                                                                 | SFKN 1504 AZFN |                                                                                     |        |        | ●                                                                                    | ○      |        |                                                                                       | ○    |    |      | 15,875 <sup>±0,075</sup> |                 | 4,76 <sup>±0,025</sup> | 1. |      |
|                                                                                                                                                                                                                                                                                                        |                                                                                                                 | SFKN 1504 AZTN | ●                                                                                   | ●      | ●      |                                                                                      |        |        | ○                                                                                     |      |    |      |                          |                 |                        | 2. |      |
|                                                                                                                                                                                                                                                                                                        |                                                                                                                 | UW 15500 R     |                                                                                     |        |        |                                                                                      |        |        |                                                                                       |      |    | ○    | 16                       | 12,2            |                        | 3. |      |

### ■ Recommended Cutting Conditions

(v<sub>c</sub> = m/min, f<sub>t</sub> = mm/tooth) (min. – optimum – max.)

| Insert Type   | Grade           | ACP100           |              |             | ACP200           |              |             | ACP300          |             | ACK200       |                   | ACK300       |                   |
|---------------|-----------------|------------------|--------------|-------------|------------------|--------------|-------------|-----------------|-------------|--------------|-------------------|--------------|-------------------|
|               |                 | 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 |              |                   |              |                   |
| UFO (-F) 4000 | v <sub>c</sub>  | 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 <sub>t</sub>  | 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      |
|               | d <sub>oc</sub> | 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 <sub>c</sub>  | 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 <sub>t</sub>  | 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      |
|               | d <sub>oc</sub> | 1,0-4,0-7,0      |              |             | 1,0-4,0-7,0      |              |             | 1,0-3,0-5,0     |             | 1,0-4,0-7,0  |                   | 1,0-4,0-7,0  |                   |

# Face Mill 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

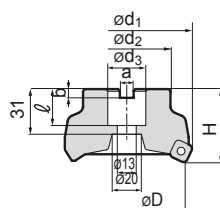


Fig. 2

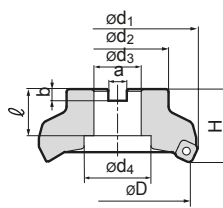


Fig. 3

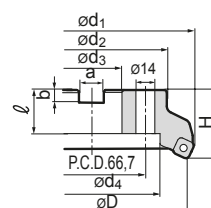
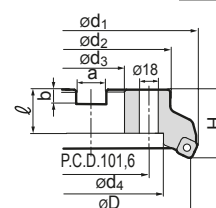


Fig. 4



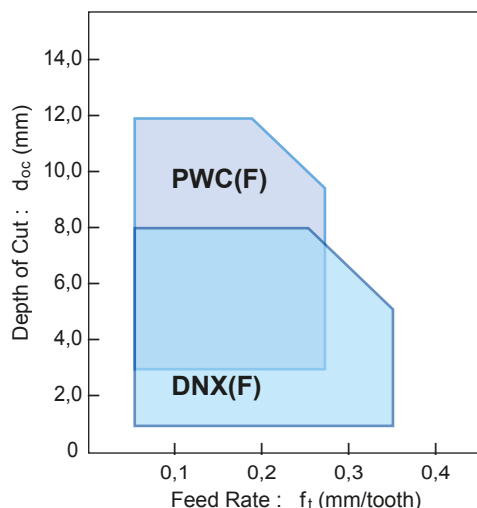
### ■ Body ● Standard DNX - Type

| Type      | Cat. No.     | Stock | Dimensions (mm) |                 |    |                 | Mounting        |                 |      |      |    | Number of teeth | Max. depth of cut | Weight (Kg) | Fig. |
|-----------|--------------|-------|-----------------|-----------------|----|-----------------|-----------------|-----------------|------|------|----|-----------------|-------------------|-------------|------|
|           |              |       | ø D             | ød <sub>1</sub> | H  | ød <sub>2</sub> | ød <sub>3</sub> | ød <sub>4</sub> | a    | b    | ℓ  |                 |                   |             |      |
| DNX 12000 | DNX 12080 RS | ●     | 80              | 88              | 50 | 60              | 27              | —               | 12,4 | 7,0  | 25 | 6               | 8,0               | 1,2         | 1.   |
|           | DNX 12100 RS | ●     | 100             | 108             | 50 | 80              | 32              | 46              | 14,4 | 8,5  | 29 | 7               |                   | 1,6         | 2.   |
|           | DNX 12125 RS | ●     | 125             | 133             | 63 | 80              | 40              | 56              | 16,4 | 9,5  | 29 | 8               |                   | 2,8         |      |
|           | DNX 12160 RS | ●     | 160             | 168             | 63 | 100             | 40              | 88              | 16,4 | 9,5  | 29 | 10              |                   | 4,4         | 3.   |
|           | DNX 12200 RS | □     | 200             | 210             | 63 | 150             | 60              | 130             | 25,7 | 14,0 | 35 | 16              |                   | 8,0         | 4.   |
|           | DNX 12250 RS | □     | 250             | 260             | 63 | 180             | 60              | 160             | 25,7 | 14,0 | 35 | 20              |                   | 12,2        |      |

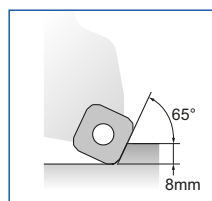
### ● Fine Pitch DNXF - Type

| Type       | Cat. No.      | Stock | Dimensions (mm) |                 |    |                 | Mounting        |                 |      |     |    | Number of teeth | Max. depth of cut | Weight (Kg) | Fig. |
|------------|---------------|-------|-----------------|-----------------|----|-----------------|-----------------|-----------------|------|-----|----|-----------------|-------------------|-------------|------|
|            |               |       | ø D             | ød <sub>1</sub> | H  | ød <sub>2</sub> | ød <sub>3</sub> | ød <sub>4</sub> | a    | b   | ℓ  |                 |                   |             |      |
| DNXF 12000 | DNXF 12080 RS | ●     | 80              | 88              | 50 | 60              | 27              | —               | 12,4 | 7,0 | 25 | 8               | 8,0               | 1,2         | 1.   |
|            | DNXF 12100 RS | ●     | 100             | 108             | 50 | 80              | 32              | 46              | 14,4 | 8,5 | 29 | 10              |                   | 1,6         | 2.   |
|            | DNXF 12125 RS | ●     | 125             | 133             | 63 | 80              | 40              | 56              | 16,4 | 9,5 | 29 | 11              |                   | 2,7         |      |
|            | DNXF 12160 RS | ●     | 160             | 168             | 63 | 100             | 40              | 88              | 16,4 | 9,5 | 29 | 12              |                   | 4,4         | 3.   |

### ■ First Recommendation: DNX



### DNX / DNXF



Wiper width = 1,2mm



| Max. depth of cut : 8mm, Approach angle : 65° |                |                                          |
|-----------------------------------------------|----------------|------------------------------------------|
| Cutter Type                                   | Diameter Range | Characteristics                          |
| DNX 12000 RS                                  | Ø80~Ø250mm     | - General purpose<br>- Medium pitch type |
| DNXF 12000 RS                                 | Ø80~Ø160mm     | - General purpose<br>- Fine pitch type   |

### ■ Spare Parts

| Cutter                    | Insert Screw | Insert Wrench | Locator   | Clamp Screw | Wrench |
|---------------------------|--------------|---------------|-----------|-------------|--------|
|                           |              |               |           |             |        |
| Ø 80 ~ Ø160<br>Ø200, Ø250 | BFTX0412 IP  | TRDR 15 IP    | —         | —           | —      |
|                           |              |               | DNXK 12 R | BX 0515     | LH 040 |

### ■ Identification of Cutter Body

**DNX F 12 080 R S**

|             |            |             |       |                   |            |
|-------------|------------|-------------|-------|-------------------|------------|
| Cutter type | Fine pitch | Insert size | Diam. | Cutting direction | Shell type |
|-------------|------------|-------------|-------|-------------------|------------|

# Face Mill 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

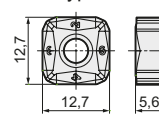


## ■ Insert

| Cat. No.          | Coated Carbide |        |        |        |        | Fig. |
|-------------------|----------------|--------|--------|--------|--------|------|
|                   | ACP200         | ACP300 | ACK100 | ACK200 | ACK300 |      |
| SNMT 1205 ZNEN-G  | ●              |        | ●      | ●      | ●      | 1    |
| SNMT 1205 ZNEN-H  | ●              |        | ●      | ●      | ●      | 2    |
| SNMT 1205 ZNEN-SH | ●              | □      | ●      | ●      | ●      | 3    |

Fig. 1

G Type

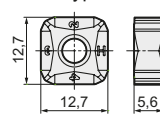


Cutting edge



Fig. 2

H Type

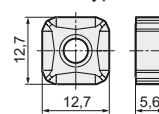


Flat land



Fig. 3

SH Type



Flat land



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<br>$v_c$ (m/min) | Feed Rate<br>$f_t$ (mm/tooth) | Insert Grade    |
|-----|-------------------------|---------------|--------------------------------|-------------------------------|-----------------|
| P   | Carbon steel            | 180 - 280     | 150 - <b>175</b> - 200         | 0,10 - <b>0,15</b> - 0,20     | ACP200          |
|     | Alloy steel             | 180 - 280     | 150 - <b>175</b> - 200         | 0,10 - <b>0,15</b> - 0,20     | ACP200          |
| K   | Grey cast iron (GG)     | 250           | 150 - <b>225</b> - 300         | 0,10 - <b>0,20</b> - 0,30     | ACK200 / ACK300 |
|     | Ductile cast iron (GGG) | 250           | 150 - <b>225</b> - 250         | 0,10 - <b>0,18</b> - 0,25     | ACK200 / ACK300 |



# Wave Radius Mill WRCX Type

High Durable Mill with Polygon Inserts

Grades for Steels, Cast Iron and Aluminium



## Features

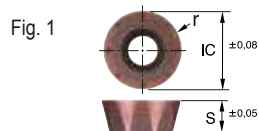
The "Wave Mill" WRCX type is a new multi purpose milling cutter for face milling, slotting, helical boring, plunging and profiling. Its unique design features 16 corner polygon inserts and a durable cutter body manufactured from high tensile alloyed steel protected by a hard surface treatment. Insert 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

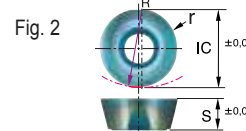
- Durable cutter body – Special alloyed steel with hard surface.
- High feed cutting – Optimised pitch and high number of cutting edges
- Excellent chip removal – Wide pocket and integral coolant hole
- Maximum rigidity – Rigid clamping of inserts with TORXPLUS screw
- Wide application range – Carbon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

## Insert

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



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



| Cat. No.           | Coated Carbide |        |        |        |        | Diamond Coated<br>DL1000 | Uncoated Carbide<br>H1 | IC (mm) | r (mm) | s (mm) | Max. d <sub>oc</sub>  |                       | Fig. | Applicable Cutter   |
|--------------------|----------------|--------|--------|--------|--------|--------------------------|------------------------|---------|--------|--------|-----------------------|-----------------------|------|---------------------|
|                    | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 |                          |                        |         |        |        | 4 corners application | 8 corners application |      |                     |
| QPMT 120440 PPEN   | ●              | ●      | ●      | ●      | ●      |                          |                        | 12      | 4,0    | 4,76   | 5,6                   | 1,5                   | ①    | WRCX/-F 12000 RS    |
| QPMT 120440 PPEN-H | ●              | ●      | ●      | ●      | ●      |                          |                        |         | 6,0    |        |                       | —                     | ②    |                     |
| QPET 120460 PPFR-S |                |        |        |        |        | ●                        | ●                      |         |        |        |                       |                       |      |                     |
| QPMT 160660 PPEN   | ●              | ●      | ●      | ●      | ●      |                          |                        | 16      | 6,0    | 6,5    | 7,6                   | 2,1                   | ①    | WRCX/-F/-X 16000 RS |
| QPMT 160660 PPEN-H | ●              | ●      | ●      | ●      | ●      |                          |                        |         | 8,0    |        |                       | —                     | ②    |                     |
| QPET 160680 PPFR-S |                |        |        |        |        | ●                        | ●                      |         |        |        |                       |                       |      |                     |
| QPMT 200670 PPEN   | ●              | ●      | ●      | ●      | ●      |                          |                        | 20      | 7,0    | 6,5    | 9,4                   | 2,5                   | ①    | WRCXF 20000 RS      |
| QPMT 200670 PPEN-H | ●              | ●      | ●      | ●      | ●      |                          |                        |         |        |        |                       |                       |      |                     |

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

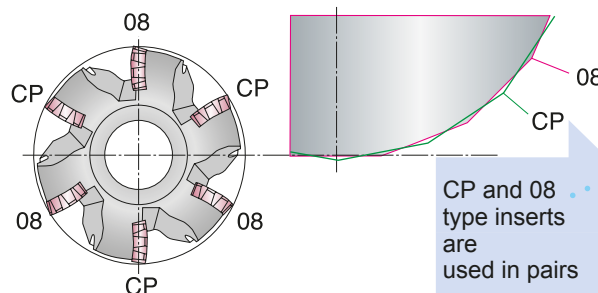
| Cat. No.            | Coated carbide |        |        |        |        | Diamond coated<br>DL1000 | Uncoated carbide<br>H1 | IC (mm) | r (mm) | s (mm) | Max. d <sub>oc</sub>  |                       | Insert type | Applicable cutter   |
|---------------------|----------------|--------|--------|--------|--------|--------------------------|------------------------|---------|--------|--------|-----------------------|-----------------------|-------------|---------------------|
|                     | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 |                          |                        |         |        |        | 4 corners application | 8 corners application |             |                     |
| QPMT 160608 PPEN    | ●              | ●      | ●      | ●      | ●      |                          |                        | 16      | 0,8    | 6,5    | 7,6                   | 1,2                   | 08          | WRCX/-F/-X 16000 RS |
| QPMT 160608 PPEN-CP | ●              | ●      | ●      | ●      | ●      |                          |                        |         |        |        |                       | 2,3                   | CP          |                     |
| QPMT 200608 PPEN    | ●              | ●      | ●      | ●      | ●      |                          |                        | 20      | 0,8    | 6,5    | 9,4                   | 1,6                   | 08          | WRCXF 20000 RS      |
| QPMT 200608 PPEN-CP | ●              | ●      | ●      | ●      | ●      |                          |                        |         |        |        |                       | 2,9                   | CP          |                     |

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

$$f_t < 0,15 \quad (IC=16 \text{ mm})$$

or

$$f_t < 0,2 \quad (IC=20 \text{ mm}).$$



CP and 08 type inserts are used in pairs

## Chip Formation

| Anti-vibration Type                                                | Standard Type |
|--------------------------------------------------------------------|---------------|
|                                                                    |               |
| Work Material: 50C                                                 |               |
| Cutting Data: f <sub>t</sub> = 0,1mm/tooth, d <sub>oc</sub> = 7 mm |               |
| Insert Size: IC = 20 mm                                            |               |

# Wave Radius Mill WRCX Type

[illegible]

Technical drawing of a shaft-hub assembly showing dimensions for fit calculation. The drawing includes the following dimensions:

- $\varnothing d_1$ : Outer diameter of the shaft.
- $\varnothing d_2$ : Inner diameter of the hub.
- $\varnothing d_3$ : Diameter of the shaft at the end of the hub.
- $a$ : Length of the shaft at the end of the hub.
- $b$ : Thickness of the hub flange.
- $l_1$ : Length of the shaft.
- $H^*$ : Height of the hub.
- $\varnothing d_5$ : Diameter of the shaft at the end of the hub.
- $\varnothing C$ : Diameter of the shaft at the end of the hub.
- $\varnothing D^*$ : Outer diameter of the hub.

Axial rake angle:  $-3^\circ$   
Radial rake angle:  $0^\circ$

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

## ■ Body

- Standard WRCX Type

| Insert<br>IC (mm)                                                                    | Cat. No.      | Stock | Dimensions (mm) |     |                  |                  |    | Mounting |     |                  |                  |                  |                | No. of<br>teeth | Helical<br>boring<br>øB Standard | Ramping<br>α <sub>max</sub> | Weight (Kg) | Fig. |
|--------------------------------------------------------------------------------------|---------------|-------|-----------------|-----|------------------|------------------|----|----------|-----|------------------|------------------|------------------|----------------|-----------------|----------------------------------|-----------------------------|-------------|------|
|                                                                                      |               |       | ø D*            | ø C | ø d <sub>1</sub> | ø d <sub>2</sub> | H* | a        | b   | ø d <sub>3</sub> | ø d <sub>4</sub> | ø d <sub>5</sub> | l <sub>1</sub> |                 |                                  |                             |             |      |
|  12 | WRCX 12040 RS | ●     | 40              | 28  | 36               | 36               | 40 | 8,4      | 5,6 | 16               | 9                | 14               | 18             | 4               | 68 ± 11                          | 10°                         | 0,2         | 1    |
|                                                                                      | WRCX 12050 RS | ●     | 50              | 38  | 46               | 40               | 40 | 10,4     | 6,3 | 22               | 11               | 18               | 20             | 4               | 88 ± 11                          | 7°                          | 0,3         |      |
|                                                                                      | WRCX 12052 RS | ●     | 52              | 40  | 48               | 40               | 40 | 10,4     | 6,3 | 22               | 11               | 18               | 20             | 5               | 92 ± 11                          | 6°30'                       | 0,3         |      |
|                                                                                      | WRCX 12063 RS | ●     | 63              | 51  | 59               | 40               | 40 | 10,4     | 6,3 | 22               | 11               | 18               | 20             | 5               | 114 ± 11                         | 5°                          | 0,4         |      |
|                                                                                      | WRCX 12080 RS | ●     | 80              | 68  | 76               | 55               | 50 | 12,4     | 7,0 | 27               | 13,5             | 20               | 25             | 6               | 148 ± 11                         | 3°30'                       | 0,9         |      |
|  16 | WRCX 16063 RS | ●     | 63              | 47  | 50               | 50               | 40 | 10,4     | 6,3 | 22               | 11               | 18               | 20             | 3               | 110 ± 15                         | 8°                          | 0,4         | 1    |
|                                                                                      | WRCX 16080 RS | ●     | 80              | 64  | 70               | 55               | 50 | 12,4     | 7,0 | 27               | 13,5             | 20               | 25             | 4               | 144 ± 15                         | 5°30'                       | 0,8         |      |
|                                                                                      | WRCX 16100 RS | ●     | 100             | 84  | 90               | 70               | 50 | 14,4     | 8,5 | 32               | -                | 46               | 32             | 5               | 184 ± 15                         | 4°                          | 1,3         | 2    |
|                                                                                      | WRCX 16125 RS | □     | 125             | 109 | 115              | 80               | 63 | 16,4     | 9,5 | 40               | -                | 52               | 38             | 5               | 234 ± 15                         | 3°                          | 2,4         |      |

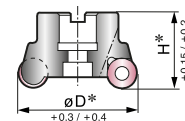
● Fine Pitch WRCXF Type

|  Insert<br>IC (mm) | Cat. No.       | Stock                                                                             | Dimensions (mm) |     |                  |                  |    | Mounting |     |                  |                  |                  |                | No. of<br>teeth | Helical<br>boring<br>øB Standard | Ramping<br>α <sub>max</sub> | Weight<br>(Kg) | Fig. |
|-----------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------|-----------------|-----|------------------|------------------|----|----------|-----|------------------|------------------|------------------|----------------|-----------------|----------------------------------|-----------------------------|----------------|------|
|                                                                                                     |                |                                                                                   | ø D*            | ø C | ø d <sub>1</sub> | ø d <sub>2</sub> | H* | a        | b   | ø d <sub>3</sub> | ø d <sub>4</sub> | ø d <sub>5</sub> | l <sub>1</sub> |                 |                                  |                             |                |      |
|  12                | WRCXF 12050 RS |  | 50              | 38  | 46               | 40               | 40 | 10,4     | 6,3 | 22               | 11               | 18               | 20             | 5               | 88 ± 11                          | 7°                          | 0,3            |      |
|                                                                                                     | WRCXF 12063 RS |  | 63              | 51  | 59               | 40               | 40 | 10,4     | 6,3 | 22               | 11               | 18               | 20             | 6               | 114 ± 11                         | 5°                          | 0,4            |      |
|  16              | WRCXF 16052 RS | ●                                                                                 | 52              | 36  | 45               | 45               | 40 | 10,4     | 6,3 | 22               | 11               | 17,7             | 20             | 4               | 88 ± 15                          | 10°                         | 0,3            | 1    |
|                                                                                                     | WRCXF 16063 RS | ●                                                                                 | 63              | 47  | 50               | 50               | 40 | 10,4     | 6,3 | 22               | 11               | 18               | 20             | 4               | 110 ± 15                         | 8°                          | 0,4            |      |
|                                                                                                     | WRCXF 16080 RS | ●                                                                                 | 80              | 64  | 70               | 55               | 50 | 12,4     | 7,0 | 27               | 13,5             | 20               | 25             | 5               | 144 ± 15                         | 5°30'                       | 0,8            |      |
|                                                                                                     | WRCXF 16100 RS | ●                                                                                 | 100             | 84  | 90               | 70               | 50 | 14,4     | 8,5 | 32               | -                | 46               | 32             | 6               | 184 ± 15                         | 4°                          | 1,3            |      |
|                                                                                                     | WRCXF 16125 RS | ●                                                                                 | 125             | 109 | 115              | 80               | 63 | 16,4     | 9,5 | 40               | 29               | 52               | 29             | 6               | 234 ± 15                         | 3°                          | 2,4            | 1    |
|                                                                                                     | WRCXF 16160 RS | ●                                                                                 | 160             | 144 | 150              | 100              | 63 | 16,4     | 9,5 | 40               | -                | 93               | 29             | 8               | 304 ± 18                         | 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    |
|  20              | WRCXF 20100 RS | ●                                                                                 | 100             | 80  | 88               | 70               | 50 | 14,4     | 8,5 | 32               | -                | 46               | 32             | 6               | 180 ± 18                         | 5°                          | 1,1            | 2    |
|                                                                                                     | WRCXF 20125 RS | ●                                                                                 | 125             | 105 | 113              | 80               | 63 | 16,4     | 9,5 | 40               | 29               | 52               | 29             | 6               | 230 ± 18                         | 3°30'                       | 2,3            | 1    |
|                                                                                                     | WRCXF 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

| Insert<br>IC (mm)                                                                   | Cat. No.              | Stock | Dimensions (mm) |     |                  |                  |    | Mounting |     |                  |                  |                  |                | No. of<br>teeth | Helical<br>boring<br>ØB Standard | Ramping<br>α <sub>max</sub> | Weight<br>(Kg) | Fig. |
|-------------------------------------------------------------------------------------|-----------------------|-------|-----------------|-----|------------------|------------------|----|----------|-----|------------------|------------------|------------------|----------------|-----------------|----------------------------------|-----------------------------|----------------|------|
|                                                                                     |                       |       | ø D*            | ø C | ø d <sub>1</sub> | ø d <sub>2</sub> | H* | a        | b   | ø d <sub>3</sub> | ø d <sub>4</sub> | ø d <sub>5</sub> | l <sub>1</sub> |                 |                                  |                             |                |      |
|  | <b>WRCXX 16080 RS</b> | ●     | 80              | 64  | 70               | 55               | 50 | 12,4     | 7,0 | 27               | 13,5             | 20               | 25             | 6               | 144 ± 15                         | 5°30'                       | 0,8            | 1    |
|                                                                                     | <b>WRCXX 16100 RS</b> | ●     | 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:  $\varnothing D^* + 0,3$  &  $H^* + 0,15$  mm  
In case of anti-vibration inserts / IC = 20, please change above dimensions:  $\varnothing D^* + 0,4$  &  $H^* + 0,2$  mm



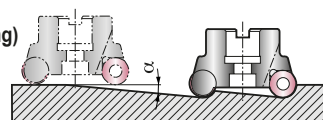
■ Maximum Rotation (min<sup>-1</sup>) for Non-ferrous cutting when using QPET Insert

| Cutter |   |  10 |  12 |  16 |
|--------|---|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| ø D    | n |                                                                                        |                                                                                        |                                                                                        |
| 25     |   | 28.000                                                                                 |                                                                                        |                                                                                        |
| 32     |   | 25.000                                                                                 |                                                                                        |                                                                                        |
| 40     |   |                                                                                        | 22.000                                                                                 |                                                                                        |
| 50     |   |                                                                                        | 20.000                                                                                 | 14.000                                                                                 |
| 63     |   |                                                                                        | 18.000                                                                                 | 13.000                                                                                 |
| 80     |   |                                                                                        | 16.000                                                                                 | 12.000                                                                                 |
| 100    |   |                                                                                        |                                                                                        | 10.000                                                                                 |
| 125    |   |                                                                                        |                                                                                        | 9.000                                                                                  |
| 160    |   |                                                                                        |                                                                                        | 8.000                                                                                  |

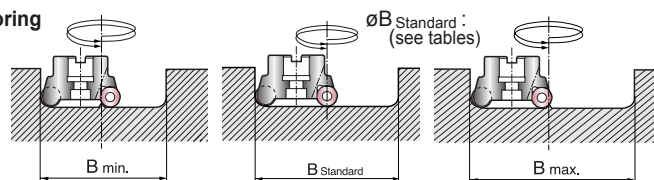
■ Spare Parts

| Cutter     |               | Screw                                                                               |                                                                                     | Screw                                                                               |
|------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|            |               |  |  |  |
| WRCX       | 12000         | 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    | 20000         | BFTX 0615 IP                                                                        | 5.0                                                                                 | TRDR 25 IP                                                                          |

### Ramping (Slant Milling)

 $\alpha_{\max}$ : (see tables)

## Helical Boring



### ■ Recommended Cutting Conditions

| Material     |                | Carbon steel<br>(ex. C40 ~ C50) | Alloy steel<br>(Below HRC40) | Stainless steel<br>(ex. X10CrNiS18-9) | Cast iron<br>(ex. GG20) | Non-ferrous<br>material |
|--------------|----------------|---------------------------------|------------------------------|---------------------------------------|-------------------------|-------------------------|
| øD<br>(mm)   | Grade          | ACP100, ACP200                  | ACP100, ACP200               | ACP200, ACP300                        | ACK200, ACK300          | DL1000, H1              |
|              |                |                                 |                              |                                       |                         |                         |
| 40 ~<br>80   | v <sub>c</sub> | 100- <b>160</b> -200            | 100- <b>140</b> -180         | 80- <b>120</b> -160                   | 80- <b>120</b> -160     | 200- <b>500</b> -1000   |
|              | f <sub>t</sub> | 0,2- <b>0,4</b> -0,6            | 0,2- <b>0,3</b> -0,4         | 0,1- <b>0,2</b> -0,3                  | 0,1- <b>0,2</b> -0,4    | 0,1- <b>0,3</b> -0,4    |
| 100 ~<br>160 | v <sub>c</sub> | 150- <b>200</b> -250            | 100- <b>160</b> -200         | 160- <b>180</b> -200                  | 100- <b>150</b> -200    | 200- <b>500</b> -1000   |
|              | f <sub>t</sub> | 0,3- <b>0,4</b> -0,6            | 0,1- <b>0,3</b> -0,5         | 0,15- <b>0,2</b> -0,3                 | 0,1- <b>0,15</b> -0,2   | 0,2- <b>0,3</b> -0,6    |

[ $v_c \equiv m/\text{min}$ ;  $f_t \equiv \text{mm/tooth}$ ] [min. = optimum – max.]

# Wave Radius Mill RSX Series



## ■ 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.

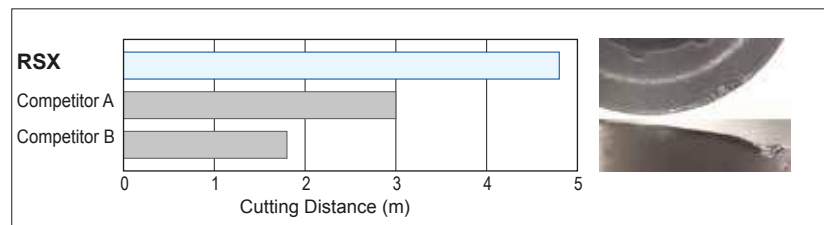
ACP200 for steel and ACK300 for cast iron enable stable machining in a wide range of applications.

## ■ Series

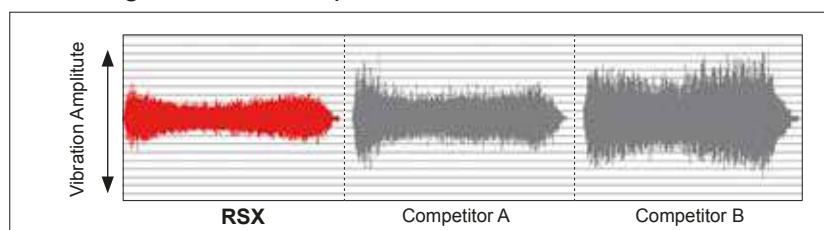
| Image                                                                                                      | Series     | Insert Size | Cat. No.      | External Diameter (mm) |     |     |     |     |     |     |     |     |      |      |      |
|------------------------------------------------------------------------------------------------------------|------------|-------------|---------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|                                                                                                            |            |             |               | ø20                    | ø25 | ø32 | ø40 | ø50 | ø52 | ø63 | ø66 | ø80 | ø100 | ø125 | ø160 |
| Shank Type<br><br>H42   | Standard   | 08          | RSX 08000 ES  | New                    | ●   | ●   |     |     |     |     |     |     |      |      |      |
|                                                                                                            |            | 10          | RSX 10000 ES  |                        | ●   | ●   |     |     |     |     |     |     |      |      |      |
|                                                                                                            |            | 12          | RSX 12000 ES  |                        | ●   | ●   |     |     |     |     |     |     |      |      |      |
|                                                                                                            | Fine Pitch | 08          | RSXF 08000 ES | New                    | ●   | ●   |     |     |     |     |     |     |      |      |      |
|                                                                                                            |            | 10          | RSXF 10000 ES |                        | ●   | ●   |     |     |     |     |     |     |      |      |      |
|                                                                                                            |            | 12          | RSXF 12000 ES |                        | ●   | ●   |     |     |     |     |     |     |      |      |      |
| Shell Type<br>          | Standard   | 10          | RSX 10000 RS  |                        |     |     | ●   | ●   | ●   |     |     | ●   | ●    |      |      |
|                                                                                                            |            | 12          | RSX 12000 RS  |                        |     |     | ●   | ●   | ●   | ●   | ●   | ●   | ●    | ●    |      |
|                                                                                                            |            | 16          | RSX 16000 RS  |                        |     |     |     |     |     | ●   |     | ●   | ●    | ●    |      |
|                                                                                                            | Fine Pitch | 20          | RSX 20000 RS  | New                    |     |     |     |     |     |     |     | ●   | ●    | ●    | ●    |
|                                                                                                            |            | 10          | RSXF 10000 RS |                        |     |     | ●   | ●   | ●   |     |     | ●   | ●    | ●    |      |
|                                                                                                            |            | 12          | RSXF 12000 RS |                        |     |     | ●   | ●   | ●   | ●   | ●   | ●   | ●    | ●    |      |
| Modular Type<br><br>H43 | Standard   | 16          | RSX 16000 RS  |                        |     |     |     |     |     | ●   |     | ●   | ●    | ●    |      |
|                                                                                                            |            | 20          | RSX 20000 RS  | New                    |     |     |     |     |     |     |     | ●   | ●    | ●    | ●    |
|                                                                                                            |            | 10          | RSXF 10000 M  | New                    | ●   | ●   | ●   |     |     |     |     |     |      |      |      |
|                                                                                                            | Fine Pitch | 12          | RSX 12000 M   |                        | ●   | ●   | ●   |     |     |     |     |     |      |      |      |
|                                                                                                            |            | 08          | RSXF 08000 M  | New                    | ●   | ●   | ●   |     |     |     |     |     |      |      |      |
|                                                                                                            |            | 10          | RSXF 10000 M  |                        | ●   | ●   | ●   |     |     |     |     |     |      |      |      |

## ■ Cutting Performance

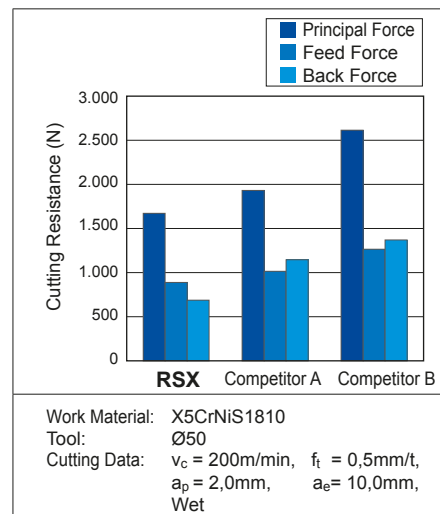
### ● Tool Life Comparison (Fracture Resistance)



### ● Cutting Vibration Comparison



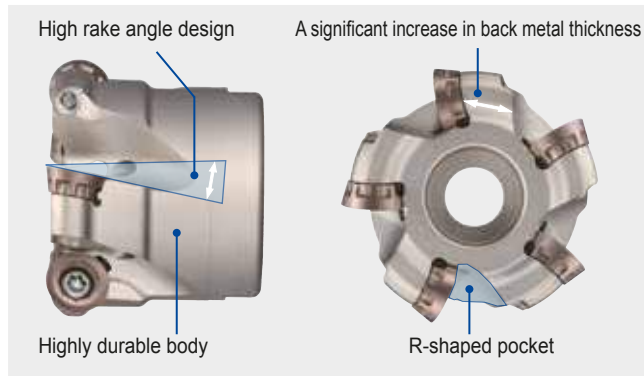
### ● Cutting Resistance Comparison



# Wave Radius Mill RSX Series

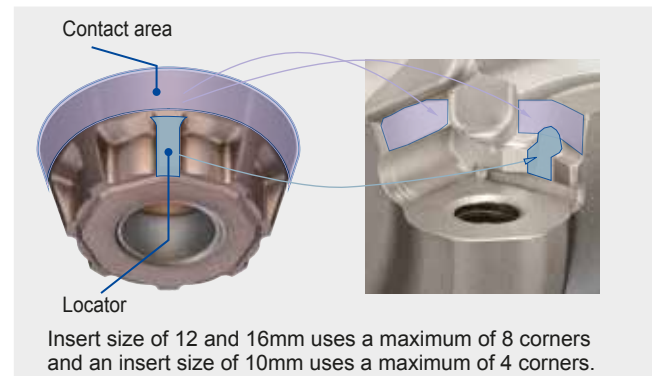
## Low Cutting Resistance, Less Vibration

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.



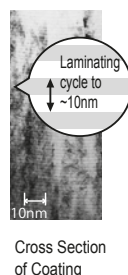
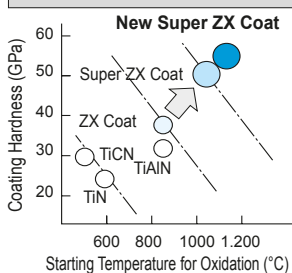
## Stable and Long Tool Life

| Work Material | Wear Resistance | Fracture Resistance |
|---------------|-----------------|---------------------|
| <b>P</b>      | ACP200          | New                 |
| <b>M</b>      | ACM100          | ACM200              |
|               |                 | ACM300              |
| <b>K</b>      | ACK300          | New                 |
| <b>S</b>      | ACM100          | ACM200              |
|               |                 | ACM300              |

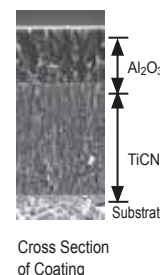
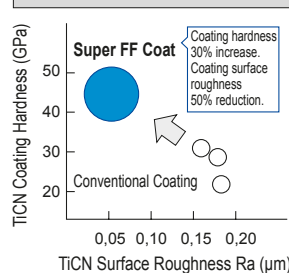
Coating Type: CVD PVD

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.

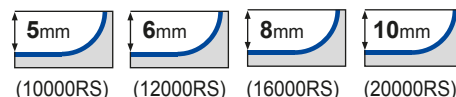
### Super FF Coat

Smooth coating surface provides excellent adhesion and chipping resistance. Improved coating adhesion strength. Harder than conventional coatings with high improvements in wear resistance. High speed, high efficiency 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.

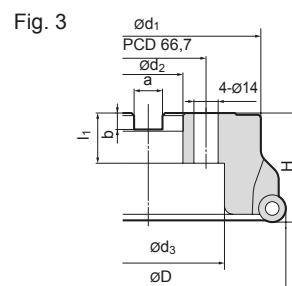
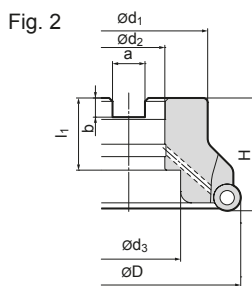
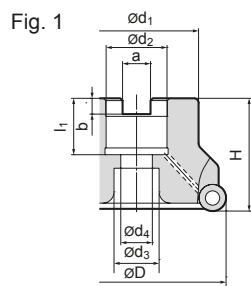


Milling of steel, stainless steel, cast iron and exotic alloys

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



## Body – Dimensions



## Body

### ● RSX...RS, Standard

| Cat. No. |          | Stock | Dimensions (mm) |                 |    |                 |      |     |                |                 |                 | No. of teeth | Weight (kg) | Fig. |
|----------|----------|-------|-----------------|-----------------|----|-----------------|------|-----|----------------|-----------------|-----------------|--------------|-------------|------|
|          |          |       | ØD              | ød <sub>1</sub> | H  | ød <sub>2</sub> | a    | b   | l <sub>1</sub> | ød <sub>3</sub> | ød <sub>4</sub> |              |             |      |
| 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    |
|          | 12100 RS | ●     | 100             | 70              | 50 | 32              | 14,4 | 8,5 | 32             | 46              | -               | 6            | 1,4         | 2    |
|          | 16063 RS | ●     | 63              | 50              | 40 | 22              | 10,4 | 6,3 | 20             | 18              | 11              | 4            | 0,5         | 1    |
| RSX      | 16080 RS | ●     | 80              | 55              | 50 | 27              | 12,4 | 7,0 | 25             | 20              | 14              | 5            | 0,9         | 1    |
|          | 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    |
|          | 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. |
|---------------------------------------------------------------------------------------------------|-------|-----------------|-----------------|----|-----------------|------|-----|----------------|-----------------|-----------------|--------------|-------------|------|
|                                                                                                   |       | ØD              | Ød <sub>1</sub> | H  | Ød <sub>2</sub> | a    | b   | l <sub>1</sub> | Ød <sub>3</sub> | Ød <sub>4</sub> |              |             |      |
| 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    |
| 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    |
| 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    |
| 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    |

## Cutter Identification

RSX

Cutter Series

F

Fine Pitch Type

12

Insert Size

040

Cutter Diameter

R

Cutting Direction

S

Metric



## Various Machining Use

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

## Helical Milling

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

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

## Ramping

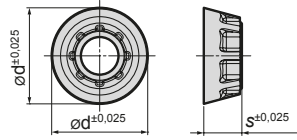
Use at  $\alpha^\circ$  or lower

## Recommended Values for Helical and Ramping

| Insert Cat. No.          | Helical              |               |                |      | Taper                                    |
|--------------------------|----------------------|---------------|----------------|------|------------------------------------------|
|                          | Cutter<br>$\phi D_c$ | Work Diameter |                |      | Ramping<br>Angle<br>$\alpha^\circ(\max)$ |
|                          |                      | Min.          | Optimal $\phi$ | 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'                                    |
| RDET16...                | 100                  | 177,5         | 188            | 199  | 2°10'                                    |
|                          | 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'                                    |
| <div>New</div> 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  |        |        |        |        | Dimens.  |      | Applicable Cutters |
|----------------------|--------|--------|--------|--------|--------|----------|------|--------------------|
| High Speed/Light Cut |        |        | M      | S      |        | $\phi d$ | S    |                    |
| General Purpose      | P      | M      | M      | S      | S      |          |      |                    |
| Roughing             | P      | K      |        |        | S      |          |      |                    |
| Cat. No.             | ACP200 | ACK300 | ACM100 | ACM200 | ACM300 | $\phi d$ | S    |                    |
| 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       |     |
|--------------------|----------|-------------|-----|
|                    |          |             |     |
| 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  | Cutting Speed<br>$v_c$ (m/min) | Feed Rate<br>$f_t$ (mm/t) | Grade            |
|-----|-------------------------|----------------|-------------------------------|-----------|--------------------------------|---------------------------|------------------|
| P   | Carbon Steel            |                |                               | 180-280HB | 100- <b>160</b> -200           | 0,20- <b>0,40</b> -0,60   | ACP200           |
|     | Alloy Steel             |                |                               | 180-280HB | 100- <b>140</b> -180           | 0,20- <b>0,30</b> -0,40   | ACP200           |
| M   | Stain-<br>less<br>Steel | Cr<br>Based    | Ferritic                      | 200HB     | 150- <b>180</b> -200           | 0,15- <b>0,25</b> -0,35   | ACM300           |
|     |                         |                | Martensitic                   | 200-330HB | 80- <b>120</b> -180            | 0,15- <b>0,25</b> -0,35   | ACM300           |
|     |                         | Cr-Ni<br>Based | Austenitic                    | 200HB     | 150- <b>180</b> -200           | 0,15- <b>0,25</b> -0,35   | ACM300           |
|     |                         |                | Austenitic, ferritic          | 230-270HB | 80- <b>120</b> -180            | 0,15- <b>0,25</b> -0,35   | ACM200           |
|     |                         |                | Precipitation hardening       | 330HB     | 60- <b>100</b> -160            | 0,15- <b>0,25</b> -0,35   | ACM200           |
| K   | Cast Iron               |                |                               | 250HB     | 80- <b>120</b> -160            | 0,10- <b>0,30</b> -0,40   | ACK300           |
| S   | Heat resistant alloy    |                | Ni based material             | 250-350HB | 20- <b>30</b> - 40             | 0,10- <b>0,20</b> -0,30   | ACM100<br>ACM200 |
|     | Titanium                |                | Pure Titanium                 | (Rm400)   | 60- <b>80</b> -100             | 0,10- <b>0,20</b> -0,30   |                  |
|     |                         |                | $\alpha + \beta$ alloy system | (Rm1050)  | 40- <b>50</b> - 60             | 0,10- <b>0,20</b> -0,30   |                  |

# Sumi Dual Mill

## 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 Ø25mm to Ø200mm
- 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 | Standard Pitch | DFC 09000 E   | Ø25~Ø80       | 2~5          |       |
|       | Medium Pitch   | DFCM 09000 E  | Ø32~Ø80       | 3~7          |       |
| Shell | Standard Pitch | DCF 09000 RS  | Ø50~Ø200      | 4~8          |       |
|       | Medium Pitch   | DFCM 09000 RS | Ø50~Ø200      | 5~12         |       |
|       | Fine Pitch     | DFCF 09000 RS | Ø50~Ø200      | 6~16         |       |

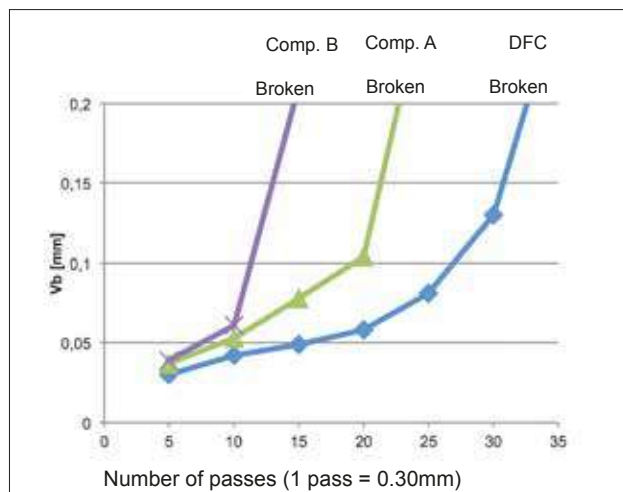
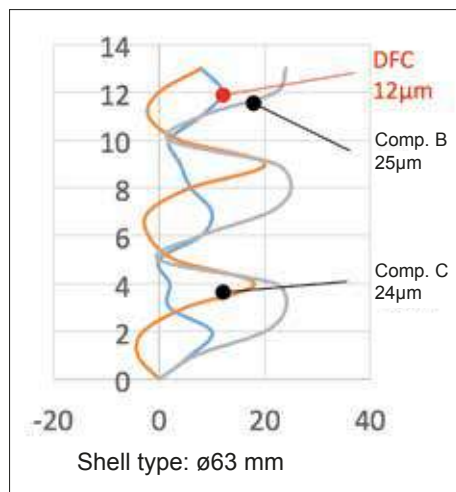
### 90 Degree Accuracy

Work material: Carbon steel

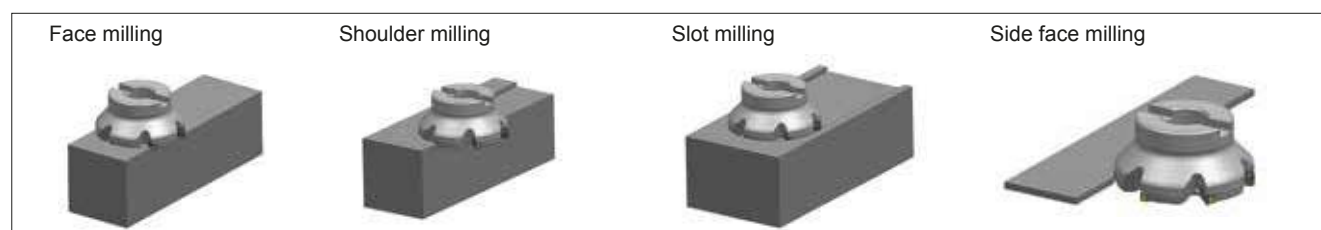
Cutting conditions:

$v_c=200\text{m/min}$ ,  $f_t=0.1\text{mm/t}$

$a_e=5.0\text{mm}$ ,  $a_p=5.0\text{mm} \times 3 \text{ passes}$



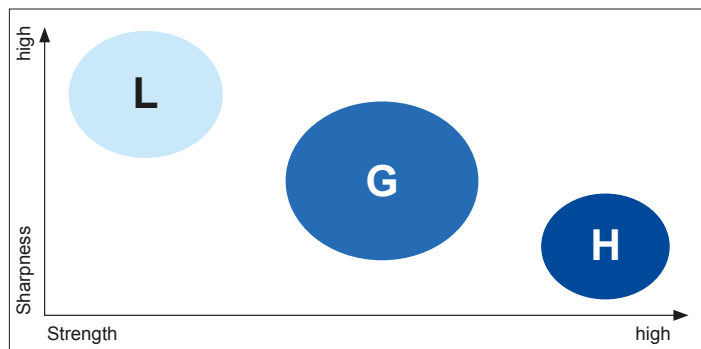
### Suitable Applications



## ■ New Insert Design Provides Excellent Machining Accuracy

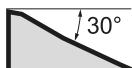
- The new insert design separates the location area and cutting edge producing an optimized solution.
- Machining accuracy is comparable to single sided inserts provided the DOC is less than 3mm.
- The SEC-Sumi Dual Mill design, equips the user with a highly stable cutter for high feed machining applications.

## ● Chipbreaker Selection Map



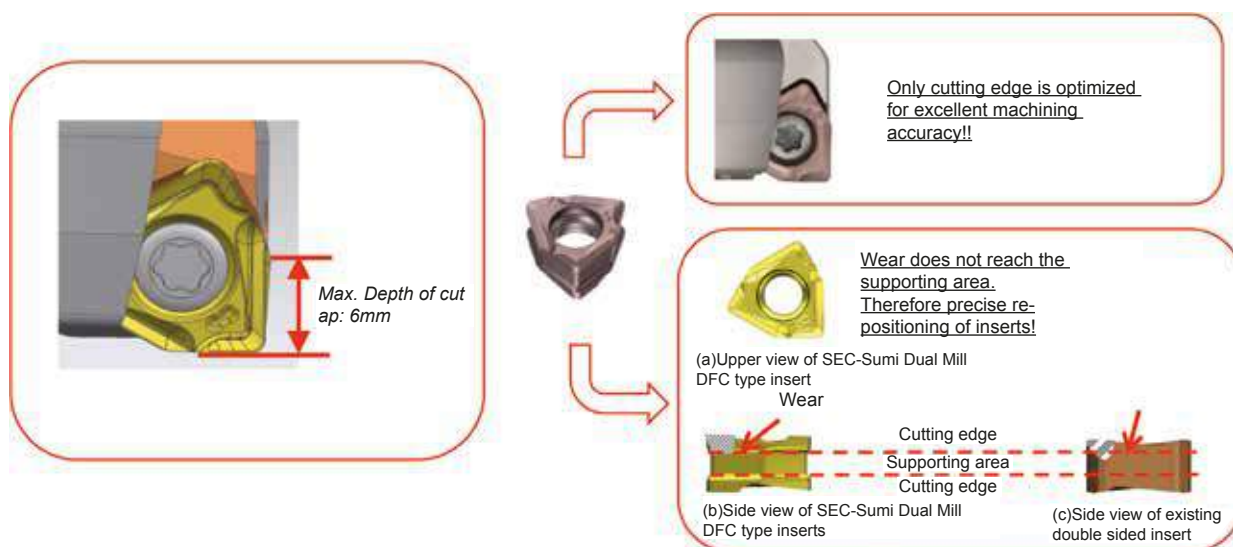
## ● Inserts

| Cat. No.         | <sup>New</sup> R0,4 | <sup>New</sup> R0,8 | <sup>New</sup> R1,2 | <sup>New</sup> R1,6 |
|------------------|---------------------|---------------------|---------------------|---------------------|
| 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.



# Sumi Dual Mill

## DFC(M/F) 09000RS Type

### Body – Shell type



Fig.1

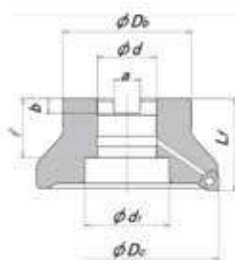


Fig.2

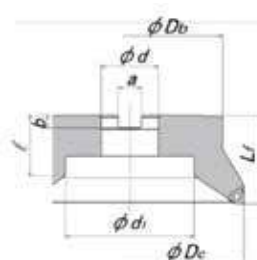


Fig.3

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

Max.  $a_p$ : 6mm

### Body – Dimensions

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

| Cat. No.   | Stock | Dimensions (mm) |            |       |          |      |     |     |            |            | No. of Teeth | Weight (kg) | Fig. |
|------------|-------|-----------------|------------|-------|----------|------|-----|-----|------------|------------|--------------|-------------|------|
|            |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $l$ | $\phi d_1$ | $\phi d_2$ |              |             |      |
| DFC09050RS | ●     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20  | 18         | 11         | 4            | 0,3         | 1    |
| DFC09063RS | ●     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20  | 18         | 11         | 4            | 0,5         | 1    |
| DFC09080RS | ●     | 80              | 55         | 50    | 27       | 12,4 | 7   | 22  | 20         | 14         | 5            | 1,0         | 1    |
| DFC09100RS | ●     | 100             | 70         | 50    | 32       | 14,4 | 8   | 26  | 46         | -          | 6            | 1,4         | 2    |
| DFC09125RS | ●     | 125             | 80         | 63    | 40       | 16,4 | 9   | 29  | 52         | 29         | 7            | 2,8         | 1    |
| DFC09160RS | ●     | 160             | 130        | 63    | 40       | 16,4 | 9   | 29  | 90         | -          | 8            | 4,6         | 3    |
| DFC09200RS | □     | 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. |
|-------------|-------|-----------------|------------|-------|----------|------|-----|-----|------------|------------|--------------|-------------|------|
|             |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $l$ | $\phi d_1$ | $\phi d_2$ |              |             |      |
| DFCM09050RS | ●     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20  | 18         | 11         | 5            | 0,3         | 1    |
| DFCM09063RS | ●     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20  | 18         | 11         | 6            | 0,5         | 1    |
| DFCM09080RS | ●     | 80              | 55         | 50    | 27       | 12,4 | 7   | 22  | 20         | 14         | 7            | 0,9         | 1    |
| DFCM09100RS | ●     | 100             | 70         | 50    | 32       | 14,4 | 8   | 26  | 46         | -          | 8            | 1,4         | 2    |
| DFCM09125RS | ●     | 125             | 80         | 63    | 40       | 16,4 | 9   | 29  | 52         | 29         | 11           | 2,7         | 1    |
| DFCM09160RS | ●     | 160             | 130        | 63    | 40       | 16,4 | 9   | 29  | 90         | -          | 12           | 4,5         | 3    |
| DFCM09200RS | □     | 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. |
|-------------|-------|-----------------|------------|-------|----------|------|-----|-----|------------|------------|--------------|-------------|------|
|             |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $l$ | $\phi d_1$ | $\phi d_2$ |              |             |      |
| DFCF09050RS | ●     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20  | 18         | 11         | 6            | 0,3         | 1    |
| DFCF09063RS | ●     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20  | 18         | 11         | 7            | 0,5         | 1    |
| DFCF09080RS | ●     | 80              | 55         | 50    | 27       | 12,4 | 7   | 22  | 20         | 14         | 9            | 0,9         | 1    |
| DFCF09100RS | ●     | 100             | 70         | 50    | 32       | 14,4 | 8   | 26  | 46         | -          | 11           | 1,3         | 2    |
| DFCF09125RS | ●     | 125             | 80         | 63    | 40       | 16,4 | 9   | 29  | 52         | 29         | 14           | 2,6         | 1    |
| DFCF09160RS | ●     | 160             | 130        | 63    | 40       | 16,4 | 9   | 29  | 90         | -          | 16           | 4,6         | 3    |
| DFCF09200RS | □     | 200             | 150        | 63    | 60       | 25,7 | 14  | 35  | 135        | -          | 20           | 5,5         |      |

### Identification Details

**DFC**

Cutter Series

**M**

M: Medium  
F: Fine

**09**

Insert Size

**050**

Cutter Diameter

**R**

Direction

**S**

Metric

### Spare Parts

| Screw                                                                                 | Wrench                                                                                |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |
| BFTX03512IP                                                                           | TRDR15IP                                                                              |

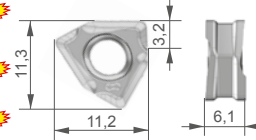
● = Euro stock  
□ = Delivery on request

 Recommended Tightening Torque (N·m)

# Sumi Dual Mill DFC Type

## ■ Inserts

| Grade              |                            | Coated Carbide |        |        |        |        |        | P      | Steel           |
|--------------------|----------------------------|----------------|--------|--------|--------|--------|--------|--------|-----------------|
| Application        | High Speed / Light Cutting |                |        |        |        |        |        |        | Stainless Steel |
|                    | General Purpose Cutting    |                |        |        |        |        |        |        | Cast Iron       |
|                    | Rough Cutting              |                |        |        |        |        |        |        | Exotic Alloy    |
| Cat. No.           |                            | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | Radius<br>rε    |
|                    |                            |                |        |        |        |        |        |        |                 |
| 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             |



## ■ Recommended Cutting Conditions

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

## ■ Application Examples

| Work piece                                     |                               | Sumitomo                    | Comp. |
|------------------------------------------------|-------------------------------|-----------------------------|-------|
| Workpiece material:<br>Steel (HRB 269-330)<br> | <b>Breaker</b>                | G                           |       |
|                                                | <b>Grade</b>                  | ACP200                      |       |
|                                                | <b>v<sub>c</sub> (m/min)</b>  | 226                         | 200   |
|                                                | <b>v<sub>f</sub> (mm/min)</b> | 1260                        |       |
|                                                | <b>f<sub>t</sub> (mm/t)</b>   | 0,28                        | 0,2   |
|                                                | <b>a<sub>p</sub> (mm)</b>     | 2                           | 2     |
|                                                | <b>a<sub>e</sub> (mm)</b>     | 5                           | 5     |
|                                                | <b>Dry or Wet</b>             | Wet                         | Wet   |
|                                                | <b>Tool diam. Ø</b>           | 80                          |       |
|                                                | <b>No. of Teeth</b>           | 5                           |       |
|                                                | <b>Result</b>                 | Efficiency: 158% achieved   |       |
|                                                | <b>Evaluation</b>             | Wear resistance, efficiency |       |

| Work piece                                                  |                               | Sumitomo                    | Comp.   |
|-------------------------------------------------------------|-------------------------------|-----------------------------|---------|
| Workpiece material:<br>S235 (Carbon steel) Face milling<br> | <b>Breaker</b>                | G                           |         |
|                                                             | <b>Grade</b>                  | ACP200                      |         |
|                                                             | <b>v<sub>c</sub> (m/min)</b>  | 180                         | 180     |
|                                                             | <b>v<sub>f</sub> (mm/min)</b> | 1092                        | 910     |
|                                                             | <b>f<sub>t</sub> (mm/t)</b>   | 0,3                         | 0,2     |
|                                                             | <b>a<sub>p</sub> (mm)</b>     | 2 x 2mm                     | 2 x 2mm |
|                                                             | <b>a<sub>e</sub> (mm)</b>     | 50                          | 50      |
|                                                             | <b>Dry or Wet</b>             | Dry                         | Dry     |
|                                                             | <b>Tool diam. Ø</b>           | 63mm                        | 63mm    |
|                                                             | <b>No. of Teeth</b>           | 4                           | 5       |
|                                                             | <b>Result</b>                 | Efficiency: 120% achieved   |         |
|                                                             | <b>Evaluation</b>             | Wear resistance, efficiency |         |

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

| Work piece                             |                               | Sumitomo                  | Comp. |
|----------------------------------------|-------------------------------|---------------------------|-------|
| Workpiece material:<br>Cr-Mo alloy<br> | <b>Breaker</b>                | G                         |       |
|                                        | <b>Grade</b>                  | ACP200                    |       |
|                                        | <b>v<sub>c</sub> (m/min)</b>  | 200                       | 200   |
|                                        | <b>v<sub>f</sub> (mm/min)</b> | 838                       | 838   |
|                                        | <b>f<sub>t</sub> (mm/t)</b>   | 0,2                       | 0,13  |
|                                        | <b>a<sub>p</sub> (mm)</b>     | 6                         | 6     |
|                                        | <b>a<sub>e</sub> (mm)</b>     | 43                        | 43    |
|                                        | <b>Dry or Wet</b>             | Dry                       | Dry   |
|                                        | <b>Tool diam. Ø</b>           | 80mm                      | 80mm  |
|                                        | <b>No. of Teeth</b>           | 5                         | 8     |
|                                        | <b>Result</b>                 | Efficiency: 120% achieved |       |
|                                        | <b>Evaluation</b>             | Efficiency                |       |



# "Wave Mill" Series WFX Type



## ■ Characteristics

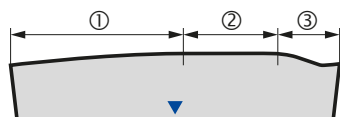
The insert shape, optimized for shoulder milling and combined with a high-precision body, leaves a superior machined surface finish.



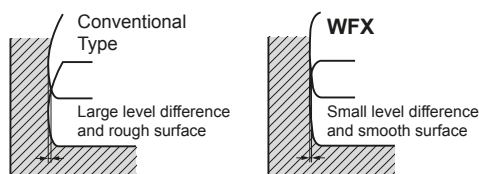
## ● Max. Depth of Cut



## ● 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.

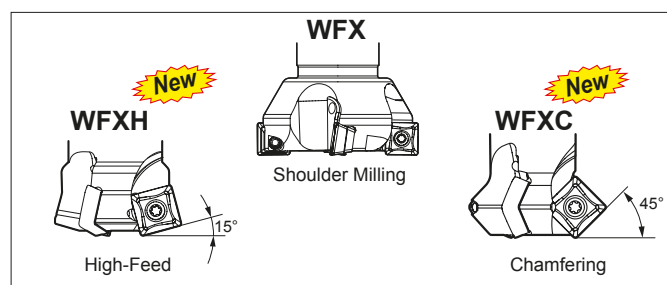
## ■ General Features

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.



## ■ Product Range

| Application      | Type         | Cat. No.      | No. of Teeth | Cutter Diameter (mm) | Shape |
|------------------|--------------|---------------|--------------|----------------------|-------|
| Shoulder Milling | Shell Type   | WFX 08000 RS  | 3 - 8        | Ø40 - Ø100           |       |
|                  |              | WFXM 08000 RS | 4 - 10       | Ø40 - Ø100           |       |
|                  |              | WFXF 08000 RS | 6 - 12       | Ø40 - Ø100           |       |
|                  |              | WFX 08000 R   | 6 - 8        | Ø80 - Ø100           |       |
|                  |              | WFXM 08000 R  | 8 - 10       | Ø80 - Ø100           |       |
|                  |              | WFXF 08000 R  | 10 - 12      | Ø80 - Ø100           |       |
|                  |              | WFX 12000 RS  | 3 - 5        | Ø60 - Ø100           |       |
|                  |              | WFXF 12000 RS | 4 - 7        | Ø60 - Ø100           |       |
|                  |              | WFX 12000 R   | 4 - 12       | Ø80 - Ø250           |       |
|                  |              | WFXF 12000 R  | 6 - 18       | Ø80 - Ø250           |       |
|                  | Endmill Type | WFX 08000 E   | 2 - 5        | Ø20 - Ø63            |       |
|                  |              | WFXM 08000 E  | 3 - 6        | Ø25 - Ø63            |       |
|                  |              | WFX 12000 E   | 3 - 4        | Ø40 - Ø80            |       |
|                  |              | WFXF 12000 E  | 4 - 6        | Ø60 - Ø80            |       |
|                  | Modular Type | WFX 08000 M   | 2 - 3        | Ø20 - Ø40            |       |
| High Efficiency  | Shell Type   | WFXH 08000 RS | 4 - 6        | Ø40 - Ø63            |       |
|                  |              | WFXH 12000 RS | 4 - 5        | Ø60 - Ø63            |       |
|                  | Modular Type | WFXH 08000 M  | 2 - 3        | Ø25 - Ø32            |       |
|                  |              | WFXH 12000 M  | 3            | Ø40                  |       |
| Chamfering       | Endmill Type | WFXC 08000 E  | 1 - 2        | Ø8 - Ø16             |       |
|                  |              | WFXC 12000 E  | 3            | Ø25 - Ø32            |       |
|                  | Modular Type | WFXC 08000 M  | 2            | Ø16                  |       |
|                  |              | WFXC 12000 M  | 3            | Ø25 - Ø32            |       |

H16/17

## ■ Inserts

| Cat. No.          | R0,2 | R0,4 | R0,8 | R1,2 | R1,6 |
|-------------------|------|------|------|------|------|
| 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)



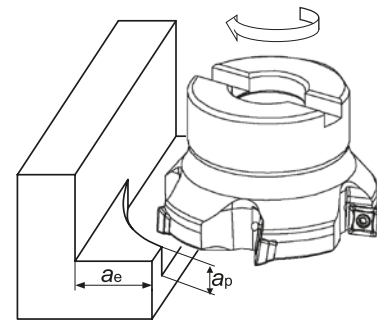
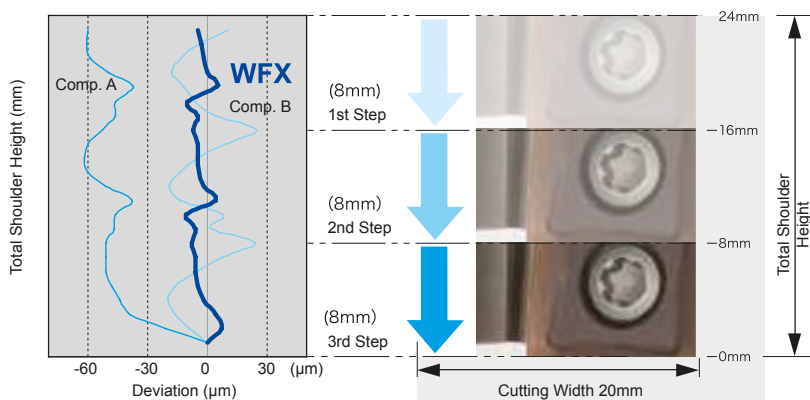
WFX12000 type insert  
(General Purpose  
G type chipbreaker)

● = Euro stock

# "Wave Mill" Series WFX Type

## Cutting Performance

### Squareness of Machined Shoulder



Work Material: C50  
Tool: WFX12100RS (Ø100mm x 5 teeth)  
Cutting Conditions:  $v_c = 200\text{m/min}$ ,  $a_p = 8,0\text{mm} \times 3$  times  
 $f_t = 0,15\text{mm/t}$ ,  $a_e = 20\text{mm}$

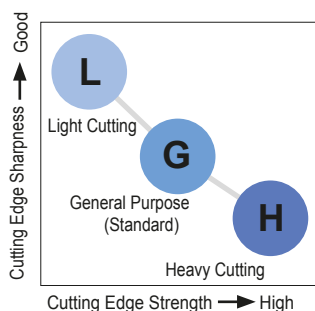
## Grade Selection

| ISO | Grade          | Finishing to Light Cutting | Medium Cut | Rough to Heavy Cutting |
|-----|----------------|----------------------------|------------|------------------------|
| P   | Coated Carbide | ACP100                     | ACP200     | ACP300                 |
|     |                |                            |            |                        |
|     |                |                            |            |                        |
| MS  | 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                     |            |                        |
|     |                |                            |            |                        |
|     | Carbide        |                            | H1         |                        |

▽ CVD ▲ PVD

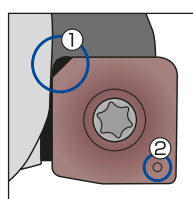
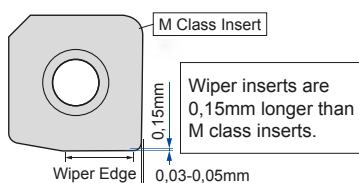
## Chipbreaker Selection



| Work Material             | P                                                        | K                                                  | Steel, Cast Iron                                           | N                   | Aluminium Alloy   |
|---------------------------|----------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------|---------------------|-------------------|
| Breaker                   | L Type                                                   | G Type                                             | H Type                                                     | Wiper Type          | S Type            |
| Characteristic            | Low Cutting Force                                        | General Purpose                                    | Strong Edge                                                | Wiper Edge          | Sharp Edge        |
| Cutting Edge Figure       |                                                          |                                                    |                                                            |                     |                   |
| 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 | 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)

# "Wave Mill" Series

## WFX(M/F) 08000 RS

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

### ■ Body - Shell Type



WFX08000RS



WFXM08000RS



WFXF08000RS

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

Fig. 1

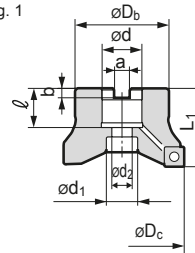
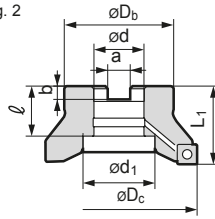


Fig. 2



### ● Body - WFX, Standard Pitch

| Cat. No.     | Stock | Dimensions (mm) |            |       |          |      |     |        |            |            | No. of Teeth | Weight (kg) | Figure |
|--------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|--------|
|              |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |        |
| WFX 08040 RS | ●     | 40              | 33         | 40    | 16       | 8,4  | 5,6 | 18     | 14         | 9          | 3            | 0,2         | 1      |
| WFX 08050 RS | ●     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 4            | 0,3         | 1      |
| WFX 08063 RS | ●     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 5            | 0,6         | 1      |
| WFX 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 |
|---------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|--------|
|               |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |        |
| WFXM 08040 RS | ●     | 40              | 33         | 40    | 16       | 8,4  | 5,6 | 18     | 14         | 9          | 4            | 0,2         | 1      |
| WFXM 08050 RS | ●     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 5            | 0,3         | 1      |
| WFXM 08063 RS | ●     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 6            | 0,5         | 1      |
| WFXM 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 |
|---------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|--------|
|               |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |        |
| WFXF 08040 RS | ●     | 40              | 33         | 40    | 16       | 8,4  | 5,6 | 18     | 14         | 9          | 6            | 0,2         | 1      |
| WFXF 08050 RS | ●     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 7            | 0,3         | 1      |
| WFXF 08063 RS | ●     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 8            | 0,5         | 1      |
| WFXF 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<br>ACP300 |
|     | Soft Steel        | ≤180          | 180-250-350   | 0,10-0,15-0,20 | <6  | ACP200<br>ACP300 |
|     | Die Steel         | 200~220       | 100-150-200   | 0,08-0,12-0,18 | <4  | ACP200<br>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<br>ACK300 |
| N   | Non Ferrous Metal | -             | 300-500-1000  | 0,10-0,15-0,20 | <6  | H1<br>DL1000     |

Min. - Optimum - Max.

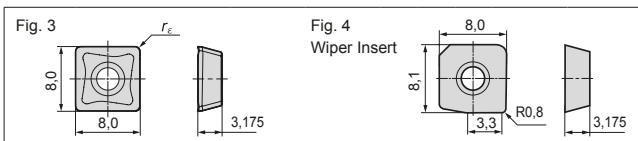
### ■ Identification Details

| 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



| Application            | Coated Carbide |        |        |        |        |        | Carbide | DLC | Radius | Fig.  |
|------------------------|----------------|--------|--------|--------|--------|--------|---------|-----|--------|-------|
|                        | P              | M      | K      | M      | S      | N      | K       | N   |        |       |
| High Speed / Light cut | P              | M      | K      | M      | S      | N      | K       | N   |        |       |
| General Purpose        | P              | M      | K      | M      | S      | N      | K       | N   |        |       |
| Roughing               | P              | M      | K      | M      | S      | N      | K       | N   |        |       |
| Cat. No.               | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300  | H1  | DL1000 |       |
| 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 |
| XOEW080308 PZTR W      | -              | -      | -      | -      | ●      | -      | -       | -   | -      | 0,8 4 |

Recommended Tightening Torque (N·m)

● = Euro stock

### Body - Shell Type

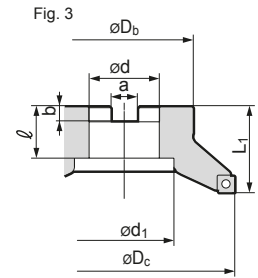
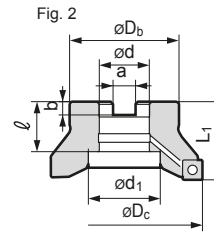
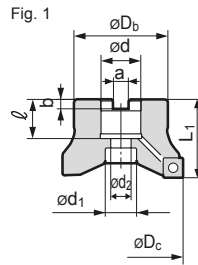
|            |        |     |      |     |
|------------|--------|-----|------|-----|
| Rake Angle | Radial | -8° | 10mm | 90° |
|            | Axial  | 8°  |      |     |



WFX 12000RS



WFXF12000RS



### Body - WFX, Standard Pitch

| Cat. No.     | Stock | Dimensions (mm) |            |       |          |      |     |        |            |            | No. of Teeth | Weight (kg) | Figure |
|--------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|--------|
|              |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |        |
| WFX 12050 RS | ●     | 50              | 40         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 3            | 0,2         | 1      |
| WFX 12063 RS | ●     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 4            | 0,4         | 1      |
| WFX 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      |
| WFX 12125 RS | ●     | 125             | 90         | 63    | 40       | 16,4 | 9,5 | 29     | 52         | -          | 6            | 2,7         | 2      |
| WFX 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 |
|---------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|--------|
|               |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |        |
| WFXF 12050 RS | ●     | 50              | 40         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 4            | 0,2         | 1      |
| WFXF 12063 RS | ●     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 5            | 0,4         | 1      |
| WFXF 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      |
| WFXF 12125 RS | ●     | 125             | 90         | 63    | 40       | 16,4 | 9,5 | 29     | 52         | -          | 8            | 2,6         | 2      |
| WFXF 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 ( $\phi 80$ : M12x30~35mm,  $\phi 100$ : M16x40~45mm) for securing  $\phi 80$  /  $\phi 100$  cutter on the arbor.  
Cutters  $\geq \phi 160$  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<br>ACP300 |
|     | Soft Steel        | $\leq 180$    | 180-250-350   | 0,10-0,15-0,20 | <10 | ACP200<br>ACP300 |
|     | Die Steel         | 200~220       | 100-150-200   | 0,10-0,15-0,20 | <6  | ACP200<br>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<br>ACK300 |
| N   | Non Ferrous Metal | -             | 300-500-1000  | 0,10-0,15-0,20 | <10 | H1<br>DL1000     |

Min. - Optimum - Max.

### Identification Details

|               |               |             |                 |           |             |
|---------------|---------------|-------------|-----------------|-----------|-------------|
| <b>WFX</b>    | <b>F</b>      | <b>12</b>   | <b>050</b>      | <b>R</b>  | <b>S</b>    |
| 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              |                |
| General Purpose        |                | P      | M      | K      |        | M      | S       |     | N              |                |
| Roughing               |                | P      | M      |        | K      |        | M       | S   |                |                |
| Cat. No.               | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300  | H1  | DL1000         |                |
|                        |                |        |        |        |        |        |         |     |                | Radius<br>Fig. |
|                        |                |        |        |        |        |        |         |     | r <sub>e</sub> |                |
| 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 PDTR S     | —              | —      | —      | —      | —      | —      | ●       | ●   | ●              | 0,8 3          |
| XOFW 120408 PDTR W     | —              | —      | —      | —      | ●      | —      | —       | —   | —              | — 4            |

### Spare Parts

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





# "Sumi Dual Mill" Series 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   |     |     |     |      |      |      | <br>H18 |
|            | TSXF 08000E  | Fine Pitch     |                              | 3   | 4   | 5   | 6   |     |     |     |      |      |      |                                                                                              |
|            | TSX 13000E   | Standard Pitch |                              |     | 2   | 2   | 3   | 4   |     |     |      |      |      |                                                                                              |
|            | TSXM 13000E  | Medium Pitch   |                              |     |     | 3   | 4   | 5   |     |     |      |      |      |                                                                                              |

## Special TSX Mills

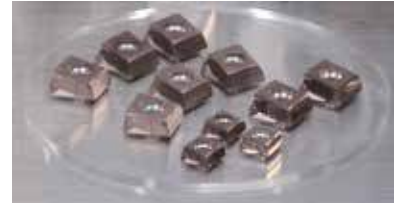
Special orders repeater and side cutter available.





## ■ Insert Grade Selection

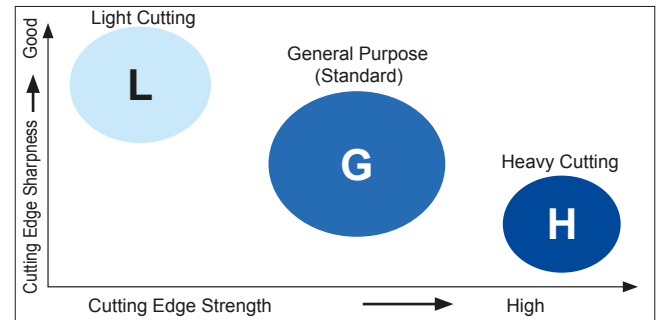
We have released ACP100 / ACP200 / ACP300 grades for steel machining, ACM200 / ACM300 grades for stainless steel machining and ACK200 / ACK300 grades for cast iron machining to cover a wide range of work materials.



| ISO      | Finishing to Light Cut | Medium Cut | Rough to Heavy Cut |
|----------|------------------------|------------|--------------------|
| <b>P</b> | ACP100                 | ACP200     | ACP300             |
| <b>M</b> | ACM200                 | ACM300     |                    |
| <b>K</b> | ACK200                 | ACK300     |                    |
| <b>S</b> |                        | ACM200     | ACM300             |

PVD    CVD

## ■ Chipbreaker Selection



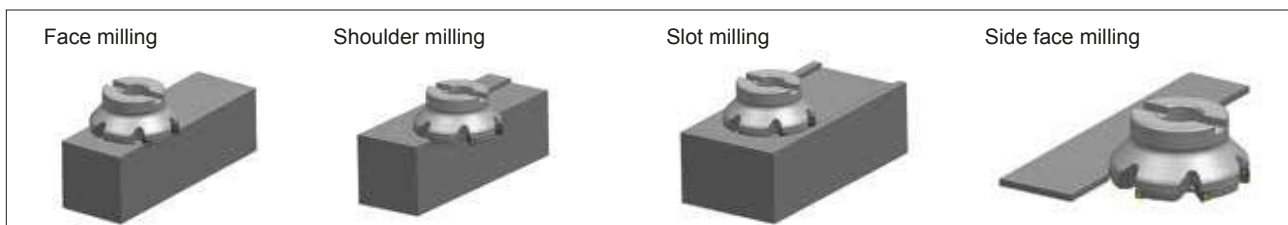
## ■ Inserts

| Cat. No.        | R0,4 | R0,8 | R1,2 | R1,6 | R2,4 | R3,2 |
|-----------------|------|------|------|------|------|------|
| LNEX0804_PNER-L | ●    | ●    |      |      |      |      |
| LNEX0804_PNER-G | ●    | ●    | ●    | ●    |      |      |
| LNEX1306_PNER-L | ●    | ●    |      |      |      |      |
| LNEX1306_PNER-G |      | ●    |      | ●    | ●    | ●    |
| LNEX1306_PNER-H | ●    | ●    |      | ●    | ●    | ●    |

## ■ Chipbreaker Lineup

| Work Material                   | <b>P M K S</b>                                    |                                               |                                                        |
|---------------------------------|---------------------------------------------------|-----------------------------------------------|--------------------------------------------------------|
|                                 | L type                                            | G type                                        | H type                                                 |
| Chipbreaker                     |                                                   |                                               |                                                        |
| Feature                         | Low cutting force                                 | General purpose                               | Strong edge                                            |
| LNEX08<br>Cutting edge geometry |                                                   |                                               | —                                                      |
| LNEX13<br>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 |

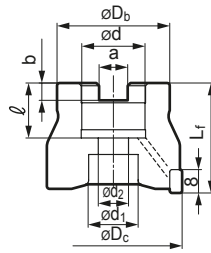
## ■ Suitable Applications



# "Sumi Dual Mill" Series TSX(F) 08000 RS

**New**

## ■ Body - Shell Type



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

## ● Body - TSX, Standard Pitch

| Cat. No.     | Stock | Dimensions (mm) |            |       |          |      |     |        |            |            | No. of Teeth | Weight (kg) |
|--------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|
|              |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |
| 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.

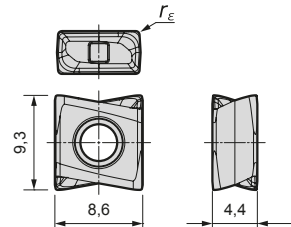
## ● Body - TSXF, Fine Pitch

| Cat. No.     | Stock | Dimensions (mm) |            |       |          |      |     |        |            |            | No. of Teeth | Weight (kg) |
|--------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|
|              |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |
| TSXF08040 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

| Grade              |                            | Coated Carbide |        |        |        |        |        | P      | Steel           |
|--------------------|----------------------------|----------------|--------|--------|--------|--------|--------|--------|-----------------|
| Application        | High Speed / Light Cutting | P              | M      | K      | S      | M      | S      | M      | Stainless Steel |
|                    | General Purpose Cutting    | P              | M      | K      | S      | M      | S      | K      | Cast Iron       |
|                    | Rough Cutting              | P              | M      | K      | S      | M      | S      | S      | Exotic Alloy    |
| Cat. No.           |                            | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | Radius          |
|                    |                            |                |        |        |        |        |        |        | $r_\epsilon$    |
| 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  | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/T)    | Grade                      |
|-----|--------------------------------|-----------|-----------------------------|---------------------------|----------------------------|
| P   | Carbon Steel                   | 180~280HB | 150 - <b>225</b> - 300      | 0,08 - <b>0,20</b> - 0,30 | ACP100<br>ACP200<br>ACP300 |
|     |                                | > 280HB   | 75 - <b>150</b> - 230       | 0,08 - <b>0,20</b> - 0,30 |                            |
|     | Alloy Steel                    | 180~280HB | 100 - <b>175</b> - 250      | 0,08 - <b>0,15</b> - 0,25 |                            |
| M   | Stainless Steel                | 220~280HB | 90 - <b>135</b> - 180       | 0,08 - <b>0,15</b> - 0,25 | ACM200<br>ACM300           |
|     |                                | >280HB    | 75 - <b>125</b> - 170       | 0,08 - <b>0,15</b> - 0,25 |                            |
| K   | Cast Iron<br>Ductile Cast Iron | 250HB     | 100 - <b>175</b> - 250      | 0,08 - <b>0,20</b> - 0,30 | ACK200<br>ACK300           |
| S   | Exotic Material                | -         | 30 - <b>60</b> - 90         | 0,05 - <b>0,10</b> - 0,15 | ACM200<br>ACM300           |

## ■ Identification Details

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

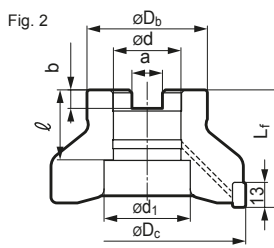
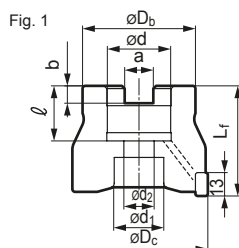
## ■ Spare Parts

| Screw                                                                               | Wrench                                                                               |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| BFTX0306IP                                                                          | TRDR08IP                                                                             |

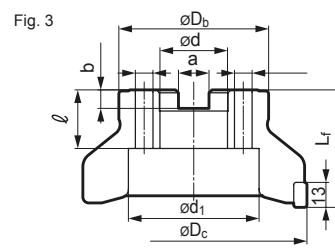
● = Euro stock

 Recommended Tightening Torque (N·m)

## Body - Shell Type



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



## Body - TSX, Standard Pitch

| Cat. No.     | Stock | Dimensions (mm) |                 |                |    |      |     |    |                 |                 | No. of Teeth | Weight (kg) | Figure |
|--------------|-------|-----------------|-----------------|----------------|----|------|-----|----|-----------------|-----------------|--------------|-------------|--------|
|              |       | øD <sub>c</sub> | øD <sub>b</sub> | L <sub>f</sub> | ød | a    | b   | ℓ  | ød <sub>1</sub> | ød <sub>2</sub> |              |             |        |
| 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      |
| 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 ( $\phi 80$ : M12x30~35mm,  $\phi 100$ : M16x40~45mm) for securing  $\phi 80$  /  $\phi 100$  cutter on the arbor.

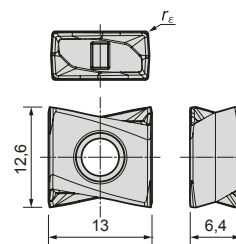
## Body - TSXM, Medium Pitch

| Cat. No.      | Stock | Dimensions (mm) |                 |                |    |      |     |    |                 |                 | No. of Teeth | Weight (kg) | Figure |
|---------------|-------|-----------------|-----------------|----------------|----|------|-----|----|-----------------|-----------------|--------------|-------------|--------|
|               |       | øD <sub>c</sub> | øD <sub>b</sub> | L <sub>f</sub> | ød | a    | b   | ℓ  | ød <sub>1</sub> | ød <sub>2</sub> |              |             |        |
| 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      |
| 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 ( $\phi 80$ : M12x30~35mm,  $\phi 100$ : M16x40~45mm) for securing  $\phi 80$  /  $\phi 100$  cutter on the arbor.

## Inserts

| Grade              |                            | Coated Carbide |        |        |        |        |        | Steel        |                 |
|--------------------|----------------------------|----------------|--------|--------|--------|--------|--------|--------------|-----------------|
| Application        | High Speed / Light Cutting | P              | M      | K      | M      | S      |        | M            | Stainless Steel |
|                    | General Purpose Cutting    | P              | M      | K      | M      | S      |        | K            | Cast Iron       |
|                    | Rough Cutting              | P              | M      | K      | M      | S      |        | S            | Exotic Alloy    |
| Cat. No.           |                            | ACP100         | ACP200 | ACP300 | ACK300 | ACM200 | ACM300 | Radius       |                 |
|                    |                            |                |        |        |        |        |        | $r_\epsilon$ |                 |
| 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 | TRDR15IP |

# "Sumi Power Mill" 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.

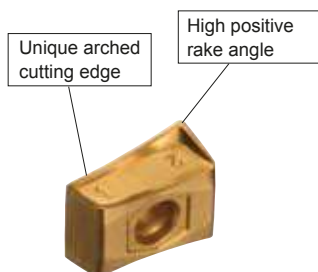
### Tough and durable body

Cutter body shows excellent toughness and durability through special steel and surface treatment.

## ■ Inserts - Design and Performance

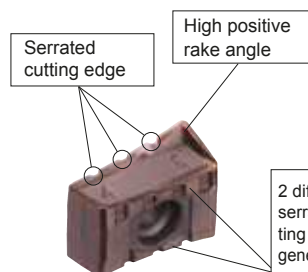
### Comparison of Chip Shape

#### General Purpose: Type G



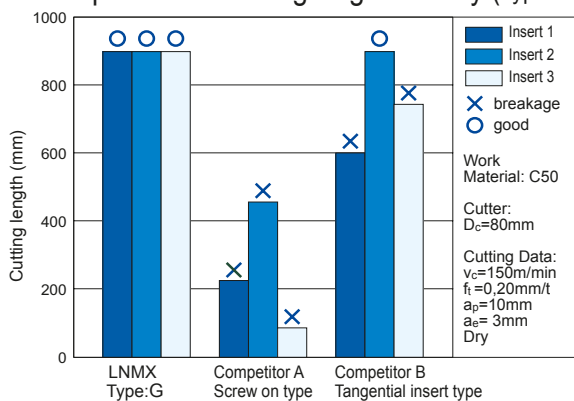
Work Material: C50  
Cutter:  $D_c = 100\text{mm}$   
Cutting Data:  $v_c = 200\text{m/min}$ ,  $f_t = 0,20\text{mm/t}$ ,  $a_p = 20\text{mm}$ ,  $a_e = 10\text{mm}$   
Coolant: Dry  
Evaluation: The serrated inserts achieve high efficient machining by reducing chattering.

#### Heavy Cut: Type R

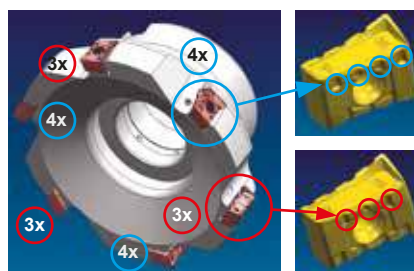


2 different serrated cutting edges generate smaller chips

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



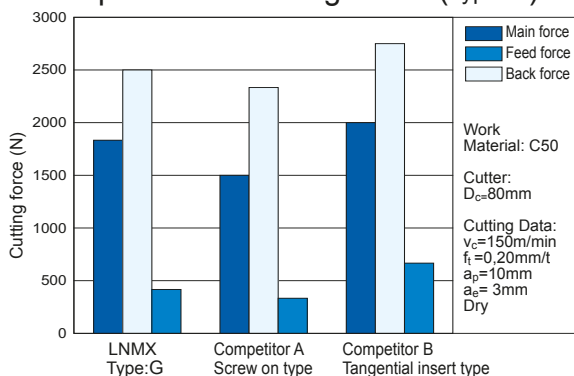
### ● Serrated Insert Application Guidance (Type R)



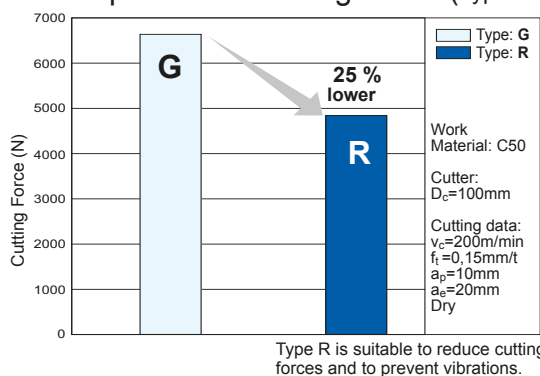
**Setting instruction:**  
Please use two different serrated inserts (3x and 4x) as shown in the left figure.

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

### ● Comparison of Cutting Force (Type G)



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

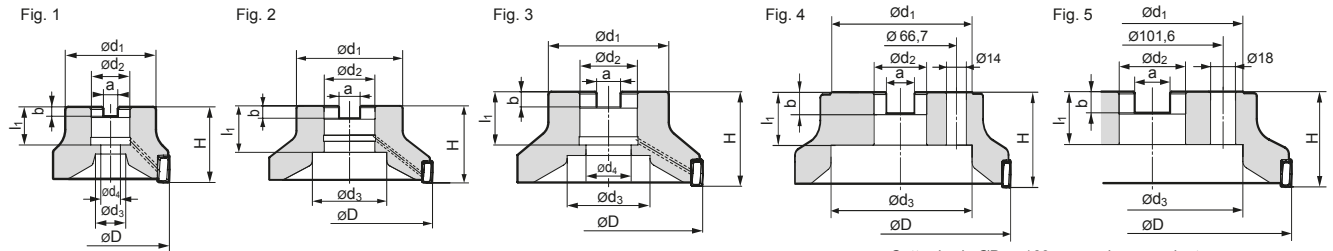


# "Sumi Power Mill" PWS(-F) Type

## ■ Body - Dimensions



|            |        |      |          |
|------------|--------|------|----------|
| Rake Angle | Radial | -15° | 16mm 90° |
|            | Axial  | -6°  |          |



Cutter body  $\varnothing D_c \geq 160\text{mm}$ : no inner coolant  
Cutter body  $\varnothing D_c \geq 200\text{mm}$ : with seat PWSS4R

## ● Body - PWS, Standard

| Type     | Cat. No.    | Stock | Dimensions (mm) |                   |    | Mounting          |                   |                   |      |     |       | No. of teeth | Weight (kg) | Fig. |
|----------|-------------|-------|-----------------|-------------------|----|-------------------|-------------------|-------------------|------|-----|-------|--------------|-------------|------|
|          |             |       | $\varnothing D$ | $\varnothing d_1$ | H  | $\varnothing d_2$ | $\varnothing d_3$ | $\varnothing d_4$ | a    | b   | $l_1$ |              |             |      |
| PWS 4000 | PWS 4080 RS | ●     | 80              | 60                | 50 | 27                | 20                | 13,5              | 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    |
|          | PWS 4125 RS | ●     | 125             | 80                | 63 | 40                | 52                | 29                | 16,4 | 9,5 | 29    | 6            | 2,4         | 3    |
|          | PWS 4160 RS | ●     | 160             | 100               | 63 | 40                | 88                | -                 | 16,4 | 9,5 | 29    | 8            | 4,2         | 4    |
|          | PWS 4200 RS | □     | 200             | 130               | 63 | 60                | 130               | -                 | 25,7 | 14  | 35    | 10           | 6,3         | 5    |
|          | PWS 4250 RS | □     | 250             | 130               | 63 | 60                | 160               | -                 | 25,7 | 14  | 35    | 12           | 11,1        | 5    |

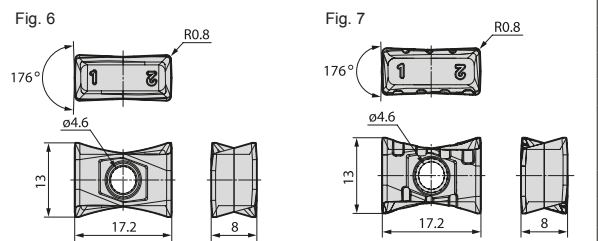
## ● Body - PWSF, Fine pitch

| Type      | Cat. No.     | Stock | Dimensions (mm) |                   |    | Mounting          |                   |                   |      |     |       | No. of teeth | Weight (kg) | Fig. |
|-----------|--------------|-------|-----------------|-------------------|----|-------------------|-------------------|-------------------|------|-----|-------|--------------|-------------|------|
|           |              |       | $\varnothing D$ | $\varnothing d_1$ | H  | $\varnothing d_2$ | $\varnothing d_3$ | $\varnothing d_4$ | a    | b   | $l_1$ |              |             |      |
| PWSF 4000 | PWSF 4080 RS | ●     | 80              | 60                | 50 | 27                | 20                | 13,5              | 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    |
|           | PWSF 4125 RS | ●     | 125             | 80                | 63 | 40                | 52                | 29                | 16,4 | 9,5 | 29    | 8            | 2,3         | 3    |
|           | PWSF 4160 RS | ●     | 160             | 100               | 63 | 40                | 88                | -                 | 16,4 | 9,5 | 29    | 10           | 4,1         | 4    |
|           | PWSF 4200 RS | □     | 200             | 130               | 63 | 60                | 130               | -                 | 25,7 | 14  | 35    | 12           | 6,2         | 5    |
|           | PWSF 4250 RS | □     | 250             | 130               | 63 | 60                | 160               | -                 | 25,7 | 14  | 35    | 14           | 11,0        | 5    |

Inserts are not included.

## ■ Inserts

| Application          |   | Coated Carbide |        |        |        |        | Application     | Remarks                | Fig. |
|----------------------|---|----------------|--------|--------|--------|--------|-----------------|------------------------|------|
|                      |   | P              | M      | M      | K      |        |                 |                        |      |
| High speed/Light cut |   | ●              | ●      | ●      | ●      |        |                 |                        |      |
| General purpose      |   | ●              | ●      | ●      | ●      |        |                 |                        |      |
| Roughing             |   | ●              | ●      | ●      | ●      |        |                 |                        |      |
| Cat. No.             |   | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 |                 |                        |      |
| LNMX170808PNSR-L     | ● | ●              | ●      | ●      | ●      | ●      | Light cut       |                        | 6    |
| LNMX170808PNSR-G     | ● | ●              | ●      | ●      | ●      | ●      | General purpose | 1 <sup>st</sup> Choice | 6    |
| LNMX170808PNSR-R     | ● | ●              | ●      | ●      | ●      | ●      | Heavy cut       | Serrated design        | 7    |



## ■ Recommended Cutting Conditions

| ISO | Work Material             | Hardness  | Cutting Speed $v_c$ (m/min) | Feed Rate $f_t$ (mm/t) | Grade  |
|-----|---------------------------|-----------|-----------------------------|------------------------|--------|
| P   | Carbon Steel              | 180-280HB | 150-250-350                 | 0,10-0,23-0,35         | ACP200 |
|     | Alloy Steel               | 180-280HB | 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<br>Ductile Iron | 250HB     | 100-175-250                 | 0,10-0,23-0,35         | ACK200 |

Min.-Optimum-Max.

## ■ Spare Parts

| Screw      | Torx wrench | Sumi-Paste | Seat * |
|------------|-------------|------------|--------|
|            |             |            |        |
| BFTX0412IP | TTR15IP     | SUMI-P     | PWSS4R |

\* from  $\varnothing D_c \geq 200\text{mm}$

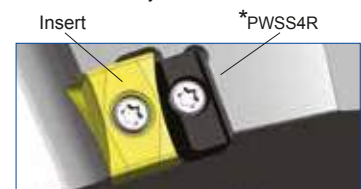
Cutter Body  $\varnothing D_c \geq 200\text{mm}$   
Please use seat PWSS4R for protection of cutter body.

## ■ Special Cutter Type PWSR



|            |        |      |          |
|------------|--------|------|----------|
| Rake Angle | Radial | -15° | 31mm 90° |
|            | Axial  | -6°  |          |

Delivery on request

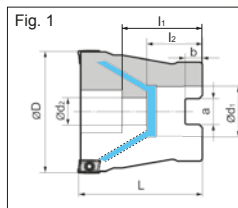




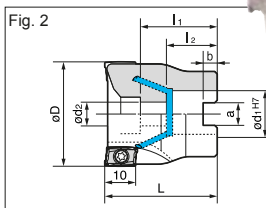
# Wavemill Series

## WEX (-F) Type

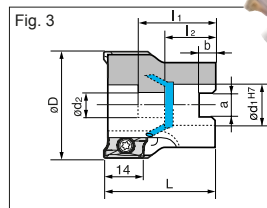
5 mm 90°



10 mm 90°



14 mm 90°



### Body (Shell Type "F")

|                       | Cat. No.   | Dimensions (mm) |     |     |      |      |     |    |    |    | No. of teeth | Fig. |
|-----------------------|------------|-----------------|-----|-----|------|------|-----|----|----|----|--------------|------|
|                       |            | Stock           | ØD  | Ød1 | Ød2  | a    | b   | L  | l1 | l2 |              |      |
| <b>New</b><br>WEX1000 | WEX 1032 F | ●               | 32  | 16  | 9    | 8,4  | 5,6 | 40 | 26 | 18 | 8            | 1    |
|                       | 1040 F     | ●               | 40  | 16  | 11   | 8,4  | 5,6 | 40 | 26 | 18 | 10           | 1    |
|                       | 1050 F     | ●               | 50  | 22  | 11   | 10,4 | 6,3 | 40 | 26 | 18 | 12           | 1    |
|                       | 1063 F     | ●               | 63  | 22  | 11   | 10,4 | 6,3 | 40 | 26 | 18 | 14           | 1    |
| WEX2000               | WEX 2040 F | ●               | 40  | 16  | 9    | 8,4  | 5,6 | 40 | 28 | 18 | 6            | 2    |
|                       | 2050 F     | ●               | 50  | 22  | 11   | 10,4 | 6,3 | 40 | 26 | 20 | 7            | 2    |
|                       | 2063 F     | ●               | 63  | 22  | 11   | 10,4 | 6,3 | 40 | 26 | 20 | 8            | 2    |
|                       | 2080 F     | ●               | 80  | 27  | 13,5 | 12,4 | 7,0 | 50 | 31 | 25 | 10           | 2    |
|                       | 2100 F     | □               | 100 | 32  | 32   | 14,4 | 8,5 | 50 | 32 | 26 | 12           | 2    |
| WEX3000               | WEX 3040 F | ●               | 40  | 16  | 9    | 8,4  | 5,6 | 40 | 28 | 18 | 4            | 3    |
|                       | 3050 F     | ●               | 50  | 22  | 11   | 10,4 | 6,3 | 40 | 26 | 20 | 5            | 3    |
|                       | 3063 F     | ●               | 63  | 22  | 11   | 10,4 | 6,3 | 40 | 26 | 20 | 6            | 3    |
|                       | 3080 F     | ●               | 80  | 27  | 13,5 | 12,4 | 7,0 | 50 | 31 | 25 | 7            | 3    |
|                       | 3100 F     | ●               | 100 | 32  | 32   | 14,4 | 8,5 | 50 | 32 | 26 | 8            | 3    |

### Inserts for WEX1000 / 2000 Type

|                          |   | Application |        | Coated Carbide |        |        |        |        |    | Carbide | DLC | Radius<br>$r_\epsilon$ |
|--------------------------|---|-------------|--------|----------------|--------|--------|--------|--------|----|---------|-----|------------------------|
|                          |   |             |        | P              | P      | K      | M      | S      | K  | N       | N   |                        |
|                          |   |             |        | P              | P      | K      | M      | S      | K  | N       | N   |                        |
|                          |   |             |        | P              | P      | K      | M      | S      | K  | N       | N   |                        |
| Cat. No.                 |   | ACP100      | ACP200 | ACP300         | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000  |     |                        |
| AXMT 060204 PDER-L       | ● | ●           | ●      | ●              | ●      | ●      | ●      | ●      | ●  | ●       | ●   | 0,4                    |
| <b>New</b> 060208 PDER-L | ● | ●           | ●      | ●              | ●      | ●      | ●      | ●      | ●  | ●       | ●   | 0,8                    |
| 060212 PDER-L            | ● | ●           | ●      | ●              | ●      | ●      | ●      | ●      | ●  | ●       | ●   | 1,2                    |
| AXMT 060204 PDER-G       | ● | ●           | ●      | ●              | ●      | ●      | ●      | ●      | ●  | ●       | ●   | 0,4                    |
| <b>New</b> 060208 PDER-G | ● | ●           | ●      | ●              | ●      | ●      | ●      | ●      | ●  | ●       | ●   | 0,8                    |
| 060212 PDER-G            | ● | ●           | ●      | ●              | ●      | ●      | ●      | ●      | ●  | ●       | ●   | 1,2                    |
| AXMT 060204 PDER-H       | ● | ●           | ●      | ●              | ●      | ●      | ●      | ●      | ●  | ●       | ●   | 0,4                    |
| <b>New</b> 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                    |
| AXET 123502 PEFR-S       | — | —           | —      | —              | —      | —      | —      | —      | —  | —       | —   | 0,2                    |
| 123504 PEFR-S            | — | —           | —      | —              | —      | —      | —      | —      | —  | —       | —   | 0,4                    |
| 123508 PEFR-S            | — | —           | —      | —              | —      | —      | —      | —      | —  | —       | —   | 0,8                    |

### Spare Parts

| Screw         | Wrench     | 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     |

### Inserts for WEX3000 Type

|                     |   | Application |        | Coated Carbide |        |        |        |        |    | Carbide | DLC | Radius<br>$r_\epsilon$ |
|---------------------|---|-------------|--------|----------------|--------|--------|--------|--------|----|---------|-----|------------------------|
|                     |   |             |        | P              | P      | K      | M      | S      | K  | N       | N   |                        |
|                     |   |             |        | P              | P      | K      | M      | S      | K  | N       | N   |                        |
|                     |   |             |        | P              | P      | K      | M      | S      | K  | N       | N   |                        |
| Cat. No.            |   | ACP100      | ACP200 | ACP300         | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000  |     |                        |
| 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.

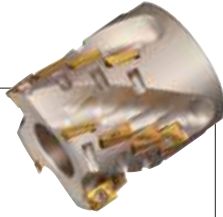
H24

— 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

### Identification Details

**WEX** **2** **016** **F**  
Cutter Series 2000 Series Cutter Diameter Shell Type

# Wave Repeater Mill WRX (-F) Type



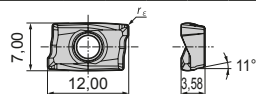
■ Body (Shell Type “F”)

| Cat. No.       | Stock | Depth of cut<br>(d <sub>oc</sub> ) | Dimensions (mm) |                 |                 |      |     |                |      |    |    | No. of teeth | No. of rows | Effective teeth |
|----------------|-------|------------------------------------|-----------------|-----------------|-----------------|------|-----|----------------|------|----|----|--------------|-------------|-----------------|
|                |       |                                    | ØD              | ød <sub>1</sub> | ød <sub>2</sub> | a    | b   | l <sub>1</sub> | l    | l  |    |              |             |                 |
| 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 (d <sub>oc</sub> ) | Dimensions (mm) |                 |                 |    |     |                |    |    | No. of teeth | No. of rows | Effective teeth |
|-----------------------|-------|---------------------------------|-----------------|-----------------|-----------------|----|-----|----------------|----|----|--------------|-------------|-----------------|
|                       |       |                                 | ØD              | Ød <sub>1</sub> | Ød <sub>2</sub> | a  | b   | l <sub>1</sub> | l  | l  |              |             |                 |
| <b>WRX3050RH27F22</b> | □     | 27                              | 50              | 22              | 11              | 10 | 6,3 | 50             | 36 | 20 | 8            | 2           | 4               |
| <b>WRX3050RH53F22</b> | ●     | 53                              | 50              | 22              | 11              | 10 | 6,3 | 70             | 56 | 20 | 12           | 4           | 3               |
| <b>WRX3063RH27F27</b> | □     | 27                              | 63              | 27              | 13,5            | 12 | 7   | 70             | 34 | 2  | 10           | 2           | 5               |
| <b>WRX3063RH53F27</b> | ●     | 53                              | 63              | 27              | 13,5            | 12 | 7   | 70             | 54 | 2  | 16           | 4           | 4               |
| <b>WRX3080RH27F32</b> | □     | 27                              | 80              | 32              | 17              | 14 | 8   | 50             | 30 | 2  | 12           | 2           | 6               |
| <b>WRX3080RH53F32</b> | ●     | 53                              | 80              | 32              | 17              | 14 | 8   | 85             | 63 | 2  | 20           | 4           | 5               |
| <b>WRX3100RH27F40</b> | □     | 27                              | 100             | 40              | 21              | 16 | 9,5 | 85             | 40 | 30 | 14           | 2           | 7               |
| <b>WRX3100RH53F40</b> | ●     | 53                              | 100             | 40              | 21              | 16 | 9,5 | 85             | 59 | 30 | 24           | 4           | 6               |

■ **Inserts** (Same as for Wavemill WEX 2000 Type)



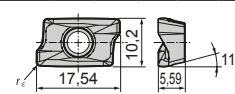
| Application            |                | Coated Carbide |        |        |        |        |        | Carbide | DLC |        |                          |
|------------------------|----------------|----------------|--------|--------|--------|--------|--------|---------|-----|--------|--------------------------|
| 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<br>$r_{\epsilon}$ |
| 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

## ■ Spare Parts

| Screw                                                                               | Wrench                                                                              |  | 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__  |

■ **Inserts** (Same as for Wavemill WEX 3000 Type)



| Application            |                | Coated Carbide |          |          |          |          |            | Carbide    | DLC      |          |                          |
|------------------------|----------------|----------------|----------|----------|----------|----------|------------|------------|----------|----------|--------------------------|
| High Speed / Light cut |                | <b>P</b>       |          |          | <b>K</b> |          | <b>M S</b> | <b>K N</b> | <b>N</b> |          |                          |
| General Purpose        |                |                | <b>P</b> |          | <b>K</b> |          | <b>M S</b> | <b>M S</b> |          | <b>N</b> |                          |
| Roughing               |                |                | <b>P</b> | <b>P</b> |          | <b>K</b> |            | <b>M S</b> |          |          |                          |
| Cat. No.               |                | ACP100         | ACP200   | ACP300   | ACK200   | ACK300   | ACM200     | ACM300     | H1       | DL1000   | Radius<br>$r_{\epsilon}$ |
| 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.



### ■ Identification Details

**WRX**

|                |            |                      |                  |                           |               |                   |
|----------------|------------|----------------------|------------------|---------------------------|---------------|-------------------|
| <u>20</u>      | <u>25</u>  | <u>R</u>             | <u>H</u>         | <u>27</u>                 | <u>W</u>      | <u>25</u>         |
|                |            |                      |                  |                           |               |                   |
| Insert<br>Size | Tool<br>øD | Cutting<br>Direction | Inner<br>coolant | Cutting<br>Edge<br>Length | Arbor<br>Type | Arbor<br>Diameter |

↓

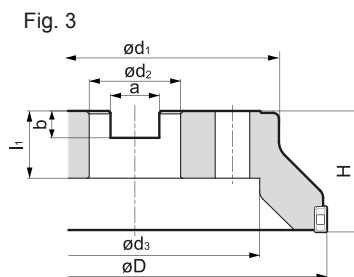
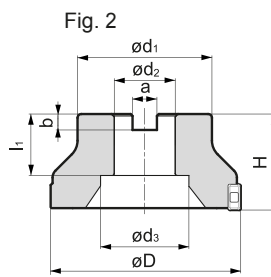
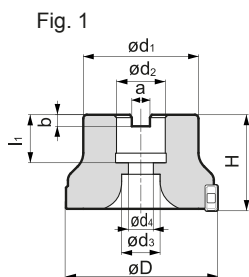
**E** - Straight Shank  
**W** - Weldon Shank  
**F** - Shell Type



# "Sumi Power Mill" PWC Type

## Powerful Tangential Milling System for Cast Iron

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



### ■ Body (Standard, PWC Type)

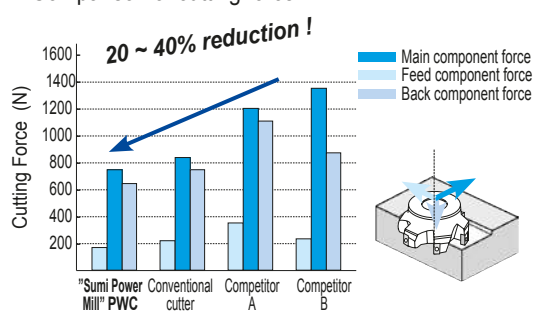
| Type     | Cat. No.       | Stock |   | Dimensions (mm) |            |    | Mounting   |            |            |      |      | Number of teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|----------|----------------|-------|---|-----------------|------------|----|------------|------------|------------|------|------|-----------------|-------------------|-------------|------|
|          |                | R     | L | $\phi D$        | $\phi d_1$ | H  | $\phi d_2$ | $\phi d_3$ | $\phi d_4$ | a    | b    | $l_1$           |                   |             |      |
| PWC 4000 | PWC 4080 R/L-S | ●     | ● | 80              | 60         | 50 | 27         | 29,5       | 13         | 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.   |
|          | PWC 4125 R/L-S | ●     | ● | 125             | 80         | 63 | 40         | 56         | —          | 16,4 | 9,5  | 29              | 10                | 2,5         |      |
|          | PWC 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         |      |

### ■ Body (Fine Pitch, PWCF Type)

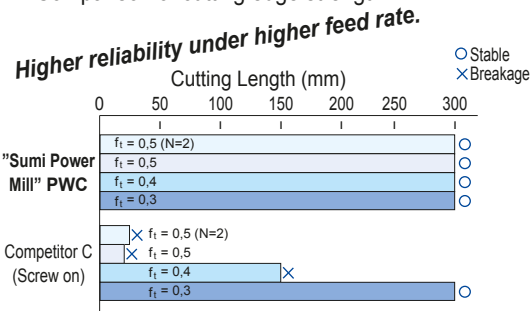
| Type      | Cat. No.        | Stock |   | Dimensions (mm) |            |    | Mounting   |            |            |      |      | Number of teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|-----------|-----------------|-------|---|-----------------|------------|----|------------|------------|------------|------|------|-----------------|-------------------|-------------|------|
|           |                 | R     | L | $\phi D$        | $\phi d_1$ | H  | $\phi d_2$ | $\phi d_3$ | $\phi d_4$ | a    | b    | $l_1$           |                   |             |      |
| PWCF 4000 | PWCF 4080 R/L-S | ●     | ● | 80              | 60         | 50 | 27         | 29,5       | 13         | 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.   |
|           | PWCF 4125 R/L-S | ●     | ● | 125             | 80         | 63 | 40         | 56         | —          | 16,4 | 9,5  | 29              | 15                | 2,6         |      |
|           | PWCF 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         |      |

### ■ Performance

#### ● Comparison of cutting force



#### ● Comparison of cutting edge strength



### ■ Recommended cutting Conditions

| Material              | Grey Cast Iron (GG)         | Ductile Cast Iron (GGG)       |
|-----------------------|-----------------------------|-------------------------------|
| Cutting speed (m/min) | 100 — 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   |
|--------------|--------------------------|----------|
|              |                          |          |
| PWC (F) 4000 | BFTX 0412 N<br>3,0 (N·m) | TTX 15 W |

# "Sumi Power Mill" PWC Type

High Metal Removal  
High Volume Insert Capacity  
High Performance Inserts



## ● Geometry



Rake angle  
G type : 20°  
H type : 15°

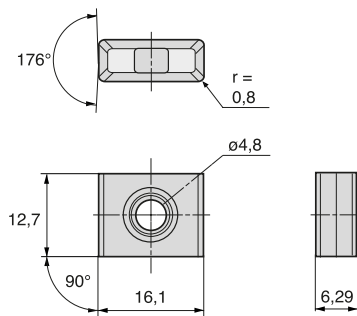


Wiper width = 2,4 mm

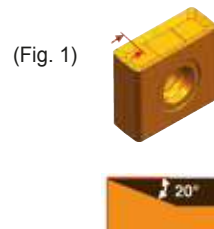
## ■ Advantages

- 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

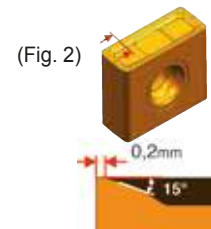


### ● G type insert for light cutting



(Fig. 1)

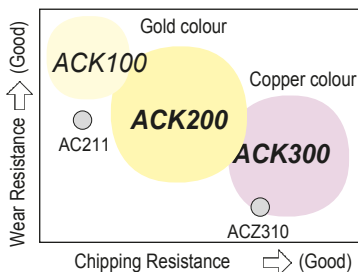
### ● H type insert with strong cutting edge



(Fig. 2)

| Cat. No.           | Nose Radius | CVD Coated |        | PVD Coated | Fig. | Application                              | Remark                          |
|--------------------|-------------|------------|--------|------------|------|------------------------------------------|---------------------------------|
|                    |             | ACK100     | ACK200 | ACK300     |      |                                          |                                 |
| LNMX 160608 PNSN-G | 0,8         |            | ●      | ●          | 1    | General application                      | First recommendation            |
| LNMX 160608 PNSN-H | 0,8         | ●          | ●      | ●          | 2    | Instable machining<br>Heavy interruption | Suitable for instable condition |

## ■ New Coated Grade for Cast Iron

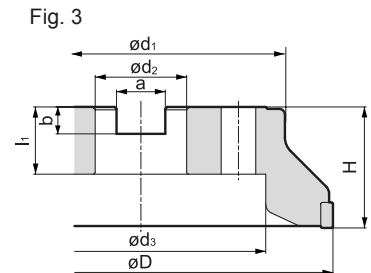
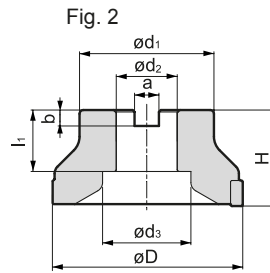
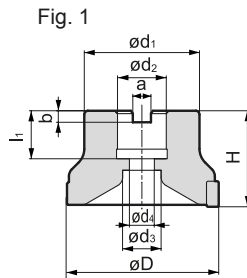


| Cast Iron (K) (GG, GGG) |      |      |      |      | Grade  | Characteristic · Application                                                                                                           |
|-------------------------|------|------|------|------|--------|----------------------------------------------------------------------------------------------------------------------------------------|
| K 01                    | K 10 | K 20 | K 30 | K 40 | ACK100 | High wear resistance with special hard substrate and fine Ti-based Al <sub>2</sub> O <sub>3</sub> CVD coating for high speed machining |
|                         |      |      |      |      | ACK200 | Excellent wear resistance with fine Ti-based and tough Al <sub>2</sub> O <sub>3</sub> CVD coating                                      |
|                         |      |      |      |      | ACK300 | Excellent toughness with fine grain carbide substrate. Cr added new PVD coating could improve hardness and oxidation resistance.       |

# Shoulder Mill CNP / CNPF Type

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

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



### ■ Body (Standard, CNP Type)

| Type     | Cat. No.     | Stock | Dimensions (mm) |                  |    | Mounting         |                  |                  |      |      |                | No. of teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|----------|--------------|-------|-----------------|------------------|----|------------------|------------------|------------------|------|------|----------------|--------------|-------------------|-------------|------|
|          |              |       | Ø D             | Ø d <sub>1</sub> | H  | Ø d <sub>2</sub> | Ø d <sub>3</sub> | Ø d <sub>4</sub> | a    | b    | l <sub>1</sub> |              |                   |             |      |
| CNP13000 | CNP 13040 RS | ●     | 40              | 36               | 40 | 22               | 14               | 9                | 8,4  | 5,6  | 18             | 4            | 12,0              | 0,3         | 1.   |
|          | CNP 13050 RS | ●     | 50              | 40               | 40 | 27               | 18               | 11               | 10,4 | 6,3  | 20             | 4            |                   | 0,4         |      |
|          | CNP 13063 RS | ●     | 63              | 40               | 40 | 22               | 18               | 11               | 10,4 | 6,3  | 20             | 5            |                   | 0,4         |      |
|          | CNP 13080 RS | ●     | 80              | 60               | 50 | 27               | 20               | 13               | 12,4 | 7,0  | 25             | 5            |                   | 0,9         | 2.   |
|          | CNP 13100 RS | ●     | 100             | 70               | 50 | 32               | —                | —                | 14,4 | 8,5  | 32             | 6            |                   | 1,3         |      |
|          | CNP 13125 RS | ●     | 125             | 80               | 63 | 40               | —                | —                | 16,4 | 9,5  | 38             | 7            |                   | 2,5         |      |
|          | CNP 13160 RS | ●     | 160             | 100              | 63 | 40               | —                | —                | 16,4 | 9,5  | 38             | 8            | 12,0              | 4,2         | 3.   |
|          | CNP 13200 RS | ●     | 200             | 150              | 63 | 60               | —                | —                | 25,7 | 14,0 | 34             | 10           |                   | 7,2         |      |

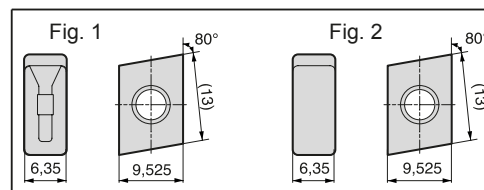
### ■ Body (Fine Pitch, CNPF Type)

|           |               |   |     |     |    |    |    |    |      |      |    |    |      |     |    |
|-----------|---------------|---|-----|-----|----|----|----|----|------|------|----|----|------|-----|----|
| CNPF13000 | CNPF 13063 RS | ● | 63  | 40  | 40 | 22 | 18 | 11 | 10,4 | 6,3  | 20 | 7  | 12,0 | 0,4 | 1. |
|           | CNPF 13080 RS | ● | 80  | 60  | 50 | 27 | 20 | 13 | 12,4 | 7,0  | 25 | 7  |      | 0,9 |    |
|           | CNPF 13100 RS | ● | 100 | 70  | 50 | 32 | —  | —  | 14,4 | 8,5  | 32 | 8  |      | 1,4 |    |
|           | CNPF 13125 RS | ● | 125 | 80  | 63 | 40 | —  | —  | 16,4 | 9,5  | 38 | 9  | 12,0 | 2,4 | 2. |
|           | CNPF 13160 RS | ● | 160 | 100 | 63 | 40 | —  | —  | 16,4 | 9,5  | 38 | 11 |      | 4,3 |    |
|           | CNPF 13200 RS | ● | 200 | 150 | 63 | 60 | —  | —  | 25,7 | 14,0 | 34 | 13 |      | 7,4 |    |



### ■ Inserts

Remarks:  
-G: General purpose  
-H: Strong cutting edge



| Cat. No.        | Tolerance Class | Nose Radius | Coated Carbide |        |        |        |        | Fig. |
|-----------------|-----------------|-------------|----------------|--------|--------|--------|--------|------|
|                 |                 |             | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 |      |
| CNMU 130608 N-G | M               | 0,8         | ●              | ●      | ●      | ●      | ●      | 1.   |
| CNMU 130608 N-H | M               | 0,8         | ●              | ●      | ●      | ●      | ●      |      |
| CNMQ 130608 N   | M               | 0,8         | ●              | ●      | ●      | ●      | ●      | 2.   |
| CNMQ 130616 N   | M               | 1,6         | ●              | ●      | ●      | ●      | ●      |      |
| CNEQ 130608 N   | E               | 0,8         | ●              | ●      | ●      | ●      | ●      |      |

### ■ Spare Parts

| Cutter        | Screw       | Wrench   |
|---------------|-------------|----------|
|               |             |          |
| CNP-(F) 13000 | BFTX 0412 N | TTX 15 W |

### ■ Recommended Cutting Conditions

[v<sub>c</sub> = m/min, f<sub>t</sub> = mm/tooth] [min. – optimum – max.]

| Insert Type |                 | CNMU / CNMQ 130600 N / -G/ -H |               |             |                  |               |             |                 |              |              |                   |              |                   |
|-------------|-----------------|-------------------------------|---------------|-------------|------------------|---------------|-------------|-----------------|--------------|--------------|-------------------|--------------|-------------------|
| Type        | Work Material   | ACP100                        |               |             | ACP200           |               |             | ACP300          |              | ACK200       |                   | ACK300       |                   |
|             |                 | 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 <sub>c</sub>  | 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 <sub>t</sub>  | 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      |
|             | d <sub>oc</sub> | -10                           |               |             | -10              |               |             | -10             |              | -10          |                   | -10          |                   |

● = Euro stock

Recommended Tightening Torque (N·m)



# "Metal Slash Mill" MSX Type

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



H8-10

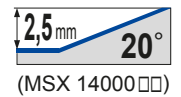
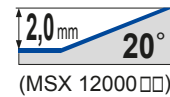
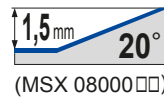


Fig. 1

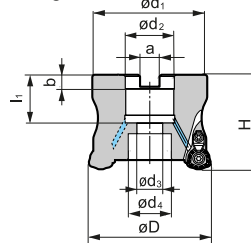
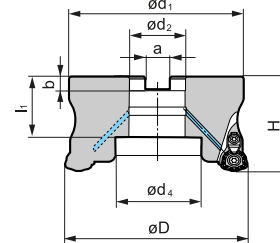


Fig. 2

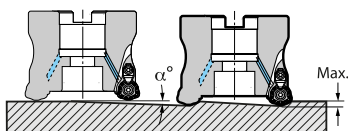


### Body

| Cat. No.     | Stock | Dimensions (mm) |            |    | Mounting |     |            |            |            |       | No. of teeth | Helical Boring<br>$\phi B_{(max-min)}$ | Ramping<br>$\alpha_{max}$ | Weight (Kg) | Fig. | Applicable Insert |
|--------------|-------|-----------------|------------|----|----------|-----|------------|------------|------------|-------|--------------|----------------------------------------|---------------------------|-------------|------|-------------------|
|              |       | $\phi D$        | $\phi d_1$ | H  | a        | b   | $\phi d_2$ | $\phi d_3$ | $\phi d_4$ | $l_1$ |              |                                        |                           |             |      |                   |
| MSX 08040 RS | ●     | 40              | 37         | 45 | 8.4      | 5.6 | 16         | 9          | 13.5       | 18    | 4            | 65 ~ 78                                | 1°30'                     | 0.2         | 1    | WDMT 0804 ZDTR-H  |
| MSX 12050 RS | ●     | 50              | 47         | 50 | 10.4     | 6.3 | 22         | 11         | 18         | 20    | 4            | 78 ~ 99                                | 2°30'                     | 0.3         | 1    | WDMT 1205 ZDTR-H  |
| MSX 12052 RS | ●     | 52              | 47         | 50 | 10.4     | 6.3 | 22         | 11         | 18         | 20    | 4            | 82 ~ 103                               | 2°00'                     | 0.3         |      |                   |
| MSX 12063 RS | ●     | 63              | 60         | 50 | 10.4     | 6.3 | 22         | 11         | 18         | 20    | 5            | 104 ~ 125                              | 1°30'                     | 0.4         |      |                   |
| MSX 12066 RS | ●     | 66              | 60         | 63 | 12.4     | 7.0 | 27         | 13.5       | 20         | 25    | 5            | 110 ~ 131                              | 1°00'                     | 0.4         |      |                   |
| MSX 14050 RS | ●     | 50              | 47         | 50 | 10.4     | 6.3 | 22         | 11         | 17         | 20    | 3            | 73 ~ 98                                | 3°30'                     | 0.3         | 1    | WDMT 1406 ZDTR-H  |
| MSX 14063 RS | ●     | 63              | 60         | 50 | 10.4     | 6.3 | 22         | 11         | 18         | 20    | 4            | 99 ~ 124                               | 2°00'                     | 0.6         |      |                   |
| MSX 14066 RS | ●     | 66              | 60         | 63 | 12.4     | 7.0 | 27         | 13.5       | 20         | 25    | 4            | 107 ~ 132                              | 2°00'                     | 0.7         |      |                   |
| MSX 14080 RS | ●     | 80              | 76         | 63 | 12.4     | 7.0 | 27         | 13.5       | 20         | 25    | 5            | 133 ~ 158                              | 1°30'                     | 1.2         |      |                   |
| MSX 14100 RS | ●     | 100             | 96         | 63 | 14.4     | 8.5 | 32         | -          | 44         | 32    | 6            | 173 ~ 198                              | 1°00'                     | 1.8         | 2    |                   |

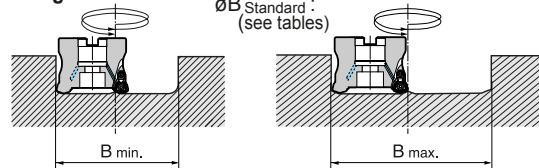
### Ramping (Slant Milling)

$\alpha_{max}$ : (see tables)



### Helical Boring

$\phi B_{Standard}$ : (see tables)



### Recommended Cutting Conditions

Depth of cut :  $d_{oc}$  (mm)  
Feed rate :  $f_t$  (mm/tooth)

### Inserts

| Cat. No.         | Coated Carbide |        |        | Dimensions (mm) |     |     | Max. $d_{oc}$ |
|------------------|----------------|--------|--------|-----------------|-----|-----|---------------|
|                  | ACP200         | ACP300 | ACK300 | $\phi d$        | s   | r   |               |
| WDMT 0804 ZDTR   | ●              | ●      | ●      | 8.5             | 4.0 | 2.0 | 1.5           |
| WDMT 0804 ZDTR-H | ●              | ●      | ●      |                 |     |     |               |
| WDMT 1205 ZDTR   | ●              | ●      | ●      | 12              | 5.0 | 2.0 | 2.0           |
| WDMT 1205 ZDTR-H | ●              | ●      | ●      |                 |     |     |               |
| WDMT 1406 ZDTR   | ●              | ●      | ●      | 14              | 6.0 | 2.0 | 2.5           |
| WDMT 1406 ZDTR-H | ●              | ●      | ●      |                 |     |     |               |

ZDTR-H: Stronger cutting edge

| Work Material                | Insert Type | Cutting Speed $v_c$ (m/min) | Insert Cat. No. | $\phi 40$ |       | $\phi 50 \sim 66$ |       | $\phi 80 \sim 100$ |       |
|------------------------------|-------------|-----------------------------|-----------------|-----------|-------|-------------------|-------|--------------------|-------|
|                              |             |                             |                 | $d_{oc}$  | $f_t$ | $d_{oc}$          | $f_t$ | $d_{oc}$           | $f_t$ |
| 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   |             |
| BFTX 0409 IP | 3.0    | TRDR 15 IP | CCH 3.5 | CR 03       | BFTX 03510 IP 15   |             |
| 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 5mm, 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 rigidity.

# "Wave Mill" Series WFXH Type

**New**



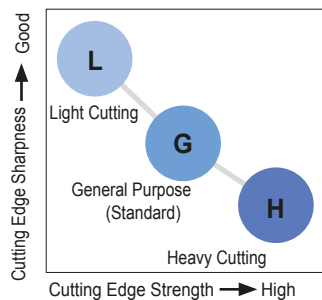
## General Features

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             | <div><div>P</div><div>M</div><div>K</div></div>                                   | Steel, Stainless Steel, Cast Iron                                                  |                                                                                     |                                                                                     | <div><div>N</div></div> Aluminium Alloy |
|---------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------|
| Breaker                   | L Type                                                                            | G Type                                                                             | H Type                                                                              | S Type                                                                              |                                         |
|                           |  |  |  |  |                                         |
| Characteristic            | Low Cutting Force                                                                 | General Purpose                                                                    | Strong Edge                                                                         | Sharp Edge                                                                          |                                         |
| Cutting Edge Figure       |  |  |  |  |                                         |
| Work Material Application | Light Cutting<br>Low rigidity Milling<br>Low-Burr Design                          | <b>Main Chipbreaker</b><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

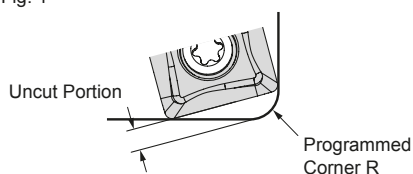
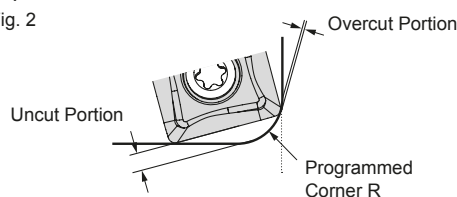


Fig. 2



## WFXH 08000 RS Type

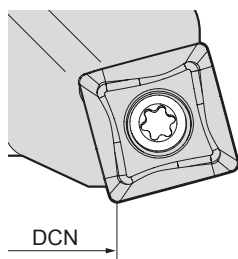
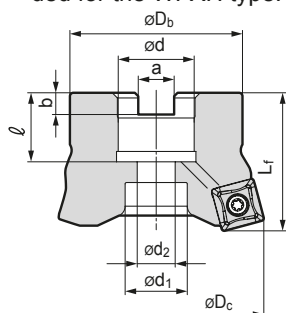
| Programmed Corner R | SOMT 080004-□ |                 |        | SOMT 080008-□ |                 |        | SOMT 080012-□ |                 |        |
|---------------------|---------------|-----------------|--------|---------------|-----------------|--------|---------------|-----------------|--------|
|                     | 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 120004-□ |                 |        | SOMT 120008-□ |                 |        | SOMT 120012-□ |                 |        | SOMT 120016-□ |                 |        |
|---------------------|---------------|-----------------|--------|---------------|-----------------|--------|---------------|-----------------|--------|---------------|-----------------|--------|
|                     | 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 |

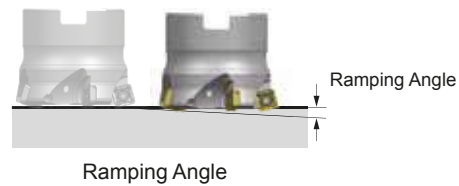
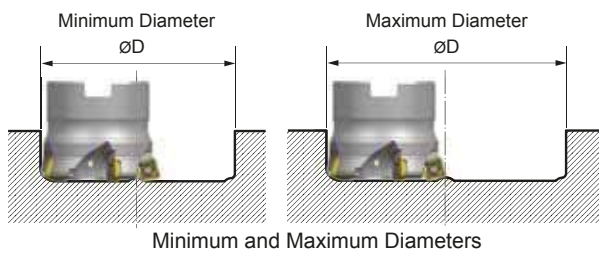
## Minimum Cutting Diameter

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. | ØDc | DCN based on insert nose |      |      |      |
|---------------|-----|--------------------------|------|------|------|
|               |     | R0,4                     | R0,8 | R1,2 | R1,6 |
| WFXH 08040 RS | 40  | 24,6                     | 24,4 | 24,2 | -    |
| 08050 RS      | 50  | 34,6                     | 34,4 | 34,2 | -    |
| 08050 RSZ6    | 50  | 34,6                     | 34,5 | 34,2 | -    |
| 08063 RS      | 63  | 47,6                     | 47,5 | 47,2 | -    |
| WFXH 12050 RS | 50  | 25,8                     | 25,6 | 25,4 | 25,2 |
| 12063 RS      | 63  | 38,6                     | 38,4 | 38,2 | 38,0 |

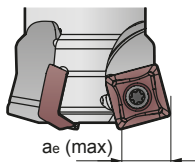
## ■ Taper Cutting and Helical Milling



| Insert Cat. No. | ØDc | Helical Milling |            | Taper Cutting      |
|-----------------|-----|-----------------|------------|--------------------|
|                 |     | Min.            | Max.       | Max. Ramping Angle |
| SOMT 080004-□   | 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 080008-□   | 25  | 35              | 48         | 3°                 |
|                 | 32  | 49              | 62         | 1°30'              |
|                 | 40  | 65              | 78         | 1°                 |
|                 | 50  | 85              | 98         | 0°30'              |
|                 | 63  | 111             | 124        | 0°30'              |
| SOMT 080012-□   | 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. | ØDc | Helical Milling |            | Taper Cutting      |
|-----------------|-----|-----------------|------------|--------------------|
|                 |     | Min.            | Max.       | Max. Ramping Angle |
| SOMT 120004-□   | 40  | 56              | 79         | 1°                 |
|                 | 50  | 76              | 99         | 0°30'              |
|                 | 63  | Impossible      | Impossible | Impossible         |
| SOMT 120008-□   | 40  | 56              | 78         | 1°30'              |
|                 | 50  | 76              | 98         | 1°                 |
|                 | 63  | 102             | 124        | 0°30'              |
| SOMT 120012-□   | 40  | 55              | 77         | 2°30'              |
|                 | 50  | 75              | 97         | 1°30'              |
|                 | 63  | 101             | 123        | 1°                 |
| SOMT 120016-□   | 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<br>ae (max) |
|-----------------|-------------------------------|
| SOMT08          | 6mm                           |
| SOMT12          | 10mm                          |

Lower the feed rate when plunge milling.

## ■ Recommended Cutting Conditions

| ISO | Work Material                            | Grade  | Cutting Speed<br>(vc (m/min)) | Insert<br>Cat. No. | Ø25        |              | Ø32        |              | Ø40        |              | Ø50        |              | Ø63        |              |
|-----|------------------------------------------|--------|-------------------------------|--------------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
|     |                                          |        |                               |                    | ap<br>(mm) | ft<br>(mm/t) | ap<br>(mm) | ft<br>(mm/t) | ap<br>(mm) | ft<br>(mm/t) | ap<br>(mm) | ft<br>(mm/t) | ap<br>(mm) | ft<br>(mm/t) |
| P   | General Steel<br><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<br><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<br>(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<br>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<br><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.

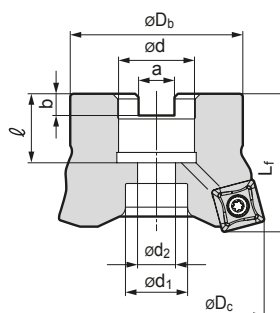
When tool overhang is more than L/D=3 and less or equal L/D=5, settings should be adjusted to approximately 70% to 80% of those indicated in the above cutting conditions (i.e. ap and fz).

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 fz).

# "Wave Mill" Series

## WFXH 08000 RS

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



|            |        |     |               |
|------------|--------|-----|---------------|
| Rake Angle | Radial | -6° | 1,5 mm<br>15° |
|            | Axial  | 6°  |               |

### ■ Body - WFXH08000RS

| Cat. No.        | Stock | Dimensions (mm) |            |       |          |      |     |        |            |            | No. of Teeth | Weight (kg) |
|-----------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|
|                 |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |
| WFXH 08040 RS   | ○     | 40              | 33         | 40    | 16       | 8,4  | 5,6 | 18     | 14         | 9          | 4            | 0,2         |
| WFXH 08050 RS   | ○     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 5            | 0,3         |
| WFXH 08050 RSZ6 | ○     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 6            | 0,3         |
| WFXH 08063 RS   | ○     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 6            | 0,5         |

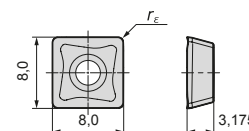
Inserts are not included.

### ■ Identification Details

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

### ■ Inserts

| Application            | Coated Carbide |        |        |        |        |        |        | Carbide | DLC    | Radius (mm)  |
|------------------------|----------------|--------|--------|--------|--------|--------|--------|---------|--------|--------------|
| High Speed / Light cut | P              |        |        | K      |        |        |        | M S     | K N    |              |
| General Purpose        |                | P M    | P M    | K      |        |        |        | M S     |        | N            |
| Roughing               |                | P M    | P M    |        | K      |        |        | M S     |        | N            |
| Cat. No.               | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1      | DL1000 | $r_\epsilon$ |
| SOMT 080304 PZER L     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 0,4          |
| SOMT 080308 PZER L     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 0,8          |
| SOMT 080304 PZER G     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 0,4          |
| SOMT 080308 PZER G     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 0,8          |
| SOMT 080312 PZER G     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 1,2          |
| SOMT 080308 PZER H     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 0,8          |
| SOMT 080312 PZER H     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 1,2          |
| SOET 080304 PZER G     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 0,4          |
| SOET 080308 PZER G     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 0,8          |
| SOET 080312 PZER G     | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 1,2          |
| SOET 080302 PZFR S*    | -              | -      | -      | -      | -      | -      | -      | ●       | ●      | 0,2          |
| SOET 080304 PZFR S*    | -              | -      | -      | -      | -      | -      | -      | ●       | ●      | 0,4          |
| SOET 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 | TRDR08IP |
| 2,0        |          |

### ■ Recommended Cutting Conditions

G45

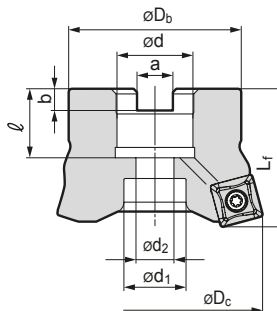
### ■ Programming and Dimension Information

G44

# "Wave Mill" Series WFXH 12000 RS

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

**New**



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



## ■ Body - WFXH12000RS

| Cat. No.      | Stock | Dimensions (mm) |            |       |          |      |     |        |            |            | No. of Teeth | Weight (kg) |
|---------------|-------|-----------------|------------|-------|----------|------|-----|--------|------------|------------|--------------|-------------|
|               |       | $\phi D_c$      | $\phi D_b$ | $L_f$ | $\phi d$ | $a$  | $b$ | $\ell$ | $\phi d_1$ | $\phi d_2$ |              |             |
| WFXH 12050 RS | ○     | 50              | 41         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 4            | 0,3         |
| WFXH 12063 RS | ○     | 63              | 50         | 40    | 22       | 10,4 | 6,3 | 20     | 18         | 11         | 5            | 0,4         |

Inserts are not included.

## ■ Identification Details

**WFX**

Cutter Series

**H**

High Efficiency Milling

**12**

Insert Size

**050**

Cutter Diameter

**R**

Direction

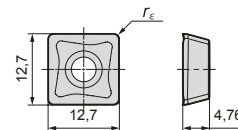
**S**

Metric Type

## ■ Inserts

| Application            | Coated Carbide |        |        |        |        |        |        | Carbide | DLC    |              |
|------------------------|----------------|--------|--------|--------|--------|--------|--------|---------|--------|--------------|
| High Speed / Light cut | P              |        |        | K      |        |        |        | K N     |        |              |
| General Purpose        |                | P M    | P M    | K      |        |        |        | M S     | N      |              |
| Roughing               |                | P M    | P M    |        | K      |        |        | M S     | N      |              |
| Cat. No.               | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1      | DL1000 | Radius (mm)  |
|                        |                |        |        |        |        |        |        |         |        | $r_\epsilon$ |
| 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 | TRDR15IP |

## ■ Recommended Cutting Conditions

G45

## ■ Programming and Dimension Information

G44



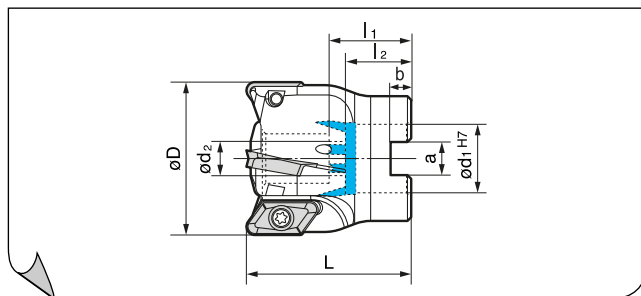
# Wavemill Series

## WAX 3000 RS Type

16-18mm 90°



(Shellmill)



### Body

(For inserts with nose radius  $\leq 3,2\text{mm}$ )

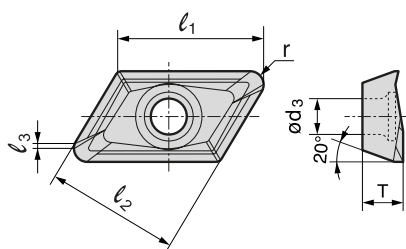
| Cat. No.        | Stock | Dimensions (mm) |                   |    |                   |      |     |       |       | No. of teeth | Weight (Kg) |
|-----------------|-------|-----------------|-------------------|----|-------------------|------|-----|-------|-------|--------------|-------------|
|                 |       | $\varnothing D$ | $\varnothing d_1$ | L  | $\varnothing d_2$ | a    | b   | $l_1$ | $l_2$ |              |             |
| WAX 3050 RS-3.2 | ●     | 50              | 22                | 50 | 11                | 10,4 | 6,3 | 26    | 21    | 4            | 0,34        |
| WAX 3063 RS-3.2 | ●     | 63              | 22                | 50 | 11                | 10,4 | 6,3 | 26    | 21    | 5            | 0,6         |
| WAX 3080 RS-3.2 | ●     | 80              | 27                | 50 | 13,5              | 12,4 | 7   | 30    | 23    | 5            | 1,0         |
| WAX 3100 RS-3.2 | ●     | 100             | 32                | 63 | 18                | 14,4 | 8   | 32    | 26    | 6            | 2,2         |
| WAX 3125 RS-3.2 | ●     | 125             | 40                | 63 | 22                | 16,4 | 9   | 35    | 29    | 7            | 3,5         |

### Body

(For inserts with nose radius  $\geq 4,0\text{mm}$ )

| Cat. No.        | Stock | Dimensions (mm) |                   |    |                   |      |     |       |       | No. of teeth | Weight (Kg) |
|-----------------|-------|-----------------|-------------------|----|-------------------|------|-----|-------|-------|--------------|-------------|
|                 |       | $\varnothing D$ | $\varnothing d_1$ | L  | $\varnothing d_2$ | a    | b   | $l_1$ | $l_2$ |              |             |
| WAX 3050 RS-4.0 | ●     | 50              | 22                | 50 | 11                | 10,4 | 6,3 | 26    | 21    | 4            | 0,34        |
| WAX 3063 RS-4.0 | ●     | 63              | 22                | 50 | 11                | 10,4 | 6,3 | 26    | 21    | 4            | 0,6         |
| WAX 3080 RS-4.0 | ●     | 80              | 27                | 50 | 13,5              | 12,4 | 7   | 30    | 23    | 5            | 1,0         |
| WAX 3100 RS-4.0 | ●     | 100             | 32                | 63 | 18                | 14,4 | 8   | 32    | 26    | 6            | 2,2         |
| WAX 3125 RS-4.0 | ●     | 125             | 40                | 63 | 22                | 16,4 | 9   | 35    | 29    | 7            | 3,5         |

### Inserts for WAX 3000 Type



| Cat. No.          | DLC Coated | Carbide | Dimensions (mm) |       |       |     |   |                   |  |
|-------------------|------------|---------|-----------------|-------|-------|-----|---|-------------------|--|
|                   | DL 1000    | H1      | $l_1$           | $l_2$ | $l_3$ | r   | T | $\varnothing d_3$ |  |
| AECT 160404 PEFRA | ●          | ●       | 18              | 16,4  | 1,4   | 0,4 | 5 | 4,4               |  |
| 160408 PEFRA      | ●          | ●       | 18              | 16,4  | 1     | 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   | 5 | 4,4               |  |
| 160430 PEFRA      | ●          | ●       | 17              | 16,4  | 0,7   | 3   | 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   | 5 | 4,4               |  |
| 160450 PEFRA      | ●          | ●       | 16              | 16,4  | 0,4   | 5   | 5 | 4,4               |  |

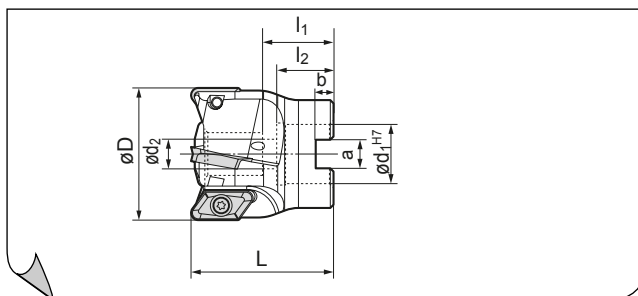
### Spare Parts

| Screw         | Insert Wrench | Applicable Endmill |
|---------------|---------------|--------------------|
| <br>3,0 (N·m) | <br>TRD 15    |                    |
| BFTX 0408     | TRD 15        | Ø50 ~ Ø125         |

# Wavemill Series WAX 4000 RS Type

22-24 mm 90°

(Shellmill)



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

| Cat. No.       | Stock | Dimensions (mm) |                 |    |                 |      |     |                |                | No. of teeth | Weight (Kg) |
|----------------|-------|-----------------|-----------------|----|-----------------|------|-----|----------------|----------------|--------------|-------------|
|                |       | øD              | ød <sub>1</sub> | L  | ød <sub>2</sub> | a    | b   | l <sub>1</sub> | l <sub>2</sub> |              |             |
| WAX4050RS -3.2 | □     | 50              | 16              | 50 | 9               | 8,4  | 5,6 | 23             | 18             | 2            | 0,37        |
| 4063RS -3.2    | □     | 63              | 22              | 50 | 11              | 10,4 | 6,3 | 26             | 21             | 3            | 0,54        |
| 4080RS -3.2    | □     | 80              | 27              | 50 | 13,5            | 12,4 | 7   | 30             | 23             | 4            | 0,81        |
| 4100RS -3.2    | □     | 100             | 32              | 63 | 18              | 14,4 | 8   | 32             | 26             | 5            | 1,7         |
| 4125RS -3.2    | □     | 125             | 40              | 63 | 22              | 16,4 | 9   | 35             | 29             | 6            | 2,6         |

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

| Cat. No.       | Stock | Dimensions (mm) |                 |    |                 |      |     |                |                | No. of teeth | Weight (Kg) |
|----------------|-------|-----------------|-----------------|----|-----------------|------|-----|----------------|----------------|--------------|-------------|
|                |       | øD              | ød <sub>1</sub> | L  | ød <sub>2</sub> | a    | b   | l <sub>1</sub> | l <sub>2</sub> |              |             |
| WAX4050RS -4.0 | □     | 50              | 16              | 50 | 9               | 8,4  | 5,6 | 23             | 18             | 2            | 0,37        |
| 4063RS -4.0    | □     | 63              | 22              | 50 | 11              | 10,4 | 6,3 | 26             | 21             | 3            | 0,54        |
| 4080RS -4.0    | □     | 80              | 27              | 50 | 13,5            | 12,4 | 7   | 30             | 23             | 4            | 0,81        |
| 4100RS -4.0    | □     | 100             | 32              | 63 | 18              | 14,4 | 8   | 32             | 26             | 5            | 1,7         |
| 4125RS -4.0    | □     | 125             | 40              | 63 | 22              | 16,4 | 9   | 35             | 29             | 6            | 2,6         |

## ■ Inserts for WAX 4000 Type

| Cat. No. |              | Dimensions (mm)       |               |                |                |                |     |      |                 |
|----------|--------------|-----------------------|---------------|----------------|----------------|----------------|-----|------|-----------------|
|          |              | DLC Coated<br>DL 1000 | Carbide<br>H1 | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | r   | T    | ød <sub>3</sub> |
| 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             |
| AECT     | 220632 PEFRA | □                     | □             | 23             | 21,8           | 0,4            | 3,2 | 6,35 | 6,0             |
|          | 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

| Screw         | Insert Wrench | Applicable Endmill |
|---------------|---------------|--------------------|
| <br>BFTX0511N | <br>TRD20     |                    |
|               |               | Ø50 ~ Ø125         |

# SUMIDIA Face Mill RF Type

## High Speed Finishing of Aluminium Alloy



Fig. 1

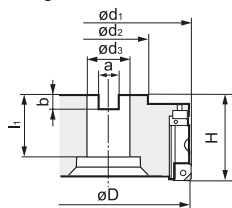


Fig. 2

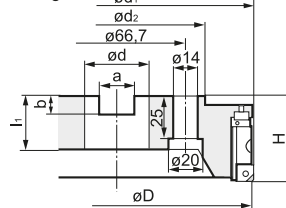
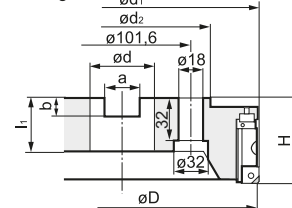


Fig. 3



### Body

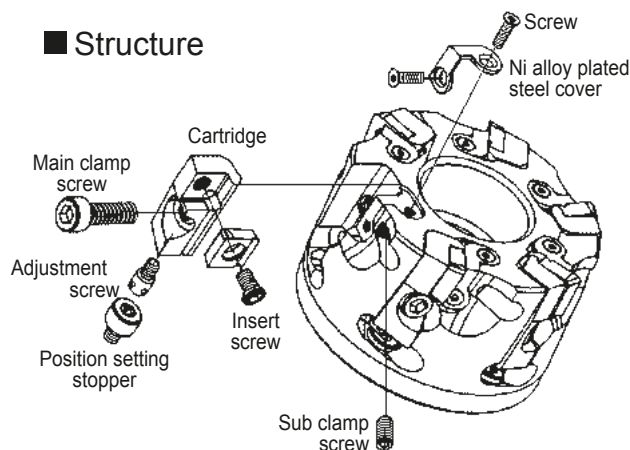
| Type    | Cat. No.    | Stock | Dimensions (mm) |            |            |    | Mounting   |      |      |       | No. of teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|---------|-------------|-------|-----------------|------------|------------|----|------------|------|------|-------|--------------|-------------------|-------------|------|
|         |             |       | $\phi D$        | $\phi d_1$ | $\phi d_2$ | H  | $\phi d_3$ | a    | b    | $l_1$ |              |                   |             |      |
| RF 4000 | RF 4080 R-S | ●     | 80              | 82         | 60         | 50 | 27         | 12,4 | 7,0  | 29    | 6            | 3,0               | 0,7         | 1.   |
|         | RF 4100 R-S | ●     | 100             | 102        | 75         | 50 | 32         | 14,4 | 8,5  | 29    | 6            |                   | 1,0         |      |
|         | RF 4125 R-S | ●     | 125             | 127        | 75         | 63 | 40         | 16,4 | 9,5  | 29    | 8            |                   | 1,6         |      |
|         | RF 4160 R-S | □     | 160             | 162        | 100        | 63 | 40         | 16,4 | 9,5  | 29    | 10           | 3,0               | 2,6         | 2.   |
|         | RF 4200 R-S | □     | 200             | 202        | 130        | 63 | 60         | 25,7 | 14,0 | 38    | 12           |                   | 3,6         |      |
|         | RF 4250 R-S | □     | 250             | 252        | 130        | 63 | 60         | 25,7 | 14,0 | 38    | 16           |                   | 6,0         |      |
|         | RF 4315 R-S | □     | 315             | 317        | 240        | 80 | 60         | 25,7 | 14,0 | 40    | 18           |                   | 11,0        |      |

Remark: PCD blades and inserts are not included.

### Insert for Roughing and Finishing

| Shape | Cat. No.                                            | Grade            | Stock  |
|-------|-----------------------------------------------------|------------------|--------|
|       | Carbide insert<br><b>SDET 1204 ZDFR</b>             | H1               | ●      |
|       | PCD insert<br><b>SNEW 1204 ADFR-NF</b>              | DA1000<br>DA2200 | ●<br>▲ |
|       | PCD insert wiper type<br><b>SNEW 1204 ADFR-W-NF</b> | DA1000<br>DA2200 | ●<br>▲ |

### Structure



### "Sumidia" Blade

| PCD grade<br>DA2200 | Cat. No.    | Stock |
|---------------------|-------------|-------|
| Standard type       | <b>RFB</b>  | □     |
| Wiper type          | <b>RFBW</b> | □     |

### Cartridge

| Shape              | Cat. No.   | Stock |
|--------------------|------------|-------|
| For carbide insert | <b>RFR</b> | ●     |
| For Sumidia insert | <b>RFF</b> | ●     |

### 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

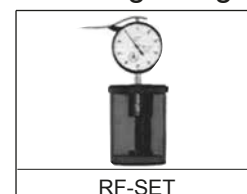
### Dummy Blade

|  |            |   |
|--|------------|---|
|  | <b>RFD</b> | □ |
|--|------------|---|

### Spare Parts

|     |     |        |         |            |     |           |                                |       |
|-----|-----|--------|---------|------------|-----|-----------|--------------------------------|-------|
|     |     |        |         |            |     |           |                                |       |
| RFC | RFS | BX0620 | BTD0510 | FBUP2-A0-8 | RFJ | BFTX0509N | TH050<br>TH015, TH025<br>TH050 | TTX20 |

### Setting Gauge



Dial-gauge is not included.

● = Euro stock

□ = Delivery on request

▲ = To be replaced by new item

# SUMIDIA Face Mill SRF Type

## High Speed Finishing of Aluminium Alloy



Fig. 1

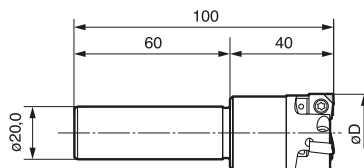
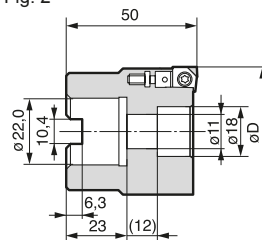


Fig. 2

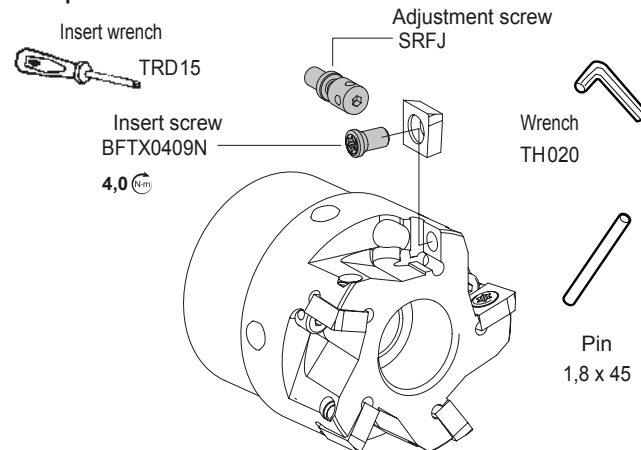


### Body

| Cat. No.    | Stock | øD(mm) | No. of teeth | Fig. | Weight (Kg) |
|-------------|-------|--------|--------------|------|-------------|
| SRF 30 R-ST | □     | 30     | 3            | 1    | 0,34        |
| SRF 40 R-ST | □     | 40     | 4            | 1    | 0,50        |
| SRF 50 RS   | □     | 50     | 5            | 2    | 0,59        |
| SRF 63 RS   | □     | 63     | 6            | 2    | 0,67        |

Inserts are sold separately.

### Spare Parts



### Insert

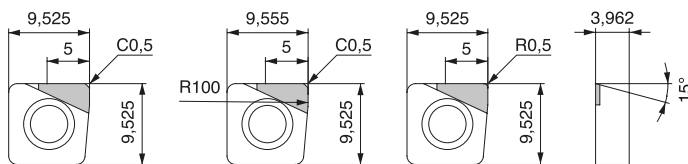


Fig. 1

Fig. 2

Fig. 3

| Cat. No.            | Cutting Edge | SUMIDIA DA2200 | Fig. |
|---------------------|--------------|----------------|------|
| SNEW 09T3 ADTR-NF   | Standard     | □              | 1    |
| SNEW 09T3 ADTR-U-NF | Wiper        | □              | 2    |
| SNEW 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 reground 3 times (up to minimum IC diameter 9,225mm).
- 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 reground amount on the same cutter.

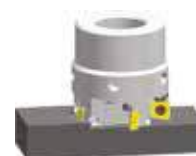
### Maximum D.O.C. Guide (SRF50RS, 5 teeth)

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<br>D.O.C.<br>(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 ADTR-NF (DA2200)  
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 | DA2200 (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 | DA2200 (PCD) | 400 ~ 800             | ~ 800    |                      |                   |          |
|                 |          | Roughing  | H1 (Carbide) | 200 ~ 400             | —        |                      |                   |          |

# SUMIBORON "BN Finish Mill" FMU Type

## High Speed Finishing of Grey Cast Iron



### ■ Features

- High speed machining  $v_c=1.500\text{m/min}$
- Excellent surface roughness  $R_z=3,2$  ( $R_a=1,0$ )
- Safety structure for the centrifugal force under high speed cutting conditions
- Run-out is less than  $10\mu\text{m}$
- 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:  $\phi 80 \sim \phi 315 \text{ mm}$   
 Insert: SNEW1203ADTR/L  
 Low cutting force type: SNEW1203ADTR/L-S

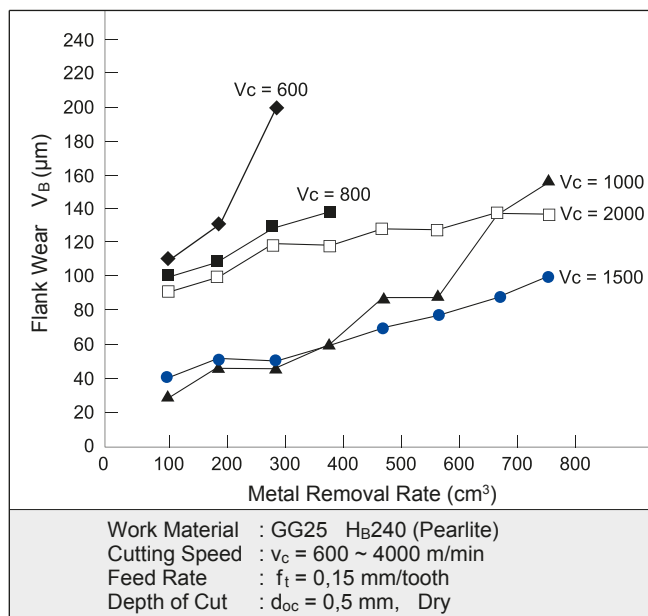


### ■ Recommended Cutting Conditions

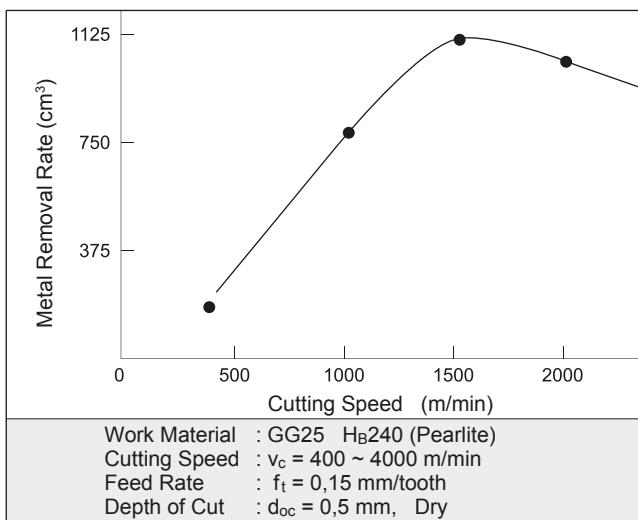
Speed:  $v_c = 800 \sim 2000 \text{ m/min}$   
 Feed:  $f_t = 0,1 \sim 0,3 \text{ mm/tooth}$   
 Depth:  $d_{oc} = 0,5 \text{ mm or less}$   
 Dry cutting

### ■ Performance

#### ● Tool Life Diagram



#### ● Estimated Tool Life



- 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  
 □ = Delivery on request

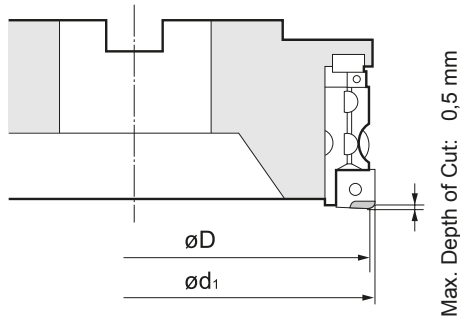
Ⓜ Recommended Tightening Torque (N·m)  
 ▲ = To be replaced by new item



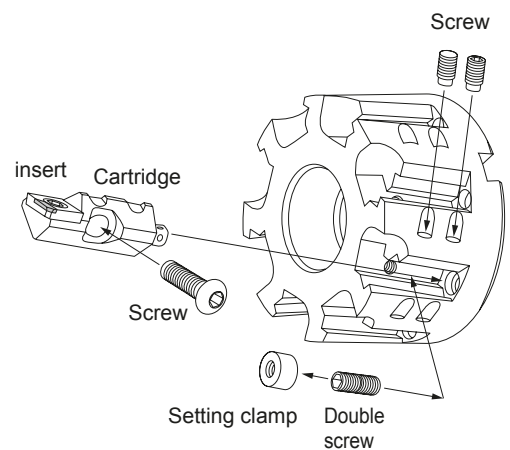
# SUMIBORON "BN Finish Mill" FMU Type

## Specifications

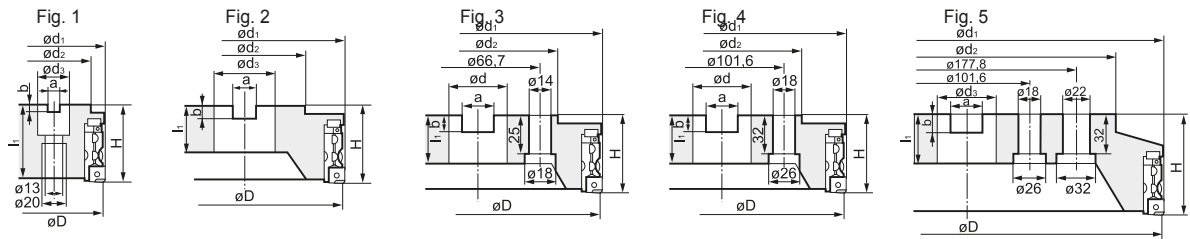
Approach angle: 90°  
Axial rake angle: + 8°  
Radial rake angle: + 2°



## Structure

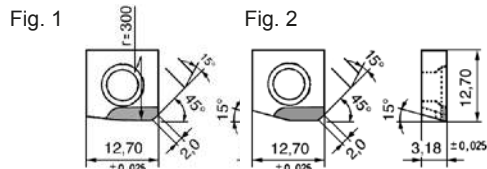


## Body



| Type     | Cat. No.     | Stock |   | Dimensions (mm) |                  |                  |    | Mounting         |      |      |                | No. of teeth | Max. Depth of Cut | Weight (Kg) | Fig. |
|----------|--------------|-------|---|-----------------|------------------|------------------|----|------------------|------|------|----------------|--------------|-------------------|-------------|------|
|          |              | R     | L | ø D             | ø d <sub>1</sub> | ø d <sub>2</sub> | H  | ø d <sub>3</sub> | a    | b    | l <sub>1</sub> |              |                   |             |      |
| FMU 4000 | FMU 4080 R-S | ●     |   | 80              | 82,8             | 60               | 63 | 27               | 12,4 | 7,0  | 25             | 6            | 0,5               | 1,6         | 1.   |
|          | FMU 4100 R-S | ●     |   | 100             | 102,8            | 76               | 63 | 32               | 14,4 | 8,5  | 29             | 8            |                   | 2,4         | 2.   |
|          | FMU 4125 R-S | □     |   | 125             | 127,8            | 75               | 63 | 40               | 16,4 | 9,5  | 29             | 10           |                   | 3,4         |      |
|          | FMU 4160 R-S | □     |   | 160             | 162,8            | 100              | 63 | 40               | 16,4 | 9,5  | 29             | 12           |                   | 5,6         | 3.   |
|          | FMU 4200 R-S | □     |   | 200             | 202,8            | 130              | 63 | 60               | 25,7 | 14,0 | 38             | 16           |                   | 9,2         | 4.   |
|          | FMU 4250 R-S | □     |   | 250             | 252,8            | 130              | 63 | 60               | 25,7 | 14,0 | 38             | 20           |                   | 14,3        |      |
|          | FMU 4315 R-S |       |   | 315             | 317,8            | 240              | 80 | 60               | 25,7 | 14,0 | 40             | 24           |                   | 27,8        | 5.   |

## Insert



| Cat. No.            | Stock |   | CBN grade | Figure |
|---------------------|-------|---|-----------|--------|
|                     | R     | L |           |        |
| SNEW 1203 ADT L/R   | ▲     |   | BN700     | 1      |
| SNEW 1203 ADT L/R-S |       |   | BN700     | 2      |

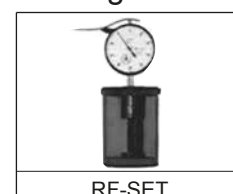
## Cartridge

|           |              |                  |        |               |          |
|-----------|--------------|------------------|--------|---------------|----------|
|           |              |                  |        |               |          |
| 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

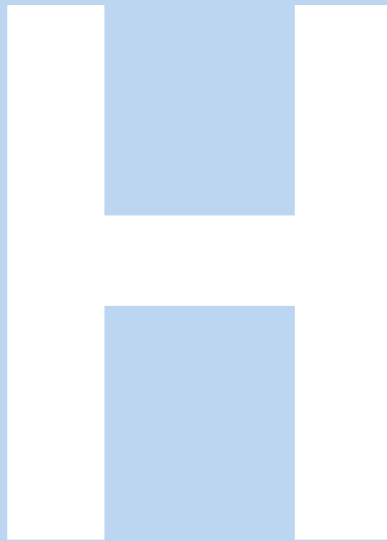


Dial-gauge is not included.



# Indexable Endmills

H1 ~ H48



Selection Guide  
Exchangeable Head Endmills

**Milling Cutter Selection Guide** ..... H 2 -3  
According to Work Materials / Applications  
Modular Tools..... H 4 -5

## Face Milling

General Purpose Face Mills

**DGC** 13000 **EW** ..... H 6  
**WGX** 13000 **EW** ..... H 7

High Feed Milling

**MSX** 06000/08000/12000/14000 **ES/EM/EW** ..... H 8 -9  
06000/08000/12000/12000 **M** ..... H10-11

High Feed Milling

**WFXH** 08000/12000 **M** ..... **New** H12-13

## Shoulder Milling

"Sumi Dual Mill"  
"Wave Mill" for Shoulder Milling

**DFC(M)** 09000 **E** ..... H14-15  
**WFX(F/M)** 08000/12000 **E**..... H16-17  
**WFX** 08000 **M**..... H16

"Sumi Dual Mill", tangential

**TSX(F/M)** 08000/13000**E**..... **New** H18-19

"Sumi Wave" for Shoulder Milling  
"Wave Mill" for Aluminium

**WEX** 1000/2000/3000 **E/EL/EW/M** ..... H20-26  
**WAX** 3000 **E/EL** ..... H27-28  
4000 **E/EL** ..... H29

"Wave Multi-Function Mill"  
"Wave Repeater Mill"

**WMM(H)** 2000 / 3000 **E/EL/EW/ELW** ..... H30-31  
**WRX** 2000 / 3000 ..... H32-35

## Others

"Wave Ball-Mill" for Roughing  
"Wave Ball-Mill" for Finishing

**WBMR** 2000/2000**L**..... H36-37  
**WBMF** 1000 ..... H38-39

"Wave Radius Mill"

**WRCX** 08000/10000 **E** ..... H40  
08000/10000/12000 **M** ..... H41

Round Insert Mill

**RSX(F)** 08000/10000/12000 **ES**..... H42  
**New** 08000/10000/12000 **M**..... H43

"Wave Mill" for Chamfering

**WFXC** 08000/12000 **E**..... **New** H44-45  
**WFXC** 08000/12000 **M** ..... **New** H46

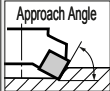
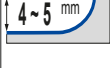
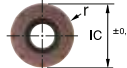
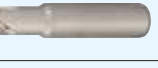
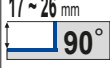
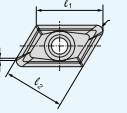
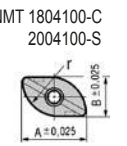
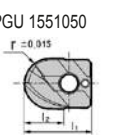
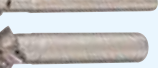
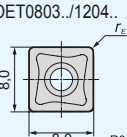
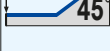
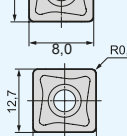
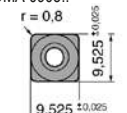
Chamfering Endmill

**SCP** 300/400 ..... H47

# Indexable Endmill Selection Guide

◎ : Preferred choice  
 ○ : Suitable

# Indexable Endmill Selection Guide

| Application   | Cutter Type                                                                                                                                                                       | Series                                                                                                                       | Insert Type                                                                                                                     | Approach Angle<br><br>Max. Depth of Cut (mm)<br>                                                                                                                                                   | Cutter Diameter (mm)                    | Application     |           |           |                  |              |         |         |            |        |           | Work Material              |                            |                 |                               |                   |                 | Ref. Page  |                                 |                            |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------|-----------|-----------|------------------|--------------|---------|---------|------------|--------|-----------|----------------------------|----------------------------|-----------------|-------------------------------|-------------------|-----------------|------------|---------------------------------|----------------------------|
|               |                                                                                                                                                                                   |                                                                                                                              |                                                                                                                                 |                                                                                                                                                                                                                                                                                     |                                         | Face Milling    |           |           | Shoulder Milling | Slot Milling | Ramping | Copying | Chamfering | Boring | Finishing | Carbon Steel / Alloy Steel | Tempered Steel / Die Steel | Stainless Steel | Cast Iron / Ductile Cast Iron | Non-Ferrous Metal | Aluminium Alloy |            | Ti Alloy / Heat Resistant Alloy | Hardened Steel HRC 45 ~ 55 |
|               |                                                                                                                                                                                   |                                                                                                                              |                                                                                                                                 |                                                                                                                                                                                                                                                                                     |                                         | General Purpose | Finishing | High Feed |                  |              |         |         |            |        |           |                            |                            |                 |                               |                   |                 |            |                                 |                            |
| Multi-Purpose | <br>WRCX                                                                                         | WRCX 08000-E<br>10000-E                                                                                                      | QPMT 0803../10T3../1204..<br>QPET 10T35../1204..                                                                                | <br>4 ~ 5 mm                                                                                                                                                                                       | ø12<br>~<br>ø32                         | ◎               |           |           |                  |              | ○       | ○       | ○          |        |           | ○                          | ○                          | ○               | ○                             | ○                 | ○               | H40        |                                 |                            |
|               | <br>WRCX-M                                                                                       | WRCX 08000-M<br>12000-M                                                                                                      |                                                | <br>4 ~ 6 mm                                                                                                                                                                                       | ø20<br>~<br>ø40                         | ◎               |           |           |                  |              | ○       | ○       | ○          |        |           | ○                          | ○                          | ○               | ○                             | ○                 | ○               | H41        |                                 |                            |
|               | <br>RSX                                                                                          | RSX(F) <br>08000-ES<br>10000-ES<br>12000-ES | RDET0803..<br>RDET10T3..<br>RDET1204..                                                                                          | <br>4 mm<br><br>5 mm<br><br>6 mm | ø20<br>~<br>ø32(ES)<br>ø40(M)           | ◎               |           |           |                  |              | ○       | ○       | ○          |        |           | ◎                          |                            |                 | ◎                             |                   |                 | H42<br>H43 |                                 |                            |
|               | <br>RSX-M                                                                                        | RSX(F) <br>08000-M<br>10000-M<br>12000-M    |                                                |                                                                                                                                                                                                                                                                                     |                                         |                 |           |           |                  |              |         |         |            |        |           |                            |                            |                 |                               |                   |                 |            |                                 |                            |
|               | <br>WMM(H)                                                                                     | WMM(H) 2000<br>3000                                                                                                          | APMT 1035../1605..<br>APET 1035../1605..<br> | <br>17 ~ 26 mm<br>90°<br><br>39 mm 90°                                                                        | ø20<br>~<br>ø25<br>~<br>ø32<br>~<br>ø40 | ◎               |           |           | ◎                | ◎            | ◎       | ◎       |            | ◎      |           | ◎                          | ◎                          | ◎               | ◎                             | ◎                 | ◎               | ◎          | H31                             |                            |
| Aluminium     | <br>WAX                                                                                        | WAX 3000-E/EL                                                                                                                | AECT1604..<br>(WAX 3000E/EL)<br>             | <br>16 ~ 18 mm<br>90°<br><br>22 ~ 24 mm<br>90°                                                                | ø20<br>~<br>ø40<br><br>ø25<br>~<br>ø40  | ○               |           |           | ◎                | ◎            | ◎       | ◎       |            |        | ×         | ×                          | ×                          | ×               | ○                             | ◎                 |                 | H28<br>H29 |                                 |                            |
|               |                                                                                                                                                                                   | WAX 4000-E/EL                                                                                                                | AECT2206..<br>(WAX 4000E/EL)                                                                                                    |                                                                                                                                                                                                                                                                                     |                                         |                 |           |           |                  |              |         |         |            |        |           |                            |                            |                 |                               |                   |                 |            |                                 |                            |
| 3D Profiling  | <br>WBMR                                                                                       | WBMR 2000                                                                                                                    | ZNMT 1804100-C<br>2004100-S<br>              | <br>20 ~ 43 mm                                                                                                                                                                                   | R10 (ø20)<br>~<br>R25 (ø50)             |                 |           |           |                  |              | ◎       |         | ◎          |        |           | ◎                          | ◎                          | ◎               | ◎                             | ○                 | ○               | H37        |                                 |                            |
|               | <br>WBMF                                                                                       | WBMF 1000                                                                                                                    | ZPGU 1551050<br>                             | <br>0,1 ~ 0,4 mm                                                                                                                                                                                 | R5 (ø10)<br>~<br>R15 (ø30)              |                 |           |           |                  |              | ◎       |         | ◎          |        | ◎         | ◎                          | ◎                          | ◎               |                               | ○                 |                 | H39        |                                 |                            |
| Chamfering    | <br>WFXC-E  | WFXC 08000-E                                                                                                                 | SOMT0803../1204..<br>SOET0803../1204..<br>   | <br>45°                                                                                                                                                                                          | ø08<br>~<br>ø16<br>~<br>ø25<br>~<br>ø32 |                 |           |           |                  |              |         |         | ◎          |        |           | ◎                          | ◎                          | ◎               | ◎                             | ◎                 | ◎               | H45        |                                 |                            |
|               | <br>WFXC-M  | WFXC 08000-M                                                                                                                 |                                              | <br>45°                                                                                                                                                                                          | ø16<br>~<br>ø25<br>~<br>ø32             |                 |           |           |                  |              |         |         | ◎          |        |           | ◎                          | ◎                          | ◎               | ◎                             | ◎                 | ◎               | H46        |                                 |                            |
|               |                                                                                                                                                                                   | WFXC 12000-E                                                                                                                 |                                                                                                                                 |                                                                                                                                                                                                                                                                                     |                                         |                 |           |           |                  |              |         |         |            |        |           |                            |                            |                 |                               |                   |                 |            |                                 |                            |
|               | <br>SCP                                                                                        | SCP                                                                                                                          | SDMA 0903..<br>                              | <br>2 ~ 3 mm 45°                                                                                                                                                                                 | ø8<br>~<br>ø32                          |                 |           |           |                  |              |         |         |            | ◎      |           |                            | ○                          | ○               | ○                             | ○                 |                 |            | H47                             |                            |



# Exchangeable Head Endmills Modular Tools

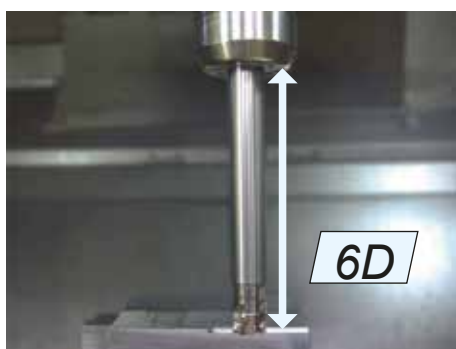


## General Features

- Exchangeable head endmills are available in 7 types !
  - 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) !

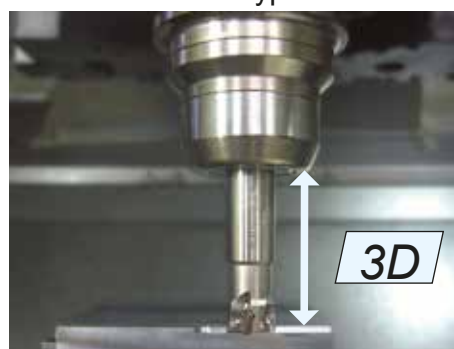
## Characteristics ● Up to 6 x D from Modular End Mill with Carbide Arbor

### Modular Head + Carbide Arbor



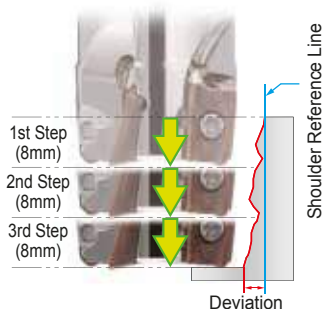
Work Material : C50  
 Tool : WEX2025M12Z4 (øD=25, 4 teeth)  
 Cutting Conditions:  $v_c = 100\text{m/min}$ ,  $f_t = 0,1\text{mm/tooth}$   
 $d_{oc} = 8\text{mm} \times 3\text{ passes}$ ,  $w_{oc} = 2,0\text{mm}$ , Equipment: M/C BT50

### Standard Shank Type Endmill



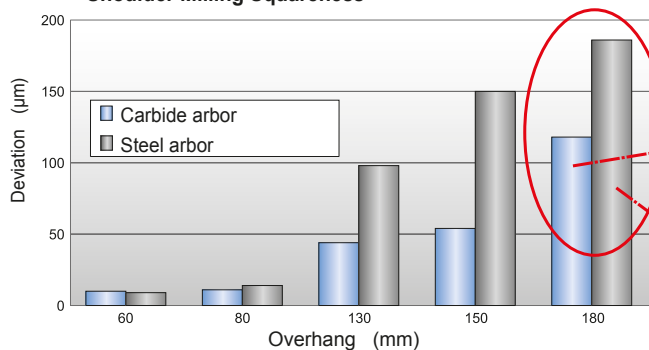
Note  
 Cutting conditions can vary according to cutter reach, rigidity of machine tool / workpiece etc.

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

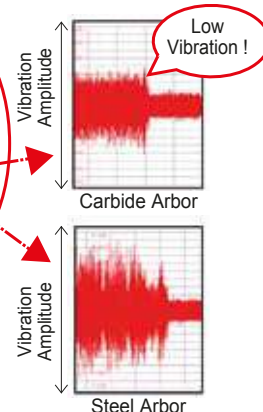


Work Material : C50  
 Tool : WEX2025M12Z4 (øD=25, 4 teeth)  
 Cutting Conditions:  $v_c = 100\text{m/min}$ ,  $f_t = 0,1\text{mm/tooth}$   
 $d_{oc} = 8\text{mm} \times 3\text{ passes}$ ,  $w_{oc} = 2,0\text{mm}$ , Equipment: M/C BT50

### Shoulder Milling Squariness



### Carbide Arbor Comparison ...



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

**Economically  
 designed  
 exchangeable head!**



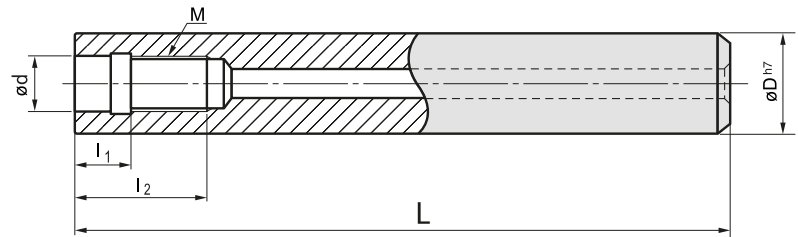
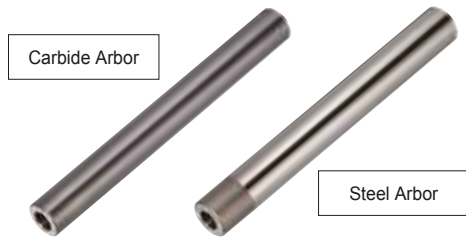
Easy to change screw-on endmill type WEX and carbide arbor

# Exchangeable Head Endmills

## Modular Tools

### Modular Type

### Carbide and Steel Arbor



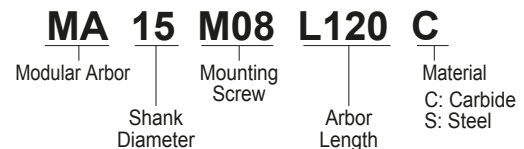
### Carbide Arbor

| Cat. No.        | Stock | Dimensions (mm) |      |    |     |                |                |                |
|-----------------|-------|-----------------|------|----|-----|----------------|----------------|----------------|
|                 |       | M               | ød   | øD | L   | L <sub>1</sub> | L <sub>2</sub> | L <sub>m</sub> |
| MA 15 M08 L120C | ●     | M8              | 8,5  | 15 | 120 | 10             | 18             | 145            |
| MA 15 M08 L160C | ●     | M8              | 8,5  | 15 | 160 | 10             | 18             | 185            |
| MA 16 M08 L120C | ●     | M8              | 8,5  | 16 | 120 | 10             | 18             | 145            |
| MA 16 M08 L160C | ●     | M8              | 8,5  | 16 | 160 | 10             | 18             | 185            |
| MA 18 M10 L150C | ●     | M10             | 10,5 | 18 | 150 | 10             | 20             | 180            |
| MA 18 M10 L200C | ●     | M10             | 10,5 | 18 | 200 | 10             | 20             | 230            |
| MA 20 M10 L150C | ●     | M10             | 10,5 | 20 | 150 | 10             | 20             | 180            |
| MA 20 M10 L200C | ●     | M10             | 10,5 | 20 | 200 | 10             | 20             | 230            |
| MA 23 M12 L200C | ●     | M12             | 12,5 | 23 | 200 | 10             | 22             | 235            |
| MA 23 M12 L250C | ●     | M12             | 12,5 | 23 | 250 | 10             | 22             | 285            |
| MA 25 M12 L200C | ●     | M12             | 12,5 | 25 | 200 | 10             | 22             | 235            |
| MA 25 M12 L250C | ●     | M12             | 12,5 | 25 | 250 | 10             | 22             | 285            |
| MA 28 M16 L200C | ●     | M16             | 17,0 | 28 | 200 | 10             | 24             | 240            |
| MA 28 M16 L300C | ●     | M16             | 17,0 | 28 | 300 | 10             | 24             | 340            |
| MA 32 M16 L200C | ●     | M16             | 17,0 | 32 | 200 | 10             | 24             | 240            |
| MA 32 M16 L300C | ●     | M16             | 17,0 | 32 | 300 | 10             | 24             | 340            |

### Steel Arbor

| Cat. No.        | Stock | Dimensions (mm) |      |    |     |                |                |                |
|-----------------|-------|-----------------|------|----|-----|----------------|----------------|----------------|
|                 |       | M               | ød   | øD | L   | L <sub>1</sub> | L <sub>2</sub> | L <sub>m</sub> |
| 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.



### Recommended Tightening Torque

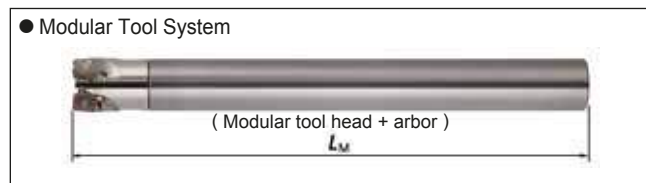
| Screw | Wrench |    | N·m |
|-------|--------|----|-----|
|       | W      | S  |     |
| M 8   | 8      | 13 | 23  |
| M10   | 8      | 15 | 46  |
| M12   | 10     | 19 | 80  |
| M16   | 10     | 24 | 90  |



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 tightening torque in the table above.

### Modular Tool System



### Product Range

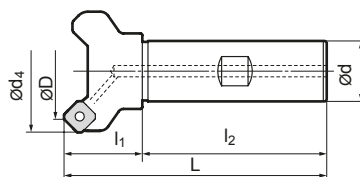
| Application       | Work Material                                                                           | Series                      | Cat. No.                           | Page       |
|-------------------|-----------------------------------------------------------------------------------------|-----------------------------|------------------------------------|------------|
| 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               | H23<br>H24 |
| 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 | H41        |
|                   | Milling of Steel, Cast Iron, Stainless Steel and Non-Ferrous Metal                      | „Wave Radius Mill“ - Series | RSX(F) 10000-M<br>12000-M          | H43        |
| Chamfering        | Chamfering of Steel, Die Steel, Cast Iron, Stainless Steel and Non-Ferrous Metal        | „Wave Mill“ - Series        | WFXC 08000-M                       | H46        |

# "Sumi Dual Mill" Face Mill

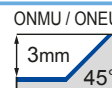
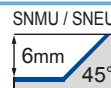
## DGC (EW) Type

General Milling for Steel and Cast Iron

### ■ Body – Shank Type



| Rake Angle | SNMU / SNEU |       | ONMU / ONEU |       |
|------------|-------------|-------|-------------|-------|
|            | Radial      | Axial | Radial      | Axial |
|            | -10°        | -5°   | -10°        | -5°   |



### ■ Body

| Cat. No.     | Stock | Dimensions (mm) |     |    |            |    |     | No. of Teeth | Weight (kg) |
|--------------|-------|-----------------|-----|----|------------|----|-----|--------------|-------------|
|              |       | ØD              | Ød4 | Ød | l1         | l2 | L   |              |             |
| DGC 13040 EW | ●     | 40 (42,90)      | 54  | 32 | 40 (38,44) | 85 | 125 | 3            | 0,7         |
| DGC 13050 EW | ●     | 50 (52,90)      | 65  | 32 | 40 (38,44) | 85 | 125 | 3            | 0,9         |
| DGC 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

|               |             |                 |                     |
|---------------|-------------|-----------------|---------------------|
| <b>DGC</b>    | <b>13</b>   | <b>040</b>      | <b>EW</b>           |
| Cutter Series | Insert Size | Cutter Diameter | Endmill Type Weldon |

### ■ Inserts

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

Fig. 1

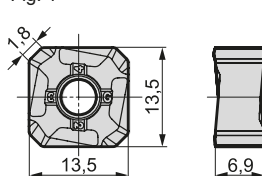


Fig. 2

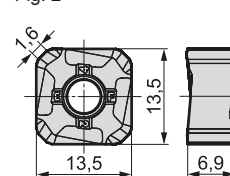


Fig. 3

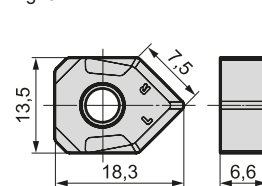
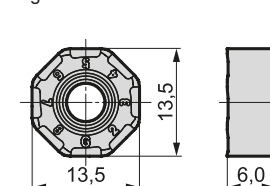


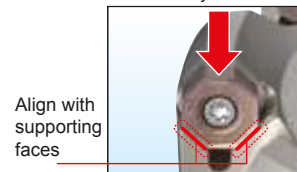
Fig. 4



### 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 Screw | Insert Wrench |
|-----------|------------|---------------|--------------|---------------|
| DGCS 13 R | BW 0609 F  | LH 040        | BFTX 0412 IP | TRDR 15 IP    |

### Optional

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

\*Corners can be changed simply by loosening the screw. (Only suitable for DGC / DGCM types with body size ≥ Ø80).

### ■ SNMU – Recommended Cutting Conditions

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

Min. – Optimum – Max.

### ■ ONMU – Recommended Cutting Conditions

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

◎ Preferred choice

○ Suitable

⌚ Recommended Tightening Torque (N·m)

● = Euro stock  
○ = Japan stock

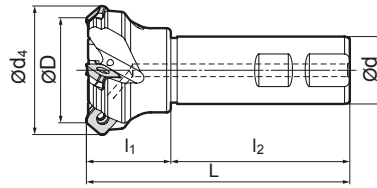


G6/G7

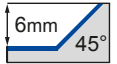
# "Sumi Wave" Face Mill WGX (EW) Type

General Milling for Steel and Cast Iron

## ■ Body – Shank Type



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



## ■ Body – Dimensions

| Cat. No.     | Stock | Dimensions (mm) |     |    |    |    |     | No. of Teeth |
|--------------|-------|-----------------|-----|----|----|----|-----|--------------|
|              |       | ØD              | Ød4 | Ød | l1 | l2 | L   |              |
| WGX 13032 EW | ○     | 32              | 44  | 32 | 40 | 85 | 125 | 3            |
| WGX 13040 EW | ○     | 40              | 52  | 32 | 40 | 85 | 125 | 3            |
| WGX 13050 EW | ○     | 50              | 62  | 32 | 40 | 85 | 125 | 4            |
| WGX 13063 EW | ○     | 63              | 76  | 32 | 40 | 85 | 125 | 5            |

Inserts are not included.  
Ø 32 mm cutters do not have a seat.

## ■ Identification Details

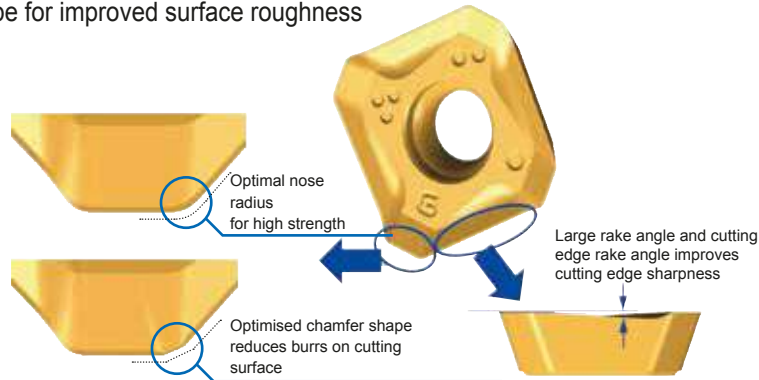
|               |             |                 |                     |
|---------------|-------------|-----------------|---------------------|
| <b>WGX</b>    | <b>13</b>   | <b>032</b>      | <b>EW</b>           |
| Cutter Series | Insert Size | Cutter Diameter | Endmill Type Weldon |

## ■ Insert Shape Characteristics

Unique wiper edge shape for improved surface roughness

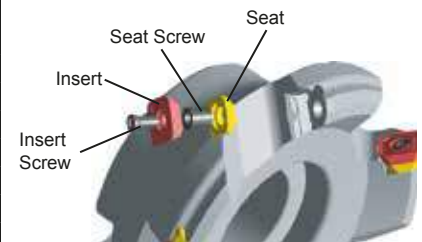
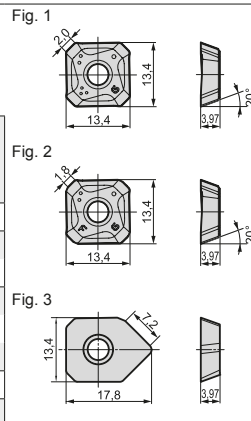
General-purpose  
G type chipbreaker

Low-burr design  
FG type chipbreaker



## ■ Inserts

| Application          | Coated Carbide |        |        |        |        |        | Carb. DLC |    |
|----------------------|----------------|--------|--------|--------|--------|--------|-----------|----|
| High Speed/Light Cut | P              |        |        | K      |        | M      | K         | N  |
| General Purpose      | P              | M      | K      |        | M      | S      | N         |    |
| Roughing             | P              | M      | K      |        | M      | S      |           |    |
| Cat. No.             | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300    | H1 |
| SEET 13T3AGFR-L      |                |        |        |        |        |        |           | ○  |
| SEET 13T3AGSR-L      | ●              | ●      | ●      | ●      | ●      | ●      | ●         | ○  |
| SEET 13T3AGSR-G      | ●              | ●      | ●      | ●      | ●      | ●      | ●         | ○  |
| SEMT 13T3AGSR-L      | ●              | ●      | ●      | ●      | ●      | ●      | ●         | ○  |
| SEMT 13T3AGSR-G      | ●              | ●      | ●      | ●      | ●      | ●      | ●         | ○  |
| SEMT 13T3AGSR-H      | ●              | ●      | ●      | ●      | ●      | ●      | ●         | ○  |
| SEMT 13T3AGSR-FG     | ●              | ●      | ●      | ●      | ●      | ●      | ●         | ○  |
| XEEW 13T3AGER-WR     | ○              |        |        | ○      |        |        |           | ○  |



## ■ Spare Parts

| Applicable Cutters | Seat      | Seat Screw | Insert Screw  | Insert Wrench | 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                |

## ■ Recommended Cutting Conditions

| ISO | Work Material   | Hardness  | Cutting Speed v <sub>c</sub> (m/min) | Feed Rate f <sub>t</sub> (mm/tooth) | Grade  |
|-----|-----------------|-----------|--------------------------------------|-------------------------------------|--------|
| P   | General Steel   | 180~280HB | 150-200-250                          | 0,15-0,20-0,25                      | ACP200 |
|     | Soft Steel      | ≤180HB    | 180-265-350                          | 0,10-0,25-0,40                      | ACP200 |
|     | Die Steel       | 200~220HB | 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       | 250HB     | 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



# "METAL SLASH MILL" 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

### Durable Cutter Body

Special alloyed steel with  
hard surface

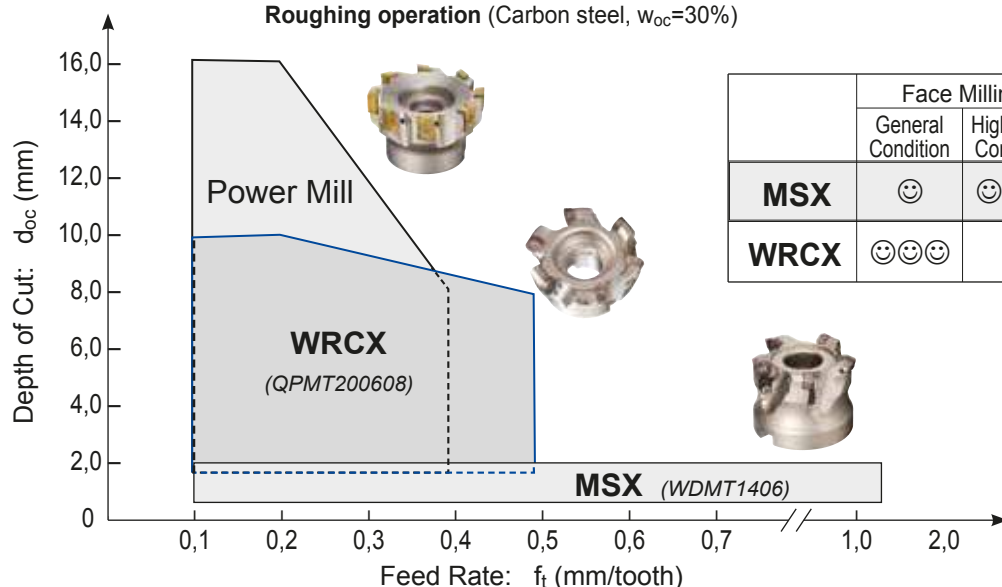
### Double Clamp

Secure insert clamping  
for stable cutting



## ■ Application Range

Roughing operation (Carbon steel,  $w_{oc}=30\%$ )



|             | Face Milling      |                     | Slotting | Helical Boring | Profiling |
|-------------|-------------------|---------------------|----------|----------------|-----------|
|             | General Condition | High Feed Condition |          |                |           |
| <b>MSX</b>  | ☺                 | ☺☺☺                 | ☺        | ☺☺☺            | —         |
| <b>WRCX</b> | ☺☺☺               | ☺                   | ☺        | ☺☺             | ☺☺        |

☺☺☺ excellent  
☺☺ very good  
☺ good

● = Euro stock  
□ = Delivery on request

⌚ Recommended Tightening Torque (N·m)

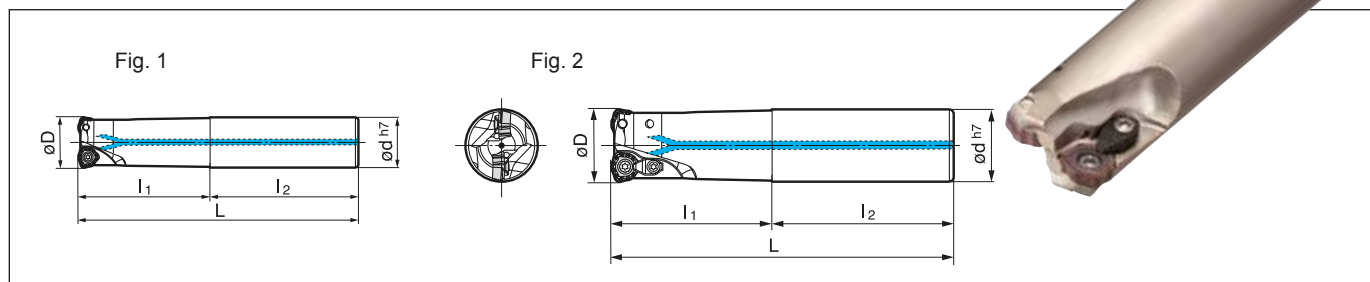
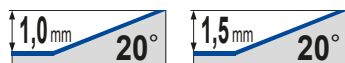


# "METAL SLASH MILL"

## MSX 06000/08000 ES/EM/EW

# "METAL SLASH MILL"

## MSX 12000/14000 ES/EM/EW



### Body

For insert type : WDMT 0603 □□□□

| Shank | Cat. No.       | Stock | Dimensions (mm) |    |                |                |     | No. of teeth | Fig. |
|-------|----------------|-------|-----------------|----|----------------|----------------|-----|--------------|------|
|       |                |       | ØD              | Ød | L <sub>1</sub> | L <sub>2</sub> | L   |              |      |
|       | MSX 06016 ES   | □     | 16              | 16 | 30             | 80             | 110 | 2            | 1    |
|       | MSX 06016 EM   | ●     | 16              | 16 | 70             | 80             | 150 | 2            | 1    |
|       | MSX 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    |
|       | MSX 06020 EM   | ●     | 20              | 20 | 100            | 80             | 180 | 3            | 1    |
|       | MSX 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    |
|       | MSX 06025 ES24 | □     | 25              | 24 | 60             | 80             | 140 | 3            | 1    |
|       | MSX 06025 EM   | ●     | 25              | 25 | 120            | 130            | 250 | 3            | 1    |
|       | MSX 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 □□□□

| Shank | Cat. No.       | Stock | Dimensions (mm) |    |                |                |     | No. of teeth | Fig. |
|-------|----------------|-------|-----------------|----|----------------|----------------|-----|--------------|------|
|       |                |       | ØD              | Ød | L <sub>1</sub> | L <sub>2</sub> | L   |              |      |
|       | MSX 08020 ES   | ●     | 20              | 20 | 50             | 80             | 130 | 2            | 1    |
|       | MSX 08020 EM   | ●     | 20              | 20 | 100            | 80             | 180 | 2            | 1    |
|       | MSX 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    |
|       | MSX 08025 EM   | ●     | 25              | 25 | 120            | 130            | 250 | 2            | 2    |
|       | MSX 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    |
|       | MSX 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    |

ES : Short type with cylindrical shank  
EM : Long type with cylindrical shank  
EW : Short type with Weldon shank

### Body

For insert type : WDMT 1205 □□□□

| Shank | Cat. No.     | Stock | Dimensions (mm) |    |                |                |     | No. of teeth | Fig. |
|-------|--------------|-------|-----------------|----|----------------|----------------|-----|--------------|------|
|       |              |       | ØD              | Ød | L <sub>1</sub> | L <sub>2</sub> | L   |              |      |
|       | MSX 12032 ES | ●     | 32              | 32 | 70             | 80             | 150 | 2            | 2    |
|       | MSX 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    |
|       | MSX 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 □□□□

| Shank | Cat. No.     | Stock | Dimensions (mm) |    |                |                |     | No. of teeth | Fig. |
|-------|--------------|-------|-----------------|----|----------------|----------------|-----|--------------|------|
|       |              |       | ØD              | Ød | L <sub>1</sub> | L <sub>2</sub> | L   |              |      |
|       | MSX 14040 ES | □     | 40              | 32 | 50             | 100            | 150 | 2            | 2    |
|       | MSX 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    |
|       | MSX 14063 ES | □     | 63              | 42 | 50             | 100            | 150 | 4            | 2    |
|       | MSX 14063 EM | □     | 63              | 42 | 50             | 200            | 250 | 4            | 2    |

ES : Short type with cylindrical shank  
EM : Long type with cylindrical shank  
EW : Short type with Weldon shank

### Inserts

| Cat. No.         | Coated Carbide |        |        | Dimensions (mm) |     |     | Max. d <sub>oc</sub> |
|------------------|----------------|--------|--------|-----------------|-----|-----|----------------------|
|                  | ACP200         | ACP300 | ACK300 | Ød              | s   | r   |                      |
| WDMT 0603 ZDTR   | ●              | ●      | ●      | 6,35            | 2,0 | 1,5 | 1,0                  |
| WDMT 0603 ZDTR-H | ●              | ●      | ●      |                 |     |     |                      |
| WDMT 0804 ZDTR   | ●              | ●      | ●      | 8,5             | 4,0 | 2,0 | 1,5                  |
| WDMT 0804 ZDTR-H | ●              | ●      | ●      |                 |     |     |                      |
| WDMT 1205 ZDTR   | ●              | ●      | ●      | 12              | 5,0 | 2,0 | 2,0                  |
| WDMT 1205 ZDTR-H | ●              | ●      | ●      |                 |     |     |                      |
| WDMT 1406 ZDTR   | ●              | ●      | ●      | 14              | 6,0 | 2,0 | 2,5                  |
| WDMT 1406 ZDTR-H | ●              | ●      | ●      |                 |     |     |                      |

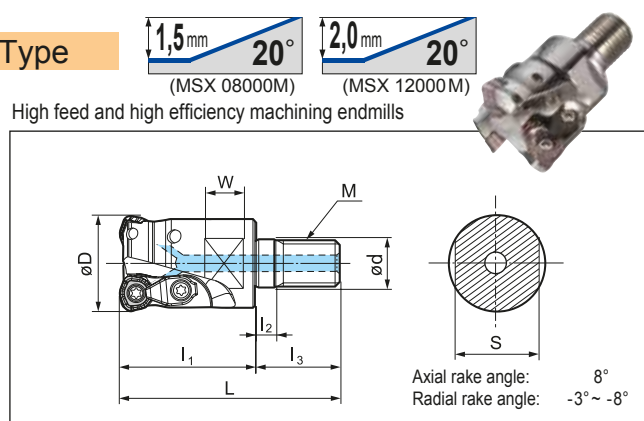
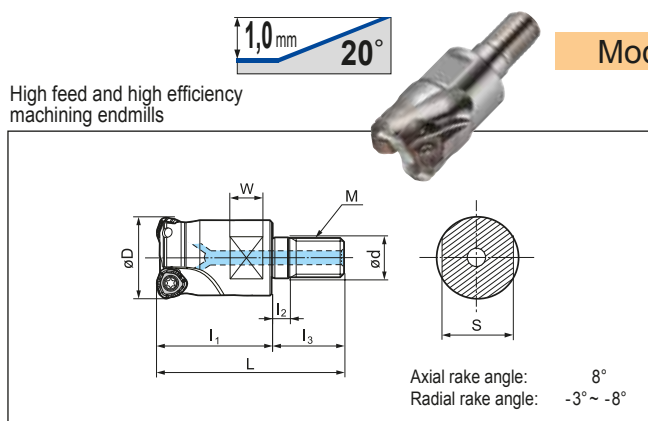
ZDTR-H : Stronger cutting edge

### Spare Parts

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

# Exchangeable Head Endmills MSX 06000/08000 M Type

# Exchangeable Head Endmills MSX 08000/12000 M Type



## Heads

For insert type : WDMT 0603

| Cat. No.      | Stock | Dimensions (mm) |      |                |                |                |   |    |    |    |   | No. of teeth |
|---------------|-------|-----------------|------|----------------|----------------|----------------|---|----|----|----|---|--------------|
| øD            | ød    | M               | L    | I <sub>1</sub> | I <sub>2</sub> | I <sub>3</sub> | W | S  |    |    |   |              |
| MSX06016M08Z2 | ●     | 16              | 8,5  | M8             | 42             | 25             | 5 | 17 | 8  | 13 | 2 |              |
| MSX06018M08Z2 | □     | 18              | 8,5  | M8             | 42             | 25             | 5 | 17 | 8  | 13 | 2 |              |
| MSX06020M10Z3 | ●     | 20              | 10,5 | M10            | 49             | 30             | 5 | 19 | 8  | 15 | 3 |              |
| MSX06022M10Z3 | □     | 22              | 10,5 | M10            | 49             | 30             | 5 | 19 | 8  | 15 | 3 |              |
| MSX06025M12Z3 | ●     | 25              | 12,5 | M12            | 56             | 35             | 5 | 21 | 10 | 19 | 3 |              |

Inserts are not included.

## Heads

For insert type : WDMT 0804

| Cat. No.      | Stock | Dimensions (mm) |      |                |                |                |   |    |    |    |   | No. of teeth |
|---------------|-------|-----------------|------|----------------|----------------|----------------|---|----|----|----|---|--------------|
| øD            | ød    | M               | L    | I <sub>1</sub> | I <sub>2</sub> | I <sub>3</sub> | W | S  |    |    |   |              |
| MSX08025M12Z2 | ●     | 25              | 12,5 | M12            | 56             | 35             | 5 | 21 | 10 | 19 | 2 |              |
| MSX08028M12Z2 | □     | 28              | 12,5 | M12            | 56             | 35             | 5 | 21 | 10 | 19 | 2 |              |
| MSX08030M16Z3 | □     | 30              | 17,0 | M16            | 63             | 40             | 5 | 23 | 10 | 24 | 3 |              |
| MSX08032M16Z3 | ●     | 32              | 17,0 | M16            | 63             | 40             | 5 | 23 | 10 | 24 | 3 |              |
| MSX08035M16Z3 | □     | 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 |
|---------------|-------|-----------------|------|----------------|----------------|----------------|---|----|----|----|---|--------------|
| øD            | ød    | M               | L    | I <sub>1</sub> | I <sub>2</sub> | I <sub>3</sub> | W | S  |    |    |   |              |
| MSX12032M16Z2 | ●     | 32              | 17,0 | M16            | 63             | 40             | 5 | 23 | 10 | 24 | 2 |              |
| MSX12035M16Z2 | □     | 35              | 17,0 | M16            | 63             | 40             | 5 | 23 | 10 | 24 | 2 |              |
| MSX12040M16Z3 | ●     | 40              | 17,0 | M16            | 63             | 40             | 5 | 23 | 10 | 24 | 3 |              |

Inserts are not included.

## Inserts for MSX 06000M Type

| Cat. No.         | Coated Carbide |         |         | Dimensions (mm) |     |     |     | Max. d <sub>oc</sub> |
|------------------|----------------|---------|---------|-----------------|-----|-----|-----|----------------------|
|                  | ACP 200        | ACP 300 | ACK 300 | ød              | s   | r   |     |                      |
| WDMT 0603 ZDTR   | ●              | ●       | ●       | 6,35            | 3,0 | 1,5 | 1,0 |                      |
| WDMT 0603 ZDTR-H | ●              | ●       | ●       |                 |     |     |     |                      |

H - Strong Cutting Edge

## Inserts for MSX 08000M/12000M Type

| Cat. No.         | Coated Carbide |         |         | Dimensions (mm) |     |     |     | Max. d <sub>oc</sub> |
|------------------|----------------|---------|---------|-----------------|-----|-----|-----|----------------------|
|                  | ACP 200        | ACP 300 | ACK 300 | ød              | s   | r   |     |                      |
| WDMT 0804 ZDTR   | ●              | ●       | ●       | 8,5             | 4,0 | 2,0 | 1,5 |                      |
| WDMT 0804 ZDTR-H | ●              | ●       | ●       |                 |     |     |     |                      |
| WDMT 1205 ZDTR   | ●              | ●       | ●       | 12              | 5,0 | 2,0 | 2,0 |                      |
| WDMT 1205 ZDTR-H | ●              | ●       | ●       |                 |     |     |     |                      |

H - Strong Cutting Edge

## Identification of Catalogue No.

**MSX 06 016 M08 Z2**

Cutter type      Diameter      No. of teeth

Insert size      Mounting screw



## Spare Parts

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

● = Euro stock  
□ = Delivery on request

Recommended Tightening Torque (N·m)

# "METAL SLASH MILL" MSX Type

## Recommended Cutting Conditions

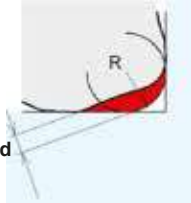
| Work Material                           | Coated Carbide Grade | Cutting Speed<br>v <sub>c</sub> (m/min) | Insert Cat. No. | Endmill Type (øD)    |                      |                      |                      |                      |                      |                      |                      |                      |                      | Shell Type (øD)      |                      |                      |                      |
|-----------------------------------------|----------------------|-----------------------------------------|-----------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                         |                      |                                         |                 | ø16                  |                      | ø20                  |                      | ø25                  |                      | ø32                  |                      | ø40                  |                      | ø50~66               |                      | ø80~100              |                      |
|                                         |                      |                                         |                 | d <sub>oc</sub> (mm) | Feed rate (mm/tooth) | d <sub>oc</sub> (mm) | Feed rate (mm/tooth) | d <sub>oc</sub> (mm) | Feed rate (mm/tooth) | d <sub>oc</sub> (mm) | Feed rate (mm/tooth) | d <sub>oc</sub> (mm) | Feed rate (mm/tooth) | d <sub>oc</sub> (mm) | Feed rate (mm/tooth) | d <sub>oc</sub> (mm) | Feed rate (mm/tooth) |
| General Steel<br>(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<br>(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<br>X5CRN1810,<br>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<br>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<br>(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 $d_{oc}$ | r   |
|-----------------|--------------|-----|
| WDMT 0603....   | 1,0          | 1,5 |
| WDMT 0804....   | 1,5          | 2,0 |
| WDMT 1205....   | 2,0          | 2,0 |
| WDMT 1406....   | 2,5          | 2,0 |

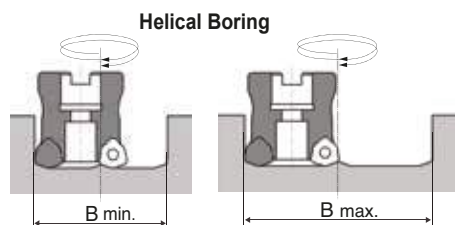
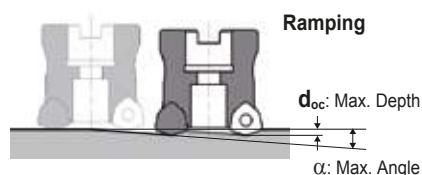
- The above recommended cutting conditions may require adjustment according to machine rigidity and work rigidity.  
The above figures are guidelines for use with the BT50 machine tool.
- The above cutting conditions assume a tool overhang length of  $L/D=3$  (i.e. overhang length is 3 times tool diameter) 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.  $d_{oc}$  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.  $d_{oc}$  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 06000 | WDMT 0603.... | 2,0                    | 0,403               |
|                                                                                     | MSX 08000 | WDMT 0804.... | 2,5                    | 0,593               |
|                                                                                     | MSX 12000 | WDMT 1205.... | 3,0                    | 1,030               |
|                                                                                     | MSX 14000 | WDMT 1406.... | 3,5                    | 1,219               |

## Plunging and Helical Boring



| Cutter $\phi$ | WDMT0603ZDTR          |                              |                              | WDMT0804ZDTR          |                              |                              | WDMT1205ZDTR          |                              |                              | WDMT1406ZDTR          |                              |                              |
|---------------|-----------------------|------------------------------|------------------------------|-----------------------|------------------------------|------------------------------|-----------------------|------------------------------|------------------------------|-----------------------|------------------------------|------------------------------|
|               | $d_{oc}$ : max 1,0    |                              |                              | $d_{oc}$ : max 1,5    |                              |                              | $d_{oc}$ : max 2,0    |                              |                              | $d_{oc}$ : max 2,5    |                              |                              |
|               | Ramping $\alpha$ max. | Helical boring min. $\phi B$ | Helical boring max. $\phi B$ | Ramping $\alpha$ max. | Helical boring min. $\phi B$ | Helical boring max. $\phi B$ | Ramping $\alpha$ max. | Helical boring min. $\phi B$ | Helical boring max. $\phi B$ | Ramping $\alpha$ max. | Helical boring min. $\phi B$ | Helical boring max. $\phi B$ |
| 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                          |

# "Wave Mill" Series

## WFXH - M Type

**New**



### 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

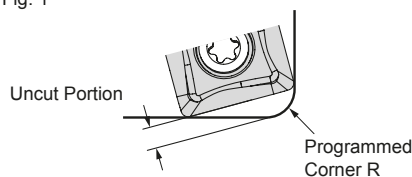
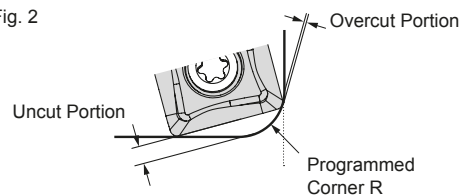


Fig. 2



### WFXH 08000 Type

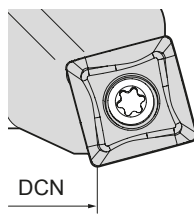
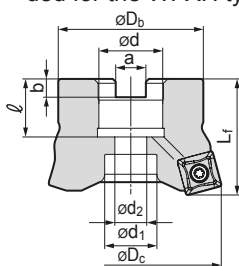
| Programmed Corner R | SOMT 080004-□ |                 |        | SOMT 080008-□ |                 |        | SOMT 080012-□ |                 |        |
|---------------------|---------------|-----------------|--------|---------------|-----------------|--------|---------------|-----------------|--------|
|                     | 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 120004-□ |                 |        | SOMT 120008-□ |                 |        | SOMT 120012-□ |                 |        | SOMT 120016-□ |                 |        |
|---------------------|---------------|-----------------|--------|---------------|-----------------|--------|---------------|-----------------|--------|---------------|-----------------|--------|
|                     | 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 |

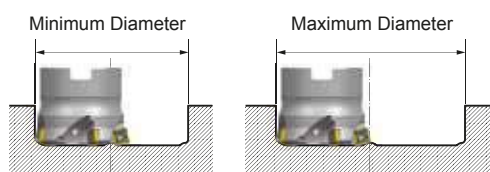
### Minimum Cutting Diameter

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. | ØDc | 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. | ØDc | Helical Milling |      | Taper Cutting      |
|-----------------|-----|-----------------|------|--------------------|
|                 |     | Min.            | Max. | Max. Ramping Angle |
| SOMT 080004-□   | 25  | 35              | 49   | 1°30'              |
|                 | 32  | 49              | 63   | 0°30'              |
| SOMT 080008-□   | 25  | 35              | 48   | 3°                 |
|                 | 32  | 49              | 62   | 1°30'              |
| SOMT 080012-□   | 25  | 34              | 47   | 4°30'              |
|                 | 32  | 48              | 61   | 2°30'              |
| SOMT 120004-□   | 40  | 56              | 79   | 1°                 |
| SOMT 120008-□   | 40  | 56              | 78   | 1°30'              |
| SOMT 120012-□   | 40  | 55              | 77   | 2°30'              |
| SOMT 120016-□   | 40  | 55              | 76   | 3°30'              |

● = Euro stock

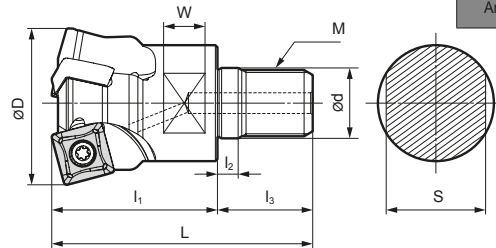
G44

Recommended Tightening Torque (N·m)

**New**

# "Wave Mill" Series WFXH 08000/12000 M Type

## Modular Type



|            |        |     |               |               |
|------------|--------|-----|---------------|---------------|
| Rake Angle | Radial | -6° | 1,5mm<br>15°  | 2,5mm<br>15°  |
|            | Axial  | 6°  |               |               |
|            |        |     | (08000M Type) | (12000M Type) |

## Head

| Cat. No.       | Stock | Dimensions (mm) |      |     |    |    |    |    |    |    | No. of Teeth | Weight (kg) |
|----------------|-------|-----------------|------|-----|----|----|----|----|----|----|--------------|-------------|
|                |       | ØD              | Ød   | M   | L  | l1 | l2 | l3 | W  | S  |              |             |
| 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.

## Head

| Cat. No.       | Stock | Dimensions (mm) |      |     |    |    |    |    |    |    | No. of Teeth | Weight (kg) |
|----------------|-------|-----------------|------|-----|----|----|----|----|----|----|--------------|-------------|
|                |       | ØD              | Ød   | M   | L  | l1 | l2 | l3 | W  | S  |              |             |
| WFXH12040M12Z3 |       | 40              | 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 |



## Inserts

| Application            |               | Coated Carbide |        |        |        |        |        |        | Carbide | DLC    |                |      |
|------------------------|---------------|----------------|--------|--------|--------|--------|--------|--------|---------|--------|----------------|------|
| High Speed / Light cut |               | P              |        |        | K      |        | M S    |        | K N     |        |                |      |
| General Purpose        |               |                | P M    | P M    | K      |        | M S    | M S    | N       |        |                |      |
| Roughing               |               |                | P M    | P M    |        | K      |        | M S    | N       |        |                |      |
| Cat. No.               |               | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1      | DL1000 | Radius (mm)    | Fig. |
|                        |               |                |        |        |        |        |        |        |         |        | $r_{\epsilon}$ |      |
| 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

Fig. 1

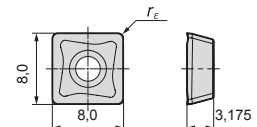
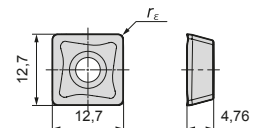


Fig. 2



## Spare Parts

| Applicable Cutter | Screw       |      | Insert Wrench |
|-------------------|-------------|------|---------------|
|                   | Image       | N/mm |               |
| 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. | Ø25     |           | Ø32     |           | Ø40     |           |
|-----|---------------------------------------|--------|----------------------------|-----------------|---------|-----------|---------|-----------|---------|-----------|
|     |                                       |        |                            |                 | 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       |
| M   | Alloy Steel <HRC45                    | ACP200 | 80 - 130 - 180             | SOMT08          | 0,7     | 0,8       | 0,7     | 0,8       | -       | -         |
|     |                                       |        |                            | SOMT12          | -       | -         | -       | -         | 0,8     | 1,0       |
| K   | Stainless Steel (X5CrNiS18 10, other) | ACM300 | 80 - 120 - 150             | SOMT08          | 0,8     | 0,7       | 0,8     | 0,7       | -       | -         |
|     |                                       |        |                            | SOMT12          | -       | -         | -       | -         | 1,0     | 0,8       |
| H   | 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).



# Sumi Dual Mill

## 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 Ø25mm to Ø200mm
- Available as standard, fine and extra-fine pitch
- Bore diameter: metric
- Insert geometry: L, G, H

### Cutter Body

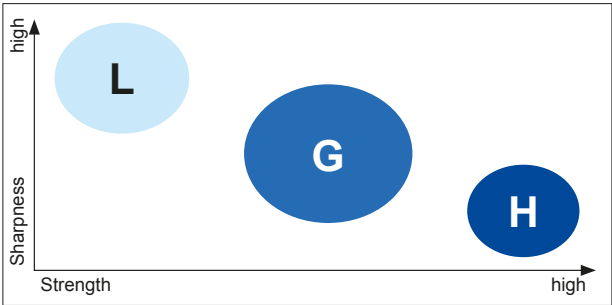
| Type  |                  | Cat. No.      | Diameter (mm) | No. of Teeth | Image |
|-------|------------------|---------------|---------------|--------------|-------|
| Shank | Standard Pitch   | DFC 09000 E   | Ø25~Ø80       | 2~5          |       |
|       | Fine Pitch       | DFCM 09000 E  | Ø32~Ø80       | 3~7          |       |
| Shell | Standard Pitch   | DCF 09000 RS  | Ø50~Ø200      | 4~8          |       |
|       | Fine Pitch       | DFCM 09000 RS | Ø50~Ø200      | 5~12         |       |
|       | Extra-Fine Pitch | DFCF 09000 RS | Ø50~Ø200      | 6~16         |       |

### New Insert Design Provides Excellent Machining Accuracy

#### Inserts

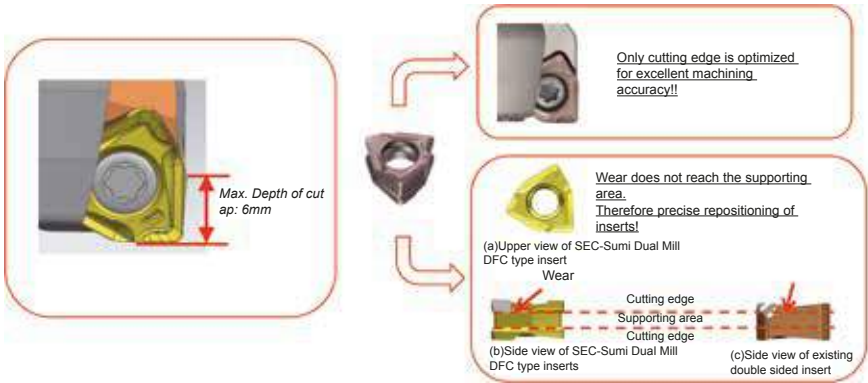
| Cat. No.         | New  |      | New  |      |
|------------------|------|------|------|------|
|                  | R0,4 | R0,8 | R1,2 | R1,6 |
| XNMU0606__PNER-L | ●    | ●    | ●    | ●    |
| XNMU0606__PNER-G | ●    | ●    | ●    | ●    |
| XNMU0606__PNER-H | ●    | ●    | ●    | ●    |

#### Chipbreaker Selection Map



| 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 |

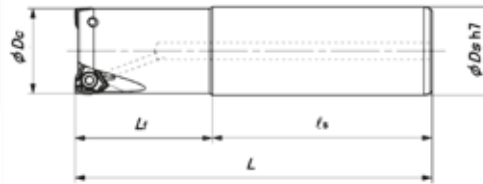
### Stable and High Cutting Performance Combined with High Toughness



# Sumi Dual Mill

## DFC(M) 09000 E Type

### Body – Shank Type



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

Max. ap: 6mm

### Body – Dimensions

#### DFC type, Standard Pitch

| Cat. No.     | Stock | Dimensions (mm) |     |     |     |     | No. of Teeth |
|--------------|-------|-----------------|-----|-----|-----|-----|--------------|
|              |       | øDc             | øDs | øLf | ls  | L   |              |
| DFC09025E    | ●     | 25              | 25  | 40  | 80  | 120 | 2            |
| DFC09032E    | ●     | 32              | 32  | 50  | 80  | 130 | 2            |
| DFC09040E    | ●     | 40              | 32  | 50  | 80  | 130 | 3            |
| DFC09050E    | ●     | 50              | 32  | 50  | 80  | 130 | 3            |
| DFC09050E-42 | ○     | 50              | 42  | 50  | 100 | 150 | 3            |
| DFC09063E    | ●     | 63              | 32  | 50  | 80  | 130 | 4            |
| DFC09063E-42 | ○     | 63              | 42  | 50  | 100 | 150 | 4            |
| DFC09080E    | ●     | 80              | 32  | 50  | 80  | 130 | 5            |
| DFC09080E-42 | ○     | 80              | 42  | 50  | 100 | 150 | 5            |

#### DFCM type, Medium Pitch

| Cat. No.      | Stock | Dimensions (mm) |     |    |     |     | No. of Teeth |
|---------------|-------|-----------------|-----|----|-----|-----|--------------|
|               |       | øDc             | øDs | Lf | ls  | L   |              |
| DFCM09032E    | ●     | 32              | 32  | 50 | 80  | 130 | 3            |
| DFCM09040E    | ●     | 40              | 32  | 50 | 80  | 130 | 4            |
| DFCM09050E    | ●     | 50              | 32  | 50 | 80  | 130 | 5            |
| DFCM09050E-42 | ○     | 50              | 42  | 50 | 100 | 150 | 5            |
| DFCM09063E    | ●     | 63              | 32  | 50 | 80  | 130 | 6            |
| DFCM09063E-42 | ●     | 63              | 42  | 50 | 100 | 150 | 6            |
| DFCM09080E    | ○     | 80              | 32  | 50 | 80  | 130 | 7            |
| DFCM09080E-42 | ●     | 80              | 42  | 50 | 100 | 150 | 7            |

### Identification Details

**DFC**

Cutter Series

**M**

M: Medium

**09**

Insert Size

**050**

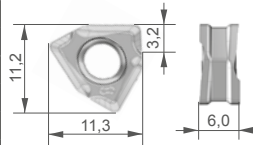
Cutter Diameter

**E**

Shank Type

### Inserts

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



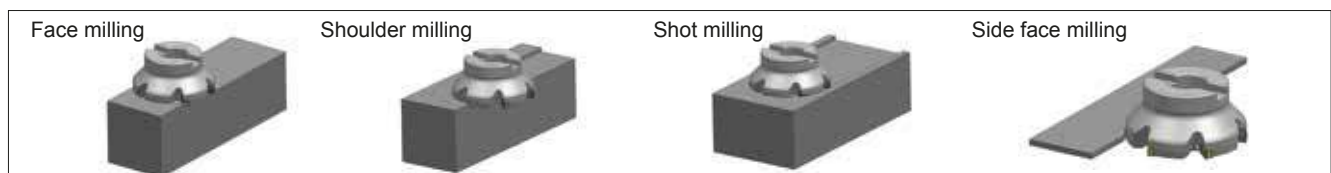
### Spare Parts

| Screw       | Wrench               |
|-------------|----------------------|
| BFTX03512IP | TRDR15IP<br>5,0 (mm) |

### Recommended Cutting Conditions

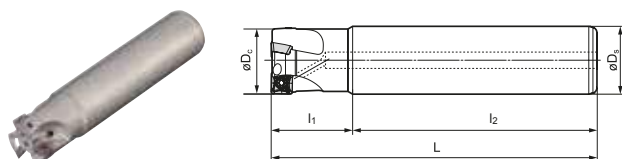
| ISO | Work-material   | Hardness  | Cutting Speed (m/min)<br>Min. - Optimum - Max. | Feed Rate<br>Min. - Optimum - Max. | Depth of Cut (mm) | Grade            |
|-----|-----------------|-----------|------------------------------------------------|------------------------------------|-------------------|------------------|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

### Suitable Applications



# "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 |
|----------------|-------|-----------------|-----------------|----------------|----------------|-----|--------------|
|                |       | øD <sub>c</sub> | øD <sub>s</sub> | L <sub>1</sub> | L <sub>2</sub> | L   |              |
| 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 |
|--------------|-------|-----------------|-----------------|----------------|----------------|-----|--------------|
|              |       | øD <sub>c</sub> | øD <sub>s</sub> | L <sub>1</sub> | L <sub>2</sub> | L   |              |
| 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<br>ACP300 |
|     | Soft Steel        | ≤180          | 180-250-350   | 0,10-0,15-0,20 | <6  | ACP200<br>ACP300 |
|     | Die Steel         | 200~220       | 100-150-200   | 0,08-0,12-0,18 | <4  | ACP200<br>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<br>ACK300 |
|     | Non Ferrous Metal | -             | 300-500-1000  | 0,10-0,15-0,20 | <6  | H1<br>DL1000     |

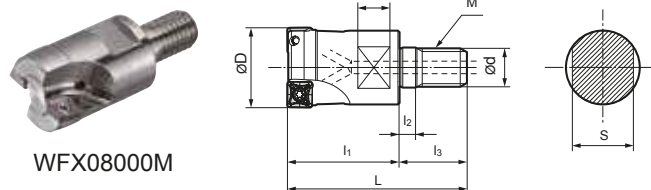
Min. - Optimum - Max.

# "Sumi Wave" Shoulder Mill WFX 08000 M Type

## Modular Type

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

6mm 90°



WFX08000M

## Head

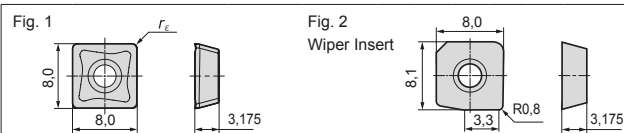
| Cat. No.        | Stock | Dimensions (mm) |      |     |    |                |                |                |    |    |   | No. of Teeth |
|-----------------|-------|-----------------|------|-----|----|----------------|----------------|----------------|----|----|---|--------------|
|                 |       | øD              | ød   | M   | L  | L <sub>1</sub> | L <sub>2</sub> | L <sub>3</sub> | W  | S  |   |              |
| WFX 08020 M10Z2 | ●     | 20              | 10,5 | M10 | 49 | 30             | 5              | 19             | 8  | 15 | 2 | 2            |
| 08022 M10Z2     | ●     | 22              | 10,5 | M10 | 49 | 30             | 5              | 19             | 8  | 15 | 2 | 2            |
| WFX 08025 M12Z2 | ●     | 25              | 12,5 | M12 | 56 | 35             | 5              | 21             | 10 | 19 | 2 | 2            |
| 08028 M10Z2     | ●     | 28              | 12,5 | M12 | 56 | 35             | 5              | 21             | 10 | 19 | 2 | 2            |
| WFX 08030 M16Z3 | ●     | 30              | 17,0 | M16 | 63 | 40             | 5              | 23             | 10 | 24 | 3 | 3            |
| 08032 M16Z3     | ●     | 32              | 17,0 | M16 | 63 | 40             | 5              | 23             | 10 | 24 | 3 | 3            |
| 08040 M16Z3     | ●     | 40              | 17,0 | M16 | 63 | 40             | 5              | 23             | 10 | 24 | 3 | 3            |

## Identification Details

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



## Inserts



| Application            | Coated Carbide |        |        |        |        |        |        | Carbide | DLC    |                 |      |
|------------------------|----------------|--------|--------|--------|--------|--------|--------|---------|--------|-----------------|------|
| High Speed / Light cut | P              |        |        | K      |        | M      | S      | K       | N      |                 |      |
| General Purpose        |                | M      | M      | K      |        | M      | S      | M       | S      |                 | N    |
| Roughing               |                | M      | M      |        | K      |        | M      | S       |        |                 |      |
| Cat. No.               | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1      | DL1000 | Radius<br>$r_e$ | 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

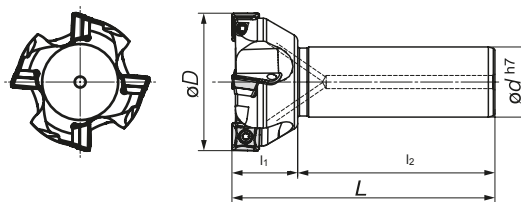
| Screw      | Wrench   |
|------------|----------|
| BFTX0306IP | TRDR08IP |

Recommended Tightening Torque (N·m)

## Body - Shank Type



WFX12000E



|            |        |     |       |     |
|------------|--------|-----|-------|-----|
| Rake Angle | Radial | -8° | 10 mm | 90° |
|            | Axial  | 8°  |       |     |

## Body - WFX\_E, Standard Pitch

| Cat. No.    | Stock | Dimensions (mm) |                 |                |                |     | No. of Teeth |
|-------------|-------|-----------------|-----------------|----------------|----------------|-----|--------------|
|             |       | øD <sub>c</sub> | øD <sub>s</sub> | I <sub>1</sub> | I <sub>2</sub> | L   |              |
| 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 |
|--------------|-------|-----------------|-----------------|----------------|----------------|-----|--------------|
|              |       | øD <sub>c</sub> | øD <sub>s</sub> | I <sub>1</sub> | I <sub>2</sub> | L   |              |
| 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

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

## Recommended Cutting Conditions

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

Min. - Optimum - Max.

## Inserts

Fig. 1

Fig. 2  
Wiper Insert

Application

Coated Carbide

Carbide DLC

High Speed / Light cut

**P**

**K**

**M**

**K**

**N**

General Purpose

**P**

**P**

**K**

**M**

**S**

**N**

Roughing

**P**

**P**

**K**

**M**

**S**

Cat. No.

ACP100

ACP200

ACP300

ACK200

ACK300

ACM200

ACM300

H1

DL1000

Radius  
 $r_e$

Fig.

SOMT 120408 PDER L

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0,8

1

SOMT 120404 PDER G

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0,4

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120408 PDER G

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120412 PDER G

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1,2

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120416 PDER G

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1,6

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SOMT 120408 PDER H

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SOET 120408 PDFR S

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XOEW 120408 PDTR W

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2

## Spare Parts

| Shim                                                                                | Shim Screw                                                                          | Insert Screw                                                                                                                                                               | Insert Wrench                                                                       | Seat Wrench                                                                         |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  | <br> |  |  |
| WFXS4R                                                                              | BW0507F                                                                             | BFTX03512IP                                                                                                                                                                | 3.0                                                                                 | TRDR15IP                                                                            |
|                                                                                     |                                                                                     |                                                                                                                                                                            |                                                                                     | LH035                                                                               |



# "Sumi Dual Mill" Series TSX Type

**New**



## 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

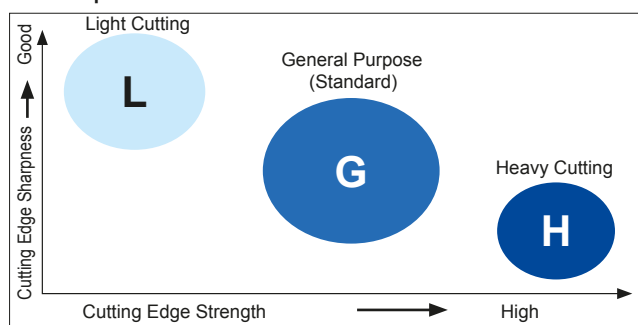
## Product Range

| 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        |                                                                                     |

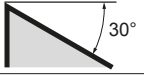
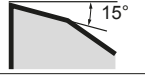
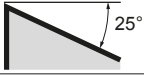
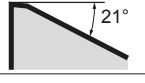
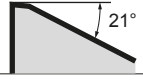
## Inserts

| Cat. No.        | R0,4 | R0,8 | R1,2 | R1,6 | R2,4 | R3,2 |
|-----------------|------|------|------|------|------|------|
| LNEX0804_PNER-L | ●    | ●    |      |      |      |      |
| LNEX0804_PNER-G | ●    | ●    | ●    | ●    |      |      |
| LNEX1306_PNER-L | ●    | ●    |      |      |      |      |
| LNEX1306_PNER-G |      | ●    |      | ●    | ●    | ●    |
| LNEX1306_PNER-H | ●    | ●    |      | ●    | ●    | ●    |

## Chipbreaker Selection



## Chipbreaker Lineup

| Work Material                   | P M K S                                                                             |                                                                                     |                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Chipbreaker                     | L type                                                                              | G type                                                                              | H type                                                                                |
| Feature                         | Low cutting force                                                                   | General purpose                                                                     | Strong edge                                                                           |
| LNEX08<br>Cutting edge geometry |  |  | —                                                                                     |
| LNEX13<br>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                                |

## Recommended Cutting Conditions

Min. - Optimum - Max.

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

● = Euro stock

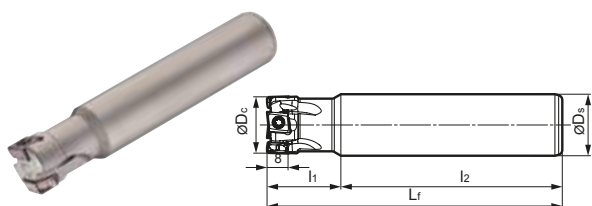
 Recommended Tightening Torque (N·m)





■ Shank Type

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



- Body - TSX, Standard Pitch

| Cat. No. |         | Stock | Dimensions (mm) |     |    |    |                | No. of<br>Teeth | Weight<br>(kg) |
|----------|---------|-------|-----------------|-----|----|----|----------------|-----------------|----------------|
|          |         |       | ØDc             | ØDs | l1 | l2 | l <sub>f</sub> |                 |                |
| 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) |
|--------------|-------|-----------------|-----|----|----|-----|--------------|-------------|
|              |       | ØDc             | ØDs | l1 | l2 | 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                                                                          | TRDR08IP                                                                            |                    |
| BFTX0308IP                                                                          |                                                                                     |                    |
| BFTX03510IP                                                                         |                                                                                     |                    |
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|                                                                                     |                                                                                     |                    |
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|                                                                                     |                                                                                     |                    |

■ Inserts

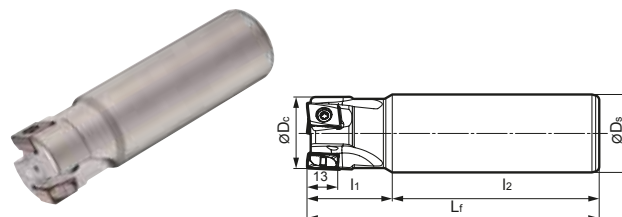
| Grade              |                            | Coated Carbide |        |        |        |        |        | P               | Steel |
|--------------------|----------------------------|----------------|--------|--------|--------|--------|--------|-----------------|-------|
| Application        | High Speed / Light Cutting |                |        |        |        |        |        | Stainless Steel |       |
|                    | General Purpose Cutting    |                |        |        |        |        |        | Cast Iron       |       |
|                    | Rough Cutting              |                |        |        |        |        |        | Exotic Alloy    |       |
| Applicable Cutters | Inserts Cat. No.           | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | Radius | LNEX 08000 type |       |
|                    |                            |                |        |        |        |        | $r_E$  |                 |       |
| 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    | LNEX 13000 type |       |
|                    | 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



■ Shank Type

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



- Body - TSX, Standard Pitch

| Cat. No.    | Stock | Dimensions (mm) |     |    |    |                | No. of Teeth | Weight (kg) |
|-------------|-------|-----------------|-----|----|----|----------------|--------------|-------------|
|             |       | ØDc             | ØDs | l1 | l2 | l <sub>f</sub> |              |             |
| 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) |
|--------------|-------|-------------------|-------------------|-------|-------|-------|--------------|-------------|
|              |       | $\varnothing D_c$ | $\varnothing D_s$ | $l_1$ | $l_2$ | $l_f$ |              |             |
| 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

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

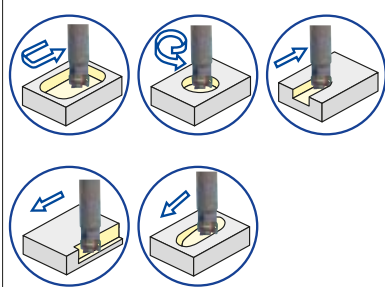
# Wavemill Series WEX Type

For the Smooth and Reliable Cutting Action



## General Features

### Wide Application Range



## Ramping (Slant Milling)

| Tool Diam.<br>ØD | Max. Ramping Angle |           |           |
|------------------|--------------------|-----------|-----------|
|                  | Type 1000          | Type 2000 | Type 3000 |
| Ø10              | 2°30'              |           |           |
| Ø12              | 1°45'              |           |           |
| Ø14              | 1°25'              | 1°40'     |           |
| Ø16              | 1°00'              | 1°20'     |           |
| Ø18              | 0°45'              | 1°10'     |           |
| Ø20              | 0°30'              | 1°00'     |           |
| Ø25              | 0°30'              | 0°45'     | 1°30'     |
| Ø32              | 0°25'              | 0°35'     | 1°00'     |
| Ø40              | 0°20'              | 0°25'     | 0°45'     |
| Ø50              | 0°15'              | 0°20'     | 0°30'     |
| Ø63              | 0°10'              | 0°15'     | 0°20'     |
| Ø80              |                    |           | 0°15'     |
| Ø100             | <b>New</b>         |           | —         |

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



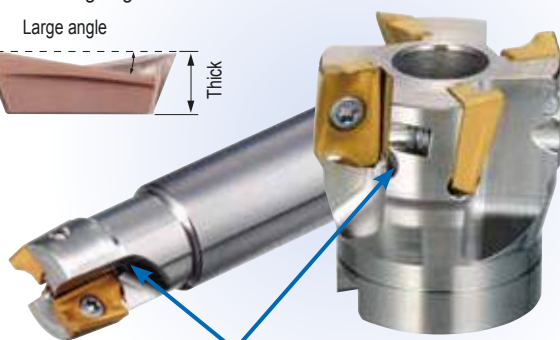
Screw hole size increased

High rake wave cutting edge

Large angle



Thick



## 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) |     |     |     | Image                             |
|---------|-----------------------|-------------------------|---------------------|-----|-----|-----|-----------------------------------|
|         |                       |                         | Ø10                 | Ø20 | Ø40 | Ø60 |                                   |
| Shank   | WEX 1000E <b>New</b>  | Short Type              | 10                  | 25  |     |     | <br>WEX3000    WEX2000    WEX1000 |
|         | WEX 1000EL <b>New</b> | 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 <b>New</b>  | Shell Type              | 32                  | 63  |     |     | <br>WEX3000    WEX2000    WEX1000 |
|         | WEX 2000F             | Shell Type              | 40                  | 63  |     |     |                                   |
|         | WEX 3000F             | Shell Type              | 40                  | 63  |     |     |                                   |
| Modular | WEX 2000M             | ModularType             | 16                  | 40  |     |     | <br>WEX3000    WEX2000            |
|         | WEX 3000M             | Modular Type            | 25                  | 40  |     |     |                                   |

G38

# Wavemill Series Inserts for WEX Type



## WEX1000 Type Expansion

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



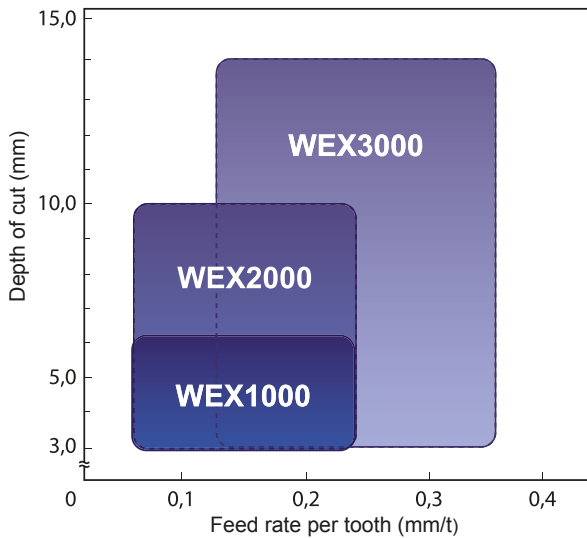
WEX3000

WEX2000

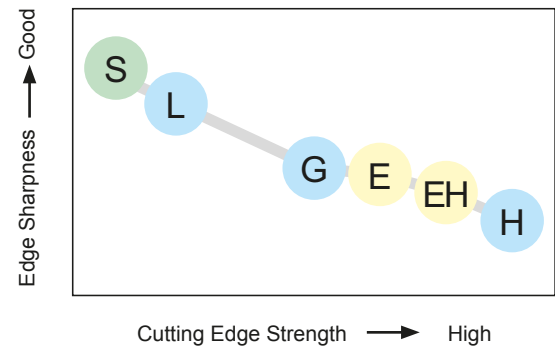
WEX1000

## 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 | <b>Main chipbreaker</b> 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

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

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

# Wavemill Series

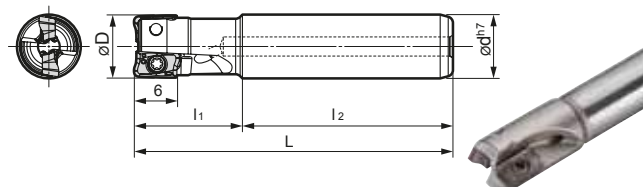
## WEX 1000 E Type

**New**

### WEX 1000 E/EL

#### Shank Type

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



#### Body (Short Type „E“)

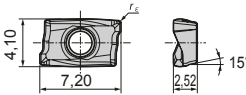
| Cat. No.   | Stock | Dimensions (mm) |    |    |    |     | No. of Teeth | Weight (kg) |
|------------|-------|-----------------|----|----|----|-----|--------------|-------------|
|            |       | øD              | ød | L1 | L2 | L   |              |             |
| WEX 1010 E | ●     | 10              | 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) |
|-------------|-------|-----------------|----|----|-----|-----|--------------|-------------|
|             |       | øD              | ød | L1 | L2  | L   |              |             |
| 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                                                                      |        |                                                                                     |        |                                                                                     |                                                                                     |  |  |                |  |
| High Speed / Light cut                                                              |  |                                                                                     |        |  |        |  |                                                                                     |  |  |                |  |
| General Purpose                                                                     |  |                                                                                     |        |  |        |  |  |  |  |                |  |
| Roughing                                                                            |  |  |        |  |        |  |  |  |  |                |  |
| Cat. No.                                                                            | ACP100                                                                              | ACP200                                                                              | ACP300 | ACK200                                                                              | ACK300 | ACM200                                                                              | ACM300                                                                              |  |  | Radius         |  |
|                                                                                     |                                                                                     |                                                                                     |        |                                                                                     |        |                                                                                     |                                                                                     |  |  | $r_{\epsilon}$ |  |
| 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            |  |

G - General type

H - Strong cutting edge

E - For stainless steel / exotic alloy

#### Cutter Identification

|               |             |                 |            |                |
|---------------|-------------|-----------------|------------|----------------|
| <b>WEX</b>    | <b>1</b>    | <b>016</b>      | <b>EL</b>  | <b>15</b>      |
| Cutter Series | 1000 Series | Cutter Diameter | Shank Type | Shank Diameter |

#### Spare Parts

| Screw                   | Wrench    | Applicable Endmill |
|-------------------------|-----------|--------------------|
| 0,5 Nm<br>BFTX 01804 IP | TRX 06 IP |                    |
|                         |           | WEX 1000           |

● = Euro stock  
□ = Delivery on request

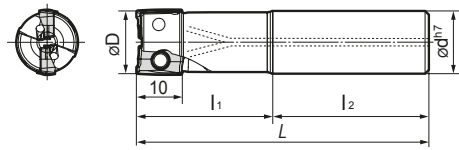
Recommended Tightening Torque (N·m)

# Wavemill Series WEX 2000 E Type

## WEX 2000 E/EL

### Shank Type

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



### Body (Short Type „E“)

| Cat. No.   | Stock | Dimensions (mm) |    |    |     |     | No. of Teeth | Weight (kg) |
|------------|-------|-----------------|----|----|-----|-----|--------------|-------------|
|            |       | øD              | ød | L1 | L2  | L   |              |             |
| 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        |
| 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        |
| 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) |
|-------------|-------|-----------------|----|----|-----|-----|--------------|-------------|
|             |       | øD              | ød | L1 | L2  | L   |              |             |
| 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        |
| 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        |
| 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) |
|---------------|-------|-----------------|----|----|-----|-----|--------------|-------------|
|               |       | øD              | ød | L1 | L2  | L   |              |             |
| 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        |
| 3032 EL30     | □     | 32              | 30 | 60 | 120 | 180 | 2            | 0,95        |

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

| Cat. No.    | Stock | Dimensions (mm) |    |    |    |     | No. of Teeth | Weight (kg) |
|-------------|-------|-----------------|----|----|----|-----|--------------|-------------|
|             |       | øD              | ød | L1 | L2 | L   |              |             |
| 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.

### Cutter Identification

|               |             |                 |            |                |
|---------------|-------------|-----------------|------------|----------------|
| <b>WEX</b>    | <b>2</b>    | <b>016</b>      | <b>EL</b>  | <b>15</b>      |
| Cutter Series | 2000 Series | Cutter Diameter | Shank Type | Shank Diameter |

### Spare Parts

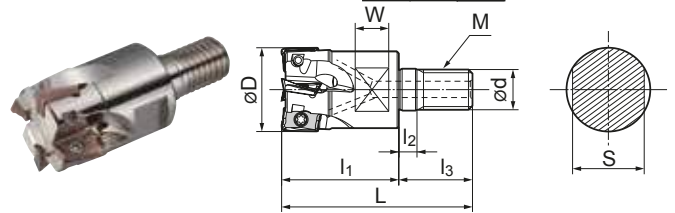
| Screw        | Wrench     | Applicable Endmill  |
|--------------|------------|---------------------|
| 2,0 N·m      |            |                     |
| BFTX 0305 IP | TRDR 08 IP | WEX 2014 ~ WEX 2018 |
| BFTX 0306 IP |            | WEX 2020 ~ WEX 2063 |

# Wavemill Series WEX 2000 M Type

## WEX 2000 M

### Modular Type

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

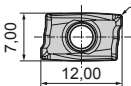


### Head

| Cat. No.      | Stock | Dimensions (mm) |      |     |    |    |    |    |    |    |  | No. of Teeth |
|---------------|-------|-----------------|------|-----|----|----|----|----|----|----|--|--------------|
|               |       | øD              | ød   | M   | L  | L1 | L2 | L3 | W  | S  |  |              |
| 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

| <div></div> |        |                |        |        |        |        |        |    |         |     |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------|--------|--------|--------|--------|--------|----|---------|-----|--------------------------|
| Application                                                                                                                                                                        |        | Coated Carbide |        |        |        |        |        |    | Carbide | DLC | Radius<br>$r_{\epsilon}$ |
| High Speed / Light cut                                                                                                                                                             | P      |                |        | K      |        | M      | S      | K  | N       |     |                          |
| General Purpose                                                                                                                                                                    |        | P              |        | K      |        | M      | S      | K  | N       |     |                          |
| Roughing                                                                                                                                                                           |        | P              | P      |        | K      |        | M      | S  |         |     |                          |
| Cat. No.                                                                                                                                                                           | ACP100 | ACP200         | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1 | DL1000  |     |                          |
| AXMT 123504 PEER-G                                                                                                                                                                 | ●      | ●              | ●      | ●      | ●      |        |        | —  | —       |     |                          |
| AXMT 123508 PEER-G                                                                                                                                                                 | ●      | ●              | ●      | ●      | ●      |        |        | —  | —       |     |                          |
| AXMT 123512 PEER-G                                                                                                                                                                 | ●      | ●              | ●      | ●      | ●      |        |        | —  | —       |     |                          |
| AXMT 123504 PEER-H                                                                                                                                                                 | ●      | ●              | ●      | ●      | ●      |        |        | —  | —       |     |                          |
| AXMT 123508 PEER-H                                                                                                                                                                 | ●      | ●              | ●      | ●      | ●      |        |        | —  | —       |     |                          |
| AXMT 123512 PEER-H                                                                                                                                                                 | ●      | ●              | ●      | ●      | ●      |        |        | —  | —       |     |                          |
| AXMT 123504 PEER-E                                                                                                                                                                 |        |                |        |        |        | ●      | ●      | —  | —       |     |                          |
| AXMT 123508 PEER-E                                                                                                                                                                 |        |                |        |        |        | ●      | ●      | —  | —       |     |                          |
| AXMT 123512 PEER-E                                                                                                                                                                 |        |                |        |        |        | ●      | ●      | —  | —       |     |                          |
| AXMT 123508 PEER-EH                                                                                                                                                                |        |                | ●      |        |        | ●      | ●      | —  | —       |     |                          |
| AXET 123502 PEFR-S                                                                                                                                                                 | —      | —              | —      | —      | —      | —      | —      | ●  | ●       |     |                          |
| AXET 123504 PEFR-S                                                                                                                                                                 | —      | —              | —      | —      | —      | —      | —      | ●  | ●       |     |                          |
| AXET 123508 PEFR-S                                                                                                                                                                 | —      | —              | —      | —      | —      | —      | —      | ●  | ●       |     |                          |

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 Identification

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



### Spare Parts

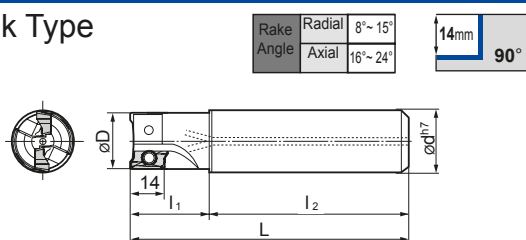
| Screw        | Wrench     | Applicable Endmill    |
|--------------|------------|-----------------------|
| 2,0 N·m      |            |                       |
| BFTX 0305 IP | TRDR 08 IP | WEX 2016M, WEX 2018M  |
| BFTX 0306 IP |            | WEX 2020M ~ WEX 2040M |
| BFTX 0407 IP | TRDR 15 IP | WEX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



# Wavemill Series WEX 3000 E Type

## WEX 3000 E/EL

### Shank Type



### Body (Short Type „E“)

| Cat. No.   | Stock | Dimensions (mm) |    |                |                |     | No. of Teeth | Weight (kg) |
|------------|-------|-----------------|----|----------------|----------------|-----|--------------|-------------|
|            |       | ØD              | Ød | L <sub>1</sub> | L <sub>2</sub> | L   |              |             |
| 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) |
|--------------|-------|-----------------|----|----------------|----------------|-----|--------------|-------------|
|              |       | ØD              | Ød | L <sub>1</sub> | L <sub>2</sub> | L   |              |             |
| 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“)

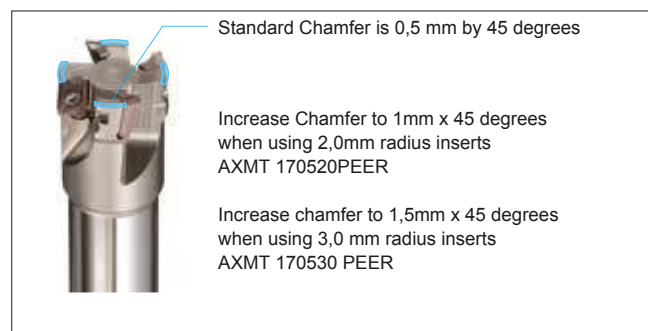
| Cat. No.    | Stock | Dimensions (mm) |    |                |                |     | No. of Teeth | Weight (kg) |
|-------------|-------|-----------------|----|----------------|----------------|-----|--------------|-------------|
|             |       | ØD              | Ød | L <sub>1</sub> | L <sub>2</sub> | L   |              |             |
| 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        |
| 3032 EL     | ●     | 32              | 32 | 60             | 120            | 180 | 2            | 0,95        |
| 3035 EL     | □     | 35              | 32 | 60             | 120            | 180 | 2            | 0,98        |
| WEX 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) |
|-------------|-------|-----------------|----|----------------|----------------|-----|--------------|-------------|
|             |       | ØD              | Ød | L <sub>1</sub> | L <sub>2</sub> | L   |              |             |
| 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.



### Spare Parts

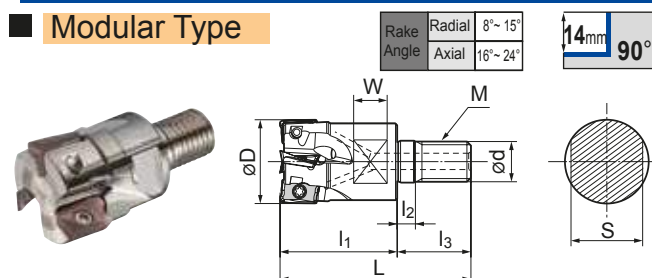
| Screw                                  | Wrench     | Applicable Endmill                         |
|----------------------------------------|------------|--------------------------------------------|
| 3,0 Nm<br>BFTX 0407 IP<br>BFTX 0409 IP | TRDR 15 IP |                                            |
|                                        |            | WEX 3025 ~ WEX 3030<br>WEX 3032 ~ WEX 3063 |

● = Euro stock  
□ = Delivery on request

# Wavemill Series WEX 3000 M Type

## WEX 3000 M

### Modular Type



### Head

| Cat. No.      | Stock | Dimensions (mm) |      |     |    |                |                |                |    |    |   | No. of Teeth |
|---------------|-------|-----------------|------|-----|----|----------------|----------------|----------------|----|----|---|--------------|
|               |       | ØD              | Ød   | M   | L  | L <sub>1</sub> | L <sub>2</sub> | L <sub>3</sub> | W  | S  |   |              |
| 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 |              |
| WEX 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      |                |
| General Purpose        |  | P              |        |        | K      |        | M      | S       | K  | N      |                |
| Roughing               |  | P              | P      |        | K      |        | M      | S       |    |        |                |
| Cat. No.               |  | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300  | H1 | DL1000 | Radius         |
|                        |  |                |        |        |        |        |        |         |    |        | r <sub>ε</sub> |
| 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

### Cutter Identification

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



Ⓜ Recommended Tightening Torque (N·m)

# Wavemill Series

## WEX Type

### Recommended Cutting Conditions

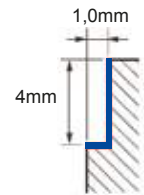
#### WEX1000 Series



Cutter: WEX1012E

Insert: AXMT060208PDER - □

Cutting Data:  $a_p = 4\text{mm}$ ,  $a_e = 1\text{mm}$ , 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.

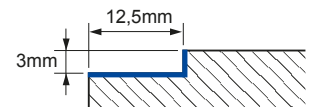
For groove milling, reduce the feed rate approximately 70% of the corresponding value shown above.

#### WEX2000 Series

Cutter: WEX2025E

Insert: AXMT123508PEER - □

Cutting Data:  $a_p = 3\text{mm}$ ,  $a_e = 12,5\text{mm}$ , 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 | 0,05                               | 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.

# Wavemill Series

## WEX Type

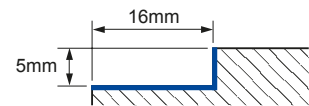
### Recommended Cutting Conditions

#### WEX3000 Series

Cutter: WEX30325E

Insert: AXMT170508PEER - □

Cutting Data:  $a_p = 5\text{mm}$ ,  $a_e = 16\text{mm}$ , 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 <sub>c</sub> (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 |  |

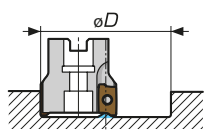
The above recommended cutting conditions are meant as a guide. Actual conditions will depend on the individual machine, work shape and clamping. They will need to be adjusted according to machine rigidity, work clamp rigidity, cutting depth and other factors.

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

### Recommended Values for Helical Milling and Ramping

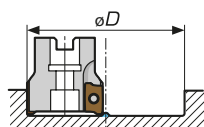
#### Helical Boring

≤ Min. Diameter



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

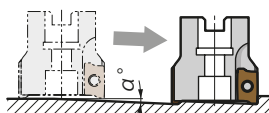
≥ Max. Diameter



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

#### Plunging

Use at ≤  $\alpha^\circ$



#### Recommended Values for Helical and Plunging

| Cutter<br>External<br>Diameter<br>$\varnothing D_c$ | WEX1000 (AXMT06...)   |       |                         | WEX2000 (AX□T12...)   |       |                         | WEX3000 (AX□T17...)   |       |                         |
|-----------------------------------------------------|-----------------------|-------|-------------------------|-----------------------|-------|-------------------------|-----------------------|-------|-------------------------|
|                                                     | Helical               |       | Plunging                | Helical               |       | Plunging                | Helical               |       | Plunging                |
|                                                     | Work Diameter<br>Min. | Max.  | Max. Ram-<br>ping Angle | Work Diameter<br>Min. | Max.  | Max. Ram-<br>ping Angle | Work Diameter<br>Min. | Max.  | Max. Ram-<br>ping Angle |
| 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 0,8mm.

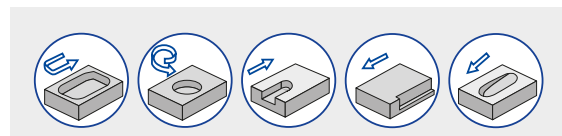


### Overview

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

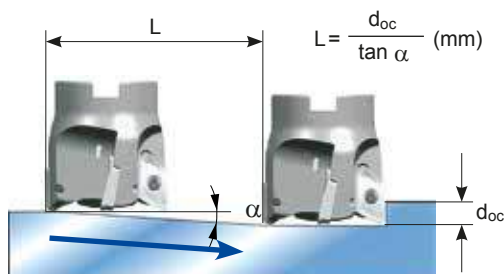
### Advantages

- 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 ( $d_{oc}$  max) at the maximum ramping angle of that cutter.  
Minimum milling length ( $L$ ) for any depth can be calculated by the equation below:



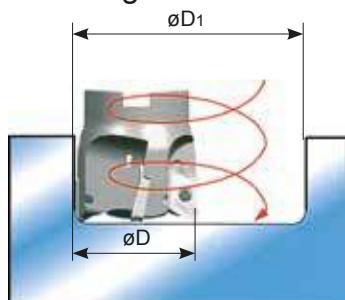
### WAX3000 E/EL Type (mm)

| Cutter Diameter<br>$\varnothing D$ | Ramping Angle<br>$\alpha$ max. | Depth-of Cut<br>$d_{oc}$ max. | Milling Distance<br>$L$ min. |
|------------------------------------|--------------------------------|-------------------------------|------------------------------|
| 20                                 | 8°                             | 10                            | 72                           |
| 25                                 | 17°                            | 10                            | 33                           |
| 32                                 | 12°                            | 10                            | 47                           |
| 40                                 | 9°                             | 10                            | 64                           |

### WAX3000 RS Type (mm)

| Cutter Diameter<br>$\varnothing D$ | Ramping Angle<br>$\alpha$ max. | Depth-of Cut<br>$d_{oc}$ max. | Milling Distance<br>$L$ 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<br>$\varnothing D$ | Milling Diameter $\varnothing D_1$ |      |
|------------------------------------|------------------------------------|------|
|                                    | 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<br>$\varnothing D$ | Spindle Revolution<br>$n$ ( $\text{min}^{-1}$ ) | Cutting Speed<br>$v_c$ (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 |

# Wavemill Series

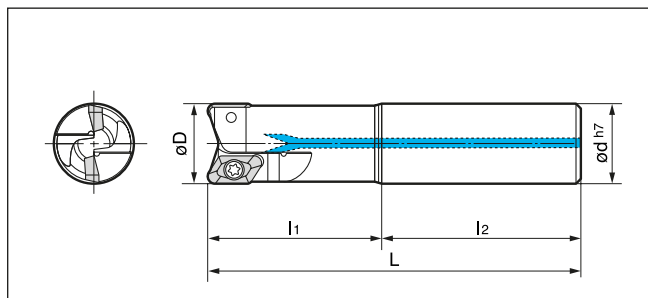
## WAX 3000 E/EL Type

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 ≤ 3,2mm)

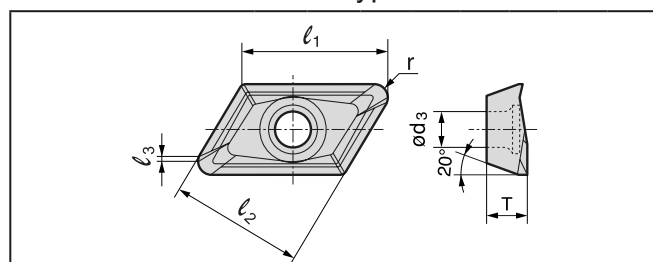
| Cat. No.        | Stock | Dimensions (mm) |    |     |                |                | No. of teeth | Weight (Kg) |
|-----------------|-------|-----------------|----|-----|----------------|----------------|--------------|-------------|
|                 |       | øD              | ød | L   | l <sub>1</sub> | l <sub>2</sub> |              |             |
| 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        |
| WAX 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        |
| WAX 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         |
| WAX 3040 EL-3.2 | ●     | 40              | 32 | 220 | 70             | 150            | 3            | 1,4         |

### ■ Body

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

| Cat. No.        | Stock | Dimensions (mm) |    |     |                |                | No. of teeth | Weight (Kg) |
|-----------------|-------|-----------------|----|-----|----------------|----------------|--------------|-------------|
|                 |       | øD              | ød | L   | l <sub>1</sub> | l <sub>2</sub> |              |             |
| 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        |
| WAX 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        |
| WAX 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         |
| WAX 3040 EL-4.0 | ●     | 40              | 32 | 220 | 70             | 150            | 3            | 1,4         |

### ■ Inserts for WAX 3000 Type



| Cat. No.          | DLC Coated<br>DL<br>1000 | Carbide<br>H1 | Dimensions (mm) |                |                |     |   |                 |  |
|-------------------|--------------------------|---------------|-----------------|----------------|----------------|-----|---|-----------------|--|
|                   |                          |               | l <sub>1</sub>  | l <sub>2</sub> | l <sub>3</sub> | r   | T | ød <sub>3</sub> |  |
| AECT 160404 PEFRA | ●                        | ●             | 18              | 16,4           | 1,4            | 0,4 | 5 | 4,4             |  |
| 160408 PEFRA      | ●                        | ●             | 18              | 16,4           | 1              | 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   | 5 | 4,4             |  |
| 160430 PEFRA      | ●                        | ●             | 17              | 16,4           | 0,7            | 3   | 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   | 5 | 4,4             |  |
| 160450 PEFRA      | ●                        | ●             | 16              | 16,4           | 0,4            | 5   | 5 | 4,4             |  |

### ■ Spare Parts

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



# Wavemill Series

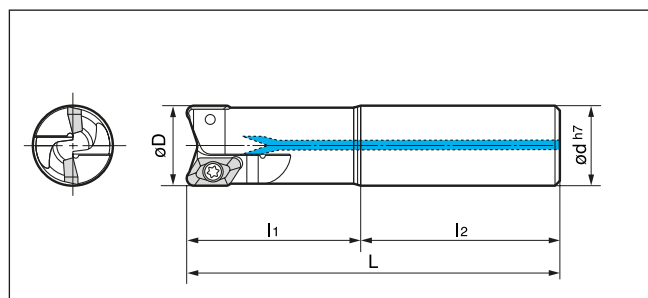
## WAX 4000 E/EL Type

22-24 mm 90°

Axial rake angle 6°  
Radial rake angle 19~25°

### (Endmill)

Short Type "E"  
Long Type "EL"



### Body

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

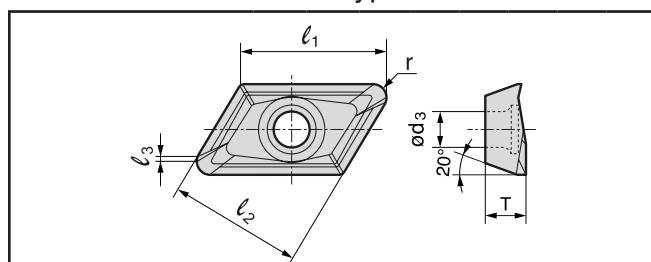
| Cat. No.       | Stock | Dimensions (mm) |    |     |                |                | No. of teeth | Weight (Kg) |
|----------------|-------|-----------------|----|-----|----------------|----------------|--------------|-------------|
|                |       | øD              | ød | L   | l <sub>1</sub> | l <sub>2</sub> |              |             |
| WAX 4025E -3.2 | □     | 25              | 25 | 140 | 60             | 80             | 1            | 0,41        |
| 4025EL-3.2     | □     | 25              | 25 | 200 | 60             | 140            | 1            | 0,63        |
| 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 ≥ 4,0mm)

| Cat. No.       | Stock | Dimensions (mm) |    |     |                |                | No. of teeth | Weight (Kg) |
|----------------|-------|-----------------|----|-----|----------------|----------------|--------------|-------------|
|                |       | øD              | ød | L   | l <sub>1</sub> | l <sub>2</sub> |              |             |
| WAX 4025E -4.0 | □     | 25              | 25 | 140 | 60             | 80             | 1            | 0,41        |
| 4025EL-4.0     | □     | 25              | 25 | 200 | 60             | 140            | 1            | 0,63        |
| 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



| Cat. No.          | DLC Coated<br>DL<br>1000 | Carbide<br>H1 | Dimensions (mm) |                |                |     |      |                 |  |
|-------------------|--------------------------|---------------|-----------------|----------------|----------------|-----|------|-----------------|--|
|                   |                          |               | l <sub>1</sub>  | l <sub>2</sub> | l <sub>3</sub> | r   | T    | ød <sub>3</sub> |  |
| 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 |
|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------|
|  5,0 (N·m) |  |                    |
| BFTX0509N                                                                                     | TRD20                                                                                 |                    |
| BFTX0511N                                                                                     | TRD20                                                                                 | Ø25 ~ Ø32          |
|                                                                                               |                                                                                       | Ø40 ~ Ø125         |

# Wave Multi-Function Mill WMM Type



## ■ Features

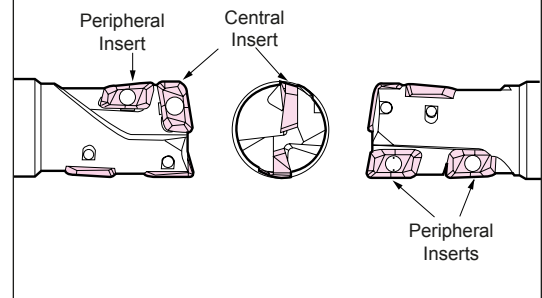
Utilising some of the design features, which made the Wave-Mill so successful, this multi-functional cutter, which utilizes standard wavy shaped inserts mounted radially and axially, performs a variety of operations.

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)                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>DIN X5CrNi810</p> <p><i>Cutting of stainless steel tool</i></p>                                                                                                                                                                      | <p>GG25</p> <p><i>Deep grooving can be performed easily. Easy chip removal</i></p>                                                                                                                                                      | <p>C50</p> <p><i>Capable of tapered recess cutting of a prepared hole</i></p>                                                                                                                                                                                       |
| <p>Tool Dia. : 25mm<br/>Insert : APMT103504PDER (Grade : ACZ350)<br/><math>v_c = 200\text{m/min}</math>, <math>f_t = 0,1\text{mm/tooth}</math><br/>Axial <math>d_{oc}</math> : 15mm, Radial <math>w_{oc}</math> : 25mm, Air blow</p>    | <p>Tool Dia. : 25mm<br/>Insert : APMT103504PDER (Grade : ACZ310)<br/><math>v_c = 180\text{m/min}</math>, <math>f_t = 0,12\text{mm/tooth}</math><br/>Axial <math>d_{oc}</math> : 15mm, Radial <math>w_{oc}</math> : 25mm, Air blow</p>   | <p>Tool Dia. : 25mm<br/>Insert : APMT103504PDER (Grade : ACZ310)<br/><math>v_c = 180\text{m/min}</math>, <math>f_t = 0,12\text{mm/tooth}</math><br/>Axial <math>d_{oc}</math> : 15mm, Radial <math>w_{oc}</math> : 25mm, Air blow</p>                               |
| ● Pocketing                                                                                                                                                                                                                             | ● Drilling                                                                                                                                                                                                                              | ● Helical Cutting                                                                                                                                                                                                                                                   |
| <p>C50</p> <p><i>Capable of pocketing with continuous lateral feed from initial drilling or taper cutting process</i></p>                                                                                                               | <p>C50</p> <p><i>Capable of easy chip removal and drilling without tool damage</i></p>                                                                                                                                                  | <p>C50</p> <p><i>Capable of large boring in diameter of 1,2-1,8 times the cutter diameter without prepared hole</i></p>                                                                                                                                             |
| <p>Tool Dia. : 25mm<br/>Insert : APMT103504PDER (Grade : ACZ350)<br/><math>v_c = 200\text{m/min}</math>, <math>f_t = 0,1\text{mm/tooth}</math><br/>Axial <math>d_{oc}</math> : 15mm, Radial <math>w_{oc}</math> : 25mm<br/>Air blow</p> | <p>Tool Dia. : 25mm<br/>Insert : APMT103504PDER (Grade : ACZ350)<br/>Bore size : 25mm, Depth : <math>d=15\text{mm}</math><br/><math>v_c = 200\text{m/min}</math>, <math>f = 0,1\text{mm/rev}</math><br/>Step feed : 0,5mm, Air blow</p> | <p>Tool Dia. : 25mm<br/>Insert : APMT103504PDER (Grade : ACZ350)<br/>Bore size : 40mm, Depth : <math>d=30\text{mm}</math><br/><math>v_c = 300\text{m/min}</math>, <math>f = 0,1\text{mm/rev}</math><br/>Axial feed : <math>t=15\text{mm/pitch}</math>, Air blow</p> |

## ■ Recommended Cutting Conditions for WMM(H) 2000

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

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

## ■ Recommended Cutting Conditions for WMM(H) 3000

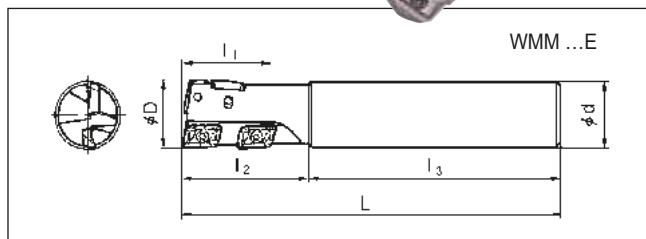
| Material<br>Type of milling<br>Type of tool | Carbon steel<br>(ex. C50) | Stainless steel<br>(ex. 10CrNiS189) | Cast iron<br>(ex. GG20) | Aluminium alloy |
|---------------------------------------------|---------------------------|-------------------------------------|-------------------------|-----------------|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

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

# Wavemill Series

## WMM (H) 2000 E/EL EW/ELW Type

WMMH ...EW



### Body

| Shank | Cat. No.  | Stock | Dimensions (mm) |    |     |    |    |     | Total teeth | Effective teeth |
|-------|-----------|-------|-----------------|----|-----|----|----|-----|-------------|-----------------|
|       | WMM 2020E | ●     | 20              | 20 | 130 | 17 | 35 | 95  | 3           | 1               |
|       | WMM 2025E | ●     | 25              | 25 | 140 | 26 | 40 | 100 | 4           | 1               |

(Long type)

|  |            |   |    |    |     |    |    |     |   |   |
|--|------------|---|----|----|-----|----|----|-----|---|---|
|  | WMM 2020EL | ● | 20 | 20 | 185 | 17 | 60 | 125 | 3 | 1 |
|  | WMM 2025EL | ● | 25 | 25 | 220 | 26 | 75 | 145 | 4 | 1 |

(Weld on shank type)

|  |            |   |    |    |     |    |    |     |   |   |
|--|------------|---|----|----|-----|----|----|-----|---|---|
|  | WMM 2020EW | ● | 20 | 20 | 130 | 17 | 35 | 95  | 3 | 1 |
|  | WMM 2025EW | ● | 25 | 25 | 140 | 26 | 40 | 100 | 4 | 1 |

(Long type with weld on shank)

|  |             |   |    |    |     |    |    |     |   |   |
|--|-------------|---|----|----|-----|----|----|-----|---|---|
|  | WMM 2020ELW | ● | 20 | 20 | 185 | 17 | 60 | 125 | 3 | 1 |
|  | WMM 2025ELW | ● | 25 | 25 | 220 | 26 | 75 | 145 | 4 | 1 |

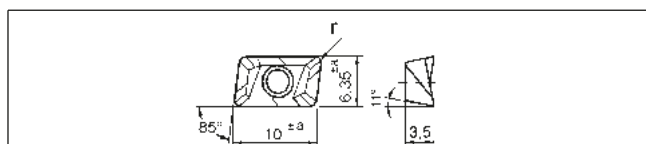
(WMMH Standard type with coolant holes and weld on shank)

|  |             |   |    |    |     |    |    |     |   |   |
|--|-------------|---|----|----|-----|----|----|-----|---|---|
|  | WMMH 2020EW | ● | 20 | 20 | 130 | 17 | 35 | 95  | 3 | 1 |
|  | WMMH 2025EW | ● | 25 | 25 | 140 | 26 | 40 | 100 | 4 | 1 |

(WMMH Long type with coolant holes and weld on shank)

|  |              |   |    |    |     |    |    |     |   |   |
|--|--------------|---|----|----|-----|----|----|-----|---|---|
|  | WMMH 2020ELW | ● | 20 | 20 | 185 | 17 | 60 | 125 | 3 | 1 |
|  | WMMH 2025ELW | ● | 25 | 25 | 220 | 26 | 75 | 145 | 4 | 1 |

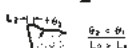
### Inserts for WMM 2000 Series



| Cat. No.           | Coated |        |        | Diamond coated | Un-coated | Dimensions |       |
|--------------------|--------|--------|--------|----------------|-----------|------------|-------|
|                    | ACZ310 | ACZ330 | ACZ350 |                |           | r          | a     |
| APMT 103504 PDER   | ●      | ●      | ●      | —              | —         | 0.4        | 0.08  |
| APMT 103508 PDER   | ●      | ●      | ●      | —              | —         | 0.8        | 0.08  |
| APMT 103512 PDER   | ○      | ○      | ○      | —              | —         | 1.2        | 0.08  |
| APMT 103504 PDER-H | ●      | ●      | ●      | —              | —         | 0.4        | 0.08  |
| APMT 103508 PDER-H | ●      | ●      | ○      | —              | —         | 0.8        | 0.08  |
| APMT 103512 PDER-H | ○      | ●      | ○      | —              | —         | 1.2        | 0.08  |
| APET 103504 PDER-F | ●      | ●      | ●      | —              | —         | 0.4        | 0.025 |
| APET 103504 PDFR-S | —      | —      | —      | ●              | ●         | 0.4        | 0.025 |

APMT ... PDER

APMT ... PDER-H



PDER-H : Stronger cutting edge

PDER-F : Ground insert for finishing

PDFR-S : Round honed sharp cutting edge for aluminium

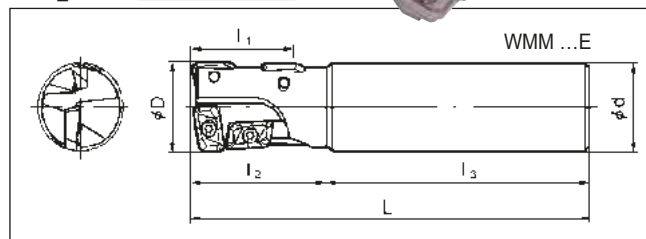
### Spare Parts

| Screw      | Wrench |
|------------|--------|
|            |        |
| BFTX02506N | TRD08  |

# Wavemill Series

## WMM (H) 3000 E/EL EW/ELW Type

WMMH ...EW



### Body

| Shank | Cat. No.  | Stock | Dimensions (mm) |    |     |    |    |     | Total teeth | Effective teeth |
|-------|-----------|-------|-----------------|----|-----|----|----|-----|-------------|-----------------|
|       | WMM 3032E | ●     | 32              | 32 | 150 | 39 | 50 | 100 | 4           | 1               |
|       | WMM 3040E | ●     | 40              | 32 | 160 | 39 | 55 | 105 | 4           | 1               |

(Long type)

|  |            |   |    |    |     |    |    |     |   |   |
|--|------------|---|----|----|-----|----|----|-----|---|---|
|  | WMM 3032EL | ● | 32 | 32 | 230 | 39 | 90 | 140 | 4 | 1 |
|  | WMM 3040EL | ● | 40 | 32 | 230 | 39 | 55 | 185 | 4 | 1 |

(Weld on shank type)

|  |            |   |    |    |     |    |    |     |   |   |
|--|------------|---|----|----|-----|----|----|-----|---|---|
|  | WMM 3032EW | ● | 32 | 32 | 150 | 39 | 50 | 100 | 4 | 1 |
|  | WMM 3040EW | ● | 40 | 32 | 160 | 39 | 55 | 105 | 4 | 1 |

(Long type with weld on shank)

|  |             |   |    |    |     |    |    |     |   |   |
|--|-------------|---|----|----|-----|----|----|-----|---|---|
|  | WMM 3032ELW | ● | 32 | 32 | 230 | 39 | 90 | 140 | 4 | 1 |
|  | WMM 3040ELW | ● | 40 | 32 | 230 | 39 | 55 | 185 | 4 | 1 |

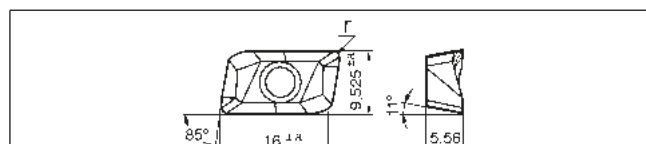
(WMMH Standard type with coolant holes and weld on shank)

|  |             |   |    |    |     |    |    |     |   |   |
|--|-------------|---|----|----|-----|----|----|-----|---|---|
|  | WMMH 3032EW | ● | 32 | 32 | 150 | 39 | 50 | 100 | 4 | 1 |
|  | WMMH 3040EW | ● | 40 | 32 | 160 | 39 | 55 | 105 | 4 | 1 |

(WMMH Long type with coolant holes and weld on shank)

|  |              |   |    |    |     |    |    |     |   |   |
|--|--------------|---|----|----|-----|----|----|-----|---|---|
|  | WMMH 3032ELW | ● | 32 | 32 | 230 | 39 | 90 | 140 | 4 | 1 |
|  | WMMH 3040ELW | ● | 40 | 32 | 230 | 39 | 55 | 185 | 4 | 1 |

### Inserts for WMM 3000 Series



| Cat. No.           | Coated |        |        | Diamond coated | Un-coated | Dimensions |       |
|--------------------|--------|--------|--------|----------------|-----------|------------|-------|
|                    | ACZ310 | ACZ330 | ACZ350 |                |           | r          | a     |
| APMT 160508 PDER   | ●      | ●      | ●      | —              | —         | 0.8        | 0.08  |
| APMT 160512 PDER   | ○      | ○      | ○      | —              | —         | 1.2        | 0.08  |
| APMT 160516 PDER   | ○      | ○      | ○      | —              | —         | 1.6        | 0.08  |
| APMT 160508 PDER-H | ●      | ●      | ●      | —              | —         | 0.8        | 0.08  |
| APMT 160512 PDER-H | ●      | ●      | ●      | —              | —         | 1.2        | 0.08  |
| APMT 160516 PDER-H | ○      | ●      | ○      | —              | —         | 1.6        | 0.08  |
| APMT 160520 PDER-H | ●      | ●      | ●      | —              | —         | 2.0        | 0.08  |
| APMT 160530 PDER-H | ●      | ●      | ●      | —              | —         | 3.0        | 0.08  |
| APMT 160540 PDER-H | ●      | ○      | ●      | —              | —         | 4.0        | 0.08  |
| APMT 160550 PDER-H | ●      | ○      | ●      | —              | —         | 5.0        | 0.08  |
| APMT 160560 PDER-H | ○      | ○      | ●      | —              | —         | 6.0        | 0.08  |
| APET 160508 PDER-F | ●      | ●      | ●      | —              | —         | 0.8        | 0.025 |
| APET 160504 PDFR-S | —      | —      | —      | ●              | ●         | 0.4        | 0.025 |
| APET 160508 PDFR-S | —      | —      | —      | ●              | ●         | 0.8        | 0.025 |

### Spare Parts

| Screw     | Wrench |
|-----------|--------|
|           |        |
| BFTX03584 | TRD15  |



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

# Wave Repeater Mill 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.

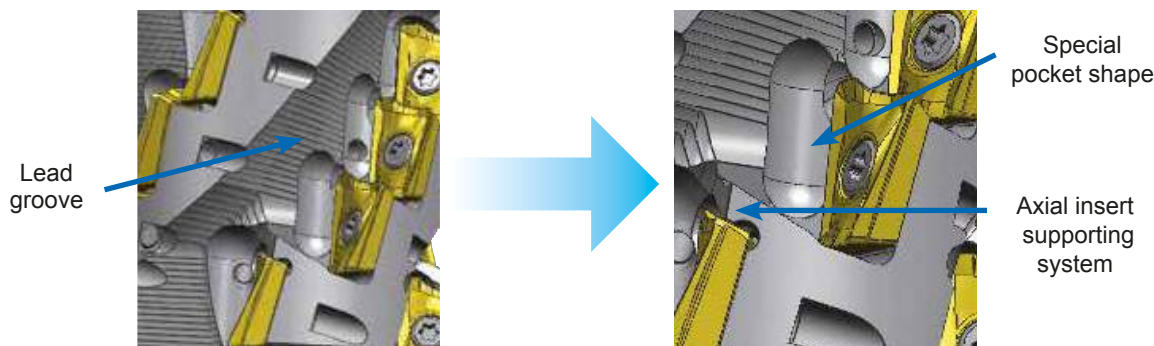
Available with our new generation Super FF and Super ZX coated inserts for unbeatable performance.

## Product Range

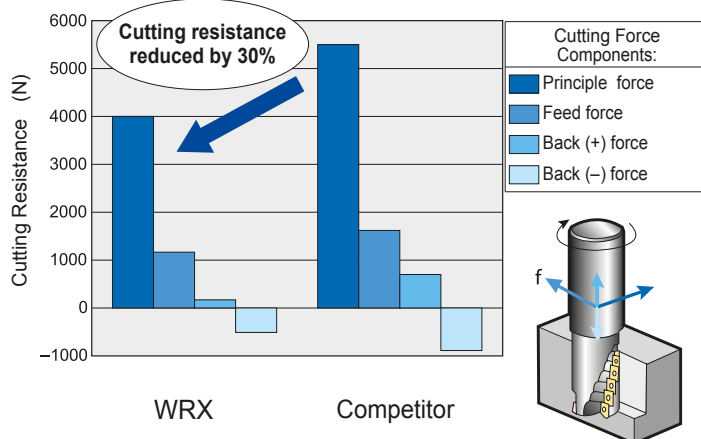
- WRX 2000 series with 12 mm inserts
- WRX 3000 series with 17mm inserts
- Cutter Diameters - 20mm ( $d_{oc} = 18mm$ ) to 100mm ( $d_{oc} = 53mm$ )
- Special Order Options – WRX Cutter with integrated arbor  
Shell type with detachable head
- Wide ISO Application Range – P/M/K/N classification

## 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

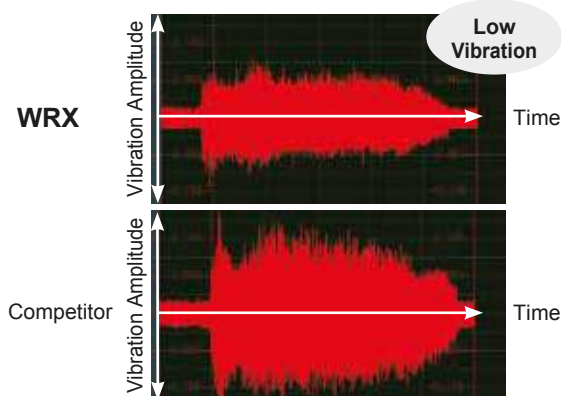


## Cutting Resistance Comparison



Work Material: C50  
Tool: WRX2025RH27E25  
Cutting Conditions:  $v_c = 100m/min$ ,  $f_t = 0,15mm/tooth$   
 $d_{oc} = 25mm$ ,  $w_{oc} = 10mm$ , Dry

## Vibration Comparison

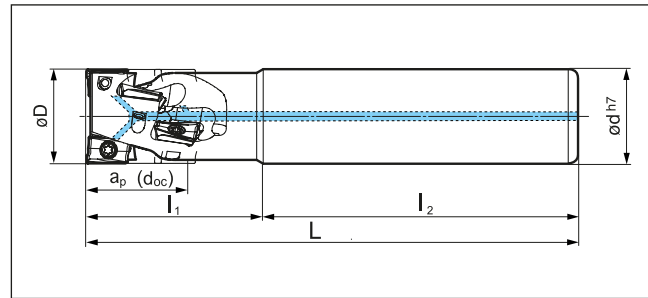
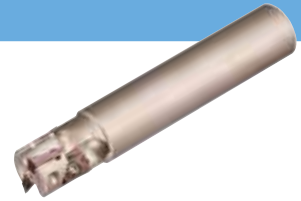


Work Material: C50  
Tool: WRX3080RH53F32  
Cutting Conditions:  $v_c = 150m/min$ ,  $f_t = 0,15mm/tooth$   
 $d_{oc} = 25mm$ ,  $w_{oc} = 10mm$ , Dry

● = Eurostock  
□ = Delivery on request

⌚ Recommended Tightening Torque (N·m)

# WRX 2000 Series with AXMT 12 mm inserts



## Body (Cylindrical Shank Type)

| Shaft                                                                             | Cat. No.       | Stock | Depth of Cut<br>(d <sub>oc</sub> ) | Dimensions (mm) |    |     |                |                | No. of<br>teeth | No. of<br>rows | Effective<br>teeth |
|-----------------------------------------------------------------------------------|----------------|-------|------------------------------------|-----------------|----|-----|----------------|----------------|-----------------|----------------|--------------------|
|                                                                                   |                |       |                                    | øD              | ød | L   | l <sub>1</sub> | l <sub>2</sub> |                 |                |                    |
|  | WRX2020RH18E20 | ●     | 18                                 | 20              | 20 | 120 | 40             | 80             | 4               | 2              | 2                  |
|                                                                                   | WRX2020RH36E20 | □     | 36                                 | 20              | 20 | 130 | 45             | 85             | 4               | 4              | 1                  |
|                                                                                   | WRX2025RH18E25 | ●     | 18                                 | 25              | 25 | 130 | 45             | 85             | 6               | 2              | 3                  |
|                                                                                   | WRX2025RH27E25 | ●     | 27                                 | 25              | 25 | 130 | 45             | 85             | 6               | 3              | 2                  |
|                                                                                   | WRX2032RH18E32 | ●     | 18                                 | 32              | 32 | 140 | 50             | 90             | 8               | 2              | 4                  |
|                                                                                   | WRX2032RH27E32 | ●     | 27                                 | 32              | 32 | 130 | 45             | 85             | 9               | 3              | 3                  |
|                                                                                   | WRX2040RH18E40 | □     | 18                                 | 40              | 40 | 160 | 40             | 120            | 10              | 2              | 5                  |
|                                                                                   | WRX2040RH36E40 | ●     | 36                                 | 40              | 40 | 130 | 45             | 85             | 16              | 4              | 4                  |

## Body (Weldon Shank Type)

| Shaft                                                                               | Cat. No.       | Stock | Depth of Cut<br>(d <sub>oc</sub> ) | Dimensions (mm) |    |     |                |                | No. of<br>teeth | No. of<br>rows | Effective<br>teeth |
|-------------------------------------------------------------------------------------|----------------|-------|------------------------------------|-----------------|----|-----|----------------|----------------|-----------------|----------------|--------------------|
|                                                                                     |                |       |                                    | øD              | ød | L   | l <sub>1</sub> | l <sub>2</sub> |                 |                |                    |
|  | WRX2020RH18W20 | ●     | 18                                 | 20              | 20 | 120 | 40             | 80             | 4               | 2              | 2                  |
|                                                                                     | WRX2020RH36W20 | □     | 36                                 | 20              | 20 | 130 | 45             | 85             | 4               | 4              | 1                  |
|                                                                                     | WRX2025RH18W25 | ●     | 18                                 | 25              | 25 | 130 | 45             | 85             | 6               | 2              | 3                  |
|                                                                                     | WRX2025RH27W25 | ●     | 27                                 | 25              | 25 | 130 | 45             | 85             | 6               | 3              | 2                  |
|                                                                                     | WRX2032RH18W32 | ●     | 18                                 | 32              | 32 | 140 | 50             | 90             | 8               | 2              | 4                  |
|                                                                                     | WRX2032RH27W32 | ●     | 27                                 | 32              | 32 | 130 | 45             | 85             | 9               | 3              | 3                  |
|                                                                                     | WRX2040RH18W40 | □     | 18                                 | 40              | 40 | 160 | 40             | 120            | 10              | 2              | 5                  |
|                                                                                     | WRX2040RH36W40 | ●     | 36                                 | 40              | 40 | 130 | 45             | 85             | 16              | 4              | 4                  |

## Spare Parts (WRX 2000)

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

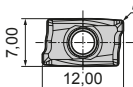
## Description Rule

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

Insert Size: 20  
 Tool øD: 25  
 Inner coolant: R  
 Cutting Direction: H  
 Cutting Edge Length: 27  
 Arbor Type: W  
 Arbor Diameter: 25

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

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

| <div><div></div><div></div></div> |        |                |        |        |        |        |        |         |        |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------|--------|--------|--------|--------|--------|---------|--------|----------------|
| 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         |
|                                                                                                                                                                                                         |        |                |        |        |        |        |        |         |        | r <sub>ε</sub> |
| 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

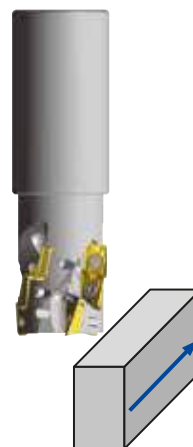
E - For stainless steel / exotic alloy

EH - Strong edge for stainless steel / exotic alloy

S - For aluminium alloy

## Application Examples

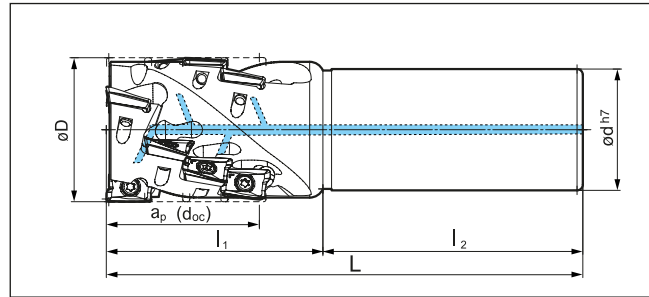
### Example



| Work Material | Construction Machine Parts (USt.42-2)                    |                               |                   |
|---------------|----------------------------------------------------------|-------------------------------|-------------------|
| Tool          | Body                                                     | Sumitomo WRX2000 Weldon shank | Competitor Ø 38,1 |
|               | Insert                                                   | AXMT                          | 18 mm             |
|               | Insert grade                                             | ACP200                        | PVD Type          |
|               | Tool dia. (mm)                                           | 38,1                          | 38,1              |
|               | Total teeth                                              | 24                            | 16                |
| Cutting Data  | Effective teeth                                          | 4                             | 4                 |
|               | 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               |
| Result        | Coolant                                                  | Wet                           | Wet               |
|               | Tool life / Cutting edge                                 | 60                            | 40                |
| Benefits      | 1,5 times longer tool life<br>30% increased productivity |                               |                   |



# WRX 3000 Series with AXMT 17 mm inserts



## Body (Cylindrical Shank Type)

| Shaft | Cat. No.       | Stock | Depth of Cut (d <sub>oc</sub> ) | Dimensions (mm) |    |     |                |                | No. of teeth | No. of rows | Effective teeth |
|-------|----------------|-------|---------------------------------|-----------------|----|-----|----------------|----------------|--------------|-------------|-----------------|
|       |                |       |                                 | ØD              | Ød | L   | L <sub>1</sub> | L <sub>2</sub> |              |             |                 |
|       | WRX3032RH40E32 | ●     | 40                              | 32              | 32 | 150 | 65             | 85             | 6            | 3           | 2               |
|       | WRX3040RH27E40 | □     | 27                              | 40              | 40 | 180 | 60             | 120            | 6            | 2           | 3               |
|       | WRX3040RH40E40 | ●     | 40                              | 40              | 40 | 150 | 65             | 85             | 9            | 3           | 3               |
|       | WRX3050RH27E40 | □     | 27                              | 50              | 40 | 180 | 60             | 120            | 8            | 2           | 4               |
|       | WRX3050RH53E40 | ●     | 53                              | 50              | 40 | 165 | 75             | 90             | 12           | 4           | 3               |

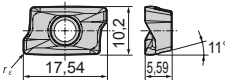
## Body (Weldon Shank Type)

| Shaft | Cat. No.       | Stock | Depth of Cut (d <sub>oc</sub> ) | Dimensions (mm) |    |     |                |                | No. of teeth | No. of rows | Effective teeth |
|-------|----------------|-------|---------------------------------|-----------------|----|-----|----------------|----------------|--------------|-------------|-----------------|
|       |                |       |                                 | ØD              | Ød | L   | L <sub>1</sub> | L <sub>2</sub> |              |             |                 |
|       | WRX3040RH27W40 | □     | 27                              | 40              | 40 | 180 | 60             | 120            | 6            | 2           | 3               |
|       | WRX3040RH40W40 | ●     | 40                              | 40              | 40 | 150 | 65             | 85             | 9            | 3           | 3               |
|       | WRX3050RH27W40 | □     | 27                              | 50              | 40 | 180 | 60             | 120            | 8            | 2           | 4               |
|       | WRX3050RH53W40 | ●     | 53                              | 50              | 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       |
|                        |                |                                                                                     |        |        |        |        |        |         |     |        | $r_\epsilon$ |
| 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

EH – Strong edge for stainless steel

S – For aluminium

\* Cutter body modification is required.

– Unable to produce

## Application Examples

### Example 1



| Work Material | Automotive Component / Cast Iron |                                        |                 |
|---------------|----------------------------------|----------------------------------------|-----------------|
| Tool          | Body                             | Sumitomo WRX3000 Type Integrated Arbor | Competitor 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             |
|               | 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 WRX3040RH40E40 | Competitor Ø 40 |
|               | Insert                                              | AXMT                    | 18 mm           |
|               | Insert grade                                        | ACP 300                 | 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             |
|               | Tool life / Cutting edge                            | 20                      | 5 ~ 10          |
| Benefits      | Stable machining, double tool life with no breakage |                         |                 |

# Wave Repeater Mill WRX Type

## 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 |
| Ø 20          | 4°                 |              |
| Ø 25          | 2°                 |              |
| Ø 32          | 1°30'              |              |
| Ø 40          | 1°                 | 2°           |
| Ø 50          | 0°30'              | 1°           |
| Ø 63          |                    | 0°30'        |
| Ø 80          |                    | 0°30'        |
| Ø100          |                    | Not possible |



## Recommended Cutting Conditions

Tool: WRX 3050 RH53 F22, ØD = 50mm, d<sub>oc</sub> = 50mm

| 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 (w <sub>oc</sub> / ØD) - must be adjusted to actual machine and workpiece conditions. |                    |                   |                    |                   |                    |
|-----|--------------------------------------------------|---------------------|---------------|----------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|--------------------|-------------------|--------------------|
|     |                                                  |                     |               |                                        |              | 10%                                                                                                                                                        |                    | 25%               |                    | > 50%             |                    |
|     |                                                  |                     |               |                                        |              | v <sub>c</sub>                                                                                                                                             | f <sub>t</sub>     | v <sub>c</sub>    | f <sub>t</sub>     | v <sub>c</sub>    | f <sub>t</sub>     |
|     |                                                  |                     |               |                                        |              | 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, annealed  | 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.

# Wave Ball Mill" for Roughing WBMR Type

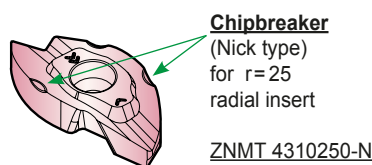


## ■ Features

Particularly suitable for die mold machining the WBMR replaceable insert ball nose endmill efficiently roughs complex profiles.

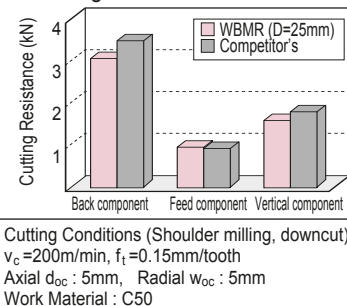
Its high feed rate capability is a direct result of a sharp cutting edge which is maintained during the cutting cycle by the special cemented carbide substrate working in parallel with the ultra hard ZX coating.

- Advantages
  - Wave shaped cutting edge
  - Economical M class insert
  - Precise clamping
  - High feed rate capability

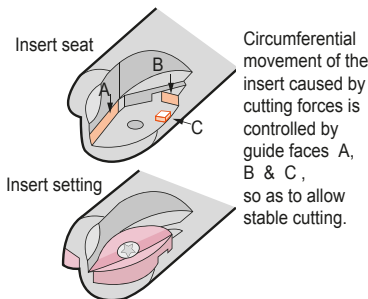


## ■ Performance

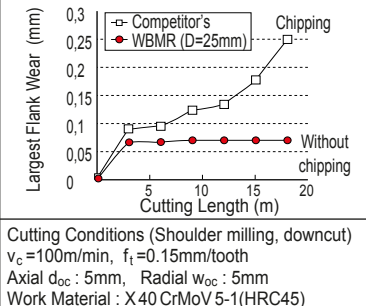
### ● Cutting Resistance



### ● Anti-Rotational Mechanism



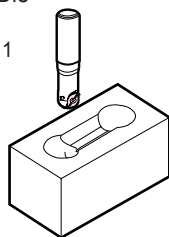
### ● Insert Life



## ■ Application Example

### ● Cold Molding Die

Work Material :  
X 155 CrVMo 12 1

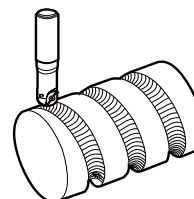


<Results>  
 Flank wear after continuous cutting for seven hours was less than other manufacturer's product. Stable cutting was observed.

WBMR 2200S ( $\phi 20 \text{ mm}$ )  
 Insert Grade : ACZ350  
 Cutting Conditions :  
 $n = 2200 \text{ rpm}$ ,  $v_f = 500 \text{ mm/min}$   
 Depth of Cut :  $0.3 \sim 2 \text{ mm}$   
 Non-water soluble cutting oil

### ● Injection Molded Part

(Cr-Mo steel + Stellite-overlay)



<Results>  
 Wave ball ( $\phi 30 \text{ mm}$ ) could cut without chattering while other manufacturer's products could not cut at all due to chattering.

WBMR 2300M ( $\phi 30 \text{ mm}$ )  
 Insert Grade : ACZ350  
 Cutting Conditions :  
 $n = 500 \text{ rpm}$ ,  $v_f = 35 \text{ mm/min}$   
 Depth of Cut :  $5 \text{ mm}$   
 Dry cut

## ■ Recommended Cutting Conditions (2 teeth)

| Material Condition | 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 |

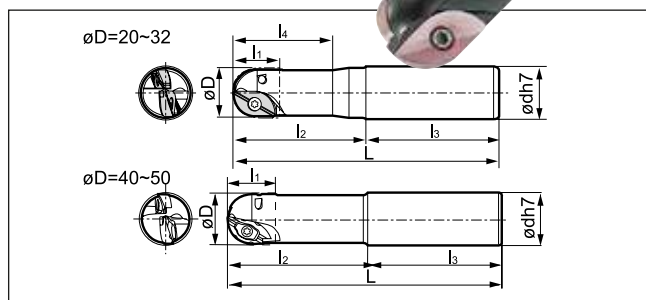
[ $v_c = \text{m/min}$ ,  $f_t = \text{mm/tooth}$ ] [min. – optimum – max.]

## ■ Recommended Cutting Conditions (4 teeth)

| Material Condition | 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 |

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

# Wave Ball Mill™ for Roughing WBMR 2000 Type



## Body (Short and middle length type, 2 teeth)

| Cat. No.     | Stock | Dimensions (mm) |    |                |                |                |                |     |
|--------------|-------|-----------------|----|----------------|----------------|----------------|----------------|-----|
|              |       | øD              | ød | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | L   |
| WBMR 2200 S  | ●     | 20              | 25 | 20             | 60             | 80             | 40             | 140 |
| WBMR 2200 M  | ●     |                 |    |                | 60             | 140            |                | 200 |
| WBMR 2200 MW | ●     |                 |    |                | 60             | 140            |                | 200 |
| WBMR 2250 S  | ●     | 25              | 32 | 23             | 70             | 80             | 50             | 150 |
| WBMR 2250 M  | ●     |                 |    |                | 73             | 147            |                | 220 |
| WBMR 2250 MW | ●     |                 |    |                | 73             | 147            |                | 220 |
| WBMR 2320 S  | ●     | 32              | 32 | 31             | 80             | 80             | 60             | 160 |
| WBMR 2320 M  | ●     |                 |    |                | 85             | 155            |                | 240 |
| WBMR 2320 MW | ●     |                 |    |                | 85             | 155            |                | 240 |
| WBMR 2400 S  | □     | 40              | 42 | 35             | 100            | 100            | -              | 200 |
| WBMR 2400 M  | □     |                 |    |                | 180            | 100            |                | 280 |
| WBMR 2400 MW | □     |                 |    |                | 180            | 100            |                | 280 |
| WBMR 2500 S  | □     | 50              | 42 | 47             | 100            | 100            | -              | 200 |
| WBMR 2500 M  | □     |                 |    |                | 180            | 100            |                | 280 |

- S: Short type with cylindrical shank  
 M: Middle length type with cylindrical shank  
 MW: Middle length type with Weldon shank

## Inserts

Fig. 1

Fig. 2

Fig. 4

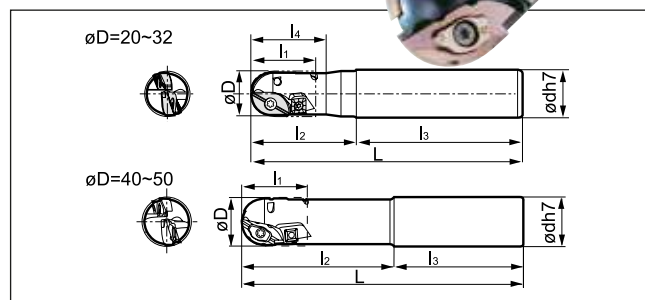
Fig. 5

| Cat. No.       | Coated  |         |         | Dimensions (mm) |       |       |      | Fig. | No. of teeth | Applicable Endmill |
|----------------|---------|---------|---------|-----------------|-------|-------|------|------|--------------|--------------------|
|                | ACP 200 | ACP 300 | ACK 300 | A               | B     | s     | r    |      |              |                    |
| ZNMT 1804100-C | ●       | ●       | ●       | 18.00           | 9.76  | 4.76  | 10   | 1    | 1            | WBMR2200           |
| ZNMT 2004100-S | ●       | ●       | ●       | 20.00           | 7.50  | 4.37  | 10   | 2    |              |                    |
| ZNMT 2205125-C | ●       | ●       | ●       | 22.50           | 12.20 | 5.70  | 12.5 | 1    | 1            | WBMR2250           |
| ZNMT 2305125-S | ●       | ●       | ●       | 23.00           | 9.38  | 5.56  | 12.5 | 2    |              |                    |
| ZNMT 2907160-C | ●       | ●       | ●       | 29.00           | 15.62 | 7.15  | 16   | 1    | 1            | WBMR2320           |
| ZNMT 3006160-S | ●       | ●       | ●       | 30.00           | 12.00 | 6.70  | 16   | 2    |              |                    |
| ZNMT 3608200   | ○       | ○       | ○       | 36.00           | 19.50 | 6.70  | 20   | 4    | 2            | WBMR2400           |
| ZNMT 4310250   | ○       | ○       | ○       | 43.00           | 25.70 | 10.15 | 25   | 4    |              |                    |
| ZNMT 4310250-N | ○       | ○       | ○       | 43.00           | 25.70 | 10.15 | 25   | 5    | 2            | WBMR2500           |
|                |         |         |         |                 |       |       |      |      |              |                    |

## Spare Parts

| Screw         | Wrench | Wrench | Applicable Endmill     |
|---------------|--------|--------|------------------------|
|               |        |        |                        |
| BFTX0307N 2.0 | TRX10  | -      | WBMR 2200              |
| BFTX0409N 3.4 | -      | TRD15  | WBMR 2250              |
| BFTX0511N 5.0 | -      | TRD20  | WBMR 2320              |
| BFTX0619N 7.5 | -      | TRD25  | WBMR 2400<br>WBMR 2500 |

# Wave Ball Mill™ for Roughing WBMR 2000 L Type

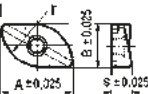
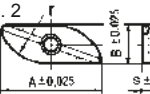
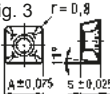
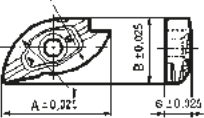
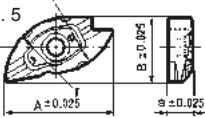


## Body (Extra long type, 4 teeth)

| Cat. No.      | Stock | Dimensions (mm) |    |                |                |                |                |     |
|---------------|-------|-----------------|----|----------------|----------------|----------------|----------------|-----|
|               |       | øD              | ød | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | L   |
| WBMR 2200 LL  | ●     | 20              | 25 | 30             | 80             | 170            | 40             | 250 |
| WBMR 2200 LLW | ●     |                 |    |                |                |                |                |     |
| WBMR 2250 LL  | ●     | 25              | 32 | 38             | 100            | 200            | 50             | 300 |
| WBMR 2250 LLW | ●     |                 |    |                |                |                |                |     |
| WBMR 2320 LL  | ●     | 32              | 32 | 44             | 120            | 230            | 60             | 350 |
| WBMR 2320 LLW | ●     |                 |    |                |                |                |                |     |
| WBMR 2400 LL  | □     | 40              | 42 | 50             | 250            | 100            | -              | 350 |
| WBMR 2400 LLW | □     |                 |    |                |                |                |                |     |
| WBMR 2500 LL  | □     | 50              | 42 | 69             | 250            | 100            | -              | 350 |
| WBMR 2500 LLW | □     |                 |    |                |                |                |                |     |

- LL: Extra long type with cylindrical shank  
 LLW: Extra long type with Weldon shank

## Inserts

| Fig. 1         |  | Fig. 2  |  | Fig. 3          |  |       |      |      |              |                    |          |
|----------------|--------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------|-------|------|------|--------------|--------------------|----------|
| Fig. 4         |  | Fig. 5  |  |                 |                                                                                       |       |      |      |              |                    |          |
| Cat. No.       | Coated                                                                               |         |                                                                                       | Dimensions (mm) |                                                                                       |       |      | Fig. | No. of teeth | Applicable Endmill |          |
|                | ACP 200                                                                              | ACP 300 | ACK 300                                                                               | A               | B                                                                                     | s     | r    |      |              |                    |          |
| ZNMT 1804100-C | ●                                                                                    | ●       | ●                                                                                     | 18.00           | 9.76                                                                                  | 4.76  | 10   | 1    | 1            | WBMR2200           |          |
| ZNMT 2004100-S | ●                                                                                    | ●       | ●                                                                                     | 20.00           | 7.50                                                                                  | 4.37  | 10   | 2    |              |                    |          |
| SPMT 070308    | ○                                                                                    | ○       | ○                                                                                     | 7.94            | —                                                                                     | 3.18  | —    | 3    | 2            | 1                  | WBMR2250 |
| ZNMT 2205125-C | ●                                                                                    | ●       | ●                                                                                     | 22.50           | 12.20                                                                                 | 5.70  | 12.5 | 1    |              |                    |          |
| ZNMT 2305125-S | ●                                                                                    | ●       | ●                                                                                     | 23.00           | 9.38                                                                                  | 5.56  | 12.5 | 2    | 2            | WBMR2320           |          |
| SPMT 09T308    | ●                                                                                    | ●       | ●                                                                                     | 9.53            | —                                                                                     | 3.97  | —    | 3    |              |                    |          |
| ZNMT 2907160-C | ●                                                                                    | ●       | ●                                                                                     | 29.00           | 15.62                                                                                 | 7.15  | 16   | 1    | 1            | WBMR2400           |          |
| ZNMT 3006160-S | ●                                                                                    | ●       | ●                                                                                     | 30.00           | 12.00                                                                                 | 6.70  | 16   | 2    |              |                    |          |
| SPMT 09T308    | ●                                                                                    | ●       | ●                                                                                     | 9.53            | —                                                                                     | 3.97  | —    | 3    | 2            | WBMR2500           |          |
| ZNMT 3608200   | ○                                                                                    | ○       | ○                                                                                     | 36.00           | 19.50                                                                                 | 6.70  | 20   | 4    |              |                    |          |
| SPMT 09T308    | ●                                                                                    | ●       | ●                                                                                     | 9.53            | —                                                                                     | 3.97  | —    | 3    | 2            | WBMR2500           |          |
| ZNMT 4310250   | ○                                                                                    | ○       | ○                                                                                     | 43.00           | 25.70                                                                                 | 10.15 | 25   | 4    |              |                    |          |
| ZNMT 4310250-N | ○                                                                                    | ○       | ○                                                                                     | 43.00           | 25.70                                                                                 | 10.15 | 25   | 5    | 2            | WBMR2500           |          |
| SPMT 120408    | ○                                                                                    | ○       | ○                                                                                     | 12.7            | —                                                                                     | 4.76  | —    | 3    |              |                    |          |

## Spare Parts

| Screw         | Wrench | Wrench | Applicable Endmill |
|---------------|--------|--------|--------------------|
|               |        |        |                    |
| BFTX0307N 2.0 | TRX10  | -      | WBMR 2200 LL       |
| BFTX0409N 3.4 | -      | TRD15  | WBMR 2250 LL       |
| BFTX0511N 5.0 | -      | TRD20  | WBMR 2320 LL       |
| BFTX0407N 3.0 | -      | TRD15  |                    |
| BFTX0619N 7.5 | -      | TRD25  | WBMR 2400 LL       |
| BFTX0409N 3.4 | -      | TRD15  | WBMR 2500 LL       |



# Wave Ball Mill for Finishing WBMF Type

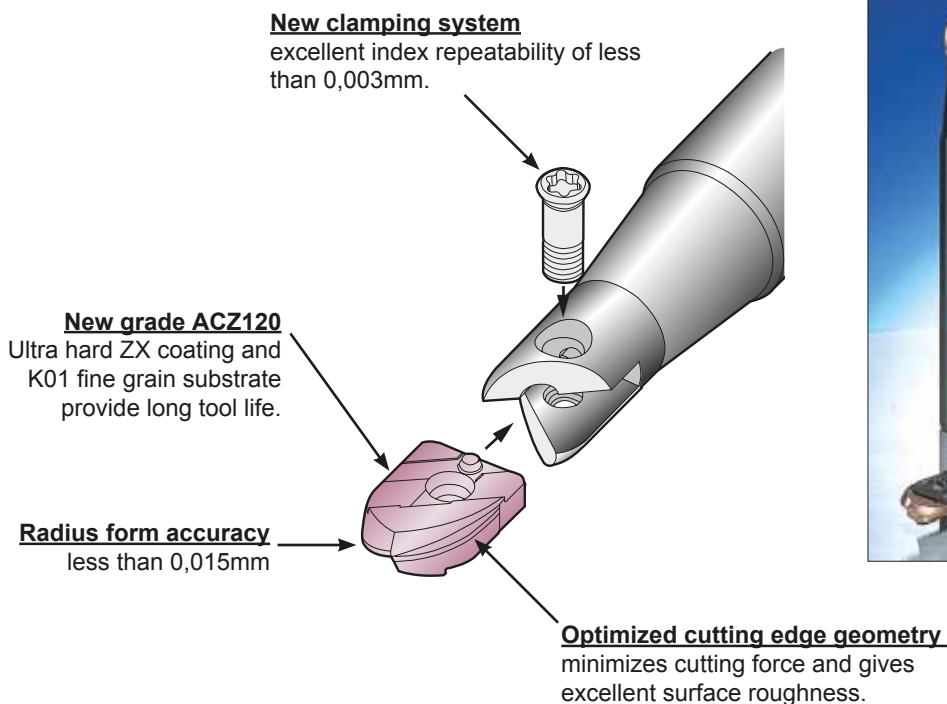


## ■ Features

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



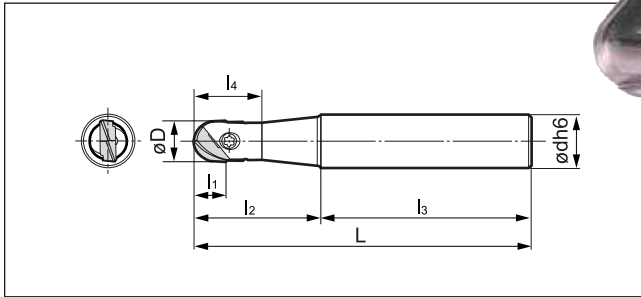
## ■ Application Example

|                                                                                                                                                                               |                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>● Bumper Moulding Die</b><br>Work Material : C55                                                                                                                           |                                                                                                                                                                         |
|                                                                                                                                                                               |                                                                                                                                                                         |
| <b>&lt;Results&gt;</b><br>Surface roughness after continuous cutting for twelve hours was better than other manufacturer's product.<br>Less width of flank wear was observed. |                                                                                                                                                                         |
| WBMF1200M (ø20mm)<br>Insert : ZPGU2471100<br>Grade : ACZ120                                                                                                                   | Cutting Conditions<br>$v_c = 88 \text{ m/min}$<br>$v_f = 700 \text{ mm/min}$ ( $f_t = 0,25 \text{ mm/tooth}$ )<br>Width of Cut : 0,5 mm<br>Depth of Cut : 0,5 mm<br>Dry |

|                                                                                                           |                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>● Bumper Moulding Die</b><br>Work Material : C50                                                       |                                                                                                                                                                           |
|                                                                                                           |                                                                                                                                                                           |
| <b>&lt;Results&gt;</b><br>Smooth cutting and good surface finish after continuous cutting for eight hours |                                                                                                                                                                           |
| WBMF1200M (ø20mm)<br>Insert : ZPGU2471100<br>Grade : ACZ120                                               | Cutting Conditions<br>$v_c = 190 \text{ m/min}$<br>$v_f = 1200 \text{ mm/min}$ ( $f_t = 0,21 \text{ mm/tooth}$ )<br>Width of Cut : 0,2 mm<br>Depth of Cut : 0,2 mm<br>Dry |



# Wave Ball Mill for Finishing WBMF 1000 Type



## Body

| Cat. No.        | Stock | Dimensions (mm) |    |                |                |                |                |     |
|-----------------|-------|-----------------|----|----------------|----------------|----------------|----------------|-----|
|                 |       | øD              | ød | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | L   |
| WBMF 1100 S     | □     | 10              | 16 | 9              | 30             | 70             | 17             | 100 |
| WBMF 1100 M     | ●     |                 |    |                | 35             | 95             |                | 130 |
| WBMF 1100 L     | □     |                 |    |                | 50             | 130            |                | 180 |
| WBMF 1120 S     | □     | 12              | 16 | 10,5           | 40             | 70             | 19,5           | 110 |
| WBMF 1120 M     | ●     |                 |    |                | 40             | 110            |                | 150 |
| WBMF 1120 MM12N | □     |                 |    |                | 40             | 110            |                | 150 |
| WBMF 1120 L     | □     | 16              | 20 | 12             | 60             | 140            | 25,5           | 200 |
| WBMF 1160 S     | □     |                 |    |                | 50             | 80             |                | 130 |
| WBMF 1160 M     | ●     |                 |    |                | 50             | 130            |                | 180 |
| WBMF 1160 MM16N | □     | 20              | 25 | 15             | 50             | 130            | 32             | 180 |
| WBMF 1160 L     | □     |                 |    |                | 70             | 150            |                | 220 |
| WBMF 1200 S     | □     |                 |    |                | 60             | 80             |                | 140 |
| WBMF 1200 M     | ●     | 25              | 32 | 18,5           | 60             | 140            | 36             | 200 |
| WBMF 1200 MM20N | □     |                 |    |                | 60             | 140            |                | 200 |
| WBMF 1200 L     | □     |                 |    |                | 80             | 170            |                | 250 |
| WBMF 1250 S     | □     | 30              | 32 | 22,5           | 70             | 80             | 43             | 150 |
| WBMF 1250 M     | ●     |                 |    |                | 73             | 147            |                | 220 |
| WBMF 1250 L     | □     |                 |    |                | 100            | 200            |                | 300 |
| WBMF 1300 S     | □     | 30              | 32 | 22,5           | 80             | 80             | 43             | 160 |
| WBMF 1300 M     | ●     |                 |    |                | 85             | 155            |                | 240 |
| WBMF 1300 L     | □     |                 |    |                | 120            | 230            |                | 350 |

S : Short type

M : Middle length type

L : Long type

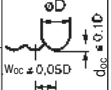
## Inserts

| Cat. No.     | Coated | Dimensions (mm) |                |                |     |      |  | Applicable Endmill |
|--------------|--------|-----------------|----------------|----------------|-----|------|--|--------------------|
|              | ACZ120 | øD              | l <sub>1</sub> | l <sub>2</sub> | s   | r    |  |                    |
| 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           |

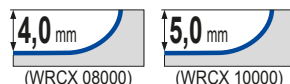
## Recommended Cutting Conditions

| Material       | Condition                  |                           |                           |             |  |
|----------------|----------------------------|---------------------------|---------------------------|-------------|---------------------------------------------------------------------------------------|
|                | Carbon steel (Below HRC25) | Alloy steel (Below HRC45) | Stainless, Die steel etc. | Cast iron   |                                                                                       |
| øD             | 200-250-300                | 100-150-200               | 50-80-100                 | 100-120-150 |                                                                                       |
| v <sub>c</sub> | 0,1-0,2-0,3                | 0,1-0,2-0,3               | 0,1-0,15-0,2              | 0,2-0,3-0,4 |                                                                                       |
| f <sub>t</sub> |                            |                           |                           |             |                                                                                       |

# Wave Radius Mill WRCX 08000/10000 E Type

## Multi Purpose Endmills with Polygon Inserts

### Shank Type with Small Diameter Inserts

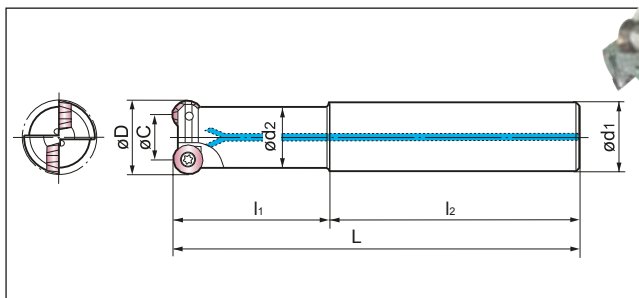


E\_ : Cylindrical straight shank type

ES : Short type with straight shank

EM : Middle length type with straight shank

EL : Long type with straight shank



Axial rake angle:  $-3^\circ$   
Radial rake angle:  $0 \sim 35^\circ$

#### BODY

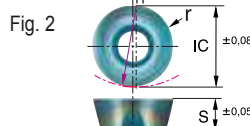
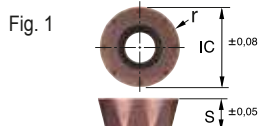
#### Spare Parts

| Insert IC (mm) | Cat. No.      | Stock | Dimensions (mm) |    |    |     |     |     |     |   | No. of teeth | Axial Rake | Radial Rake | Helical Boring<br>øB Standard | Plunging<br>$\alpha$ max. |               |            |
|----------------|---------------|-------|-----------------|----|----|-----|-----|-----|-----|---|--------------|------------|-------------|-------------------------------|---------------------------|---------------|------------|
| 8              | WRCX 08012 ES | ●     | 12              | -  | 12 | 9,4 | 110 | 40  | 70  | 1 | -3°          | -35°       | -           | 0°30'                         |                           | BFTX 02505 IP | TRDR 08 IP |
|                | WRCX 08012 EM | ●     | 12              | -  | 12 | 9,4 | 150 | 70  | 80  | 1 | -3°          | -10°       | 24 $\pm 4$  | 5°30'                         |                           |               |            |
|                | WRCX 08016 ES | ●     | 16              | -  | 16 | 14  | 120 | 50  | 70  | 1 | -3°          | -10°       | 24 $\pm 4$  | 5°30'                         |                           |               |            |
|                | WRCX 08016 EM | ●     | 16              | -  | 16 | 14  | 150 | 70  | 80  | 1 | -3°          | -10°       | 24 $\pm 4$  | 5°30'                         |                           |               |            |
|                | WRCX 08020 ES | ●     | 20              | 12 | 20 | 18  | 130 | 50  | 80  | 2 | -3°          | -3°        | 32 $\pm 7$  | 13°                           |                           | BFTX 02506 IP | TRDR 08 IP |
|                | WRCX 08020 EM | ●     | 20              | 12 | 20 | 18  | 180 | 100 | 80  | 2 | -3°          | -3°        | 32 $\pm 7$  | 13°                           |                           |               |            |
|                | WRCX 08020 EL | ●     | 20              | 12 | 20 | 18  | 250 | 130 | 120 | 2 | -3°          | -3°        | 32 $\pm 7$  | 13°                           |                           |               |            |
|                | WRCX 08025 ES | ●     | 25              | 17 | 25 | 21  | 130 | 50  | 80  | 3 | -3°          | 0°         | 42 $\pm 7$  | 8°20'                         |                           |               |            |
| 10             | WRCX 08025 EM | ●     | 25              | 17 | 25 | 21  | 180 | 100 | 80  | 3 | -3°          | 0°         | 42 $\pm 7$  | 8°20'                         |                           |               |            |
|                | WRCX 08025 EL | ●     | 25              | 17 | 25 | 21  | 250 | 130 | 120 | 3 | -3°          | 0°         | 42 $\pm 7$  | 8°20'                         |                           |               |            |
|                | WRCX 10025 ES | ●     | 25              | 15 | 25 | 21  | 130 | 50  | 80  | 2 | -3°          | 0°         | 40 $\pm 8$  | 13°10'                        |                           | BFTX 03584 IP | TRDR 15 IP |
|                | WRCX 10025 EM | ●     | 25              | 15 | 25 | 21  | 180 | 100 | 80  | 2 | -3°          | 0°         | 40 $\pm 8$  | 13°10'                        |                           |               |            |
|                | WRCX 10025 EL | ●     | 25              | 15 | 25 | 21  | 250 | 130 | 120 | 2 | -3°          | 0°         | 40 $\pm 8$  | 13°10'                        |                           |               |            |
|                | WRCX 10032 ES | ●     | 32              | 22 | 32 | 28  | 130 | 50  | 80  | 3 | -3°          | 0°         | 54 $\pm 8$  | 8°                            |                           |               |            |
|                | WRCX 10032 EM | ●     | 32              | 22 | 32 | 28  | 200 | 120 | 80  | 3 | -3°          | 0°         | 54 $\pm 8$  | 8°                            |                           |               |            |
|                | WRCX 10032 EL | ●     | 32              | 22 | 32 | 28  | 300 | 180 | 120 | 3 | -3°          | 0°         | 54 $\pm 8$  | 8°                            |                           |               |            |

#### Insert

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

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



Rake angle:  $25^\circ$   
4 corners use  
R : wiper radius

| Cat. No.           | Coated Carbide |        |        |        |        | Diamond Coated | Uncoated carbide | IC (mm) | r (mm) | s (mm) | Max. d <sub>oc</sub>  |                       | Fig. | Applicable Endmill |
|--------------------|----------------|--------|--------|--------|--------|----------------|------------------|---------|--------|--------|-----------------------|-----------------------|------|--------------------|
|                    | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | DL1000         | H1               |         |        |        | 4 corners application | 8 corners application |      |                    |
| QPMT 080330 PPEN   | ●              | ●      | ●      | ●      | ●      |                |                  | 8       | 3,0    | 3,18   | 3,8                   | 1,0                   | ①    | WRCX 08000 E       |
| QPMT 080330 PPEN-H | ●              | ●      | ●      | ●      | ●      |                |                  |         |        |        |                       |                       |      |                    |
| QPMT 10T335 PPEN   | ●              | ●      | ●      | ●      | ●      |                |                  | 10      | 3,5    | 3,97   | 4,7                   | 1,2                   | ①    | WRCX 10000 E       |
| QPMT 10T335 PPEN-H | ●              | ●      | ●      | ●      | ●      |                |                  |         |        |        |                       |                       |      |                    |
| QPET 10T350 PPFR-S |                |        |        |        |        | ●              | ●                |         | 5,0    |        |                       | -                     | ②    |                    |

#### Recommended Cutting Conditions

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

| Material      | Carbon steel (ex. C40 ~ C50) | Alloy steel (Below HRC40) | Stainless steel (ex. X10CrNiS18-9) | Cast iron (ex. GG20) | Non-ferrous material |
|---------------|------------------------------|---------------------------|------------------------------------|----------------------|----------------------|
| Grade         | ACP100, ACP200               | ACP100, ACP200            | ACP200, ACP300                     | ACK200, ACK300       | DL1000, H1           |
| $\phi D$ (mm) |                              |                           |                                    |                      |                      |
| 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

Recommended Tightening Torque (N·m)

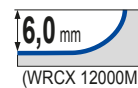
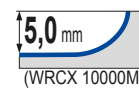
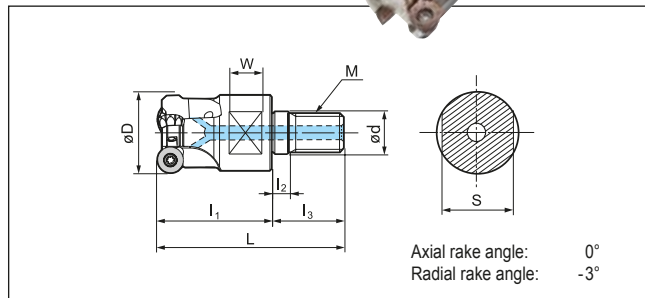
# Exchangeable Head Endmills WRCX 08000 M Type

# Exchangeable Head Endmills WRCX 10000/12000 M Type

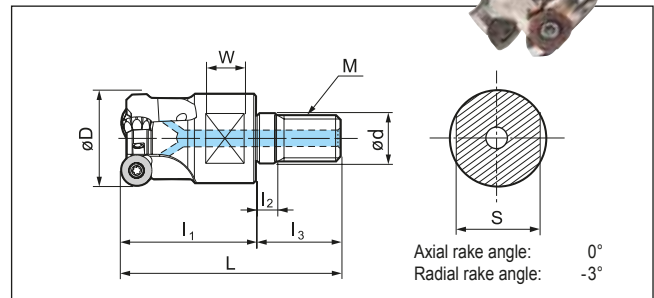


## Modular Type

High efficiency multi purpose endmills



High efficiency multi purpose endmills



## Heads

For insert type : QPMT 0803

| Cat. No.       | Stock | Dimensions (mm) |      |     |    |    |   |    |    |    | No. of teeth |
|----------------|-------|-----------------|------|-----|----|----|---|----|----|----|--------------|
| WRCX08020M10Z2 | ●     | 20              | 10,5 | M10 | 49 | 30 | 5 | 19 | 8  | 15 | 2            |
| WRCX08025M12Z3 | ●     | 25              | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 3            |

Inserts are not included.

## Heads

For insert type : QPOT 10T3

| Cat. No.       | Stock | Dimensions (mm) |      |     |    |    |   |    |    |    | No. of teeth |
|----------------|-------|-----------------|------|-----|----|----|---|----|----|----|--------------|
| WRCX10025M12Z2 | ●     | 25              | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2            |
| WRCX10028M12Z2 | □     | 28              | 12,5 | M12 | 56 | 35 | 5 | 21 | 10 | 19 | 2            |
| WRCX10030M16Z3 | □     | 30              | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3            |
| WRCX10032M16Z3 | ●     | 32              | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 3            |

Inserts are not included.

## Heads

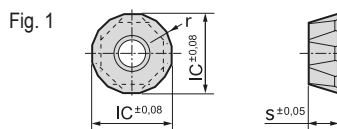
For insert type : QPOT 1204

| Cat. No.       | Stock | Dimensions (mm) |      |     |    |    |   |    |    |    | No. of teeth |
|----------------|-------|-----------------|------|-----|----|----|---|----|----|----|--------------|
| WRCX12040M16Z4 | □     | 40              | 17,0 | M16 | 63 | 40 | 5 | 23 | 10 | 24 | 4            |

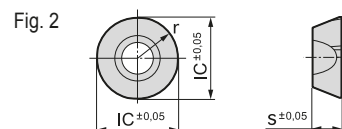
Inserts are not included.

## Inserts

- 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



Rake angle: 25°

4 corners use

| Cat. No.           | Coated Carbide |         |         |         |         | DLC Coated<br>DL1000 | Uncoated Carbide<br>H1 | IC (mm) | r (mm) | s (mm) | Max. d <sub>oc</sub>  |                       | Fig. | Applicable Endmill |
|--------------------|----------------|---------|---------|---------|---------|----------------------|------------------------|---------|--------|--------|-----------------------|-----------------------|------|--------------------|
|                    | ACP 100        | ACP 200 | ACP 300 | ACK 200 | ACK 300 |                      |                        |         |        |        | 4 corners application | 8 corners application |      |                    |
| QPMT 080330 PPEN   | ●              | ●       | ●       | ●       | ●       |                      |                        | 8       | 3,0    | 3,18   | 3,8                   | 1,0                   | ①    | WRCX 08000M        |
| QPMT 080330 PPEN-H | ●              | ●       | ●       | ●       | ●       |                      |                        |         |        |        |                       |                       |      |                    |
| QPMT 10T335 PPEN   | ●              | ●       | ●       | ●       | ●       |                      |                        | 10      | 3,5    | 3,97   | 4,7                   | 1,2                   | ①    | WRCX 10000M        |
| QPMT 10T335 PPEN-H | ●              | ●       | ●       | ●       | ●       |                      |                        |         |        |        |                       |                       | ②    |                    |
| QPMT 10T350 PPFR-S |                |         |         |         |         | ●                    | ●                      |         | 5,0    |        |                       |                       |      |                    |
| QPMT 120440 PPEN   | ●              | ●       | ●       | ●       | ●       |                      |                        | 12      | 4,0    | 4,76   | 5,6                   | 1,5                   | ①    | WRCX 12000M        |
| QPMT 120440 PPEN-H | ●              | ●       | ●       | ●       | ●       |                      |                        |         |        |        |                       |                       |      |                    |
| QPET 120460 PPFR-S |                |         |         |         |         | ●                    | ●                      |         | 6,0    |        |                       |                       | ②    |                    |

## Identification of Catalogue No.

**WRCX 08 020 M10 Z2**

Cutter Type

Diameter

Insert Size

Mounting Screw

No. of Teeth



## Spare Parts

| Wrench     | Screw         | Applicable Endmill        |
|------------|---------------|---------------------------|
|            |               |                           |
| TRDR 08 IP | BFTX 02506 IP | 1,5                       |
|            |               | WRCX 08020M ~ WRCX 08025M |

## Spare Parts

| Wrench     | Screw         | Applicable Endmill        |
|------------|---------------|---------------------------|
|            |               |                           |
| TRDR 15 IP | BFTX 03584 IP | 3,0                       |
|            | BFTX 0409 IP  | 3,0                       |
|            |               | WRCX 10025M ~ WRCX 10032M |
|            |               | WRCX 12040M               |

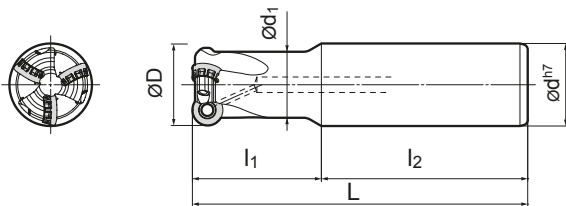
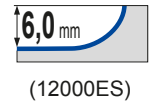
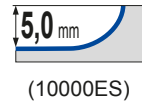
# Wave Radius Mill RSX(F)08000/10000/12000ES

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

**New**

## Shank Type

|            |        |           |
|------------|--------|-----------|
| Rake Angle | Radial | -5° ~ -8° |
|            | Axial  | 10°       |



## Body (RSX...ES, Standard)

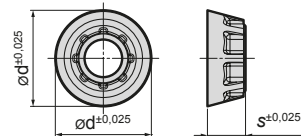
| Cat. No.     | Stock | Dimensions (mm) |    |      |    |    |     | No. of teeth | Weight (kg) |
|--------------|-------|-----------------|----|------|----|----|-----|--------------|-------------|
|              |       | ØD              | Ød | Ød1  | L1 | L2 | L   |              |             |
| RSX 08020 ES | ●     | 20              | 20 | 16,9 | 30 | 70 | 100 | 2            | 0,3         |
| RSX 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         |
| RSX 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) |
|--------------|-------|-----------------|----|------|----|----|-----|--------------|-------------|
|              |       | ØD              | Ød | Ød1  | L1 | L2 | L   |              |             |
| RSXF08020 ES | ●     | 20              | 20 | 16,9 | 30 | 70 | 100 | 3            | 0,3         |
| RSXF08025 ES | ●     | 25              | 25 | 21,9 | 40 | 80 | 120 | 4            | 0,4         |
| RSXF10025 ES | ●     | 25              | 25 | 20,3 | 50 | 80 | 130 | 3            | 0,4         |
| RSXF10032 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 |        |        | M      | S      |        |         |      |                    |
| General Purpose      | P      |        | M      | S      | S      |         |      |                    |
| Roughing             | P      | K      |        |        | S      |         |      |                    |
| Cat. No.             | ACP200 | ACK300 | ACM100 | ACM200 | ACM300 | Dimens. |      | Applicable Cutters |
|                      |        |        |        |        |        | ød (IC) | S    |                    |
| ew RDET 0803M0EN G   | ●      | ●      | ●      | ●      | ●      | 8       | 3,18 | RSX(F) 08000ES     |
|                      | ●      | ●      | ●      | ●      | ●      | 8       | 3,18 |                    |
| RDET 10T3M0EN G      | ●      | ●      | ●      | ●      | ●      | 10      | 3,97 | RSX(F) 10000ES     |
|                      | ●      | ●      | ●      | ●      | ●      | 10      | 3,97 |                    |
| RDET 1204M0EN G      | ●      | ●      | ●      | ●      | ●      | 12      | 4,76 | RSX(F) 12000ES     |
|                      | ●      | ●      | ●      | ●      | ●      | 12      | 4,76 |                    |



Cutting Edge Cross Section



M0: IC is metric

## Spare Parts

| Applicable Cutters | Wrench   | Screw       |     |
|--------------------|----------|-------------|-----|
|                    |          |             |     |
| RSX(F) 08000ES     | TRDR08IP | BFTX02506IP | 1,5 |
| RSX(F) 10000ES     | TRDR15IP | BFTX03584IP | 3,0 |
| RSX(F) 12000ES     |          | BFTX0409IP  | 3,0 |

## Cutter Identification

**RSX**

Cutter Series

**F**

Fine Pitch Type

**10**

Insert Size

**025**

Cutter Diameter

**ES**

Endmill Type

## Recommended Cutting Conditions

Min.-Optimum-Max.

| ISO | Work Material           |                |                               | Hardness  | Cutting Speed<br>$v_c$ (m/min) | Feed Rate<br>$f_t$ (mm/t) | Grade            |
|-----|-------------------------|----------------|-------------------------------|-----------|--------------------------------|---------------------------|------------------|
| P   | Carbon Steel            |                |                               | 180-280HB | 100- <b>160</b> -200           | 0,20- <b>0,40</b> -0,60   | ACP200           |
|     | Alloy Steel             |                |                               | 180-280HB | 100- <b>140</b> -180           | 0,20- <b>0,30</b> -0,40   | ACP200           |
| M   | Stain-<br>less<br>Steel | Cr<br>Based    | Ferritic                      | 200HB     | 150- <b>180</b> -200           | 0,15- <b>0,25</b> -0,35   | ACM300           |
|     |                         |                | Martensitic                   | 200-330HB | 80- <b>120</b> -180            | 0,15- <b>0,25</b> -0,35   | ACM300           |
|     |                         | Cr-Ni<br>Based | Austenitic                    | 200HB     | 150- <b>180</b> -200           | 0,15- <b>0,25</b> -0,35   | ACM300           |
|     |                         |                | Austenitic, ferritic          | 230-270HB | 80- <b>120</b> -180            | 0,15- <b>0,25</b> -0,35   | ACM200           |
|     |                         |                | Precipitation hardening       | 330HB     | 60- <b>100</b> -160            | 0,15- <b>0,25</b> -0,35   | ACM200           |
| K   | Cast Iron               |                |                               | 250HB     | 80- <b>120</b> -160            | 0,10- <b>0,30</b> -0,40   | ACK300           |
| S   | Heat resistant alloy    |                | Ni based material             | 250-350HB | 20- <b>30</b> - 40             | 0,10- <b>0,20</b> -0,30   | ACM100<br>ACM200 |
|     | Titanium                |                | Pure Titanium                 | (Rm400)   | 60- <b>80</b> -100             | 0,10- <b>0,20</b> -0,30   |                  |
|     |                         |                | $\alpha + \beta$ alloy system | (Rm1050)  | 40- <b>50</b> - 60             | 0,10- <b>0,20</b> -0,30   |                  |

● = Euro stock

G20/G21

Recommended Tightening Torque (N·m)

# Exchangeable Head Endmills

## RSX(F)08000/10000/12000 M

**New**

### Modular Type

|            |        |           |
|------------|--------|-----------|
| Rake Angle | Radial | -5° ~ -8° |
|            | Axial  | 10°       |



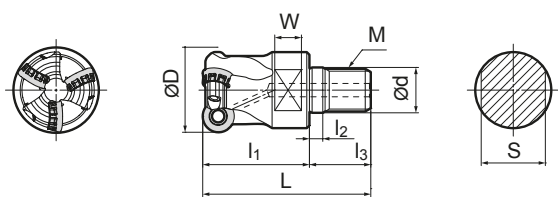
(08000ES)



(10000ES)



(12000ES)



### Body (RSX...M, Standard)

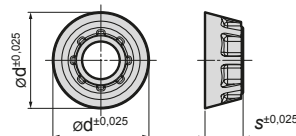
| Cat. No.                                                                                         | Stock | Dimensions (mm) |      |     |    |                |                |                |    |    |   | No. of Teeth | Weight (kg) |
|--------------------------------------------------------------------------------------------------|-------|-----------------|------|-----|----|----------------|----------------|----------------|----|----|---|--------------|-------------|
|                                                                                                  |       | ØD              | Ød   | M   | L  | I <sub>1</sub> | I <sub>2</sub> | I <sub>3</sub> | W  | S  |   |              |             |
|  RSX 08020M10Z2 | ●     | 20              | 10,5 | M10 | 49 | 30             | 5              | 19             | 8  | 15 | 2 | 0,1          |             |
|                                                                                                  | ●     | 25              | 12,5 | M12 | 56 | 35             | 5              | 21             | 10 | 19 | 3 | 0,1          |             |
|                                                                                                  | ●     | 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          |             |
|                                                                                                  | ●     | 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          |             |
|                                                                                                  | ●     | 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) |
|---------------------------------------------------------------------------------------------------|-------|-----------------|------|-----|----|----------------|----------------|----------------|----|----|---|--------------|-------------|
|                                                                                                   |       | ØD              | Ød   | M   | L  | L <sub>1</sub> | L <sub>2</sub> | L <sub>3</sub> | W  | S  |   |              |             |
|  RSXF 08020M10Z3 | ●     | 20              | 10,5 | M10 | 49 | 30             | 5              | 19             | 8  | 15 | 3 | 0,1          |             |
|                                                                                                   | ●     | 25              | 12,5 | M12 | 56 | 35             | 5              | 21             | 10 | 19 | 4 | 0,1          |             |
|                                                                                                   | ●     | 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          |             |
|                                                                                                   | ●     | 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          |             |
|                                                                                                   | ●     | 40              | 17,0 | M16 | 63 | 40             | 5              | 23             | 10 | 24 | 4 | 0,3          |             |

### Inserts

| Application                | Grade  |        |        |        |        |         |      | Applicable Cutters |
|----------------------------|--------|--------|--------|--------|--------|---------|------|--------------------|
| High Speed/Light Cut       |        |        | M      | S      |        |         |      |                    |
| General Purpose            | P      | M      | M      | S      | S      |         |      |                    |
| Roughing                   | P      | M      | K      |        | S      |         |      |                    |
| Cat. No.                   | ACP200 | ACK300 | ACM100 | ACM200 | ACM300 | Dimens. |      |                    |
|                            |        |        |        |        |        | Ød (IC) | S    |                    |
| <b>New</b> RDET 0803M0EN G | ●      | ●      | ●      | ●      | ●      | 8       | 3,18 | RSX(F) 08000ES     |
|                            | ●      | ●      | ●      | ●      | ●      | 8       | 3,18 |                    |
| RDET 10T3M0EN G            | ●      | ●      | ●      | ●      | ●      | 10      | 3,97 | RSX(F) 10000ES     |
|                            | ●      | ●      | ●      | ●      | ●      | 10      | 3,97 |                    |
| RDET 1204M0EN G            | ●      | ●      | ●      | ●      | ●      | 12      | 4,76 | RSX(F) 12000ES     |
|                            | ●      | ●      | ●      | ●      | ●      | 12      | 4,76 |                    |



Cutting Edge Cross Section



G - Type



H - Type

M0: IC is metric

### Spare Parts

| Applicable Cutters | Wrench   | Screw       |     |
|--------------------|----------|-------------|-----|
|                    |          |             |     |
| RSX(F) 08000M      | TRDR08IP | BFTX02506IP | 1,5 |
| RSX(F) 10000M      | TRDR15IP | BFTX03584IP | 3,0 |
| RSX(F) 12000M      |          | BFTX0409IP  | 3,0 |

### Cutter Identification

|               |                 |             |                 |                     |              |
|---------------|-----------------|-------------|-----------------|---------------------|--------------|
| <b>RSX</b>    | <b>F</b>        | <b>10</b>   | <b>025</b>      | <b>M12</b>          | <b>Z3</b>    |
| 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  | Cutting Speed<br>v <sub>c</sub> (m/min) | Feed Rate<br>f <sub>t</sub> (mm/t) | Grade            |
|-----|----------------------|-------------|-------------------------|-----------|-----------------------------------------|------------------------------------|------------------|
| P   | Carbon Steel         |             |                         | 180-280HB | 100- <b>160</b> -200                    | 0,20- <b>0,40</b> -0,60            | ACP200           |
|     | Alloy Steel          |             |                         | 180-280HB | 100- <b>140</b> -180                    | 0,20- <b>0,30</b> -0,40            | ACP200           |
| M   | Stain-less Steel     | Cr Based    | Ferritic                | 200HB     | 150- <b>180</b> -200                    | 0,15- <b>0,25</b> -0,35            | ACM300           |
|     |                      |             | Martensitic             | 200-330HB | 80- <b>120</b> -180                     | 0,15- <b>0,25</b> -0,35            | ACM300           |
|     |                      | Cr-Ni Based | Austenitic              | 200HB     | 150- <b>180</b> -200                    | 0,15- <b>0,25</b> -0,35            | ACM300           |
|     |                      |             | Austenitic, ferritic    | 230-270HB | 80- <b>120</b> -180                     | 0,15- <b>0,25</b> -0,35            | ACM200           |
|     |                      |             | Precipitation hardening | 330HB     | 60- <b>100</b> -160                     | 0,15- <b>0,25</b> -0,35            | ACM200           |
| K   | Cast Iron            |             |                         | 250HB     | 80- <b>120</b> -160                     | 0,10- <b>0,30</b> -0,40            | ACK300           |
| S   | Heat resistant alloy |             | Ni based material       | 250-350HB | 20- <b>30</b> - 40                      | 0,10- <b>0,20</b> -0,30            | ACM100<br>ACM200 |
|     | Titanium             |             | Pure Titanium           | (Rm400)   | 60- <b>80</b> -100                      | 0,10- <b>0,20</b> -0,30            |                  |
|     |                      |             | α + β alloy system      | (Rm1050)  | 40- <b>50</b> - 60                      | 0,10- <b>0,20</b> -0,30            |                  |



# "Wave Mill" Series

## WFXC Type

**New**



### 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

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

| ISO      | Grade          | Finishing to Light Cutting | Medium Cut | Rough to Heavy Cutting |
|----------|----------------|----------------------------|------------|------------------------|
| <b>K</b> | Coated Carbide | ACK200                     | ACK300     |                        |
|          |                |                            |            |                        |
|          |                |                            |            |                        |
| <b>N</b> | Coated Carbide | DL1000                     |            |                        |
|          |                |                            |            |                        |
|          |                |                            |            |                        |

### Application Notes

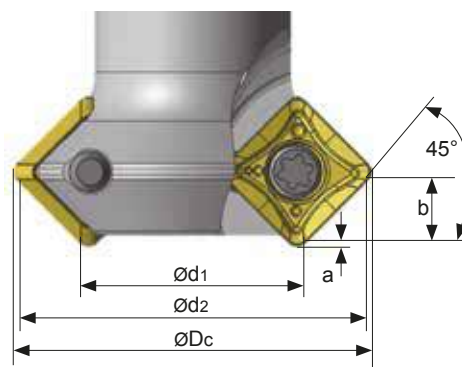
Since chamfering uses the straight cutting edge portion of the insert, the range that can be chamfered will change depending on the corner radius ( $r_\epsilon$ ) of the insert that is attached to the body.

Work diameter: Use in a range greater or equal to  $\phi d_1$  and less than or equal to  $\phi d_2$ .

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.    | $r_\epsilon$ | $\phi d_1$         | $\phi d_2$         | a          | b          | $\phi D_c$    |
| 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)



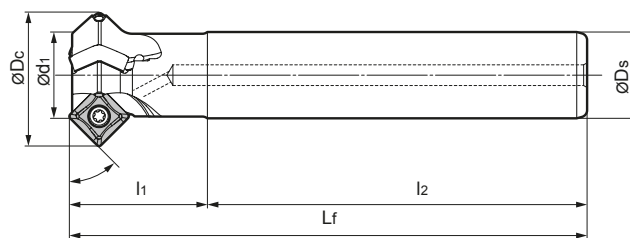
**New**

# "Wave Mill" Series

## 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) |
|-------------|-------|-----------------|------|-----|----|----|-----|--------------|-------------|
|             |       | Ød1             | ØDc  | Lf  | l1 | l2 | ØDs |              |             |
| WFCX 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) |
|-------------|-------|-----------------|------|-----|----|-----|-----|--------------|-------------|
|             |       | Ød1             | ØDc  | Lf  | l1 | l2  | ØDs |              |             |
| WFCX 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**

Cutter Series

**C**

Chamfering

**08**

Insert Size

**016**

Cutter Diameter

**E**

Endmill Type

### Inserts

| Application            |                    | Coated Carbide |        |        |        |        |        |        | Carbide | DLC    |                               |      |                    |  |
|------------------------|--------------------|----------------|--------|--------|--------|--------|--------|--------|---------|--------|-------------------------------|------|--------------------|--|
| High Speed / Light cut |                    | P              |        |        |        | K      |        |        | M S     | K N    |                               |      |                    |  |
| General Purpose        |                    |                | P M    | P M    |        | K      |        |        | M S     | M S    |                               |      | N                  |  |
| Roughing               |                    |                | P M    | P M    |        | K      |        |        | M S     |        |                               |      | N                  |  |
| Cat. No.               |                    | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1      | DL1000 | Radius (mm)<br>r <sub>ε</sub> | Fig. | Applicable Cutters |  |
| SOMT                   | 080304 PZER L      | ●              | ●      | ●      | ●      | ●      | ●      | ●      | —       | —      | 0,4                           | 1    | WFXC08000E         |  |
|                        | 080308 PZER L      | ●              | ●      | ●      | ●      | ●      | ●      | ●      | —       | —      | 0,8                           | 1    |                    |  |
|                        | 080304 PZER G      | ●              | ●      | ●      | ●      | ●      | ●      | ●      | —       | —      | 0,4                           | 1    |                    |  |
|                        | 080308 PZER G      | ●              | ●      | ●      | ●      | ●      | ●      | ●      | —       | —      | 0,8                           | 1    |                    |  |
|                        | 080312 PZER G      | ●              | ●      | ●      | ●      | ●      | ●      | ●      | —       | —      | 1,2                           | 1    |                    |  |
|                        | 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    | WFXC12000E         |  |
|                        | 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 PDER S      | —              | —      | —      | —      | —      | —      | —      | ●       | ●      | 0,8                           | 2    |                    |  |

### Spare Parts

| Applicable Cutter | Screw       |     | Wrench   |
|-------------------|-------------|-----|----------|
|                   |             |     |          |
| 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.

Indexable Endmills

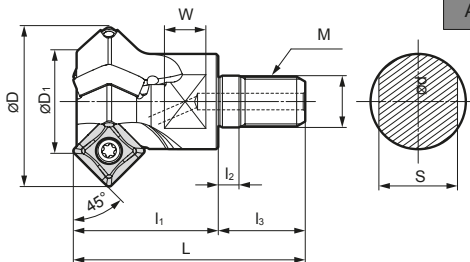
H45

# "Wave Mill" Series

## WFXC 08000/12000 M

**New**

### Modular Type



|            |        |     |
|------------|--------|-----|
| Rake Angle | Radial | 0°  |
|            | Axial  | 0°  |
|            |        | 45° |

### Head (WFXC 08000M)

| Cat. No.       | Stock | Dimensions (mm) |      |     |    |    |    |    |    |   |    | No. of Teeth | Weight (kg) |
|----------------|-------|-----------------|------|-----|----|----|----|----|----|---|----|--------------|-------------|
|                |       | ØD1             | ØD   | Ød  | M  | L  | l1 | l2 | l3 | W | S  |              |             |
| WFXC08016M08Z2 |       | 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 | Chamfering | Insert Size | Cutter Diameter | Screw Size | No. of Teeth |

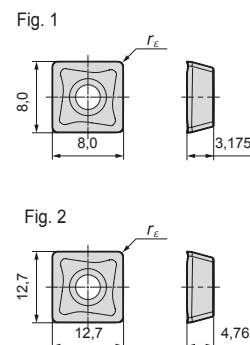
### Head (WFXC 12000M)

| Cat. No.       | Stock | Dimensions (mm) |      |      |     |    |    |    |    |    |    | No. of Teeth | Weight (kg) |
|----------------|-------|-----------------|------|------|-----|----|----|----|----|----|----|--------------|-------------|
|                |       | ØD1             | ØD   | Ød   | M   | L  | l1 | l2 | l3 | W  | S  |              |             |
| WFXC12025M12Z3 |       | 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      |        |        | M S    | K N     |        |                               |      |
| General Purpose        |               | P M            | P M    | K      |        |        |        | M S    | M S     | N      |                               |      |
| Roughing               |               | P M            | P M    |        | K      |        |        | M S    |         | N      |                               |      |
| Cat. No.               |               | ACP100         | ACP200 | ACP300 | ACK200 | ACK300 | ACM200 | ACM300 | H1      | DL1000 | Radius (mm)<br>r <sub>ε</sub> | 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    |
|                        | 120408 PDER H | ●              | ●      | ●      | ●      | ●      | ●      | ●      | -       | -      | 0,8                           | 2    |
| SOET 120408 PDER S     |               | -              | -      | -      | -      | -      | -      | -      | ●       | ●      | 0,8                           | 2    |



### Spare Parts

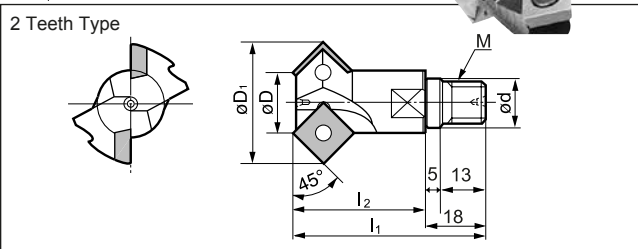
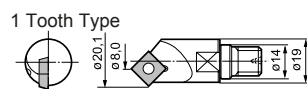
| Applicable Cutter | Screw       |     | Wrench   |
|-------------------|-------------|-----|----------|
|                   |             |     |          |
| WFXC08000M        | BFTX0306IP  | 2,0 | TRDR08IP |
| WFXC12000M        | BFTX03512IP | 3,0 | TRDR15IP |

### 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 |
|     | 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       | 250HB         | 100-175-250   | 0,05-0,10-0,15 |

Min. - Optimum - Max.

# Chamfering Endmills SCP Type



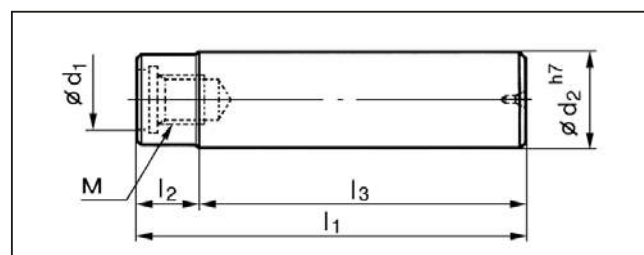
## Body

| Cat. No. | Stock | Dimensions (mm) |                  |     |                |                |     | No. of teeth |
|----------|-------|-----------------|------------------|-----|----------------|----------------|-----|--------------|
|          |       | ø D             | ø D <sub>1</sub> | ø d | l <sub>1</sub> | l <sub>2</sub> | M   |              |
| SCP 308  | ●     | 8               | 20,1             | 14  | 50             | 32             | M12 | 1            |
| SCP 419  | ●     | 19              | 35,6             | 14  | 56             | 38             | M12 | 2            |
| SCP 432  | ●     | 32              | 48,6             | 20  | 60             | 42             | M16 | 3            |

## Inserts

| Cat. No.      | Carbide |      |  |  | Fig. | Applicable Endmill |
|---------------|---------|------|--|--|------|--------------------|
|               | A30N    | G10E |  |  |      |                    |
| SDMA 090308   | ●       | ●    |  |  | 1.   | SCP 308            |
| SDMA 090308 T | ●       |      |  |  |      |                    |
| SPMA 120408   |         | ●    |  |  | 2.   | SCP 419            |
| SPMA 120408 T | ●       |      |  |  |      | SCP 432            |

## Holder for SCP

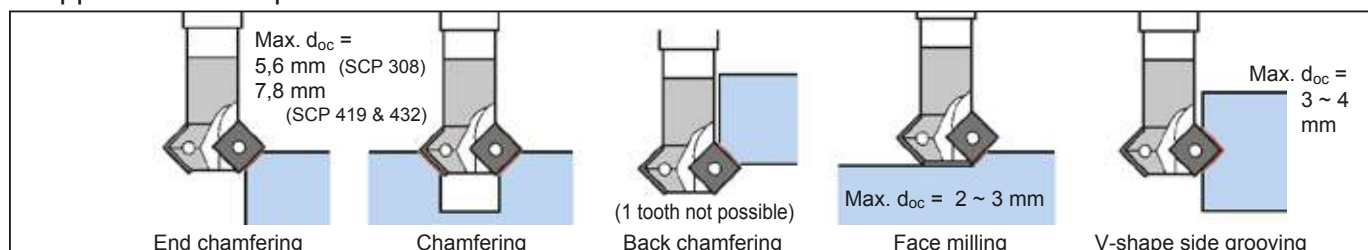


| Cat. No. | Stock | Dimensions (mm)  |                  |     |                |                |                | Applicable Endmill |
|----------|-------|------------------|------------------|-----|----------------|----------------|----------------|--------------------|
|          |       | ø d <sub>1</sub> | ø d <sub>2</sub> | M   | L <sub>1</sub> | L <sub>2</sub> | L <sub>3</sub> |                    |
| SCA 20   | ●     | 14               | 20               | M12 | 105            | 20             | 85             | SCP 308<br>SCP 419 |
| SCA 32   | ●     | 20               | 32               | M16 | 130            | 20             | 110            | SCP 432            |

## Spare Parts

| SCP     | Screw       | Wrench     |
|---------|-------------|------------|
|         |             |            |
| 308     | BFTX 0407 N | 3,0 TRX 10 |
| 419,432 | BFTX 0511 N | 5,0 TRX 20 |

## Application Examples



## Recommended Cutting Conditions for SCP

( min. - optimal - max.)

| Multi-Mills | ø D (mm)    | Tooling      | Cutting Conditions        | General steel   |              |              | Cast iron      |
|-------------|-------------|--------------|---------------------------|-----------------|--------------|--------------|----------------|
|             |             |              |                           | Less than HRC25 | HRC25 ~ 35   | HRC35 ~ 45   | (GG20)         |
| SCP 308     | 8,5 ~ 19,5  | Chamfering   | v <sub>c</sub> (m/min)    | 80 - 100 - 140  | 50 - 60 - 80 | 20 - 40 - 60 | 90 - 110 - 130 |
| SCP 419     | 19,5 ~ 35,1 |              | f <sub>t</sub> (mm/tooth) | 0,15 - 0,4      | 0,1 - 0,25   | 0,05 - 0,15  | 0,2 - 0,5      |
| SCP 432     | 32,5 ~ 48,1 | Face milling | v <sub>c</sub> (m/min)    | 80 - 100 - 140  | 50 - 60 - 80 | 20 - 40 - 60 | 90 - 110 - 130 |
|             |             |              | f <sub>t</sub> (mm/tooth) | 0,1 - 0,2       | 0,05 - 0,1   | 0,04 - 0,08  | 0,1 - 0,3      |



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# Coated & Solid Endmills

J1 ~ J50



## Coated Endmills

|                                    |                                                  |          |
|------------------------------------|--------------------------------------------------|----------|
| Selection Guide                    | According to Work Materials.....                 | J 2 - 3  |
|                                    | New Global Standard Endmills.....                | J 4 - 6  |
| GSX MILL Series                    | <b>GSX</b> 20000 .....                           | J 7 - 11 |
|                                    | <b>GSX</b> 30000 .....                           | J12-13   |
| Slotted Type                       | <b>GSXSLT</b> 30000.....                         | J14      |
|                                    | <b>GSX</b> 40000 .....                           | J15-19   |
| Anti-Vibration Type                | <b>GSXVL</b> 40000.....                          | J20-21   |
| SSEH MILL Series for Exotic Alloys | <b>SSEHVL</b> 4000W-R / <b>SSEH</b> 4000W-R..... | J22-24   |
| GS MILL Series, Roughing Type      | <b>GSRE</b> 4000SF.....                          | J25      |
| Hard Type                          | <b>GSH</b> 4000/6000/8000SF .....                | J26      |
| AURORA COAT MILL Series            | <b>ASM</b> 2000/4000DL / <b>DL-R</b> .....       | J27-28   |
| SSUP MILL Series                   | <b>SSUP</b> 4000ZX/ZX-R.....                     | J32-33   |
| Standard Type                      | <b>SSM</b> 2000/4000ZX .....                     | J29      |
| Hard Type                          | <b>LHHM</b> 4000/6000/8000ZX .....               | J30      |
|                                    | <b>EHHM</b> 4000/6000/8000ZX .....               | J30      |
| Fast Helix Type                    | <b>HSM</b> 2000/3000/4000ZX.....                 | J31      |
| GSX Mills Ball Type                | <b>GSXB</b> 20000 .....                          | J34      |
| GS Mills Ball Type                 | <b>GLB</b> 2000SF .....                          | J35      |
| Ball Mills "Neo"                   | <b>SNB</b> 2000ZX .....                          | J36-37   |
| AURORA COAT Ball Type              | <b>SNB</b> 2000DL .....                          | J38      |

## Uncoated Endmills

|                                                    |                                                |        |
|----------------------------------------------------|------------------------------------------------|--------|
| SSEH MILL Series for Exotic Alloys                 | <b>SSEHVL</b> 4000-R / <b>SSEH</b> 4000-R..... | J39    |
| Standard Type                                      | <b>SSM</b> 2000/4000.....                      | J40-41 |
| Long Type                                          | <b>LSM</b> 2000/4000 .....                     | J42    |
| Extra LongType                                     | <b>ELSM</b> 2000/4000 .....                    | J43    |
| Fast Helix Type                                    | <b>HSM</b> 2000/3000/4000 .....                | J44    |
| For Aluminium Cutting                              | <b>ASM</b> 2000 .....                          | J45    |
| Straight Flute Ball Type                           | <b>BSM</b> 2000 .....                          | J45    |
| SUMIBORON "Helical Master" for Hardened Steel      | <b>BNES</b> 1000.....                          | J46    |
| SUMIBORON "Mould Finish Master" for Hardened Steel | <b>BNBP</b> 2R...4/6 .....                     | J47    |
| SUMIDIA "Mould Finish Master" Binderless           | <b>NPDRS</b> / <b>NPDB(S)</b> .....            | J48-49 |

Solid Carbide  
Endmills

# Solid Carbide Endmills 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**  
ø1~25mm  
•2 Flutes  
•3 Flutes  
•4 Flutes

Anti-Vibration Radius Corner Endmills  
**GSXVL Type**  
ø2~25mm  
•4 Flutes

⇒ J7~19

⇒ J20~21

Coated Sharp General

ZX-COATED  
**SSM-ZX Type**  
ø0.3~32mm  
•2 Flutes  
•4 Flutes

⇒ J29

#### General Steel (Special Use)

Plunge Cut Multi-Purpose

Coated Sharp General

GSX MILL  
**GSXSLT Type**  
ø1~16mm  
•3 Flutes

⇒ J14

High Efficiency

Coated Strong High Efficiency

UPMILL  
**SSUP-ZX Type**  
ø2~20mm  
•4 Flutes

⇒ J28~29

High Efficiency

Coated Strong High Efficiency

ROUGHING ENDMILL  
**GSRE-SF Type**  
ø6~20mm  
•4 Flutes

⇒ J27

#### Hardened Steel

High performance Type

Coated Strong High Efficiency

GS-MILL-HARD  
**GSH-SF Type**  
ø1~20mm  
•4 Flutes  
•6 Flutes  
•8 Flutes

⇒ J26

High Rigidity Type

Coated Strong High Efficiency

HARD ENDMILL  
**LHHM...ZX**  
**EHHM...ZX**  
ø3~32mm  
•4 Flutes  
•6 Flutes  
•8 Flutes

⇒ J30

SumiBoron Endmill

CBN

"Helical Master"  
**BNES Type**  
ø6~16mm  
•1 Flute

⇒ J46, M50

#### Exotic Metals

For Heat Resistant Steel

Coated Sharp General

Radius Endmills Standard  
**SSEH Type**  
ø4.5~25mm  
•4 Flutes

Anti-Vibration Radius Endmills  
**SSEHVL Type**  
ø4.5~25mm  
•4 Flut

⇒ J22, J24, J39

⇒ J22~23, J39

#### Non-ferrous Metal

SumiDia Endmill

PCD

SUMIDIA brazed  
**DFE Type**  
ø4~13mm  
•1 Flute  
•2 Flutes  
•4 Flutes

⇒ Stock in Japan

DLC-Coated Endmill

Coated Sharp General

AURORA COATED  
**ASM-DL Type**  
ø2~16mm  
•2 Flutes  
•4 Flutes

⇒ J27~28

For Heat Resistant Steel

Coated Strong High Efficiency

ZX-COATED HI-HELIX  
**HSM-ZX Type**  
ø2~25mm  
•2 Flutes  
•3 Flutes  
•4 Flutes

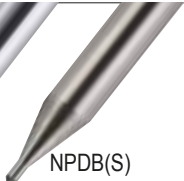
⇒ J31

# Solid Carbide Endmills Selection Guide

## ● According to Work Materials

### Ballnose Type

|                             |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                        |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General Steel (Common Use)  | <div>Coated General</div> <div>GSX MILL BALL<br/><b>GSXB Type</b><br/>R0.2~12.5mm<br/>•2 Flutes</div>  <div>⇒ J34</div>                           | <div>Coated General</div> <div>GS MILL BALL<br/><b>GLB-SF Type</b><br/>R0.5~6mm<br/>•2 Flutes</div>  <div>⇒ J35</div>                                 |
|                             | <div>Coated General</div> <div>NEOBALL<br/><b>SNB-ZX Type</b><br/>R0.5~15mm<br/>•2 Flutes</div>  <div>⇒ J36~37</div>                             |                                                                                                                                                                                                                                        |
|                             | General Steel (Short Series)                                                                                                                                                                                                       |                                                                                                                                                                                                                                        |
|                             | <div>Coated Short General</div> <div>NEOBALL SHORT FLUTE<br/><b>S-SNB-ZX Type</b><br/>R1.5~15mm<br/>•2 Flutes</div>  <div>⇒ Stock in Japan</div> | <div>Coated Short General</div> <div>ZX-COATED SHORT FLUTE<br/><b>S-SSB-ZX Type</b><br/>R1.5~4mm<br/>•2 Flutes</div>  <div>⇒ Stock in Japan</div>   |
| General Steel (Long Series) |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                        |
|                             |                                                                                                                                                                                                                                    | <div>Coated Long General</div> <div>NEOBALL (LONG TYPE)<br/><b>LSNB-ZX Type</b><br/>R0.5~15mm<br/>•2 Flutes</div>  <div>⇒ Stock in Japan</div>      |
|                             |                                                                                                                                                                                                                                    | <div>Coated Long General</div> <div>NEOBALL (EXTRA-LONG TYPE)<br/><b>ESNB-ZX Type</b><br/>R3~15mm<br/>•2 Flutes</div>  <div>⇒ Stock in Japan</div> |

|                |                                                                                                                                                                                                                                 |                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hardened Steel | High Rigidity Type                                                                                                                                                                                                              | Hardened Steel                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                | <div>Coated Strong High Efficiency</div> <div>HARDBALL<br/><b>SHB-ZX Type</b><br/>R0.5~10mm<br/>•2 Flutes</div>  <div>⇒ Stock in Japan</div> | <div>CBN</div> <div>SUMIBORON brazed<br/><b>BNBP Type</b><br/>R0.2~1.0mm<br/>•2 Flutes</div>  <div>⇒ J47, M51</div> | <div>PCD <b>New</b></div> <div>SUMIDIA binderless<br/><b>NPDRS Type</b><br/>R0.2~2.0mm<br/>•1 Flute<br/>Radius Endmill</div>  <div><b>NPDB(S) Type</b><br/>R0.1~1.0mm<br/>•1 Flute<br/>Ballnose Endmill</div>  <div>⇒ J48-49, M52-53</div> |

|                   |                                                                                                                                                                                                         |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Non-ferrous Metal | DLC-Coated Endmill                                                                                                                                                                                      |
|                   | <div>Coated General</div> <div>AURORA COATED<br/><b>SNB-DL Type</b><br/>R1~8mm<br/>•2 Flutes</div>  <div>⇒ J38</div> |

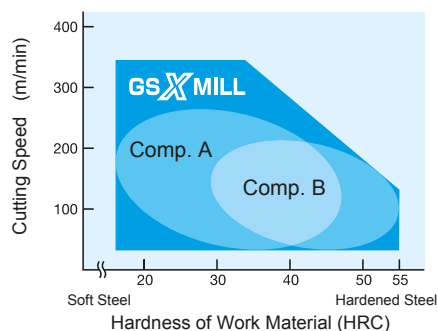
# GSX MILL Series



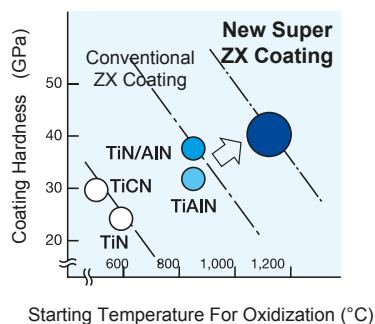
## ■ Characteristics and Applications

- 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.

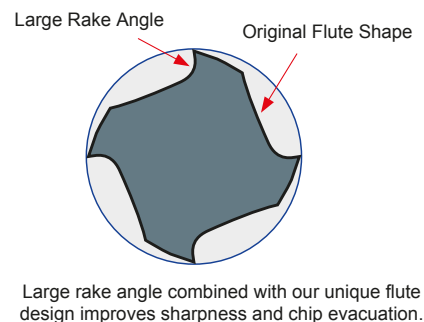
## ● Wear Resistance



## ● Thermal Resistance

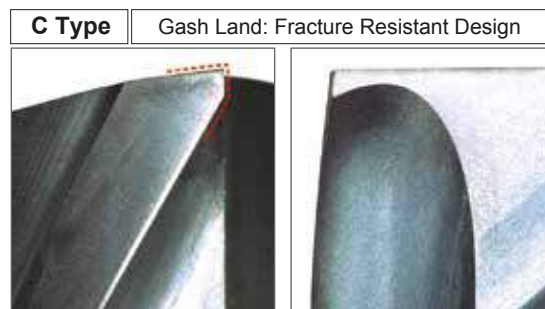
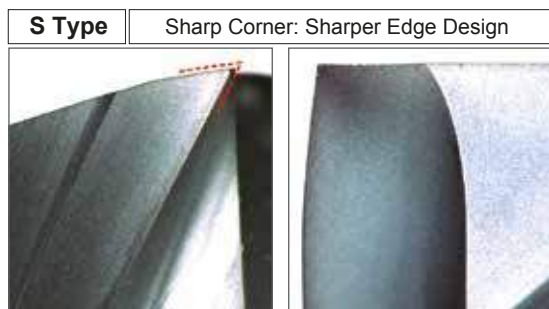


## ● Improved Chip Evacuation



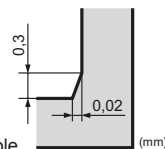
## ■ 2 cutting edge designs expand machining applications

Sharper edge S type and fracture resistant C type added to the 2D size series.



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  $\phi 10$ 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 |             |             | Stainless Steel | Ti Alloy | Heat Resistant Alloy | Cast Iron | Al Alloy |
|                   |              |              |             |                    |                    | 45 ~ 55 HRC    | 55 ~ 60 HRC | 60 ~ 65 HRC |                 |          |                      |           |          |
| ○                 | ○            | ○            | ○           | ○                  | ○                  | ○              | ○           | ○           | ○               | ○        | ○                    | ○         | ○        |

○ : 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.

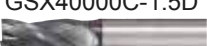
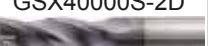
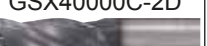
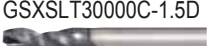
\*2: Use with small depth of cut.

# GSX MILL Series



Large rake angle and unique flute design improve sharpness and excellent chip evacuation.

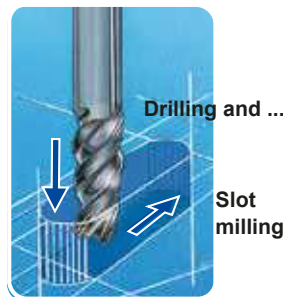
## Product Range

| 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<br><br>⇒ J 7      | GSX20000S-2D<br><br>⇒ J 8  | GSX20000C-2D<br><br>⇒ J 9  | GSX20000C-3D<br><br>⇒ J 10 | GSX20000C-4D<br><br>⇒ J 11 |
|                     | 3 Flutes     | GSX30000C-1.5D<br><br>⇒ J 12     |                                                                                                             | GSX30000C-2D<br><br>⇒ J 13 |                                                                                                               |                                                                                                               |
|                     | 4 Flutes     | GSX40000C-1.5D<br><br>⇒ J 15     | GSX40000S-2D<br><br>⇒ J 16 | GSX40000C-2D<br><br>⇒ J 17 | GSX40000C-3D<br><br>⇒ J 18 | GSX40000C-4D<br><br>⇒ J 19 |
| Compound Endmilling | 3 Flutes     | GSXSLT30000C-1.5D<br><br>⇒ J 14 |                                                                                                             |                                                                                                              |                                                                                                               |                                                                                                               |

## Multi-Purpose "GSX-SLT" Slot Type

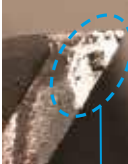
- Optimized flute design of slotted 3 flute (1.5D) short type reduces cutting resistance.

- Allows drilling and slot milling and other continuous (compound) applications.
- Perfect for use with thin sheets and small machining centres



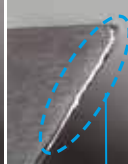
## Application Examples

### Carbon Steel Grooving with GSX20000C

| GSX 20000C                                                                          | Competitor                                                                          | Gash land for stronger cutting edge.             |                                                                            |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------|
|  |  | Tool dimension<br>Work material<br>Cutting speed | ø6 (2 Flutes)<br>C50<br>$v_c = 87 \text{ m/min}$<br>$n = 4615 \text{ rpm}$ |
|                                                                                     |                                                                                     | Feed rate                                        | $f_t = 0,06 \text{ mm/teeth}$<br>$v_f = 553 \text{ mm/min}$                |
|                                                                                     |                                                                                     | Depth of cut<br>Wide of cut<br>Cooland           | $d_{oc} = 3 \text{ mm}$<br>$w_{oc} = 6 \text{ mm}$<br>Dry                  |
|                                                                                     |                                                                                     | Vertical machining centre (BT50)                 |                                                                            |

Breakage

### Cast Iron Grooving with GSX20000C

| GSX 20000C                                                                          | Competitor                                                                           | GSX coating for improved wear resistance.        |                                                                               |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------|
|  |  | Tool dimension<br>Work material<br>Cutting speed | ø10 (2 Flutes)<br>GGG60<br>$v_c = 66 \text{ m/min}$<br>$n = 2100 \text{ rpm}$ |
|                                                                                     |                                                                                      | Feed rate                                        | $f_t = 0,072 \text{ mm/teeth}$<br>$v_f = 302 \text{ mm/min}$                  |
|                                                                                     |                                                                                      | Depth of cut<br>Wide of cut<br>Cooland           | $d_{oc} = 5 \text{ mm}, 5 \text{ passes}$<br>$w_{oc} = 10 \text{ mm}$<br>Dry  |
|                                                                                     |                                                                                      | Vertical machining centre (BT40)                 |                                                                               |

High Wear

### Stainless Steel Machining with GSX20000C

| GSX 20000C                                                                          | Competitor                                                                          | Improved reliability even under wet machining.   |                                                                                      |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  | Tool dimension<br>Work material<br>Cutting speed | ø10 (2 Flutes)<br>X5 CrNi 1812<br>$v_c = 50 \text{ m/min}$<br>$n = 1591 \text{ rpm}$ |
|                                                                                     |                                                                                     | Feed rate                                        | $f_t = 0,04 \text{ mm/teeth}$<br>$v_f = 27 \text{ mm/min}$                           |
|                                                                                     |                                                                                     | Depth of cut<br>Wide of cut<br>Cooland           | $d_{oc} = 10 \text{ mm}$<br>$w_{oc} = 0,5 \text{ mm}$<br>Wet                         |
|                                                                                     |                                                                                     | Vertical machining centre (BT50)                 |                                                                                      |

Coating peel off

### Surface Milling C50 with GSX20000S

| GSX 20000S                                                                          | Competitor                                                                           | S type delivers optimum cutting performance.     |                                                                            |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------|
|  |  | Tool dimension<br>Work material<br>Cutting speed | ø6 (2 Flutes)<br>C50<br>$v_c = 87 \text{ m/min}$<br>$n = 4615 \text{ rpm}$ |
|                                                                                     |                                                                                      | Feed rate                                        | $f_t = 0,06 \text{ mm/teeth}$<br>$v_f = 553 \text{ mm/min}$                |
|                                                                                     |                                                                                      | Depth of cut<br>Wide of cut<br>Cooland           | $d_{oc} = 10 \text{ mm}$<br>$w_{oc} = 0,3 \text{ mm}$<br>Dry               |
|                                                                                     |                                                                                      | Vertical machining centre (BT50)                 |                                                                            |

Chipping



# 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  $\phi 4$  and up).
- New fine-grained carbide substrate and special coating for better rigidity and thermal and wear resistance.

### ■ Product Range

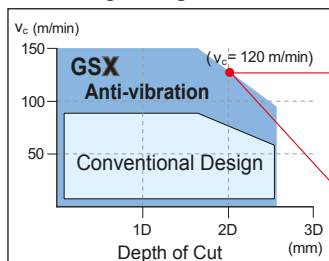
#### GSX MILL Anti-vibration Square Type

| Series                | No. of Teeth | Series                                                                              | $\phi D$ (mm)         |
|-----------------------|--------------|-------------------------------------------------------------------------------------|-----------------------|
| <b>GSXVL4000-2.5D</b> | 4 Flutes     |  | $\phi 2 \sim \phi 20$ |
|                       |              | $\Rightarrow$ J 20                                                                  |                       |

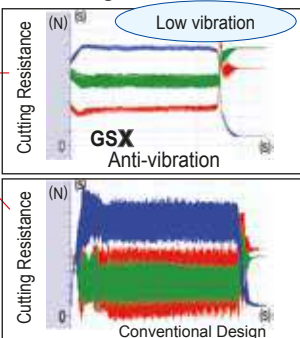
#### GSX MILL Anti-vibration Corner Radius Type

| Series                  | No. of Teeth | Series                                                                              | $\phi D$ (mm)         |
|-------------------------|--------------|-------------------------------------------------------------------------------------|-----------------------|
| <b>GSXVL4000-R-2.5D</b> | 4 Flutes     |  | $\phi 3 \sim \phi 20$ |
|                         |              | $\Rightarrow$ J 21                                                                  |                       |

### ■ Cutting Range

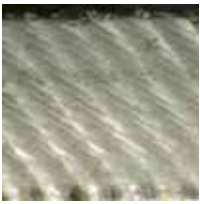


### ■ Cutting Resistance



### ■ Application Range

#### ● Surface Finish Quality

| GSX Anti-vibration                                                                  | Competitor's Anti-vibration                                                         | Conventional Design                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |
| No Chattering<br>Clean Surface                                                      | Minute Chattering<br>Poor Surface                                                   | Heavy Chattering<br>Poor Surface                                                    |
| Work material: C50                                                                  | Cutting Conditions: $n = 4.800$ rpm<br>$v_f = 800$ mm/min<br>$d_{oc} = 10$ mm       | Equipment: BT50                                                                     |
| Grooving: $\phi 10$                                                                 | Depth of cut                                                                        |                                                                                     |
| Tool dimension: $\phi 10$                                                           | Equipment:                                                                          |                                                                                     |



J 34

## GSX MILL Ball

### ■ Characteristics and Applications

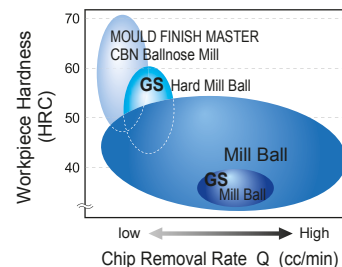
- New coating combined with a fine-grained carbide substrate affords better thermal and wear resistance.
- Large helix angle on cutting edge reduces cutting resistance.
- Unique pocket design and expanded pocket area promotes better chip evacuation.

Expands the range of machineable material from soft to hardened steels, and offers reliability and longer tool life.

### ■ Product Range

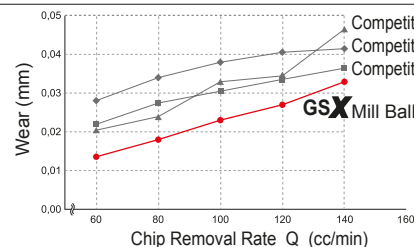
| Series             | No. of Teeth | Series                                                                                | $\phi D$ (mm)                                          |
|--------------------|--------------|---------------------------------------------------------------------------------------|--------------------------------------------------------|
| <b>GSX-B 20000</b> | 2 Flutes     |  | $R\phi 0,2 \sim \phi 15$<br>( $\phi D = 0,2 \sim 30$ ) |
|                    |              | $\Rightarrow$ J 36                                                                    |                                                        |

### ■ Application Range



### ■ Application Examples

#### ● Flank Wear



#### GSX Ball (Cutting Length 140 m)



Able to continue

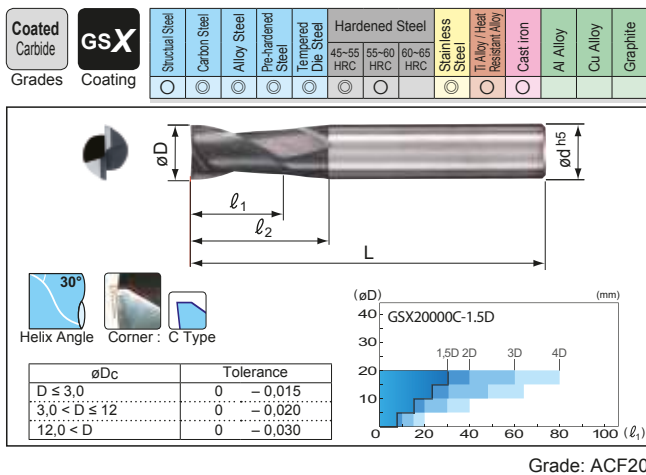
#### Conventional Tool (Cutting Length 80 m)



Unable to continue

Work Material : X40CrMo5-1 (50HRC)  
 Tool Dimensions : R3 (2 Flutes)  
 Cutting Conditions :  $v_c = 179$  m/min ( $n = 9.500$  rpm)  
 $v_f = 2.250$  mm/min ( $f_t = 0,12$  mm/t)  
 $d_{oc} = 0,2 \sim 1,0$  mm,  $w_{oc} = 0,3$  mm, Wet  
 Equipment Vertical Machining Centre BT40

Chipping in centre  
 Heavy wear on  
 flank face



### Endmill Identification (GSX MILL Series)

## GSX 2 0100 C - 1.5D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length

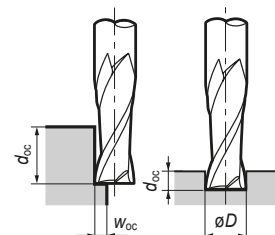
( S: Sharp Edge  
C: Gash Land Drilling )

### Endmills

| Cat. No.        | Stock | øD   | l <sub>1</sub> | l <sub>2</sub> | L   | ød |
|-----------------|-------|------|----------------|----------------|-----|----|
| 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 |

### Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



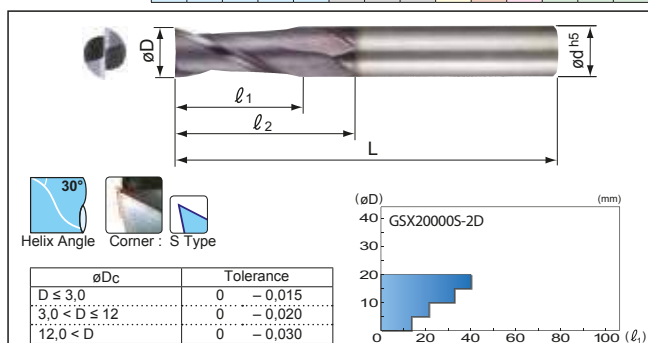
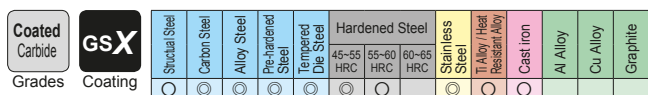
### Shoulder Milling

| Work Material    | 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 Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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 | d <sub>oc</sub>     |                    | 1,5 D                       |                    |                     |                    |                           |                    |                                              |                    | 1,0 D                        |                    |                     |                    |                                      |                    |
|                  | w <sub>oc</sub>     |                    | 0,05 D                      |                    |                     |                    |                           |                    |                                              |                    | 0,02 D                       |                    |                     |                    |                                      |                    |

### Grooving

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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      | d <sub>oc</sub>     |                    | 0,2 D                       |                    | 0,5 D               |                    |                           |                    | 0,2 D                                        |                    | 0,05 D                       |                    | 0,2 D               |                    |                                      |                    |

# GSX 20000S-2D Type



Grade: ACF20

### ■ Endmill Identification (GSX MILL Series)

# GSX 2 0050 S - 2D

| ①           | ②            | ③        | ④            | ⑤                   |
|-------------|--------------|----------|--------------|---------------------|
| Series Code | No. of Teeth | Diameter | Cutting Edge | Cutting Edge Length |

( S: Sharp Edge  
C: Gash Land Drilling )

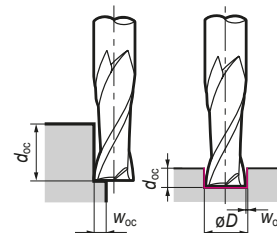
## ■ Endmills

(mm)

| Cat. No.      | Stock | øD   | $\ell_1$ | $\ell_2$ | L   | ød |
|---------------|-------|------|----------|----------|-----|----|
| GSX 20050S-2D | ●     | 0,5  | 1,3      | 1,7      | 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 |

### ■ 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.

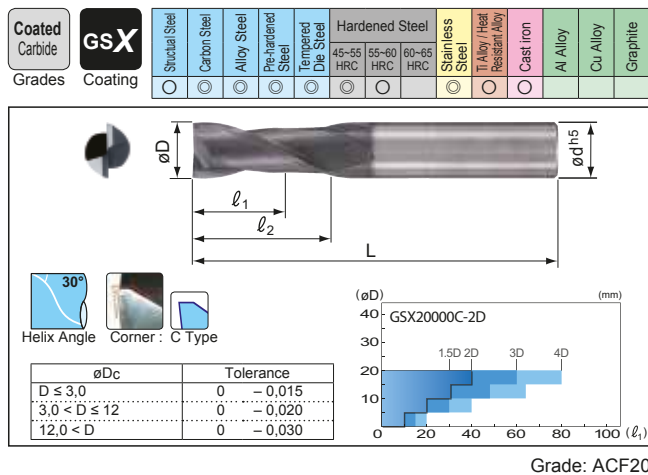


### ● Shoulder Milling

| Work Material        | Structural Steel       |                       | Carbon Steel<br>(150 to 250HB) |                       | Cast Iron              |                       | Alloy Steel<br>(25 to 35HRC) |                       | Tempered Steel,<br>Hardened Steel<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC) |                       | Stainless Steel        |                       | Heat Resistant<br>Steel,<br>Titanium Alloy |                       |
|----------------------|------------------------|-----------------------|--------------------------------|-----------------------|------------------------|-----------------------|------------------------------|-----------------------|----------------------------------------------------|-----------------------|---------------------------------|-----------------------|------------------------|-----------------------|--------------------------------------------|-----------------------|
| Cond.                |                        |                       |                                |                       |                        |                       |                              |                       |                                                    |                       |                                 |                       |                        |                       |                                            |                       |
| $\varnothing D$ (mm) | Spindle Speed<br>(rpm) | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)         | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm) | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)       | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)                             | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)          | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm) | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)                     | Feed Rate<br>(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<br>cutting  | $d_{oc}$<br>$w_{oc}$   | 1,5 $D$               |                                |                       |                        |                       |                              |                       |                                                    |                       |                                 | 1,0 $D$               |                        |                       |                                            |                       |
|                      |                        | 0,05 $D$              |                                |                       |                        |                       |                              |                       |                                                    |                       |                                 | 0,02 $D$              |                        |                       |                                            |                       |

### ● Groove Finishing

[illegible]



### Endmill Identification (GSX MILL Series)

## GSX 2 0050 C - 2D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length

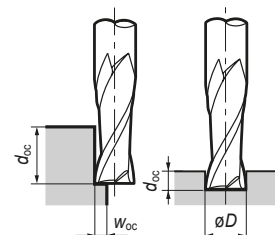
(S: Sharp Edge  
C: Gash Land Drilling)

### Endmills

| Cat. No.      | Stock | $\phi D$ | $\ell_1$ | $\ell_2$ | L   | $\phi d$ |
|---------------|-------|----------|----------|----------|-----|----------|
| 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       |

### Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- 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.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



### Shoulder Milling

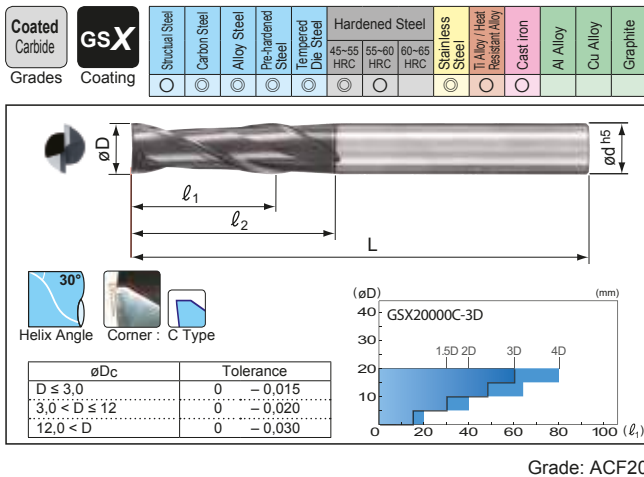
| Work Material    | Structural Steel    |                    | Carbon Steel (150 to 250HB) |                    | Cast Iron           |                    | Alloy Steel (25 to 35HRC) |                    | Tempered Steel, Hardened Steel (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC) |                    | Stainless Steel     |                    | Heat Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| $\phi D$ (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 | $d_{oc}$            | $w_{oc}$           | $1,5 D$                     |                    |                     |                    | $0,05 D$                  |                    |                                              |                    | $1,0 D$                      |                    |                     |                    | $0,02 D$                             |                    |

### Grooving

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| $\phi D$ (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      | $d_{oc}$            | $0,2 D$            | $0,5 D$                     |                    |                     |                    | $0,2 D$                   |                    |                                              |                    | $0,05 D$                     |                    | $0,2 D$             |                    |                                      |                    |



## GSX 20000C-3D Type



## Endmills

(mm)

| Cat. No.      | Stock | øD   | ℓ <sub>1</sub> | ℓ <sub>2</sub> | L   | ød |
|---------------|-------|------|----------------|----------------|-----|----|
| 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)

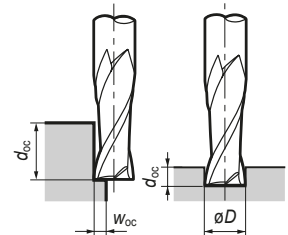
## GSX 2 0100 C - 3D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length

( S: Sharp Edge  
C: Gash Land Drilling )

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- In rare cases, chattering may occur in early milling stages, dissipating after 2m of cutting.
- 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.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Shoulder Milling

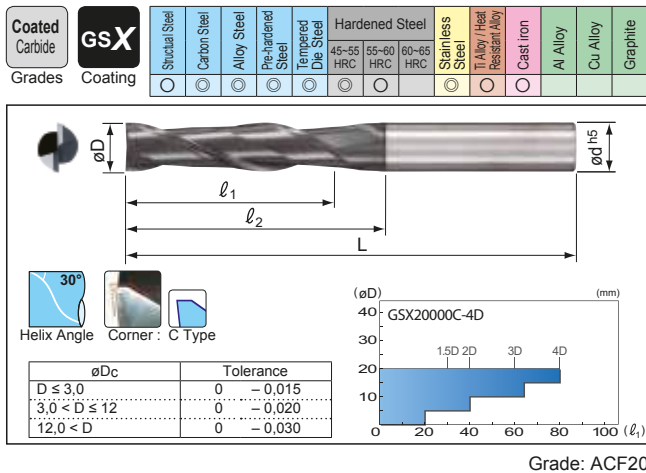
| Work Material    | Structural Steel               |                    | Carbon Steel (150 to 250HB) |                    | Cast Iron           |                    | Alloy Steel (25 to 35HRC) |                    | Tempered Steel, Hardened Steel (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC) |                    | Stainless Steel     |                    | Heat Resistant Steel, Titanium Alloy |                    |
|------------------|--------------------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            | 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) |
| øD (mm)          |                                |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| 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 | 2,5 D                          |                    |                             |                    |                     |                    |                           |                    | 2,0 D                                        |                    |                              |                    |                     |                    |                                      |                    |
|                  | øD < 3: 0,05 D , 3 ≤ øD: 0,1 D |                    |                             |                    |                     |                    |                           |                    | 0,02 D                                       |                    |                              |                    |                     |                    |                                      |                    |

## Grooving

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         | 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) |
| øD (mm)       |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| 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      | 0,1 D               |                    | 0,2 D                       |                    |                     |                    | 0,05 D                    |                    |                                              |                    | 0,1 D                        |                    |                     |                    |                                      |                    |

● = Euro stock





## ■ Endmills

(mm)

| Cat. No.      | Stock | øD   | ℓ <sub>1</sub> | ℓ <sub>2</sub> | L   | ød |
|---------------|-------|------|----------------|----------------|-----|----|
| 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)

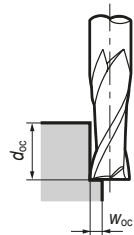
## GSX 2 0100 C - 4D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length

( S: Sharp Edge  
C: Gash Land Drilling )

## ■ Recommended Cutting Conditions

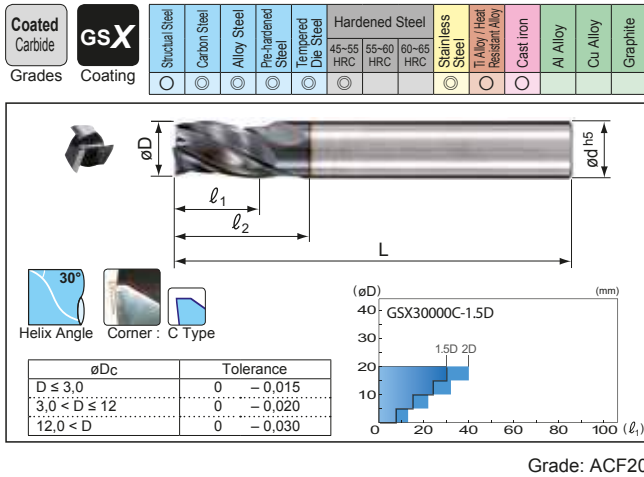
- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- In rear cases, chattering may occur in early milling stages, dissipating after 2m of cutting.
- 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.
- This series is not recommended for grooving.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## ● Shoulder Milling

| Work Material        | Structural Steel       |                       | Carbon Steel<br>(150 to 250HB) |                       | Cast Iron              |                       | Alloy Steel<br>(25 to 35HRC) |                       | Tempered Steel,<br>Hardened Steel<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC) |                       | Stainless Steel        |                       | Heat Resistant<br>Steel,<br>Titanium Alloy |                       |
|----------------------|------------------------|-----------------------|--------------------------------|-----------------------|------------------------|-----------------------|------------------------------|-----------------------|----------------------------------------------------|-----------------------|---------------------------------|-----------------------|------------------------|-----------------------|--------------------------------------------|-----------------------|
| Cond.                |                        |                       |                                |                       |                        |                       |                              |                       |                                                    |                       |                                 |                       |                        |                       |                                            |                       |
| $\varnothing D$ (mm) | Spindle Speed<br>(rpm) | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)         | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm) | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)       | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)                             | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)          | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm) | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)                     | Feed Rate<br>(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<br>cutting  | $d_{oc}$               | 3,5 D                 |                                |                       |                        | 3,0 D                 |                              |                       |                                                    | 3,0 D                 |                                 |                       |                        |                       |                                            |                       |
|                      | $w_{oc}$               | 0,08 D                |                                |                       |                        | 0,04 D                |                              |                       |                                                    |                       |                                 |                       |                        |                       |                                            |                       |

# GSX 30000C-1.5D Type



## Endmills

| Cat. No.        | Stock | ØD   | ℓ <sub>1</sub> | ℓ <sub>2</sub> | L   | Ød |
|-----------------|-------|------|----------------|----------------|-----|----|
| 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 |

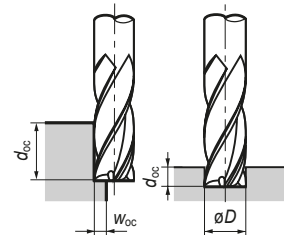
## Endmill Identification (GSX MILL Series)

# GSX 3 0100 C - 1.5D

- ① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length
- ( S: Sharp Edge    C: Gash Land Drilling )

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.

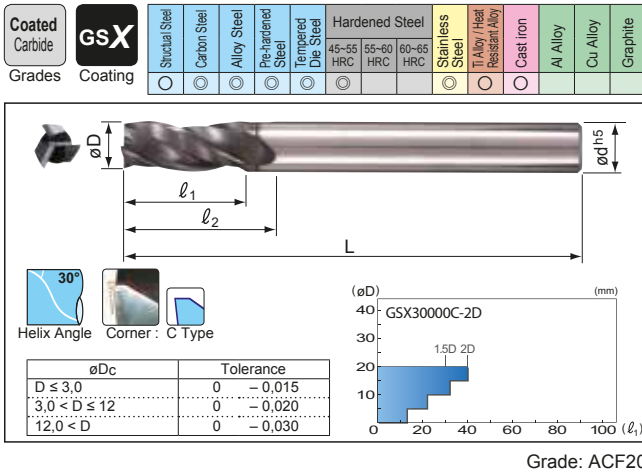


## Shoulder Milling

| Work Material    | 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 Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            | 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) |
| ØD (mm)          |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| 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 | d <sub>oc</sub>     |                    | 1,5 D                       |                    |                     |                    | 1,0 D                     |                    |                                              |                    | 1,0 D                        |                    |                     |                    |                                      |                    |
|                  | W <sub>oc</sub>     |                    | 0,05 D                      |                    |                     |                    | 0,02 D                    |                    |                                              |                    | 0,02 D                       |                    |                     |                    |                                      |                    |

## Grooving

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         | 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) |
| ØD (mm)       |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| 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      | d <sub>oc</sub>     |                    | 0,2 D                       |                    |                     |                    | 0,5 D                     |                    |                                              |                    | 0,05 D                       |                    | 0,2 D               |                    |                                      |                    |
|               | W <sub>oc</sub>     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |



## Endmills

| Cat. No.      | Stock | ØD   | l <sub>1</sub> | l <sub>2</sub> | L   | Ød |
|---------------|-------|------|----------------|----------------|-----|----|
| 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 |

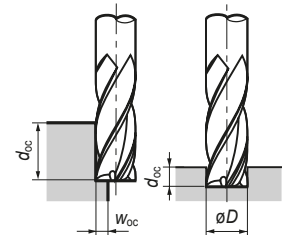
## Endmill Identification (GSX MILL Series)

### GSX 3 0100 C - 2D

- ① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length
- ( S: Sharp Edge    C: Gash Land Drilling )

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



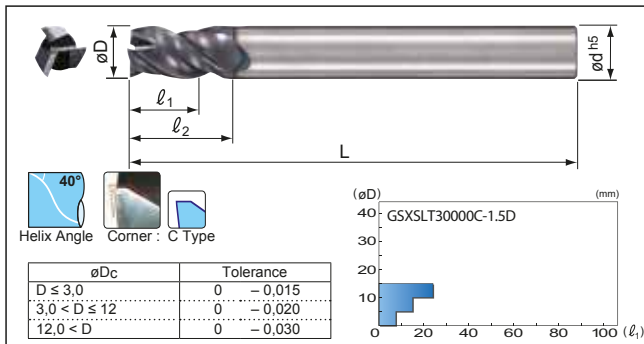
## Shoulder Milling

| Work Material    | 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 Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| ØD (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 | d <sub>oc</sub>     |                    | 1,5 D                       |                    |                     |                    |                           |                    |                                              |                    | 1,0 D                        |                    |                     |                    |                                      |                    |
|                  | w <sub>oc</sub>     |                    | 0,05 D                      |                    |                     |                    |                           |                    |                                              |                    | 0,02 D                       |                    |                     |                    |                                      |                    |

## Grooving

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| ØD (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      | d <sub>oc</sub>     | 0,2 D              | 0,5 D                       |                    |                     |                    | 0,2 D                     |                    |                                              |                    | 0,05 D                       |                    | 0,2 D               |                    |                                      |                    |

| Coated Carbide | GSX     | Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast Iron | Al Alloy | Cu Alloy | Graphite |
|----------------|---------|------------------|--------------|-------------|--------------------|--------------------|----------------|-----------------|---------------------------------|-----------|----------|----------|----------|
| Grades         | Coating | ○                | ○            | ○           | ○                  | ○                  | ○              | ○               | ○                               | ○         | ○        | ○        | ○        |



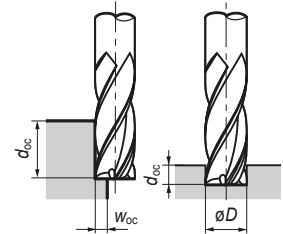
Grade: ACF20

## Endmills

| Cat. No.           | Stock | øD   | l <sub>1</sub> | l <sub>2</sub> | L  | ød |
|--------------------|-------|------|----------------|----------------|----|----|
| 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

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- Use step machining of 0.1Dc when drilling stainless steel, heat resistant alloy, and titanium alloy.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Shoulder Milling

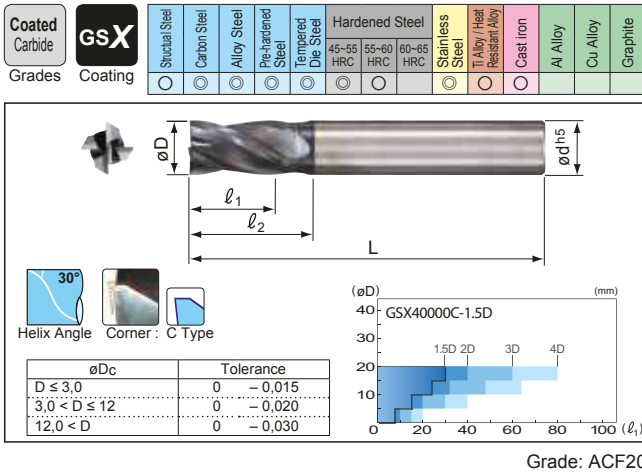
| Work Material    | Structural Steel    |                    | Carbon Steel (150 to 250HB) |                    | Cast Iron           |                    | Alloy Steel (25 to 35HRC) |                    | Tempered Steel, Hardened Steel (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC) |                    | Stainless Steel     |                    | Heat Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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                |
| Shoulder cutting | 1.5 D               |                    |                             |                    |                     |                    |                           |                    |                                              |                    | 1.0 D                        |                    |                     |                    |                                      |                    |
| Woc              | 0.05 D              |                    |                             |                    |                     |                    |                           |                    |                                              |                    | 0.02 D                       |                    |                     |                    |                                      |                    |

## Grooving

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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                 |
| Grooving dOc  | 0,2 D               |                    | 0,5 D                       |                    |                     |                    | 0,2 D                     |                    |                                              |                    | 0,05 D                       |                    | 0,2 D               |                    |                                      |                    |

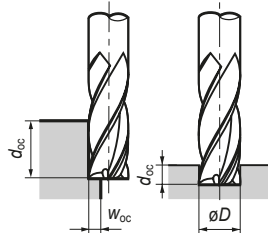
## Drilling

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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              | 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                 |



### Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



### Endmills

| Cat. No.        | Stock | øD   | l <sub>1</sub> | l <sub>2</sub> | L   | ød |
|-----------------|-------|------|----------------|----------------|-----|----|
| 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 |

### Shoulder Milling

| Work Material    | 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 Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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 | 1,5 D<br>0,05 D     |                    |                             |                    |                     |                    |                           |                    |                                              |                    | 1,0 D<br>0,02 D              |                    |                     |                    |                                      |                    |

### Shoulder Milling (High Speed Machining Centre)

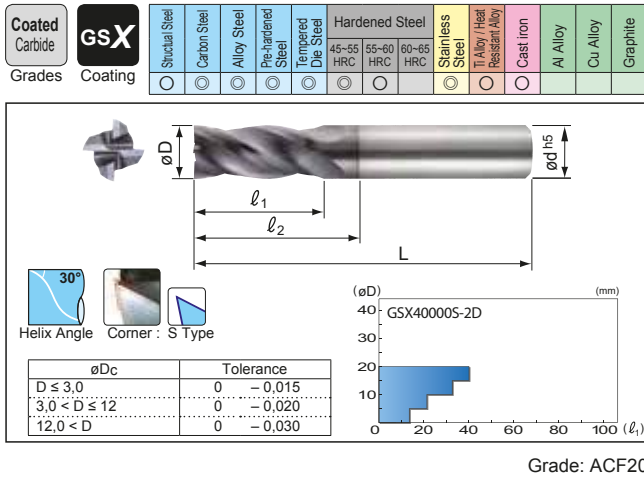
| Work Material    | Structural Steel    |                    | Carbon Steel (150 to 250HB) |                    | Cast Iron           |                    | Alloy Steel (25 to 35HRC) |                    | Tempered Steel, Hardened Steel (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC) |                    | Stainless Steel     |                    | Heat Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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 | 1,5 D<br>0,05 D     |                    |                             |                    |                     |                    |                           |                    |                                              |                    | 1,0 D<br>0,02 D              |                    |                     |                    |                                      |                    |

### Grooving

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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      | 0,2 D               |                    | 0,5 D                       |                    | 0,5 D               |                    | 0,2 D                     |                    | 0,05 D                                       |                    | 0,2 D                        |                    | 0,2 D               |                    |                                      |                    |



# GSX 40000S-2D Type



## Endmills

| Cat. No.      | Stock | $\phi D$ | $\ell_1$ | $\ell_2$ | L   | $\phi d$ |
|---------------|-------|----------|----------|----------|-----|----------|
| 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       |

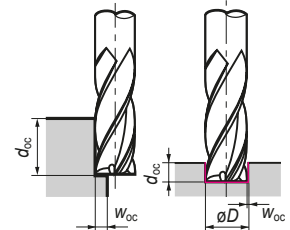
## Endmill Identification (GSX MILL Series)

### GSX 4 1000 S - 2D

- ① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length
- ( S: Sharp Edge    C: Gash Land Drilling )

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- 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.
- This series is not recommended for grooving.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



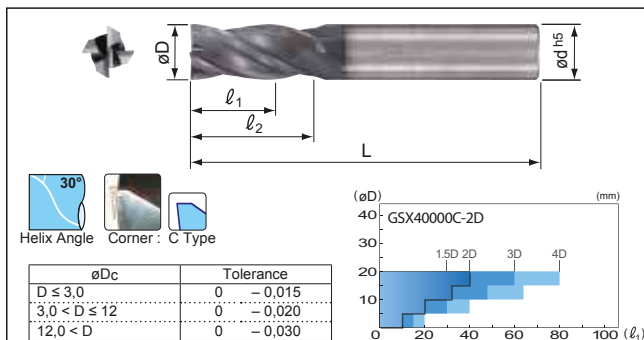
## Shoulder Milling

| Work Material    | 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 Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            | 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) |
| $\phi D$ (mm)    |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| 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 | $d_{oc}$            |                    |                             |                    |                     |                    |                           |                    | $2.0 D$                                      |                    |                              |                    |                     |                    |                                      |                    |
|                  | $w_{oc}$            |                    |                             |                    |                     |                    |                           |                    | $0.03 D$                                     |                    |                              |                    |                     |                    | $0.01 D$                             |                    |

## Groove Finishing

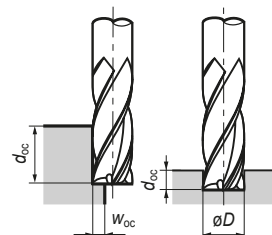
| Work Material    | Structural Steel    |                    | Carbon Steel (150 to 250HB) |                    | Cast Iron           |                    | Alloy Steel (25 to 35HRC) |                    | Tempered Steel, Hardened Steel (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC) |                    | Stainless Steel     |                    | Heat Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            | 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) |
| $\phi D$ (mm)    |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| 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 | $d_{oc}$            |                    |                             |                    |                     |                    |                           |                    | $1.5 D$                                      |                    |                              |                    |                     |                    |                                      |                    |
|                  | $w_{oc}$            |                    |                             |                    |                     |                    |                           |                    | $\sim 0.02 D$                                |                    |                              |                    |                     |                    |                                      |                    |

| Coated Carbide | GSX     | Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast Iron | Al Alloy | Cu Alloy | Graphite |
|----------------|---------|------------------|--------------|-------------|--------------------|--------------------|----------------|-----------------|---------------------------------|-----------|----------|----------|----------|
| Grades         | Coating | ○                | ○            | ○           | ○                  | ○                  | ○              | ○               | ○                               | ○         | ○        | ○        | ○        |



### Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- 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.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



### Shoulder Milling

| Work Material    | 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 Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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 | 1,5 D<br>0,05 D     |                    |                             |                    |                     |                    |                           |                    |                                              |                    | 1,0 D<br>0,02 D              |                    |                     |                    |                                      |                    |

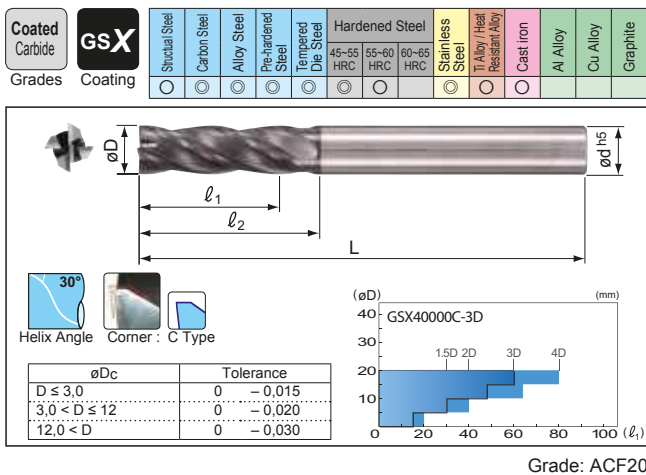
### Shoulder Milling (High Speed Machining Centre)

| Work Material    | 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 Resistant Steel, Titanium Alloy |                    |
|------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.            |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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 | 1,5 D<br>0,05 D     |                    |                             |                    |                     |                    |                           |                    |                                              |                    | 1,0 D<br>0,02 D              |                    |                     |                    |                                      |                    |

### Grooving

| Work Material | 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 Resistant Steel, Titanium Alloy |                    |
|---------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.         |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| øD (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      | 0,2 D               |                    | 0,5 D                       |                    | 0,5 D               |                    | 0,5 D                     |                    | 0,2 D                                        |                    | 0,05 D                       |                    | 0,2 D               |                    | 0,2 D                                |                    |

## GSX 40000C-3D Type



## Endmills

(mm)

| Cat. No.      | Stock | $\phi D$ | $\ell_1$ | $\ell_2$ | L   | $\phi d$ |
|---------------|-------|----------|----------|----------|-----|----------|
| 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)

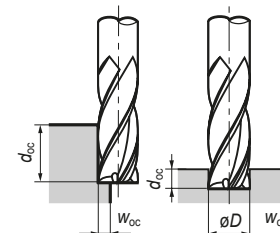
## GSX 4 0100 C - 2D/3D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length

( S: Sharp Edge  
C: Gash Land Drilling )

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- In rear cases, chattering may occur in early milling stages, dissipating after 2m of cutting.
- 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.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



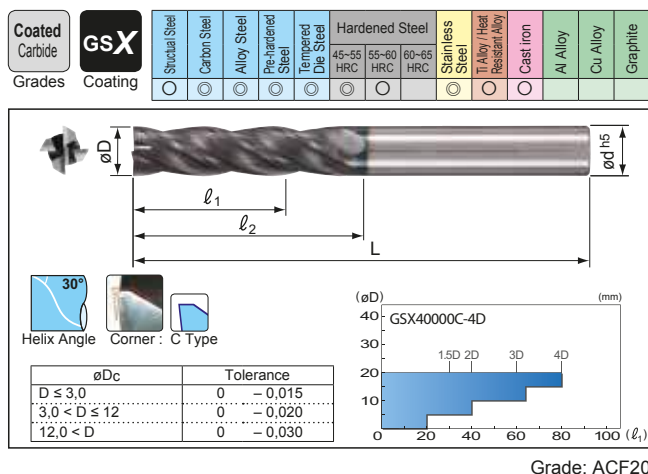
## Shoulder Milling

| Work Material             | 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 Resistant Steel, Titanium Alloy |                    |
|---------------------------|-----------------------------------------------------------------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.                     |                                                                             |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| $\phi D$ (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 $d_{Oc}$ | 2,5 D                                                                       |                    |                             |                    |                     |                    |                           |                    |                                              |                    | 2,0 D                        |                    |                     |                    |                                      |                    |
| $W_{Oc}$                  | $\phi D < 3: 0,05 D$ , $3 \leq \phi D < 8: 0,1 D$ , $8 \leq \phi D: 0,15 D$ |                    |                             |                    |                     |                    |                           |                    |                                              |                    | 0,02 D                       |                    |                     |                    |                                      |                    |

## Grooving

| Work Material     | 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 Resistant Steel, Titanium Alloy |                    |
|-------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|------------------------------|--------------------|---------------------|--------------------|--------------------------------------|--------------------|
| Cond.             |                     |                    |                             |                    |                     |                    |                           |                    |                                              |                    |                              |                    |                     |                    |                                      |                    |
| $\phi D$ (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 $d_{Oc}$ | 0,1 D               |                    | 0,2 D                       |                    |                     |                    | 0,05 D                    |                    |                                              |                    | 0,1 D                        |                    |                     |                    |                                      |                    |

● = Euro stock



### ■ Endmill Identification (GSX MILL Series)

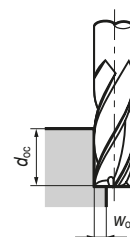
# GSX 4 0100 C - 4D

| ①<br>Series<br>Code | ②<br>No. of<br>Teeth | ③<br>Diameter | ④<br>Cutting<br>Edge | ⑤<br>Cutting Edge<br>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    |                      | Structural Steel                                                                |                       | Carbon Steel<br>(150 to 250HB) |                       | Cast Iron              |                       | Alloy Steel<br>(25 to 35HRC) |                       | Tempered Steel,<br>Hardened Steel<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC) |                       | Stainless Steel        |                       | Heat Resistant<br>Steel,<br>Titanium Alloy |                       |
|------------------|----------------------|---------------------------------------------------------------------------------|-----------------------|--------------------------------|-----------------------|------------------------|-----------------------|------------------------------|-----------------------|----------------------------------------------------|-----------------------|---------------------------------|-----------------------|------------------------|-----------------------|--------------------------------------------|-----------------------|
| Cond.            |                      |                                                                                 |                       |                                |                       |                        |                       |                              |                       |                                                    |                       |                                 |                       |                        |                       |                                            |                       |
| $\phi D$ (mm)    |                      | Spindle Speed<br>(rpm)                                                          | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)         | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm) | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)       | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)                             | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)          | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm) | Feed Rate<br>(mm/min) | Spindle Speed<br>(rpm)                     | Feed Rate<br>(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 | $d_{oc}$<br>$W_{oc}$ | 3,5 $D$                                                                         |                       |                                |                       |                        |                       |                              |                       |                                                    |                       | 3,0 $D$                         |                       |                        |                       |                                            |                       |
|                  |                      | $\phi D < 3: 0,04 D \quad 3 \leq \phi D < 8: 0,08 D \quad 8 \leq \phi D: 0,1 D$ |                       |                                |                       |                        |                       |                              |                       |                                                    |                       | $0,02 D$                        |                       |                        |                       |                                            |                       |

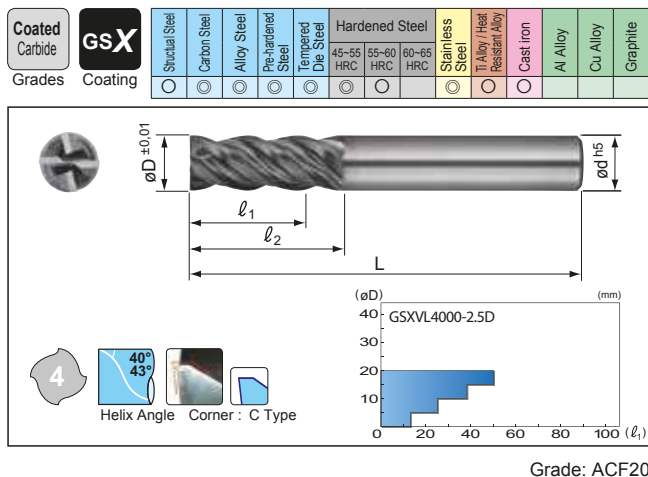
# Anti-Vibration Typ GSX MILL

## GSXVL 4000-2.5D Type

4

Anti-Vibration Type and HAIMER's

SAFE-LOCK™ Applicable Endmills (4 Flutes)



Grade: ACF20

### Endmills

(mm)

| Cat. No.        | Stock | øD   | l <sub>1</sub> | l <sub>2</sub> | L   | ød |
|-----------------|-------|------|----------------|----------------|-----|----|
| 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)

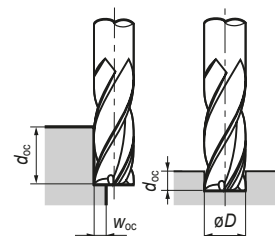
| Cat. No.         | Stock | øD   | l <sub>1</sub> | l <sub>2</sub> | L   | ød |
|------------------|-------|------|----------------|----------------|-----|----|
| GSXVL 4120S-2.5D | □     | 12,0 | 30             | —              | 90  | 12 |
| GSXVL 4140S-2.5D | □     | 14,0 | 35             | 37,5           | 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    | Carbon Steel, Cast Iron (150 to 250HB) |                    | Alloy Steel (25 to 35HRC) |                    | Tempered Steel, Hardened Steel (40 to 50HRC) |                    | Stainless Steel     |                    | Heat Resistant Steel, Titanium Alloy (20 to 45HRC) |                    |
|------------------|----------------------------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|---------------------|--------------------|----------------------------------------------------|--------------------|
| Cond.            | 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) |
| øD (mm)          |                                        |                    |                           |                    |                                              |                    |                     |                    |                                                    |                    |
| 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 | d <sub>oc</sub>                        | 1,5 D              |                           |                    |                                              | 0,1 D              |                     | 0,05 D             |                                                    |                    |
|                  | w <sub>oc</sub>                        | 0,1 D              |                           |                    |                                              | 0,05 D             |                     | 0,1 D              |                                                    |                    |

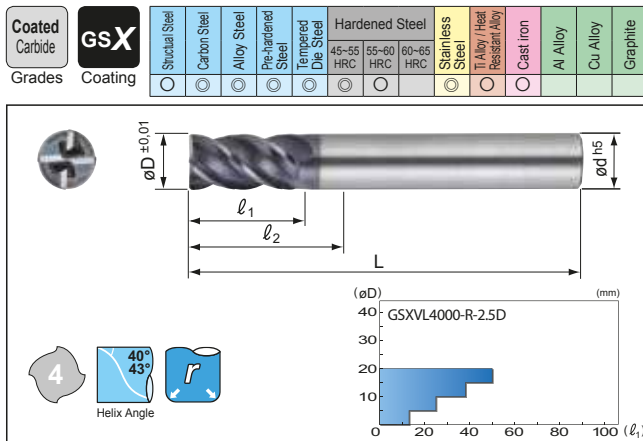


### Shoulder Milling

| Work Material | Carbon Steel, Cast Iron (150 to 250HB) |                    | Alloy Steel (25 to 35HRC) |                    | Tempered Steel, Hardened Steel (40 to 50HRC) |                    | Stainless Steel     |                    | Heat Resistant Steel, Titanium Alloy (20 to 45HRC) |                    |
|---------------|----------------------------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|---------------------|--------------------|----------------------------------------------------|--------------------|
| Cond.         | 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) |
| øD (mm)       |                                        |                    |                           |                    |                                              |                    |                     |                    |                                                    |                    |
| 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      | d <sub>oc</sub>                        | 1,0 D              |                           |                    |                                              | 0,2 D              |                     | 0,3 D              |                                                    | 0,2 D              |

- = Euro stock
- = Delivery on request





## ■ Endmills

| Cat. No.            | Stock | $\phi D$ | r   | $\ell_1$ | $\ell_2$ | L   | $\phi d$ |
|---------------------|-------|----------|-----|----------|----------|-----|----------|
| 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

## ● Shoulder Milling and Grooving

| Work Material    | Carbon Steel, Cast Iron (150 to 250HB) |                    | Alloy Steel (25 to 35HRC) |                    | Tempered Steel, Hardened Steel (40 to 50HRC) |                    | Stainless Steel     |                    | Heat Resistant Steel, Titanium Alloy (20 to 45HRC) |                    |
|------------------|----------------------------------------|--------------------|---------------------------|--------------------|----------------------------------------------|--------------------|---------------------|--------------------|----------------------------------------------------|--------------------|
| Cond.            | 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) |
| $\phi D$ (mm)    |                                        |                    |                           |                    |                                              |                    |                     |                    |                                                    |                    |
| 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 | $d_{oc}$                               |                    | $w_{oc}$                  |                    | $1,5 D$                                      |                    | $0,1 D$             |                    | $0,05 D$                                           |                    |
| Grooving         | $d_{oc}$                               |                    | $1,0 D$                   |                    | $0,2 D$                                      |                    | $0,3 D$             |                    | $0,2 D$                                            |                    |

## Endmills

## SAFE-LOCK™

## Applicable Endmills



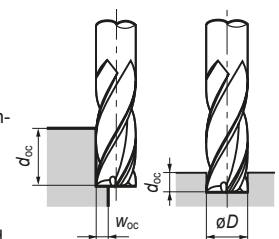
## ■ Endmills

| Cat. No.             | Stock | $\phi D$ | r   | $\ell_1$ | $\ell_2$ | L   | $\phi d$ |
|----------------------|-------|----------|-----|----------|----------|-----|----------|
| 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

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blowing when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## ■ Corner Radius Selection

| $\phi D$  | r0,2 | r0,3 | r0,5 | r1,0 | r1,5 | r2,0 | r3,0 |
|-----------|------|------|------|------|------|------|------|
| $\phi 3$  | □    |      | □    |      |      |      |      |
| $\phi 4$  |      |      | □    | □    |      |      |      |
| $\phi 5$  | □    |      | □    | □    |      |      |      |
| $\phi 6$  |      | □    | □    | □    | □    |      |      |
| $\phi 8$  |      | □    | □    | □    | □    | □    |      |
| $\phi 10$ |      |      | □    | □    | □    | □    |      |
| $\phi 12$ |      |      |      | □    | □    | □    | □    |
| $\phi 16$ |      |      |      |      | □    | □    | □    |
| $\phi 20$ |      |      |      |      |      | □    | □    |
| $\phi 25$ |      |      |      |      |      |      | □    |

# Radius Endmill for Exotic Alloys

## SSEH Series



J 24, J 39

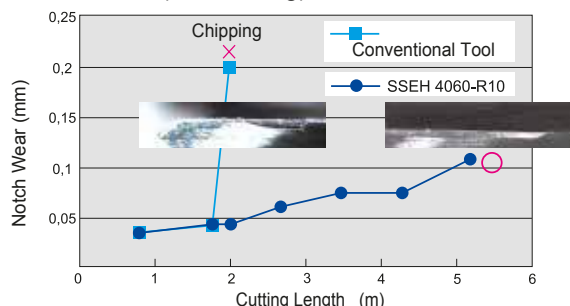
### SSEH Radius

#### ■ 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

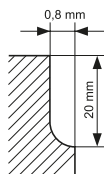
##### ● Inconel 718 (Side Milling)



Tool Diameter:  $\phi 6 \times R1$   
 Cutting Conditions:  $v_c = 20 \text{ m/min}$ ,  $f_t = 0,025 \text{ mm/t}$ ,  
 $d_{oc} = 5 \text{ mm}$ ,  $w_{oc} = 0,5 \text{ mm}$ , wet

##### ● Inconel 713 (Side Milling)

| SSEH 4100W-R10                                                                                                                                                                  | Competitor's Product |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
|                                                                                                                                                                                 |                      |
| Tool Diameter : $\phi 10 \times R1$<br>Cutting Conditions : $v_c = 32 \text{ m/min}$ , $f_t = 0,018 \text{ mm/t}$<br>$d_{oc} = 20 \text{ mm}$ , $w_{oc} = 0,8 \text{ mm}$ , 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.

Unique, smooth radius design

- = Euro stock
- = Delivery on request

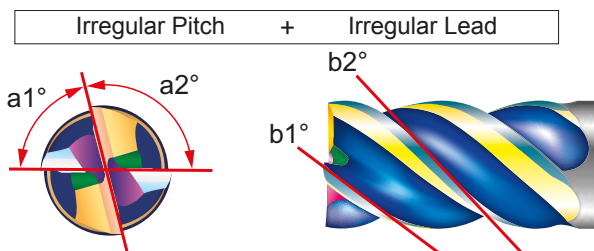


J 23, J 39

### 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.



#### ■ Application Examples

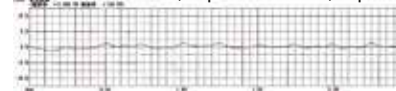
##### ● Surface Roughness Comparison

###### SSEH Anti-vibration Type

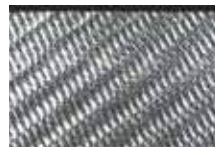


Good Surface Quality

Ra 0,37 $\mu\text{m}$  Rz 1,86 $\mu\text{m}$

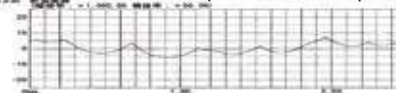


###### Conventional Tool



Surface shows chattering

Ra 1,52 $\mu\text{m}$  Rz 6,45 $\mu\text{m}$



Work Material:

X5CrNi1810 (Surface Milling)

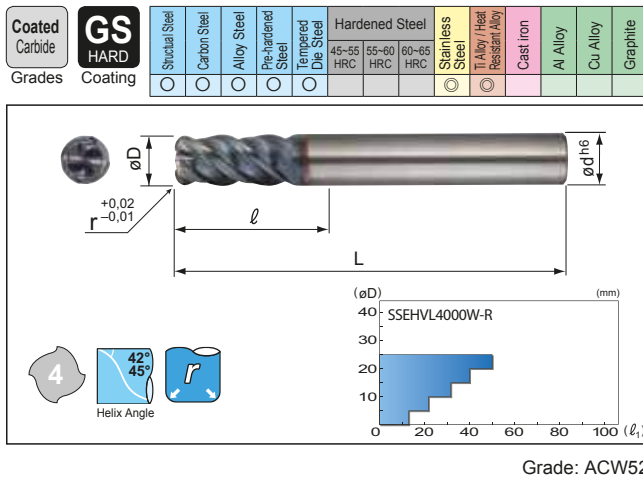
Tool Diameter:

$\phi 12 \text{ mm}$

Cutting Conditions:

$n = 1.300 \text{ rpm}$ ,  $v_f = 300 \text{ mm/min}$   
 $d_{oc} = 18 \text{ mm}$ ,  $w_{oc} = 1,2 \text{ mm}$

Equipment: BT50

**SAFE-LOCK™**

Applicable Endmills



## ■ Endmills

(mm)

| Cat. No.         | Stock | øD   | r   | ℓ  | L   | ød |
|------------------|-------|------|-----|----|-----|----|
| 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 |

## ■ Endmills

(mm)

| Cat. No.          | Stock | øD   | r   | ℓ  | L   | ød |
|-------------------|-------|------|-----|----|-----|----|
| 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

| øD    | r0,5 | r1,0 | r3,0 |
|-------|------|------|------|
| ø 4,5 | ●    | ●    |      |
| ø 5   | ●    | ●    |      |
| ø 6   |      | ●    |      |
| ø 8   |      | ●    |      |
| ø 10  |      | ●    | ●    |
| ø 12  |      | ●    | ●    |
| ø 16  |      | ●    | ●    |
| ø 20  |      | □    | □    |
| ø 25  |      | □    | □    |

## ■ Recommended Cutting Conditions

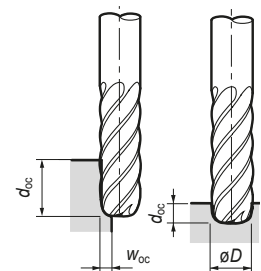
- For stable machining, a more rigid machine is recommended.
- Wet machining is recommended for stainless steel and heat resistant alloy applications.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## ● Shoulder Milling

| Work Material    | Stainless Steel     |                    | Titanium Alloy      |                    | Heat Resistant Steel |                    |
|------------------|---------------------|--------------------|---------------------|--------------------|----------------------|--------------------|
| Cond.            |                     |                    |                     |                    |                      |                    |
| øD (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 | 1,5 D               |                    |                     |                    |                      |                    |
|                  | 0,1 D               |                    | 0,05 D              |                    | 0,05 D               |                    |

## ● Grooving

| Work Material | Stainless Steel     |                    | Titanium Alloy      |                    | Heat Resistant Steel |                    |
|---------------|---------------------|--------------------|---------------------|--------------------|----------------------|--------------------|
| Cond.         |                     |                    |                     |                    |                      |                    |
| øD (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      | 0,3 D               |                    | 0,2 D               |                    | 0,15 D               |                    |



# Radius Endmill for Exotic Alloys

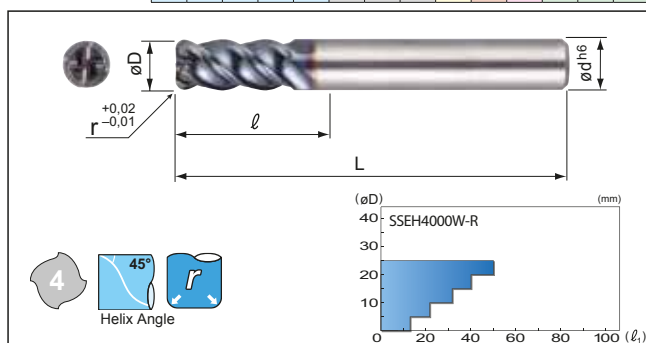
## SSEH 4000W-R Type

4

4 Flutes Endmills with Radius Corner and

HAIMER's SAFE-LOCK™ Applicable Endmills

| Coated Carbide | GS HARD | Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast Iron | Al Alloy | Cu Alloy | Graphite |
|----------------|---------|------------------|--------------|-------------|--------------------|--------------------|----------------|-----------------|---------------------------------|-----------|----------|----------|----------|
| Grades         | Coating | ○                | ○            | ○           | ○                  | ○                  | ○              | ○               | ○                               | ○         | ○        | ○        | ○        |



### SAFE-LOCK™

Applicable Endmills



### Endmills

(mm)

| Cat. No.       | Stock | øD   | ℓ <sub>1</sub> | ℓ <sub>2</sub> | L   | ød |
|----------------|-------|------|----------------|----------------|-----|----|
| SSEH 4045W-R05 | ●     | 4,5  | 0,5            | 12             | 50  | 6  |
| SSEH 4045W-R10 | ●     | 4,5  | 1,0            | 12             | 50  | 6  |
| SSEH 4050W-R05 | ●     | 5,0  | 0,5            | 13             | 60  | 6  |
| SSEH 4050W-R10 | ●     | 5,0  | 1,0            | 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 |

### Endmills

(mm)

| Cat. No.        | Stock | øD   | ℓ <sub>1</sub> | ℓ <sub>2</sub> | L   | ød |
|-----------------|-------|------|----------------|----------------|-----|----|
| 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

| øD    | r0,5 | r1,0 | r3,0 |
|-------|------|------|------|
| ø 4,5 | ●    | ●    |      |
| ø 5   | ●    | ●    |      |
| ø 6   |      | ●    |      |
| ø 8   |      | ●    |      |
| ø 10  |      | ●    | ●    |
| ø 12  |      | ●    | ●    |
| ø 16  |      | ●    | ●    |
| ø 20  |      | □    | □    |
| ø 25  |      | □    | □    |

### Recommended Cutting Conditions

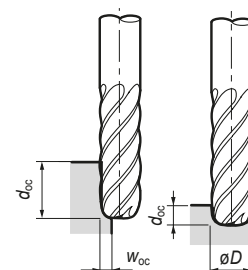
- For stable machining, a more rigid machine is recommended.
- Wet machining is recommended for stainless steel and heat resistant alloy applications.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

### Shoulder Milling

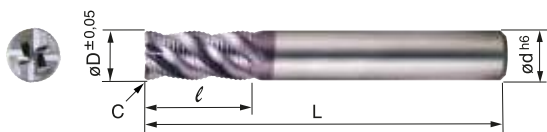
| Work Material    | Stainless Steel     |                    | Titanium Alloy      |                    | Heat Resistant Steel |                    |
|------------------|---------------------|--------------------|---------------------|--------------------|----------------------|--------------------|
| Cond.            |                     |                    |                     |                    |                      |                    |
| øD (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 | 1,5 D               |                    | 1,5 D               |                    | 1,5 D                |                    |
|                  | 0,1 D               |                    | 0,05 D              |                    | 0,05 D               |                    |

### Grooving

| Work Material | Stainless Steel     |                    | Titanium Alloy      |                    | Heat Resistant Steel |                    |
|---------------|---------------------|--------------------|---------------------|--------------------|----------------------|--------------------|
| Cond.         |                     |                    |                     |                    |                      |                    |
| øD (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      | 0,3 D               |                    | 0,2 D               |                    | 0,15 D               |                    |





Coated carbide grade: **ACZ20W**

Helix angle : 40°



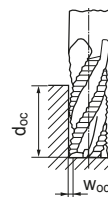
### Endmills

(mm)

| No. of teeth | Cat. No.     | Stock | øD   | ℓ  | L   | ød |
|--------------|--------------|-------|------|----|-----|----|
| 4            | GSRE 4060 SF | ●     | 6,0  | 13 | 50  | 6  |
|              | GSRE 4070 SF | ●     | 7,0  | 16 | 60  | 8  |
|              | GSRE 4080 SF | ●     | 8,0  | 19 | 60  | 8  |
|              | GSRE 4090 SF | ●     | 9,0  | 19 | 70  | 10 |
|              | GSRE 4100 SF | ●     | 10,0 | 22 | 70  | 10 |
|              | GSRE 4110 SF | ●     | 11,0 | 22 | 75  | 12 |
|              | GSRE 4120 SF | ●     | 12,0 | 26 | 75  | 12 |
|              | GSRE 4140 SF | ●     | 14,0 | 26 | 90  | 16 |
|              | GSRE 4160 SF | ●     | 16,0 | 32 | 90  | 16 |
|              | GSRE 4180 SF | ●     | 18,0 | 32 | 100 | 20 |
|              | GSRE 4200 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.



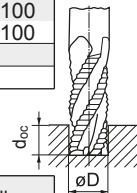
### Recommended Cutting Conditions

#### Shoulder cutting

| Material<br>Cutting data<br>Tool Dia.<br>(mm) | Carbon steel<br>( HB150~250) |                  | Cast iron      |                  | Alloy steel,<br>Prehardened steel<br>(HRC25~35) |                  | Hardened steel<br>(HRC40~50) |                  | Stainless steel |                  | Heat resistant alloys<br>Titanium alloy |                  |
|-----------------------------------------------|------------------------------|------------------|----------------|------------------|-------------------------------------------------|------------------|------------------------------|------------------|-----------------|------------------|-----------------------------------------|------------------|
|                                               | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm) | Feed<br>(mm/min) | Speed<br>(rpm)                                  | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)  | Feed<br>(mm/min) | Speed<br>(rpm)                          | Feed<br>(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                              | d oc                         | 1,5D             |                |                  |                                                 |                  |                              | 1,5D             |                 |                  |                                         |                  |
|                                               | W oc                         | 0,5D             |                |                  |                                                 |                  |                              | 0,3D             |                 |                  |                                         |                  |

#### Slotting

| Material<br>Cutting data<br>Tool Dia.<br>(mm) | Carbon steel<br>( HB150~250) |                  | Cast iron      |                  | Alloy steel,<br>Prehardened steel<br>(HRC25~35) |                  | Hardened steel<br>(HRC40~50) |                  | Stainless steel |                  | Heat resistant alloys<br>Titanium alloy |                  |
|-----------------------------------------------|------------------------------|------------------|----------------|------------------|-------------------------------------------------|------------------|------------------------------|------------------|-----------------|------------------|-----------------------------------------|------------------|
|                                               | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm) | Feed<br>(mm/min) | Speed<br>(rpm)                                  | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)  | Feed<br>(mm/min) | Speed<br>(rpm)                          | Feed<br>(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                                      | d oc                         | 1,0D             |                |                  |                                                 |                  |                              | 0,5D             |                 |                  |                                         |                  |

Coated  
Endmills

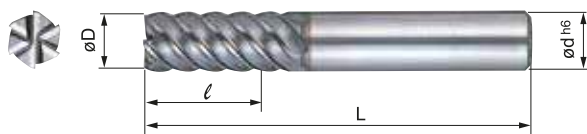


# GS MILL Series

## GSH 4000/6000/8000 SF Type

TiAlN Coated Fast Helix Endmills

Coated carbide grade: ACF07C



Helix angle : 50°  
Corner : Edge with honing

| øD      | Tolerance (mm) |
|---------|----------------|
| D ≤ 3,0 | 0 ~ - 0,015    |
| 3,0 < D | 0 ~ - 0,030    |



### Endmills

(mm)

| No. of teeth | Cat. No.    | Stock | øD   | ℓ  | L   | ød |
|--------------|-------------|-------|------|----|-----|----|
| 4            | GSH 4010 SF | ●     | 1,0  | 3  | 50  | 6  |
|              | GSH 4015 SF | ●     | 1,5  | 4  | 50  | 6  |
|              | GSH 4020 SF | ●     | 2,0  | 6  | 50  | 6  |
| 6            | GSH 6030 SF | ●     | 3,0  | 8  | 50  | 6  |
|              | GSH 6040 SF | ●     | 4,0  | 11 | 50  | 6  |
|              | GSH 6050 SF | ●     | 5,0  | 12 | 50  | 6  |
|              | GSH 6060 SF | ●     | 6,0  | 13 | 50  | 6  |
|              | GSH 6080 SF | ●     | 8,0  | 19 | 60  | 8  |
|              | GSH 6100 SF | ●     | 10,0 | 22 | 70  | 10 |
| 8            | GSH 8120 SF | ●     | 12,0 | 26 | 75  | 12 |
|              | GSH 8160 SF | ●     | 16,0 | 32 | 90  | 16 |
|              | GSH 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.

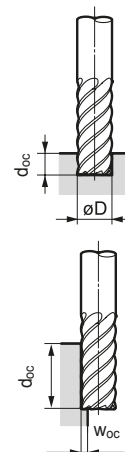
### Recommended Cutting Conditions

#### Conventional Milling Operations

| Material<br>Cutting data | Alloy steel,<br>Prehardened steel<br>( ~ HRC35) |                  | Heat treated alloy steel,<br>hardened steel<br>(HRC35~45) |                  | Hardened steel<br>(HRC45~55) |                  | Hardened steel<br>(HRC55~60) |                  | Hardened steel<br>(HRC60~65) |                   | Hardened steel<br>(HRC65 ~ ) |                  |
|--------------------------|-------------------------------------------------|------------------|-----------------------------------------------------------|------------------|------------------------------|------------------|------------------------------|------------------|------------------------------|-------------------|------------------------------|------------------|
|                          | Speed<br>(rpm)                                  | Feed<br>(mm/min) | Speed<br>(rpm)                                            | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min)  | Speed<br>(rpm)               | Feed<br>(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<br>cutting      | d <sub>oc</sub>                                 | 1 ~ 1,5D         |                                                           |                  |                              | 1 ~ 1,5D         |                              |                  |                              | 1 ~ 1,5D          |                              |                  |
|                          | w <sub>oc</sub>                                 | 0,1D             |                                                           |                  |                              | 0,05D            |                              |                  |                              | 0,02D             |                              |                  |
| Slotting                 | d <sub>oc</sub>                                 | 0,1D             |                                                           |                  |                              | 0,05D            |                              |                  |                              | ~ 0,05D (Max 0,5) |                              |                  |

#### HSC Machining Centre Operations

| Material<br>Cutting data<br>Tool Dia.<br>(mm) |                 | Alloy steel,<br>Prehardened steel<br>( ~ HRC35) |                  | Heat treated alloy steel,<br>hardened steel<br>(HRC35~45) |                  | Hardened steel<br>(HRC45~55) |                  | Hardened steel<br>(HRC55~60) |                  | Hardened steel<br>(HRC60~65) |                  |
|-----------------------------------------------|-----------------|-------------------------------------------------|------------------|-----------------------------------------------------------|------------------|------------------------------|------------------|------------------------------|------------------|------------------------------|------------------|
|                                               |                 | Speed<br>(rpm)                                  | Feed<br>(mm/min) | Speed<br>(rpm)                                            | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(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                              | d <sub>oc</sub> | 1 ~ 1,5D                                        |                  | 1 ~ 1,5D                                                  |                  |                              |                  | 1 ~ 1,5D                     |                  | 1 ~ 1,5D                     |                  |
|                                               | w <sub>oc</sub> | 0,1D                                            |                  | 0,05D                                                     |                  |                              |                  | 0,02D                        |                  | 0,12D                        |                  |



● = Euro stock

# DLC (Diamond Like Carbon) Coating 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

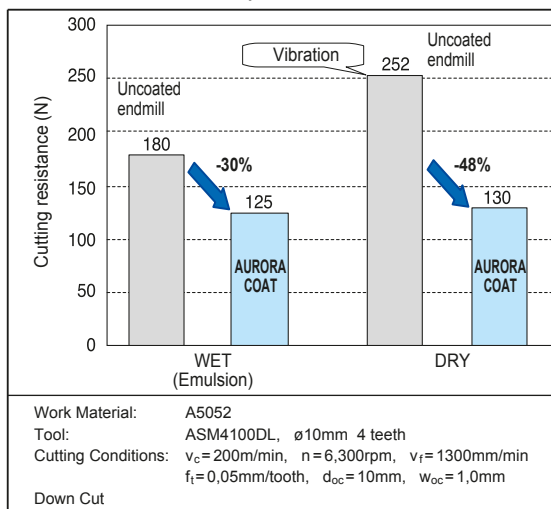
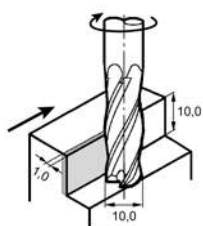
- Very smooth AURORA COAT results in low adhesion as well as good surface finish
- With lower cutting forces and high rigidity, this series is suitable for low rigidity machine
- Available in 2 and 4 flutes square type as well as ballnose type endmills

## ■ Product Range

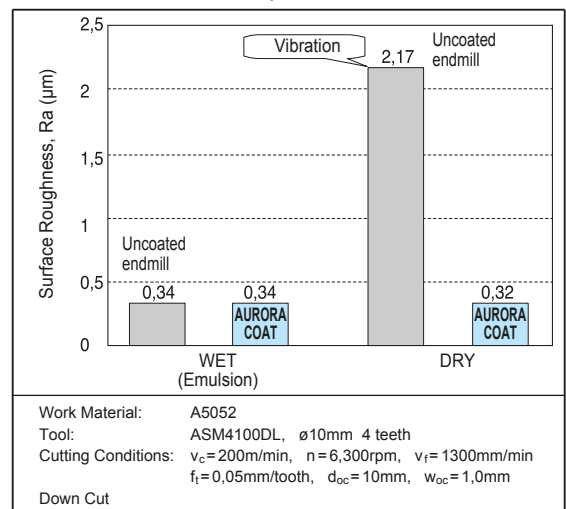
| Series           | No. of teeth | Shape                                                                                           | Diameter          |
|------------------|--------------|-------------------------------------------------------------------------------------------------|-------------------|
| <b>ASM2000DL</b> | 2            | Square<br>   | ø2~ø16            |
| <b>ASM4000DL</b> | 4            | Square<br>   | ø2~ø16            |
| <b>SNB2000DL</b> | 2            | Ballnose<br> | ø2~ø16<br>(R1~R8) |

## ■ Efficiency

### ● Performance Comparison

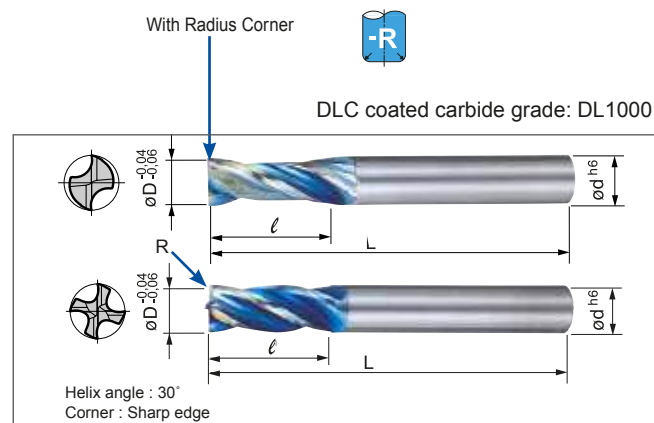
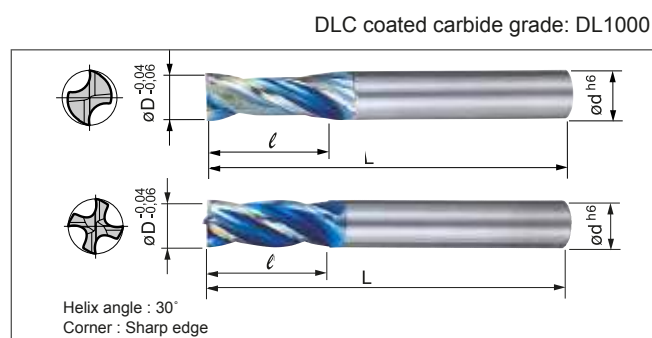


### ● Surface Finish Comparison



# AURORA Coated Spiral Endmills ASM 2000/4000 DL Type

# AURORA Coated Spiral Endmills ASM 2000/4000 DL-R Type



## ■ Endmills (mm)

|   | Cat. No.    | Stock | øD   | l  | L  | ød |
|---|-------------|-------|------|----|----|----|
| 2 | ASM 2020 DL | ●     | 2,0  | 6  | 40 | 4  |
|   | ASM 2030 DL | ●     | 3,0  | 10 | 45 | 6  |
|   | ASM 2040 DL | ●     | 4,0  | 12 | 45 | 6  |
|   | ASM 2050 DL | ●     | 5,0  | 15 | 50 | 6  |
|   | ASM 2060 DL | ●     | 6,0  | 15 | 50 | 6  |
|   | ASM 2080 DL | ●     | 8,0  | 18 | 60 | 8  |
|   | ASM 2100 DL | ●     | 10,0 | 22 | 71 | 10 |
|   | ASM 2120 DL | ●     | 12,0 | 25 | 75 | 12 |
|   | ASM 2160 DL | ●     | 16,0 | 32 | 90 | 16 |
| 4 | ASM 4020 DL | ●     | 2,0  | 6  | 40 | 4  |
|   | ASM 4030 DL | ●     | 3,0  | 10 | 45 | 6  |
|   | ASM 4040 DL | ●     | 4,0  | 12 | 45 | 6  |
|   | ASM 4050 DL | ●     | 5,0  | 15 | 50 | 6  |
|   | ASM 4060 DL | ●     | 6,0  | 15 | 50 | 6  |
|   | ASM 4080 DL | ●     | 8,0  | 18 | 60 | 8  |
|   | ASM 4100 DL | ●     | 10,0 | 22 | 71 | 10 |
|   | ASM 4120 DL | ●     | 12,0 | 25 | 75 | 12 |
|   | ASM 4160 DL | ●     | 16,0 | 32 | 90 | 16 |

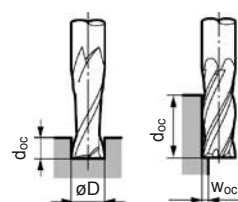
## ■ Endmills (mm)

|   | Cat. No.        | Stock | øD   | R   | l  | L  | ød |
|---|-----------------|-------|------|-----|----|----|----|
| 2 | ASM 2080 DL-R10 | ●     | 8,0  | 1,0 | 18 | 60 | 8  |
|   | ASM 2080 DL-R20 | ●     | 8,0  | 2,0 | 18 | 60 | 8  |
|   | ASM 2100 DL-R10 | ●     | 10,0 | 1,0 | 22 | 71 | 10 |
|   | ASM 2100 DL-R20 | ●     | 10,0 | 2,0 | 22 | 71 | 10 |
|   | ASM 2120 DL-R20 | ●     | 12,0 | 2,0 | 25 | 75 | 12 |
|   | ASM 2120 DL-R30 | ●     | 12,0 | 3,0 | 25 | 75 | 12 |
|   | ASM 2160 DL-R30 | ●     | 16,0 | 3,0 | 32 | 90 | 16 |
|   |                 |       |      |     |    |    |    |
| 4 | ASM 4080 DL-R10 | ●     | 8,0  | 1,0 | 18 | 60 | 8  |
|   | ASM 4080 DL-R20 | ●     | 8,0  | 2,0 | 18 | 60 | 8  |
|   | ASM 4100 DL-R10 | ●     | 10,0 | 1,0 | 22 | 71 | 10 |
|   | ASM 4100 DL-R20 | ●     | 10,0 | 2,0 | 22 | 71 | 10 |
|   | ASM 4120 DL-R20 | ●     | 12,0 | 2,0 | 25 | 75 | 12 |
|   | ASM 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.



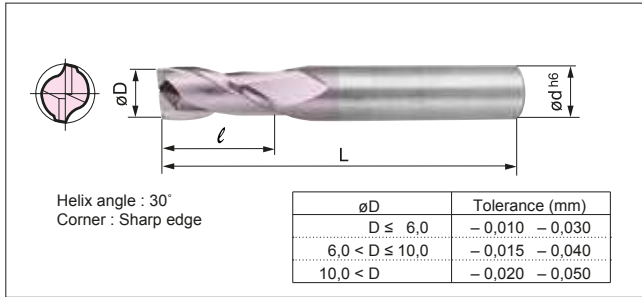
| Work Material           |                 | Aluminium Alloy        |               |                          |               |                        |               |                          |               |
|-------------------------|-----------------|------------------------|---------------|--------------------------|---------------|------------------------|---------------|--------------------------|---------------|
| Cutting data<br>øD (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   | d <sub>oc</sub> | 1,5D                   |               | 1,0D                     |               | 1,5D                   |               | 0,5D                     |               |
|                         | W <sub>oc</sub> | 0,2D                   |               | (D)                      |               | 0,2D                   |               | (D)                      |               |

● = Euro stock

▲ = To be replaced by new item  
□ = Delivery on request

# ZX Coated Spiral Endmills SSM 2000ZX Type

Coated carbide grade: ACZ50



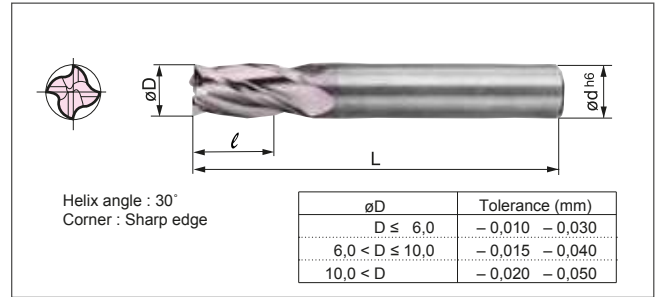
## Endmills

(mm)

|   | Cat. No.   | Stock | øD   | ℓ  | L   | ød |
|---|------------|-------|------|----|-----|----|
| 2 | SSM 2010ZX | ▲     | 1,0  | 3  | 40  | 4  |
|   | SSM 2015ZX | ▲     | 1,5  | 5  | 40  | 4  |
|   | SSM 2020ZX | ▲     | 2,0  | 6  | 40  | 4  |
|   | SSM 2021ZX |       | 2,1  | 6  | 40  | 4  |
|   | SSM 2022ZX |       | 2,2  | 6  | 40  | 4  |
|   | SSM 2023ZX |       | 2,3  | 6  | 40  | 4  |
|   | SSM 2024ZX |       | 2,4  | 6  | 40  | 4  |
|   | SSM 2025ZX | ▲     | 2,5  | 8  | 40  | 4  |
|   | SSM 2026ZX |       | 2,6  | 8  | 40  | 4  |
|   | SSM 2027ZX |       | 2,7  | 8  | 40  | 4  |
|   | SSM 2028ZX |       | 2,8  | 8  | 40  | 4  |
|   | SSM 2029ZX |       | 2,9  | 8  | 40  | 4  |
|   | SSM 2030ZX | ▲     | 3,0  | 8  | 45  | 6  |
|   | SSM 2035ZX | ▲     | 3,5  | 8  | 45  | 6  |
|   | SSM 2040ZX | ▲     | 4,0  | 10 | 45  | 6  |
|   | SSM 2045ZX | ▲     | 4,5  | 10 | 45  | 6  |
|   | SSM 2050ZX | ▲     | 5,0  | 12 | 50  | 6  |
|   | SSM 2055ZX | ▲     | 5,5  | 12 | 50  | 6  |
|   | SSM 2060ZX | ▲     | 6,0  | 12 | 50  | 6  |
|   | SSM 2065ZX | □     | 6,5  | 12 | 50  | 8  |
|   | SSM 2070ZX | ▲     | 7,0  | 15 | 55  | 8  |
|   | SSM 2075ZX | ▲     | 7,5  | 15 | 55  | 8  |
|   | SSM 2080ZX | ▲     | 8,0  | 15 | 55  | 8  |
|   | SSM 2085ZX | ▲     | 8,5  | 15 | 55  | 10 |
|   | SSM 2090ZX | ▲     | 9,0  | 15 | 55  | 10 |
|   | SSM 2095ZX | ▲     | 9,5  | 15 | 55  | 10 |
|   | SSM 2100ZX | ▲     | 10,0 | 18 | 65  | 10 |
|   | SSM 2105ZX |       | 10,5 | 18 | 70  | 12 |
|   | SSM 2110ZX | ▲     | 11,0 | 18 | 70  | 12 |
|   | SSM 2115ZX |       | 11,5 | 18 | 70  | 12 |
|   | SSM 2120ZX | ▲     | 12,0 | 18 | 70  | 12 |
|   | SSM 2130ZX |       | 13,0 | 20 | 80  | 16 |
|   | SSM 2140ZX | ▲     | 14,0 | 20 | 80  | 16 |
|   | SSM 2150ZX | ▲     | 15,0 | 25 | 80  | 16 |
|   | SSM 2160ZX | ▲     | 16,0 | 35 | 90  | 16 |
|   | SSM 2180ZX | ▲     | 18,0 | 40 | 105 | 20 |
|   | SSM 2200ZX | ▲     | 20,0 | 40 | 105 | 20 |

# ZX Coated Spiral Endmills SSM 4000ZX Type

Coated carbide grade: ACZ50



## Endmills

(mm)

|   | Cat. No.   | Stock | øD   | ℓ    | L   | ød |
|---|------------|-------|------|------|-----|----|
| 4 | SSM 4015ZX | ▲     | 1,5  | 5,0  | 40  | 4  |
|   | SSM 4020ZX | ▲     | 2,0  | 6,0  | 40  | 4  |
|   | SSM 4025ZX | ▲     | 2,5  | 8,0  | 40  | 4  |
|   | SSM 4030ZX | ▲     | 3,0  | 8,0  | 45  | 6  |
|   | SSM 4035ZX | ▲     | 3,5  | 8,0  | 45  | 6  |
|   | SSM 4040ZX | ▲     | 4,0  | 10,0 | 45  | 6  |
|   | SSM 4045ZX | ▲     | 4,5  | 10,0 | 45  | 6  |
|   | SSM 4050ZX | ▲     | 5,0  | 12,0 | 50  | 6  |
|   | SSM 4055ZX | ▲     | 5,5  | 12,0 | 50  | 6  |
|   | SSM 4060ZX | ▲     | 6,0  | 12,0 | 50  | 6  |
|   | SSM 4065ZX | ▲     | 6,5  | 12,0 | 50  | 8  |
|   | SSM 4070ZX | ▲     | 7,0  | 15,0 | 55  | 8  |
|   | SSM 4075ZX | ▲     | 7,5  | 15,0 | 55  | 8  |
|   | SSM 4080ZX | ▲     | 8,0  | 15,0 | 55  | 8  |
|   | SSM 4085ZX | ▲     | 8,5  | 15,0 | 55  | 10 |
|   | SSM 4090ZX | ▲     | 9,0  | 15,0 | 55  | 10 |
|   | SSM 4095ZX | ▲     | 9,5  | 15,0 | 55  | 10 |
|   | SSM 4100ZX | ▲     | 10,0 | 18,0 | 65  | 10 |
|   | SSM 4105ZX |       | 10,5 | 18,0 | 65  | 12 |
|   | SSM 4110ZX | ▲     | 11,0 | 18,0 | 70  | 12 |
|   | SSM 4115ZX |       | 11,5 | 18,0 | 70  | 12 |
|   | SSM 4120ZX | ▲     | 12,0 | 18,0 | 70  | 12 |
|   | SSM 4130ZX | ▲     | 13,0 | 20,0 | 80  | 16 |
|   | SSM 4135ZX |       | 13,5 | 20,0 | 80  | 16 |
|   | SSM 4140ZX | ▲     | 14,0 | 20,0 | 80  | 16 |
|   | SSM 4150ZX | ▲     | 15,0 | 25,0 | 80  | 16 |
|   | SSM 4160ZX | ▲     | 16,0 | 35,0 | 90  | 16 |
|   | SSM 4170ZX |       | 17,0 | 35,0 | 90  | 20 |
|   | SSM 4180ZX |       | 18,0 | 40,0 | 105 | 20 |
|   | SSM 4190ZX |       | 19,0 | 40,0 | 105 | 20 |
|   | SSM 4200ZX | ▲     | 20,0 | 40,0 | 105 | 20 |
|   | SSM 4220ZX |       | 22,0 | 40,0 | 105 | 25 |
|   | SSM 4240ZX | ▲     | 24,0 | 45,0 | 115 | 25 |
|   | SSM 4250ZX |       | 24,0 | 50,0 | 120 | 25 |
|   | SSM 4300ZX |       | 30,0 | 55,0 | 130 | 32 |
|   | SSM 4320ZX |       | 32,0 | 55,0 | 130 | 32 |

## Recommended conditions

(Slotting) øD < ø3 ; d<sub>oc</sub> = 0,5 x øD  
øD ≥ ø3 ; d<sub>oc</sub> = 1,0 x øD

| Material<br>øD |                | Carbon steel, Alloy steel<br>(Below HRC25) (Below HRC45) |             | Stainless steel<br>Cast iron Ti-alloy etc. |             |
|----------------|----------------|----------------------------------------------------------|-------------|--------------------------------------------|-------------|
|                |                |                                                          |             |                                            |             |
| 1,0 ~ 2,9      | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150                                | 60-75-90    |
|                | f <sub>t</sub> | 0,003~0,010                                              | 0,002~0,005 | 0,005~0,016                                | 0,002~0,005 |
| 3,0 ~ 5,9      | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150                                | 60-75-90    |
|                | f <sub>t</sub> | 0,012~0,024                                              | 0,006~0,011 | 0,018~0,040                                | 0,006~0,011 |
| 6,0 ~ 12,9     | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150                                | 60-75-90    |
|                | f <sub>t</sub> | 0,025~0,050                                              | 0,013~0,025 | 0,045~0,105                                | 0,013~0,025 |
| 13,0 ~ 20,0    | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150                                | 60-75-90    |
|                | f <sub>t</sub> | 0,055~0,085                                              | 0,030~0,050 | 0,110~0,170                                | 0,030~0,050 |

v<sub>c</sub> = m/min f<sub>t</sub> = mm/tooth

## Recommended conditions

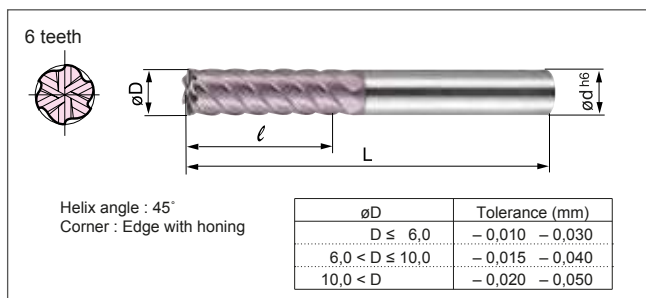
(Shoulder processing) d<sub>oc</sub> = 1,5 x øD  
w<sub>oc</sub> = 0,1 x øD

| Material<br>øD |                | Carbon steel, Alloy steel<br>(Below HRC25) (Below HRC45) |             | Cast iron   | Stainless steel<br>Ti-alloy etc. |
|----------------|----------------|----------------------------------------------------------|-------------|-------------|----------------------------------|
|                |                |                                                          |             |             |                                  |
| 1,0 ~ 2,9      | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150 | 60-75-90                         |
|                | f <sub>t</sub> | 0,004~0,017                                              | 0,002~0,008 | 0,008~0,020 | 0,002~0,008                      |
| 3,0 ~ 5,9      | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150 | 60-75-90                         |
|                | f <sub>t</sub> | 0,018~0,036                                              | 0,009~0,018 | 0,027~0,060 | 0,009~0,018                      |
| 6,0 ~ 12,9     | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150 | 60-75-90                         |
|                | f <sub>t</sub> | 0,038~0,070                                              | 0,019~0,035 | 0,065~0,157 | 0,019~0,035                      |
| 13,0 ~ 19,9    | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150 | 60-75-90                         |
|                | f <sub>t</sub> | 0,075~0,125                                              | 0,040~0,075 | 0,160~0,250 | 0,040~0,075                      |
| 20,0 ~ 32,0    | v <sub>c</sub> | 200-250-300                                              | 100-150-200 | 100-120-150 | 60-75-90                         |
|                | f <sub>t</sub> | 0,135~0,170                                              | 0,085~0,110 | 0,257~0,390 | 0,085~0,110                      |

v<sub>c</sub> = m/min f<sub>t</sub> = mm/tooth

# ZX Coated Long Fast Helix Endmills LHHM 4000/6000/8000 ZX Type

Coated carbide grade: ACZ10M



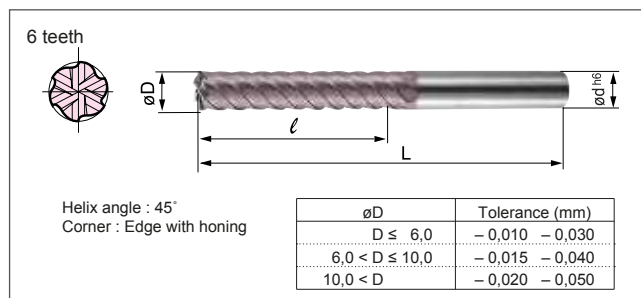
## Endmills

(mm)

|   | Cat. No.    | Stock | øD   | ℓ  | L   | ød |
|---|-------------|-------|------|----|-----|----|
| 4 | LHHM 4030ZX | □     | 3,0  | 12 | 55  | 6  |
|   | LHHM 4040ZX | □     | 4,0  | 15 | 60  | 6  |
|   | LHHM 4050ZX | □     | 5,0  | 18 | 60  | 6  |
| 6 | LHHM 6060ZX | □     | 6,0  | 18 | 60  | 6  |
|   | LHHM 6080ZX | □     | 8,0  | 25 | 75  | 8  |
|   | LHHM 6100ZX | □     | 10,0 | 30 | 80  | 10 |
|   | LHHM 6120ZX | □     | 12,0 | 30 | 100 | 12 |
| 8 | LHHM 8160ZX | □     | 16,0 | 50 | 105 | 16 |
|   | LHHM 8200ZX | □     | 20,0 | 55 | 120 | 20 |
|   | LHHM 8250ZX | □     | 25,0 | 65 | 140 | 25 |
|   | LHHM 8300ZX | □     | 30,0 | 75 | 160 | 32 |
|   | LHHM 8320ZX | □     | 32,0 | 85 | 170 | 32 |

# ZX Coated Extra Long Fast Helix Endmills EHHM 4000/6000/8000 ZX Type

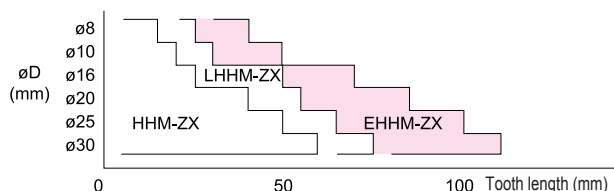
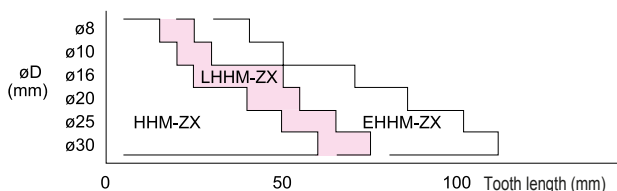
Coated carbide grade: ACZ10M



## Endmills

(mm)

|   | Cat. No.    | Stock | øD   | ℓ   | L   | ød |
|---|-------------|-------|------|-----|-----|----|
| 4 | EHHM 4030ZX | □     | 3,0  | 20  | 60  | 6  |
|   | EHHM 4040ZX | □     | 4,0  | 25  | 65  | 6  |
|   | EHHM 4050ZX | □     | 5,0  | 30  | 70  | 6  |
| 6 | EHHM 6060ZX | □     | 6,0  | 30  | 70  | 6  |
|   | EHHM 6080ZX | □     | 8,0  | 40  | 90  | 8  |
|   | EHHM 6100ZX | □     | 10,0 | 50  | 100 | 10 |
|   | EHHM 6120ZX | □     | 12,0 | 50  | 120 | 12 |
| 8 | EHHM 8160ZX | □     | 16,0 | 70  | 140 | 16 |
|   | EHHM 8200ZX | □     | 20,0 | 85  | 165 | 20 |
|   | EHHM 8250ZX | □     | 25,0 | 100 | 185 | 25 |
|   | EHHM 8300ZX | □     | 30,0 | 110 | 205 | 32 |
|   | EHHM 8320ZX | □     | 32,0 | 110 | 205 | 32 |



## Recommended conditions

(Shoulder processing)  $d_{oc} = 1,5 \times \phi D$   
 $w_{oc} = 0,025(\text{HRC}56\sim65) \sim 0,2(\text{below HRC}25) \times \phi D$

| Material    | Carbon steel, Alloy steel<br>(Below HRC25) | Hardened steel<br>(Below HRC65) | Cast iron                 |
|-------------|--------------------------------------------|---------------------------------|---------------------------|
| øD          |                                            |                                 |                           |
| 3,0 ~ 5,0   | $v_c$ 200-250-300<br>$f_t$ 0,030~0,060     | 100-150-200<br>0,022~0,037      | 80-100-120<br>0,007~0,015 |
| 6,0 ~ 12,0  | $v_c$ 200-250-300<br>$f_t$ 0,061~0,090     | 100-150-200<br>0,037~0,067      | 40-50-60<br>0,060~0,165   |
| 16,0 ~ 32,0 | $v_c$ 200-250-300<br>$f_t$ 0,090~0,098     | 100-150-200<br>0,067~0,075      | 40-50-60<br>0,187~0,262   |

$v_c = \text{m/min}$   $f_t = \text{mm/tooth}$

## Recommended conditions

(Shoulder processing)  $d_{oc} = 1,5 \times \phi D$   
 $w_{oc} = 0,025(\text{HRC}56\sim65) \sim 0,2(\text{below HRC}25) \times \phi D$

| Material    | Carbon steel, Alloy steel<br>(Below HRC25) | Hardened steel<br>(Below HRC65) | Cast iron                  |
|-------------|--------------------------------------------|---------------------------------|----------------------------|
| øD          |                                            |                                 |                            |
| 3,0 ~ 5,0   | $v_c$ 200-250-300<br>$f_t$ 0,020~0,040     | 100-150-200<br>0,015~0,025      | 80-100-120<br>0,005~0,010  |
| 6,0 ~ 12,0  | $v_c$ 200-250-300<br>$f_t$ 0,041~0,060     | 100-150-200<br>0,025~0,045      | 100-120-150<br>0,040~0,110 |
| 16,0 ~ 32,0 | $v_c$ 200-250-300<br>$f_t$ 0,060~0,065     | 100-150-200<br>0,045~0,050      | 100-120-150<br>0,125~0,175 |

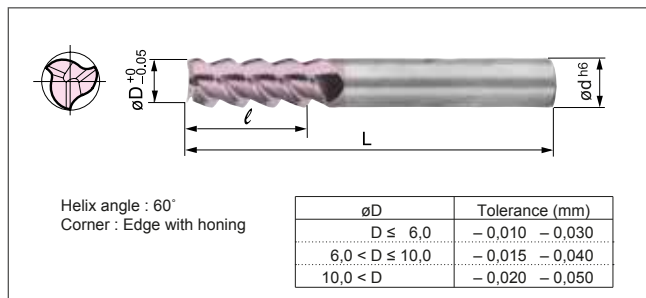
$v_c = \text{m/min}$   $f_t = \text{mm/tooth}$



# ZX Coated Fast Helix Endmills

## HSM 2000/3000/4000 ZX Type

Coated carbide grade: ACZ50



### Endmills

(mm)

|   | Cat. No.   | Stock | øD  | ℓ  | L  | ød |
|---|------------|-------|-----|----|----|----|
| 2 | HSM 2020ZX | □     | 2,0 | 6  | 40 | 4  |
|   | HSM 2030ZX | □     | 3,0 | 8  | 45 | 6  |
|   | HSM 2040ZX | □     | 4,0 | 10 | 45 | 6  |

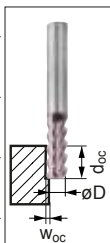
|   |            |   |      |    |     |    |
|---|------------|---|------|----|-----|----|
| 3 | HSM 3030ZX | ▲ | 3,0  | 12 | 45  | 6  |
|   | HSM 3040ZX | ▲ | 4,0  | 15 | 45  | 6  |
|   | HSM 3050ZX | ▲ | 5,0  | 12 | 50  | 6  |
|   | HSM 3060ZX | ▲ | 6,0  | 15 | 50  | 6  |
|   | HSM 3070ZX | □ | 7,0  | 18 | 60  | 8  |
|   | HSM 3080ZX | ▲ | 8,0  | 18 | 60  | 8  |
|   | HSM 3090ZX | □ | 9,0  | 20 | 65  | 10 |
|   | HSM 3100ZX | ▲ | 10,0 | 25 | 70  | 10 |
|   | HSM 3110ZX | ▲ | 11,0 | 25 | 75  | 12 |
|   | HSM 3120ZX | ▲ | 12,0 | 30 | 75  | 12 |
|   | HSM 3130ZX | ▲ | 13,0 | 30 | 80  | 16 |
|   | HSM 3140ZX | □ | 14,0 | 30 | 90  | 16 |
|   | HSM 3150ZX | ▲ | 15,0 | 30 | 95  | 16 |
|   | HSM 3160ZX | ▲ | 16,0 | 35 | 95  | 16 |
|   | HSM 3180ZX | ▲ | 18,0 | 40 | 110 | 20 |
|   | HSM 3200ZX | □ | 20,0 | 40 | 110 | 20 |

|   |            |   |      |    |     |    |
|---|------------|---|------|----|-----|----|
| 4 | HSM 4200ZX | □ | 20,0 | 40 | 110 | 20 |
|   | HSM 4250ZX | □ | 25,0 | 50 | 120 | 25 |

Recommended conditions (Shoulder processing)  $d_{oc} = 1,5 \times \phi D$   
 $w_{oc} = 0,1 \times \phi D$

| øD          |       | Material                                   |               | Cast iron   | Stainless steel,<br>Ti-alloy etc. |
|-------------|-------|--------------------------------------------|---------------|-------------|-----------------------------------|
|             |       | Carbon steel, Alloy steel<br>(Below HRC25) | (Below HRC45) |             |                                   |
| 1,0 ~ 2,9   | $v_c$ | 200-250-300                                | 100-150-200   | 100-120-150 | 60-75-90                          |
|             | $f_t$ | 0,010~0,035                                | 0,005~0,017   | 0,015~0,055 | 0,005~0,017                       |
| 3,0 ~ 5,9   | $v_c$ | 200-250-300                                | 100-150-200   | 100-120-150 | 60-75-90                          |
|             | $f_t$ | 0,040~0,050                                | 0,020~0,025   | 0,060~0,070 | 0,020~0,025                       |
| 6,0 ~ 12,9  | $v_c$ | 200-250-300                                | 100-150-200   | 100-120-150 | 60-75-90                          |
|             | $f_t$ | 0,055~0,110                                | 0,028~0,055   | 0,080~0,220 | 0,028~0,055                       |
| 13,0 ~ 19,9 | $v_c$ | 200-250-300                                | 100-150-200   | 100-120-150 | 60-75-90                          |
|             | $f_t$ | 0,120~0,180                                | 0,060~0,090   | 0,250~0,350 | 0,060~0,090                       |
| 20,0 ~ 25,0 | $v_c$ | 200-250-300                                | 100-150-200   | 100-120-150 | 60-75-90                          |
|             | $f_t$ | 0,190~0,245                                | 0,095~0,125   | 0,380~0,490 | 0,095~0,125                       |

$v_c = \text{m/min}$   $f_t = \text{mm/tooth}$



# High Efficient Endmills 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

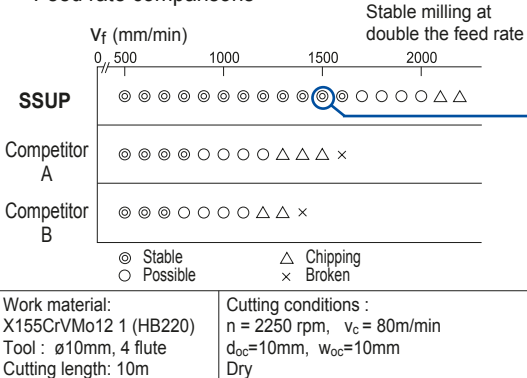


SSUP 4000ZX-R Series  
Diameter and Corner Radius Range

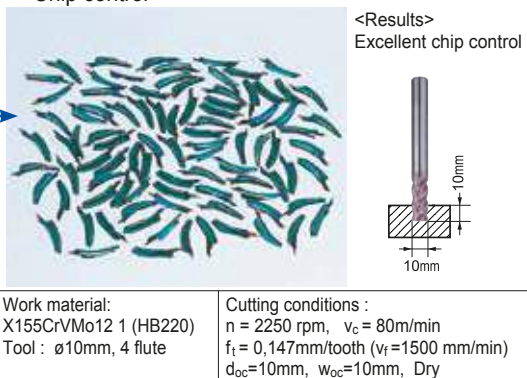
| ØD \ R | R0,2 | R0,3 | R0,5 | R1,0 | R1,5 | R2,0 | R3,0 |
|--------|------|------|------|------|------|------|------|
| ø3     | ●    |      | ●    |      |      |      |      |
| ø4     | ●    |      |      | ●    |      |      |      |
| ø5     | ●    |      | ●    | ●    |      |      |      |
| ø6     |      | ●    | ●    | ●    | ●    |      |      |
| ø8     |      | ●    | ●    | ●    | ●    |      |      |
| ø10    |      | ●    | ●    | ●    | ●    | ●    |      |
| ø12    |      |      | ●    | ●    | ●    | ●    | ●    |
| ø16    |      |      |      | ●    | ●    | ●    | ●    |
| ø20    |      |      |      | ●    | ●    | ●    | ●    |

## ■ Performance

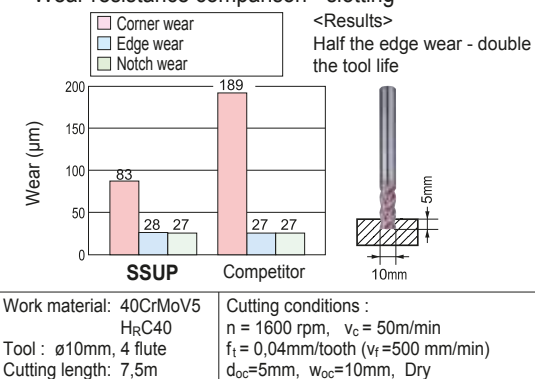
### ● Feed rate comparisons



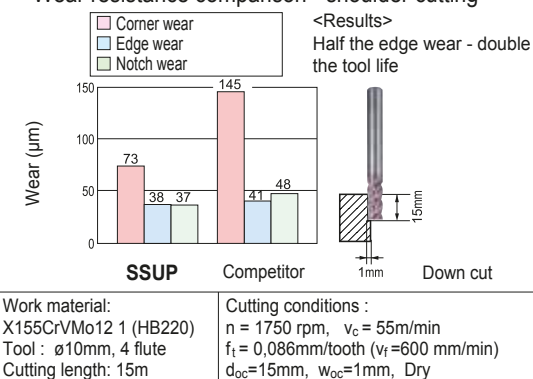
### ● Chip control



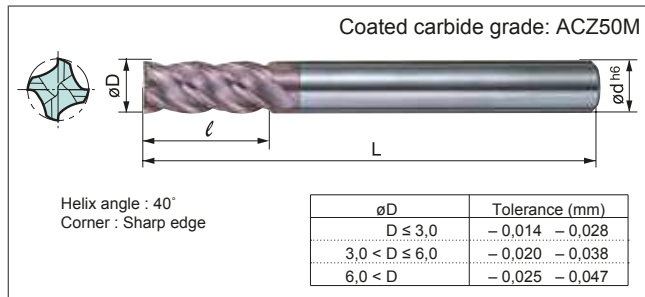
### ● Wear resistance comparison - slotting



### ● Wear resistance comparison - shoulder cutting



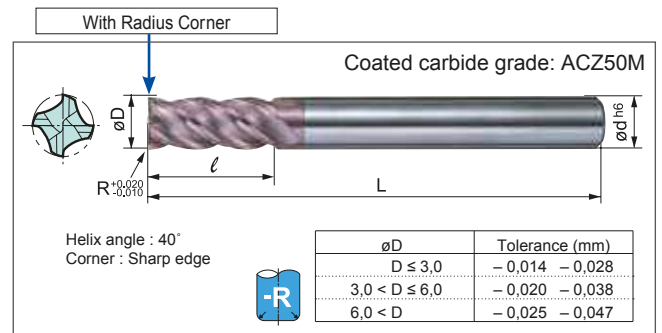
# ZX Coated SSUP MILL SSUP 4000ZX Type



## Endmills

|   | Cat. No.    | Stock | $\phi D$ | $\ell$ | L   | $\phi d$ |
|---|-------------|-------|----------|--------|-----|----------|
| 4 | SSUP 4020ZX | ●     | 2,0      | 6      | 50  | 4        |
|   | SSUP 4030ZX | ●     | 3,0      | 8      | 50  | 6        |
|   | SSUP 4040ZX | ●     | 4,0      | 11     | 50  | 6        |
|   | SSUP 4050ZX | ●     | 5,0      | 13     | 60  | 6        |
|   | SSUP 4060ZX | ●     | 6,0      | 13     | 60  | 6        |
|   | SSUP 4070ZX | ●     | 7,0      | 16     | 70  | 8        |
|   | SSUP 4080ZX | ●     | 8,0      | 19     | 80  | 8        |
|   | SSUP 4090ZX | ●     | 9,0      | 19     | 90  | 10       |
|   | SSUP 4100ZX | ●     | 10,0     | 22     | 90  | 10       |
|   | SSUP 4110ZX | ●     | 11,0     | 22     | 90  | 12       |
|   | SSUP 4120ZX | ●     | 12,0     | 26     | 90  | 12       |
|   | SSUP 4140ZX | ●     | 14,0     | 26     | 110 | 16       |
|   | SSUP 4150ZX | □     | 15,0     | 26     | 110 | 16       |
|   | SSUP 4160ZX | ●     | 16,0     | 32     | 115 | 16       |
|   | SSUP 4180ZX | □     | 18,0     | 32     | 120 | 20       |
|   | SSUP 4200ZX | ●     | 20,0     | 38     | 125 | 20       |

# ZX Coated SSUP MILL SSUP 4000ZX-R Type

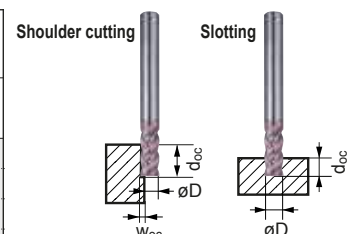


## Endmills

|   | Cat. No.        | Stock | $\phi D$ | R   | $\ell$ | L   | $\phi d$ |
|---|-----------------|-------|----------|-----|--------|-----|----------|
| 4 | SSUP 4030ZX-R02 | ●     | 3,0      | 0,2 | 8      | 50  | 6        |
|   | SSUP 4030ZX-R05 | □     | 3,0      | 0,5 | 8      | 50  | 6        |
|   | SSUP 4040ZX-R02 | ●     | 4,0      | 0,2 | 11     | 50  | 6        |
|   | SSUP 4040ZX-R05 | ●     | 4,0      | 0,5 | 11     | 50  | 6        |
|   | SSUP 4040ZX-R10 | □     | 4,0      | 1,0 | 11     | 50  | 6        |
|   | SSUP 4050ZX-R02 | ●     | 5,0      | 0,2 | 13     | 60  | 6        |
|   | SSUP 4050ZX-R05 | ●     | 5,0      | 0,5 | 13     | 60  | 6        |
|   | SSUP 4050ZX-R10 | □     | 5,0      | 1,0 | 13     | 60  | 6        |
|   | SSUP 4060ZX-R03 | ●     | 6,0      | 0,3 | 13     | 60  | 6        |
|   | SSUP 4060ZX-R05 | ●     | 6,0      | 0,5 | 13     | 60  | 6        |
|   | SSUP 4060ZX-R10 | ●     | 6,0      | 1,0 | 13     | 60  | 6        |
|   | SSUP 4060ZX-R15 | □     | 6,0      | 1,5 | 13     | 60  | 6        |
|   | SSUP 4080ZX-R03 | ●     | 8,0      | 0,3 | 13     | 80  | 8        |
|   | SSUP 4080ZX-R05 | ●     | 8,0      | 0,5 | 13     | 80  | 8        |
|   | SSUP 4080ZX-R10 | ●     | 8,0      | 1,0 | 19     | 80  | 8        |
|   | SSUP 4080ZX-R15 | □     | 8,0      | 1,5 | 19     | 80  | 8        |
|   | SSUP 4080ZX-R20 | □     | 8,0      | 2,0 | 19     | 80  | 8        |
|   | SSUP 4100ZX-R03 | ●     | 10,0     | 0,3 | 22     | 90  | 10       |
|   | SSUP 4100ZX-R05 | ●     | 10,0     | 0,5 | 22     | 90  | 10       |
|   | SSUP 4100ZX-R10 | ●     | 10,0     | 1,0 | 22     | 90  | 10       |
|   | SSUP 4100ZX-R15 | □     | 10,0     | 1,5 | 22     | 90  | 10       |
|   | SSUP 4100ZX-R20 | □     | 10,0     | 2,0 | 22     | 90  | 10       |
|   | SSUP 4120ZX-R05 | ●     | 12,0     | 0,5 | 26     | 90  | 12       |
|   | SSUP 4120ZX-R10 | ●     | 12,0     | 1,0 | 26     | 90  | 12       |
|   | SSUP 4120ZX-R15 | ●     | 12,0     | 1,5 | 26     | 90  | 12       |
|   | SSUP 4120ZX-R20 | □     | 12,0     | 2,0 | 26     | 90  | 12       |
|   | SSUP 4120ZX-R30 | □     | 12,0     | 3,0 | 26     | 90  | 12       |
|   | SSUP 4160ZX-R10 | ●     | 16,0     | 1,0 | 32     | 115 | 16       |
|   | SSUP 4160ZX-R15 | ●     | 16,0     | 1,5 | 32     | 115 | 16       |
|   | SSUP 4160ZX-R20 | □     | 16,0     | 2,0 | 32     | 115 | 16       |
|   | SSUP 4160ZX-R30 | □     | 16,0     | 3,0 | 32     | 115 | 16       |
|   | SSUP 4200ZX-R10 | ●     | 20,0     | 1,0 | 38     | 125 | 20       |
|   | SSUP 4200ZX-R15 | □     | 20,0     | 1,5 | 38     | 125 | 20       |
|   | SSUP 4200ZX-R20 | □     | 20,0     | 2,0 | 38     | 125 | 20       |
|   | SSUP 4200ZX-R30 | □     | 20,0     | 3,0 | 38     | 125 | 20       |

## Recommended Cutting Conditions

| Material<br><div>Cutting data</div> | Carbon steel,<br>Cast iron<br>(HB150~250) |                  | Alloy steel,<br>Prehardened steel<br>(HRC25~35) |                  | Hardened steel<br>(HRC40~50) |                  | Stainless steel |                  | Heat resistant alloys<br>Titanium alloy<br>(HRC20~45) |                  |
|-------------------------------------|-------------------------------------------|------------------|-------------------------------------------------|------------------|------------------------------|------------------|-----------------|------------------|-------------------------------------------------------|------------------|
|                                     | Speed<br>(rpm)                            | Feed<br>(mm/min) | Speed<br>(rpm)                                  | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)  | Feed<br>(mm/min) | Speed<br>(rpm)                                        | Feed<br>(mm/min) |
| øD<br>(mm)                          |                                           |                  |                                                 |                  |                              |                  |                 |                  |                                                       |                  |
| 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<br>cutting                 | d <sub>oc</sub>                           | 1,5D             |                                                 |                  |                              |                  |                 |                  |                                                       |                  |
|                                     | w <sub>oc</sub>                           | 0,1D             |                                                 |                  | 0,05D                        |                  | 0,1D            |                  | 0,05D                                                 |                  |
| Slotting                            | d <sub>sc</sub>                           | 1,0D             |                                                 |                  | 0,2D                         |                  | 0,3D            |                  | 0,2D                                                  |                  |

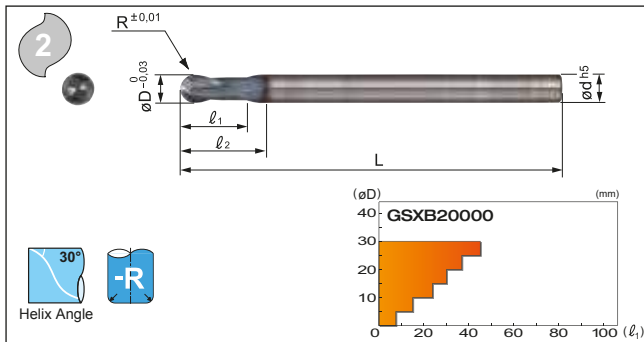


- (1) Cutting performance is improved when using a high rigidity machine.
- (2) Speeds and feeds should be reduced when slotting some stainless steels.
- (3) In case of chatter first check the cutting conditions.

# GSX MILL Ball Endmills

## GSXB 20000 Type

| Coated Carbide Grades | GSX Coating | Structural Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Die Steel | Hardened Steel | Stainless Steel | Ti Alloy / Heat Resistant Alloy | Cast Iron | Al Alloy | Cu Alloy | Graphite |
|-----------------------|-------------|------------------|--------------|-------------|--------------------|--------------------|----------------|-----------------|---------------------------------|-----------|----------|----------|----------|
| Grades                | Coating     | ○                | ○            | ○           | ○                  | ○                  | ○              | ○               | ○                               | ○         | ○        | ○        | ○        |



Coated carbide grade: **ACB20**

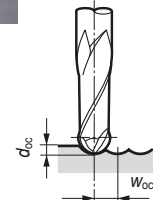
### Endmill Identification (GSXB Type)

## GSXB 2 0200

- ① Series Code  
② No. of Teeth  
③ Radius of Ballnose



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.

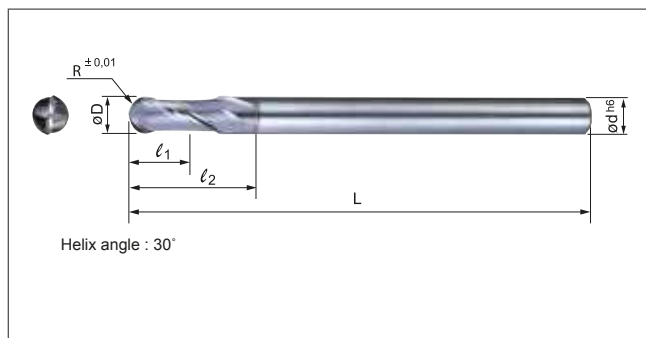
### Radius Milling

| Work Material         | 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) |
| Cutting Conditions    |                                         |                    |                                         |                    |                             |                    |                                |                    |
| R (mm)                |                                         |                    |                                         |                    |                             |                    |                                |                    |
| 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 | d <sub>oc</sub>                         | 0.02 D             | 0.02 D                                  | 0.02 D             | 0.02 D                      | 0.02 D             | 0.02 D                         | 0.02 D             |
|                       | W <sub>oc</sub>                         | 0.05 D             | 0.05 D                                  | 0.05 D             | 0.05 D                      | 0.05 D             | 0.05 D                         | 0.05 D             |

- = Euro stock  
▲ = To be replaced by new item

# GS MILL Ball Endmills GLB 2000SF Type

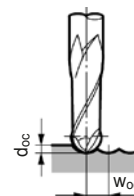
Coated carbide grade: **ACZ20W**



## Endmills

(mm)

|   | Cat. No.    | Stock | R    | ØD   | L <sub>1</sub> | L <sub>2</sub> | L   | Ød |
|---|-------------|-------|------|------|----------------|----------------|-----|----|
| 2 | GLB 2010 SF | ▲     | 0,5  | 1,0  | 1,5            | 2              | 50  | 4  |
|   | GLB 2015 SF | ▲     | 0,75 | 1,5  | 2,5            | 3              | 50  | 4  |
|   | GLB 2020 SF | ▲     | 1,0  | 2,0  | 3              | 4              | 60  | 6  |
|   | GLB 2025 SF | ▲     | 1,25 | 2,5  | 4              | 5              | 60  | 6  |
|   | GLB 2030 SF | ▲     | 1,5  | 3,0  | 4,5            | 6              | 60  | 6  |
|   | GLB 2040 SF | ▲     | 2,0  | 4,0  | 6              | 8              | 70  | 6  |
|   | GLB 2050 SF | ▲     | 2,5  | 5,0  | 7,5            | 10             | 80  | 6  |
|   | GLB 2060 SF | ▲     | 3,0  | 6,0  | 9              | —              | 80  | 6  |
|   | GLB 2080 SF | ▲     | 4,0  | 8,0  | 12             | —              | 90  | 8  |
|   | GLB 2100 SF | ▲     | 5,0  | 10,0 | 15             | —              | 100 | 10 |
|   | GLB 2120 SF | ▲     | 6,0  | 12,0 | 21             | —              | 110 | 12 |



## Recommended Cutting Conditions

### Conventional Milling Operations

Recommended :

- (1) Cutting performance is enhanced when using a high quality machine and rigid set up.
- (2) In case of chatter check immediately rigidity of set up and the cutting conditions.

### ● GS Mill, 2 teeth ball nose type endmill, GLB 2000SF

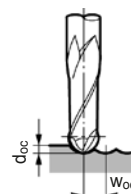
| Material<br>Cutting data<br>R<br>(mm) | Carbon steel,<br>Cast iron<br>(HB150~250) |                  | Alloy steel,<br>Prehardened steel<br>(HRC25~35) |                  | Heat treated alloy steel,<br>hardened steel<br>(HRC35~45) |                  | Hardened steel<br>(HRC45~55) |                  | Stainless steel |                  | Heat resistant alloys<br>Titanium alloy |                  |
|---------------------------------------|-------------------------------------------|------------------|-------------------------------------------------|------------------|-----------------------------------------------------------|------------------|------------------------------|------------------|-----------------|------------------|-----------------------------------------|------------------|
|                                       | Speed<br>(rpm)                            | Feed<br>(mm/min) | Speed<br>(rpm)                                  | Feed<br>(mm/min) | Speed<br>(rpm)                                            | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)  | Feed<br>(mm/min) | Speed<br>(rpm)                          | Feed<br>(mm/min) |
| R = 1                                 | 19.100                                    | 770              | 12.800                                          | 370              | 10.200                                                    | 270              | 8.900                        | 190              | 8.900           | 210              | 6.400                                   | 120              |
| R = 2                                 | 10.800                                    | 1.100            | 7.200                                           | 550              | 5.700                                                     | 400              | 5.000                        | 280              | 5.000           | 310              | 3.600                                   | 180              |
| R = 3                                 | 7.700                                     | 1.300            | 5.200                                           | 660              | 4.100                                                     | 480              | 3.600                        | 330              | 3.600           | 380              | 2.600                                   | 210              |
| R = 4                                 | 6.000                                     | 1.400            | 4.000                                           | 700              | 3.200                                                     | 510              | 2.800                        | 360              | 2.800           | 400              | 2.000                                   | 230              |
| R = 5                                 | 4.800                                     | 1.400            | 3.200                                           | 700              | 2.600                                                     | 520              | 2.300                        | 370              | 2.300           | 410              | 1.600                                   | 230              |
| R = 6                                 | 4.000                                     | 1.400            | 2.700                                           | 710              | 2.200                                                     | 530              | 1.900                        | 370              | 1.900           | 410              | 1.400                                   | 240              |
| Depth and width of cut                | d <sub>oc</sub>                           | 0,1D             |                                                 |                  |                                                           | 0,05D            |                              |                  | 0,1D            |                  |                                         | 0,05D            |
|                                       | W <sub>oc</sub>                           | 0,2D             |                                                 |                  |                                                           | 0,05D            |                              |                  | 0,2D            |                  |                                         | 0,1D             |

Coated  
Endmills

### HSC Machining Centre Operations

### ● GS Mill, HSC operations with 2 teeth ball nose type endmill, GLB 2000SF

| Material<br>Cutting data<br>R<br>(mm) | Carbon steel,<br>Cast iron<br>(HB150~250) |                  | Alloy steel,<br>Prehardened steel<br>(HRC25~35) |                  | Heat treated alloy steel,<br>hardened steel<br>(HRC35~45) |                  | Hardened steel<br>(HRC45~55) |                  | Stainless steel |                  |
|---------------------------------------|-------------------------------------------|------------------|-------------------------------------------------|------------------|-----------------------------------------------------------|------------------|------------------------------|------------------|-----------------|------------------|
|                                       | Speed<br>(rpm)                            | Feed<br>(mm/min) | Speed<br>(rpm)                                  | Feed<br>(mm/min) | Speed<br>(rpm)                                            | Feed<br>(mm/min) | Speed<br>(rpm)               | Feed<br>(mm/min) | Speed<br>(rpm)  | Feed<br>(mm/min) |
| R = 1                                 | 51.000                                    | 2.100            | 39.800                                          | 1.300            | 35.700                                                    | 960              | 23.700                       | 640              | 35.700          | 960              |
| R = 2                                 | 25.500                                    | 2.700            | 19.900                                          | 1.700            | 17.900                                                    | 1.300            | 11.900                       | 830              | 17.900          | 1.300            |
| R = 3                                 | 17.000                                    | 3.000            | 13.300                                          | 1.900            | 11.900                                                    | 1.400            | 7.900                        | 920              | 11.900          | 1.400            |
| R = 4                                 | 12.800                                    | 3.100            | 10.000                                          | 2.000            | 9.000                                                     | 1.500            | 6.000                        | 960              | 9.000           | 1.500            |
| R = 5                                 | 10.200                                    | 3.100            | 8.000                                           | 2.000            | 7.200                                                     | 1.500            | 4.800                        | 960              | 7.200           | 1.500            |
| R = 6                                 | 8.500                                     | 3.100            | 6.700                                           | 2.000            | 6.000                                                     | 1.500            | 4.000                        | 960              | 6.000           | 1.500            |
| Depth and width of cut                | d <sub>oc</sub>                           | 0,05D            |                                                 |                  |                                                           | 0,02D            |                              |                  | 0,05D           |                  |
|                                       | W <sub>oc</sub>                           | 0,1D             |                                                 |                  |                                                           | 0,05D            |                              |                  | 0,1D            |                  |





# High Efficient Endmills Ball Endmills "Neo"

Extreme Hard ZX Coated Ball Endmills

Grade: ACZ10M



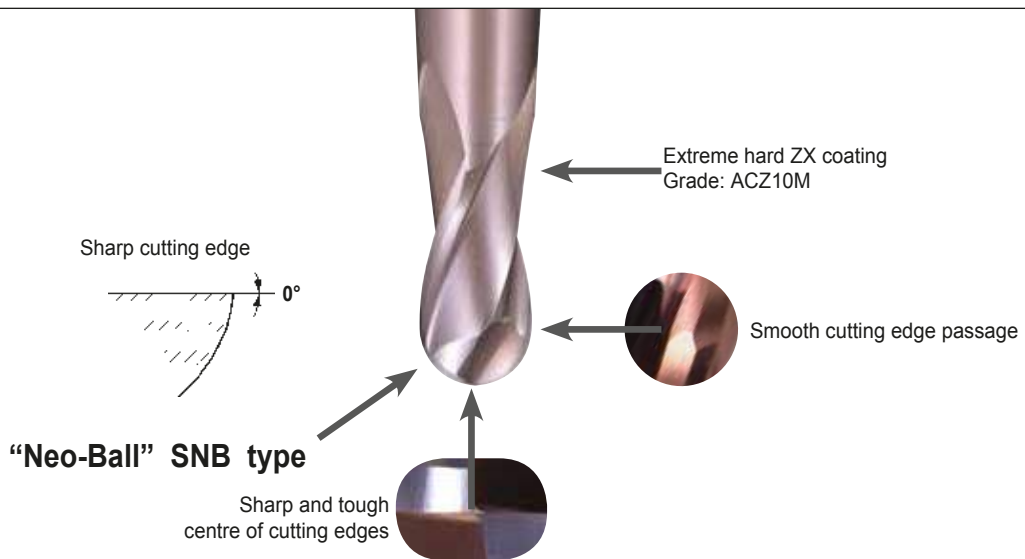
## ■ Features

ZX coated ball-nose endmill "Neo" features the wave shaped sharp cutting edge for optimized chip control and performs a variety of high performance machining steels, stainless steels and high temperature alloys.

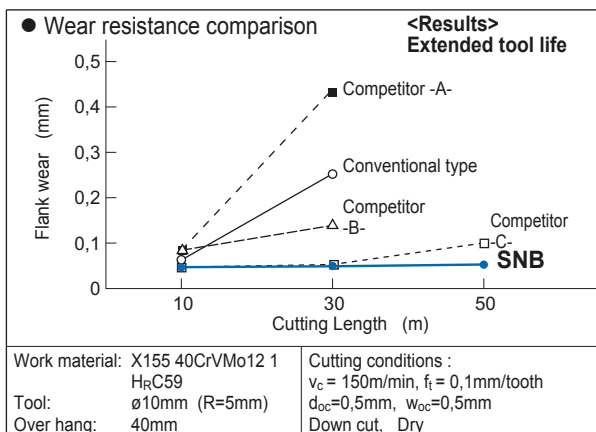
Extended tool life is realized even when hard machining thanks to a special stiff substrate and new ultra hard ZX coating.

## ■ Advantages

- Smooth cutting due to sharp cutting edge
- Smooth passage at the cutting edge of radius part and straight part
- Sharp and tough ball-nose centre
- Extra durable due to the combination of extreme hard ZX coating (Hv4000) and stiff substrate
- Possible to high precision cutting with this high young ratio substrate



## ■ Performance

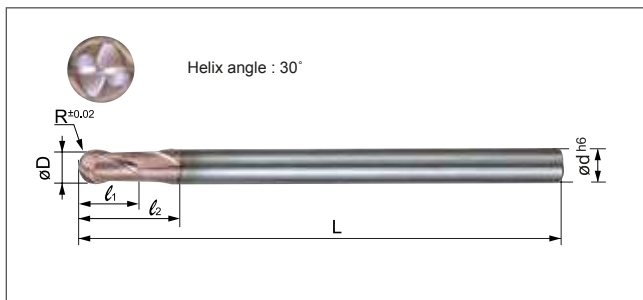


# ZX Coated "Neo Ball" Endmills

## SNB 2000ZX Type

2

Coated carbide grade: ACZ10M



### Endmills

(mm)

|   | Cat. No.   | Stock | R    | øD | ℓ <sub>1</sub> | ℓ <sub>2</sub> | L   | ød |
|---|------------|-------|------|----|----------------|----------------|-----|----|
| 2 | SNB 2010ZX | ●     | 0,5  | 1  | 1,5            | 3              | 50  | 4  |
|   | SNB 2020ZX | ●     | 1,0  | 2  | 3,0            | 5              | 60  | 6  |
|   | SNB 2030ZX | ●     | 1,5  | 3  | 4,5            | 8              | 80  | 6  |
|   | SNB 2040ZX | ●     | 2,0  | 4  | 6,0            | 12             | 80  | 6  |
|   | SNB 2050ZX | ●     | 2,5  | 5  | 7,5            | 14             | 90  | 6  |
|   | SNB 2060ZX | ●     | 3,0  | 6  | 9,0            | —              | 100 | 6  |
|   | SNB 2070ZX | □     | 3,5  | 7  | 11,0           | 20             | 100 | 8  |
|   | SNB 2080ZX | ●     | 4,0  | 8  | 12,0           | —              | 100 | 8  |
|   | SNB 2100ZX | ●     | 5,0  | 10 | 15,0           | —              | 120 | 10 |
|   | SNB 2120ZX | ●     | 6,0  | 12 | 18,0           | —              | 120 | 12 |
|   | SNB 2140ZX | ●     | 7,0  | 14 | 21,0           | 38             | 160 | 16 |
|   | SNB 2160ZX | ●     | 8,0  | 16 | 24,0           | —              | 160 | 16 |
|   | SNB 2180ZX | ●     | 9,0  | 18 | 27,0           | 50             | 180 | 20 |
|   | SNB 2200ZX | ●     | 10,0 | 20 | 30,0           | —              | 180 | 20 |
|   | SNB 2250ZX |       | 12,5 | 25 | 38,0           | —              | 200 | 25 |
|   | SNB 2300ZX |       | 15,0 | 30 | 45,0           | 80             | 200 | 32 |



### Recommended conditions

$d_{oc} = 0,3 \times \phi D$ , (Below R1,0 ;  $0,2 \times \phi D$ )  
 $w_{oc} = 0,7 \times \phi D$ , (Below R1,0 ;  $0,6 \times \phi D$ )

| R             | Material | Carbon steel, Alloy steel |               | Hardened steel | Cast iron   | Stainless steel, Ti-alloy etc, |
|---------------|----------|---------------------------|---------------|----------------|-------------|--------------------------------|
|               |          | (Below HRC25)             | (Below HRC45) |                |             |                                |
| R0,5 ~ R1,4   | $v_c$    | 200-250-300               | 100-150-200   | 100-120-150    | 100-120-150 | 60-75-90                       |
|               | $f_t$    | 0,005~0,010               | 0,003~0,005   | 0,002~0,003    | 0,008~0,015 | 0,003~0,005                    |
| R1,5 ~ R2,9   | $v_c$    | 200-250-300               | 100-150-200   | 100-120-150    | 100-120-150 | 60-75-90                       |
|               | $f_t$    | 0,013~0,025               | 0,007~0,013   | 0,005~0,008    | 0,017~0,042 | 0,007~0,013                    |
| R3,0 ~ R6,4   | $v_c$    | 200-250-300               | 100-150-200   | 100-120-150    | 100-120-150 | 60-75-90                       |
|               | $f_t$    | 0,030~0,050               | 0,017~0,033   | 0,010~0,020    | 0,056~0,136 | 0,017~0,033                    |
| R6,5 ~ R9,9   | $v_c$    | 200-250-300               | 100-150-200   | 100-120-150    | 100-120-150 | 60-75-90                       |
|               | $f_t$    | 0,070~0,100               | 0,040~0,057   | 0,020~0,040    | 0,167~0,238 | 0,040~0,057                    |
| R10,0 ~ R15,0 | $v_c$    | 200-250-300               | 100-150-200   | 100-120-150    | 100-120-150 | 60-75-90                       |
|               | $f_t$    | 0,118~0,167               | 0,085~0,095   | 0,045~0,080    | 0,250~0,350 | 0,085~0,095                    |

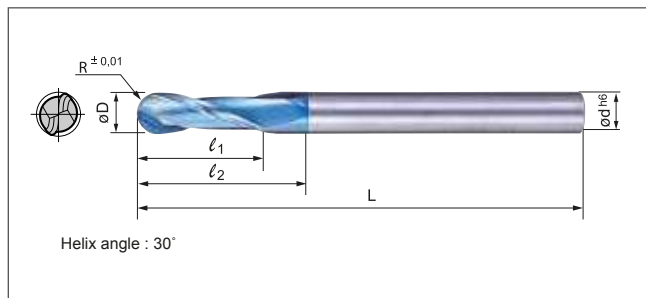
$v_c$  = m/min  $f_t$  = mm/tooth

# AURORA Coated Ball Endmills

## SNB 2000DL Type

### DLC (Diamond Like Carbon) Coating

DLC coated carbide grade: DL1200



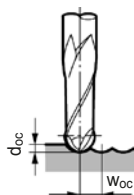
#### Endmills

(mm)

|   | Cat. No.    | Stock | R   | $\phi D$ | $l_1$ | $l_2$ | L   | $\phi d$ |
|---|-------------|-------|-----|----------|-------|-------|-----|----------|
| 2 | SNB 2020 DL | ●     | 1,0 | 2,0      | 3     | 5     | 60  | 6        |
|   | SNB 2030 DL | ●     | 1,5 | 3,0      | 4,5   | 8     | 80  | 6        |
|   | SNB 2040 DL | ●     | 2,0 | 4,0      | 6     | 12    | 80  | 6        |
|   | SNB 2050 DL | ●     | 2,5 | 5,0      | 7,5   | 14    | 90  | 6        |
|   | SNB 2060 DL | ●     | 3,0 | 6,0      | 9     | —     | 100 | 6        |
|   | SNB 2080 DL | ●     | 4,0 | 8,0      | 12    | —     | 100 | 8        |
|   | SNB 2100 DL | ●     | 5,0 | 10,0     | 15    | —     | 120 | 10       |
|   | SNB 2120 DL | ●     | 6,0 | 12,0     | 18    | —     | 120 | 12       |
|   | SNB 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

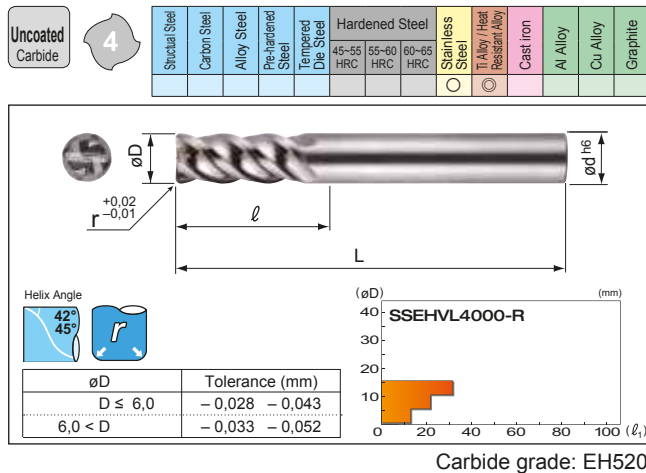


#### Recommended Cutting Conditions

| Work Material            |           | Aluminum Alloy    |                  |                |                  |
|--------------------------|-----------|-------------------|------------------|----------------|------------------|
| Cutting data             | R<br>(mm) | Wet<br>(Emulsion) |                  | Dry            |                  |
|                          |           | Speed<br>(rpm)    | Feed<br>(mm/min) | Speed<br>(rpm) | Feed<br>(mm/min) |
|                          | R = 1     | 48.000            | 1.500            | 48.000         | 1.000            |
|                          | R = 1,5   | 48.000            | 2.100            | 48.000         | 1.500            |
|                          | R = 2     | 31.000            | 2.800            | 31.000         | 2.000            |
|                          | R = 2,5   | 24.000            | 2.800            | 24.000         | 2.000            |
|                          | R = 3     | 20.000            | 2.800            | 20.000         | 2.000            |
|                          | R = 4     | 15.000            | 2.800            | 15.000         | 2.000            |
|                          | R = 5     | 13.000            | 3.000            | 13.000         | 2.100            |
|                          | R = 6     | 10.000            | 3.000            | 10.000         | 2.100            |
|                          | R = 8     | 7.700             | 3.000            | 7.700          | 2.100            |
| Depth and<br>wide of cut | $d_{Oc}$  | 1,5D              |                  | 1,0D           |                  |
|                          | $W_{Oc}$  | 0,2D              |                  | (D)            |                  |

● = Euro stock

# SSEHVL 4000-R Type



## Endmills

| Cat. No.        | Stock | ØD   | ℓ <sub>1</sub> | ℓ <sub>2</sub> | L   | Ød |
|-----------------|-------|------|----------------|----------------|-----|----|
| 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 |

## Characteristics / Application

- For stable machining, a more rigid machine is recommended.
- Wet machining is recommended for stainless steel and heat resistant alloy applications.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

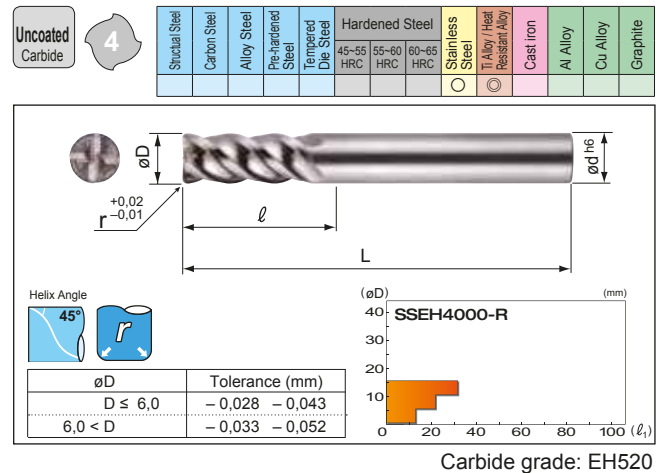
### Shoulder Milling

| Work Material    | Stainless Steel     |                    | Titanium Alloy      |                    | Heat Resistant Steel |                    |
|------------------|---------------------|--------------------|---------------------|--------------------|----------------------|--------------------|
| Cond.            | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm)  | Feed Rate (mm/min) |
| ØD (mm)          |                     |                    |                     |                    |                      |                    |
| 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 | 1,5 D               |                    | 0,05 D              |                    | 0,05 D               |                    |

### Grooving

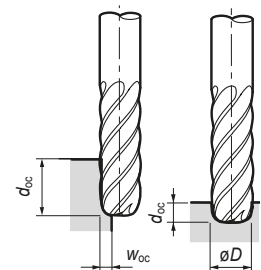
| Work Material | Stainless Steel     |                    | Titanium Alloy      |                    | Heat Resistant Steel |                    |
|---------------|---------------------|--------------------|---------------------|--------------------|----------------------|--------------------|
| Cond.         | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm)  | Feed Rate (mm/min) |
| ØD (mm)       |                     |                    |                     |                    |                      |                    |
| 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      | 0,3 D               |                    | 0,2 D               |                    | 0,15 D               |                    |

# SSEH 4000-R Type



## Endmills

| Cat. No.      | Stock | ØD   | ℓ <sub>1</sub> | ℓ <sub>2</sub> | L   | Ød |
|---------------|-------|------|----------------|----------------|-----|----|
| 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 |



### Shoulder Milling

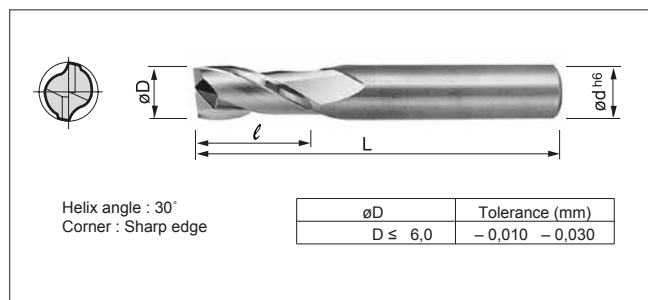
| Work Material    | Stainless Steel     |                    | Titanium Alloy      |                    | Heat Resistant Steel |                    |
|------------------|---------------------|--------------------|---------------------|--------------------|----------------------|--------------------|
| Cond.            | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm)  | Feed Rate (mm/min) |
| ØD (mm)          |                     |                    |                     |                    |                      |                    |
| 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 | 1,5 D               |                    | 0,05 D              |                    | 0,05 D               |                    |

### Grooving

| Work Material | Stainless Steel     |                    | Titanium Alloy      |                    | Heat Resistant Steel |                    |
|---------------|---------------------|--------------------|---------------------|--------------------|----------------------|--------------------|
| Cond.         | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm) | Feed Rate (mm/min) | Spindle Speed (rpm)  | Feed Rate (mm/min) |
| ØD (mm)       |                     |                    |                     |                    |                      |                    |
| 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      | 0,3 D               |                    | 0,2 D               |                    | 0,15 D               |                    |

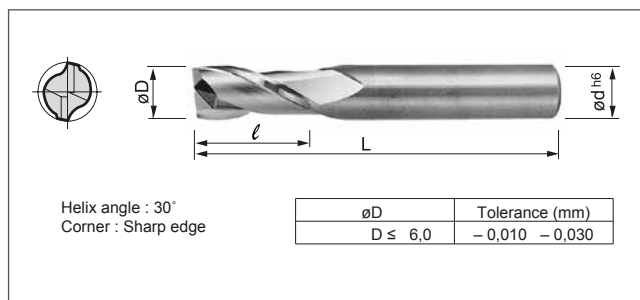
# Solid Carbide Spiral Endmills SSM 2000 Type ( $\phi 0,2 \sim \phi 4,3$ )

Carbide grade: A1 (Micrograin)



# Solid Carbide Spiral Endmills SSM 2000 Type ( $\phi 4,4 \sim \phi 8,5$ )

Carbide grade: A1 (Micrograin)



## ■ Endmills (mm)

|  | Cat. No. | Stock | øD  | ℓ   | L  | ød |
|--|----------|-------|-----|-----|----|----|
|  | SSM 2002 | ●     |     | 0,5 | 40 | 3  |
|  | SSM 2003 | ●     | 0,3 | 1   | 40 | 3  |
|  | SSM 2004 | ●     | 0,4 | 1   | 40 | 3  |
|  | SSM 2005 | ●     | 0,5 | 1,5 | 40 | 3  |
|  | SSM 2006 | ●     | 0,6 | 1,5 | 40 | 3  |
|  | SSM 2007 | ●     | 0,7 | 1,5 | 40 | 3  |
|  | SSM 2008 | ●     | 0,8 | 2   | 40 | 3  |
|  | SSM 2009 | ●     | 0,9 | 2   | 40 | 3  |
|  | SSM 2010 | ●     | 1,0 | 3   | 40 |    |
|  | SSM 2011 | □     | 1,1 |     | 40 |    |
|  | SSM 2012 | □     | 1,2 |     | 40 |    |
|  | SSM 2013 |       | 1,3 |     | 40 |    |
|  | SSM 2014 |       | 1,4 |     | 40 |    |
|  | SSM 2015 | ●     | 1,5 | 5   | 40 | 4  |
|  | SSM 2016 |       | 1,6 | 5   | 40 | 4  |
|  | SSM 2017 |       | 1,7 | 5   | 40 | 4  |
|  | SSM 2018 |       | 1,8 | 5   | 40 | 4  |
|  | SSM 2019 |       | 1,9 | 5   | 40 | 4  |
|  | SSM 2020 | ●     | 2,0 | 6   | 40 | 4  |
|  | SSM 2021 |       | 2,1 | 6   | 40 | 4  |
|  | SSM 2022 | □     | 2,2 | 6   | 40 | 4  |
|  | SSM 2023 | □     | 2,3 | 6   | 40 | 4  |
|  | SSM 2024 | □     | 2,4 | 6   | 40 | 4  |
|  | SSM 2025 | ●     | 2,5 | 8   | 40 | 4  |
|  | SSM 2026 |       | 2,6 | 8   | 40 | 4  |
|  | SSM 2027 | ●     | 2,7 | 8   | 40 | 4  |
|  | SSM 2028 | □     | 2,8 | 8   | 40 | 4  |
|  | SSM 2029 |       | 2,9 | 8   | 40 | 4  |
|  | SSM 2030 | ●     | 3,0 | 8   | 45 | 6  |
|  | SSM 2031 | □     | 3,1 | 8   | 45 | 6  |
|  | SSM 2032 | □     | 3,2 | 8   | 45 | 6  |
|  | SSM 2033 |       | 3,3 | 8   | 45 | 6  |
|  | SSM 2034 | □     | 3,4 | 8   | 45 | 6  |
|  | SSM 2035 | ●     | 3,5 | 8   | 45 | 6  |
|  | SSM 2036 |       | 3,6 | 10  | 45 | 6  |
|  | SSM 2037 |       | 3,7 | 10  | 45 | 6  |
|  | SSM 2038 | □     | 3,8 | 10  | 45 | 6  |
|  | SSM 2039 | □     | 3,9 | 10  | 45 | 6  |
|  | SSM 2040 | ●     | 4,0 | 10  | 45 | 6  |
|  | SSM 2041 | □     | 4,1 | 10  | 45 | 6  |
|  | SSM 2042 | □     | 4,2 | 10  | 45 | 6  |
|  | SSM 2043 |       | 4,3 | 10  | 45 | 6  |

## ■ Endmills (mm)

|  | Cat. No. | Stock | øD  | ℓ  | L  | ød |
|--|----------|-------|-----|----|----|----|
|  | SSM 2044 | □     | 4,4 | 10 | 45 | 6  |
|  | SSM 2045 | ●     | 4,5 | 10 | 45 | 6  |
|  | SSM 2046 |       | 4,6 | 12 | 50 | 6  |
|  | SSM 2047 |       | 4,7 | 12 | 50 | 6  |
|  | SSM 2048 |       | 4,8 | 12 | 50 | 6  |
|  | SSM 2049 |       | 4,9 | 12 | 50 | 6  |
|  | SSM 2050 | ●     | 5,0 | 12 | 50 | 6  |
|  | SSM 2051 | □     | 5,1 | 12 | 50 | 6  |
|  | SSM 2052 |       | 5,2 | 12 | 50 |    |
|  | SSM 2053 |       | 5,3 |    | 50 |    |
|  | SSM 2054 |       | 5,4 | 12 | 50 | 6  |
|  | SSM 2055 | ●     | 5,5 | 12 | 50 | 6  |
|  | SSM 2056 |       | 5,6 | 12 | 50 | 6  |
|  | SSM 2057 |       | 5,7 | 12 | 50 | 6  |
|  | SSM 2058 |       | 5,8 | 12 | 50 | 6  |
|  | SSM 2059 |       | 5,9 | 12 | 50 | 6  |
|  | SSM 2060 | ●     | 6,0 | 12 | 50 | 6  |
|  | SSM 2061 |       | 6,1 | 12 | 50 | 6  |
|  | SSM 2062 | □     | 6,2 | 12 | 50 | 6  |
|  | SSM 2063 | □     | 6,3 | 12 | 50 | 6  |
|  | SSM 2064 |       | 6,4 | 12 |    | 6  |
|  | SSM 2065 | ●     | 6,5 | 12 | 50 | 8  |
|  | SSM 2066 | □     | 6,6 |    | 55 | 8  |
|  | SSM 2067 |       | 6,7 | 15 | 55 | 8  |
|  | SSM 2068 |       | 6,8 | 15 | 55 | 8  |
|  | SSM 2069 |       | 6,9 | 15 | 55 | 8  |
|  | SSM 2070 | ●     | 7,0 | 15 | 55 | 8  |
|  | SSM 2071 | □     | 7,1 | 15 | 55 | 8  |
|  | SSM 2072 |       | 7,2 | 15 | 55 | 8  |
|  | SSM 2073 |       | 7,3 | 15 | 55 | 8  |
|  | SSM 2074 |       | 7,4 | 15 | 55 | 8  |
|  | SSM 2075 | ●     | 7,5 | 15 | 55 | 8  |
|  | SSM 2076 |       | 7,6 | 15 | 55 | 8  |
|  | SSM 2077 |       | 7,7 | 15 | 55 | 8  |
|  | SSM 2078 |       | 7,8 | 15 | 55 | 8  |
|  | SSM 2079 |       | 7,9 | 15 | 55 | 8  |
|  | SSM 2080 | ●     | 8,0 | 15 | 55 | 8  |
|  | SSM 2081 | □     | 8,1 | 15 | 55 | 8  |
|  | SSM 2082 | □     | 8,2 | 15 | 55 | 8  |
|  | SSM 2083 |       | 8,3 | 15 | 55 | 8  |
|  | SSM 2084 |       | 8,4 | 15 | 55 | 8  |
|  | SSM 2085 | ●     | 8,5 | 15 | 55 | 10 |

Recommended Conditions (Slotting)  $\phi D < \phi 3$  ;  $d_{oc} = 0,5 \times \phi D$   
 $\phi D \geq \phi 3$  ;  $d_{oc} = 1,0 \times \phi D$

| øD        | Material | Carbon steel, Alloy steel |               |               | Cast iron   |
|-----------|----------|---------------------------|---------------|---------------|-------------|
|           |          | (Below HRC30)             | (Below HRC40) | (Below HRC45) |             |
| 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

Recommended Conditions (Slotting)  $\phi D \geq \phi 3$  ;  $d_{oc} = 1,0 \times \phi D$

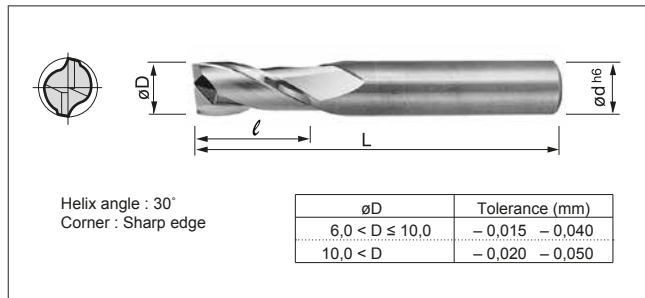
| øD      | Material | Carbon steel, Alloy steel |               |               | Cast iron   |
|---------|----------|---------------------------|---------------|---------------|-------------|
|         |          | (Below HRC30)             | (Below HRC40) | (Below HRC45) |             |
| 5 ~ 5,9 | $v_c$    | 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



# Solid Carbide Spiral Endmills SSM 2000 Type (ø8,6~ø30)

Carbide grade: A1 (Micrograin)



## Endmills (mm)

|   | Cat. No. | Stock | øD   | ℓ  | L   | ød |
|---|----------|-------|------|----|-----|----|
| 2 | SSM 2086 | ○     | 8,6  | 15 | 55  | 10 |
|   | SSM 2087 |       | 8,7  | 15 | 55  | 10 |
|   | SSM 2088 |       | 8,8  | 15 | 55  | 10 |
|   | SSM 2089 |       | 8,9  | 15 | 55  | 10 |
|   | SSM 2090 | ●     | 9,0  | 15 | 55  | 10 |
|   | SSM 2091 |       | 9,1  | 15 | 55  | 10 |
|   | SSM 2092 |       | 9,2  | 15 | 55  | 10 |
|   | SSM 2093 |       | 9,3  | 15 | 55  | 10 |
|   | SSM 2094 |       | 9,4  | 15 | 55  | 10 |
|   | SSM 2095 |       | 9,5  | 15 | 55  | 10 |
|   | SSM 2096 |       | 9,6  | 18 | 65  | 10 |
|   | SSM 2097 |       | 9,7  | 18 | 65  | 10 |
|   | SSM 2098 |       | 9,8  | 18 | 65  | 10 |
|   | SSM 2099 |       | 9,9  | 18 | 65  | 10 |
|   | SSM 2100 | ●     | 10,0 | 18 | 65  | 10 |
|   | SSM 2105 | □     | 10,5 | 18 | 70  | 12 |
|   | SSM 2110 | ●     | 11,0 | 18 | 70  | 12 |
|   | SSM 2115 | ●     | 11,5 | 18 | 70  | 12 |
|   | SSM 2120 | ●     | 12,0 | 18 | 70  | 12 |
|   | SSM 2125 |       | 12,5 | 20 | 80  | 16 |
|   | SSM 2130 | ●     | 13,0 | 20 | 80  | 16 |
|   | SSM 2135 |       | 13,5 |    | 80  | 16 |
|   | SSM 2140 | ●     | 14,0 | 20 | 80  | 16 |
|   | SSM 2145 |       | 14,5 | 25 | 80  | 16 |
|   | SSM 2150 | ●     | 15,0 | 25 | 80  | 16 |
|   | SSM 2155 |       | 15,5 | 35 | 90  | 16 |
|   | SSM 2160 | ●     | 16,0 | 35 | 90  | 16 |
|   | SSM 2165 |       | 16,5 | 35 | 90  | 20 |
|   | SSM 2170 | ●     | 17,0 | 35 | 90  | 20 |
|   | SSM 2175 |       | 17,5 | 40 | 105 | 20 |
|   | SSM 2180 | ●     | 18,0 | 40 | 105 | 20 |
|   | SSM 2185 |       | 18,5 | 40 | 105 | 20 |
|   | SSM 2190 |       | 19,0 | 40 | 105 | 20 |
|   | SSM 2195 |       | 19,5 | 40 | 105 | 20 |
|   | SSM 2200 | ●     | 20,0 | 40 | 105 | 20 |
|   | SSM 2210 | ●     | 21,0 | 40 | 105 | 25 |
|   | SSM 2220 | ●     | 22,0 | 40 |     | 25 |
|   | SSM 2230 | ●     |      | 45 | 115 | 25 |
|   | SSM 2240 |       | 24,0 | 45 | 115 | 25 |
|   | SSM 2250 | ●     |      | 50 |     | 25 |
|   | SSM 2300 |       |      | 55 | 130 | 32 |

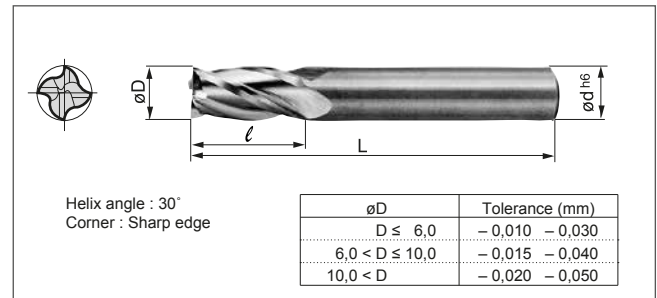
Recommended Conditions (Slotting) øD ≥ ø3 ; d<sub>oc</sub> = 1,0 x øD

| øD   | Material       | Carbon steel, Alloy steel |              |              | Cast iron   |
|------|----------------|---------------------------|--------------|--------------|-------------|
|      |                | (BelowHRC30)              | (BelowHRC40) | (BelowHRC45) |             |
| 9 ~  | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
| 12,5 | f <sub>t</sub> | 0,025~0,050               | 0,025~0,050  | 0,013~0,025  | 0,045~0,105 |
| 13 ~ | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
| 19,5 | f <sub>t</sub> | 0,055~0,085               | 0,055~0,085  | 0,030~0,050  | 0,110~0,170 |
| 20 ~ | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
| 30   | f <sub>t</sub> | 0,095~0,120               | 0,095~0,120  | 0,055~0,070  | 0,185~0,260 |

v<sub>c</sub> = m/min f<sub>t</sub> = mm/tooth

# Solid Carbide Spiral Endmills SSM 4000 Type (ø1,5~ø25)

Carbide grade: A1 (Micrograin)



## Endmills (mm)

|   | Cat. No. | Stock | øD   | ℓ  | L   | ød |
|---|----------|-------|------|----|-----|----|
| 4 | SSM 4015 | ●     | 1,5  | 5  | 40  | 4  |
|   | SSM 4020 | ●     | 2,0  | 6  | 40  | 4  |
|   | SSM 4025 | ●     | 2,5  | 8  | 40  | 4  |
|   | SSM 4030 | ●     | 3,0  | 8  | 45  | 6  |
|   | SSM 4035 | ●     | 3,5  | 8  | 45  | 6  |
|   | SSM 4040 | ●     | 4,0  | 10 | 45  | 6  |
|   | SSM 4045 | ●     | 4,5  | 10 | 45  | 6  |
|   | SSM 4050 | ●     | 5,0  | 12 | 50  | 6  |
|   | SSM 4055 | ●     | 5,5  | 12 | 50  | 6  |
|   | SSM 4060 | ●     | 6,0  | 12 | 50  | 6  |
|   | SSM 4065 | ●     | 6,5  | 12 | 50  | 8  |
|   | SSM 4070 | ●     | 7,0  | 15 | 55  | 8  |
|   | SSM 4075 | ●     | 7,5  | 15 | 55  | 8  |
|   | SSM 4080 | ●     | 8,0  | 15 | 55  | 8  |
|   | SSM 4085 | ●     | 8,5  | 15 | 55  | 10 |
|   | SSM 4090 | ●     | 9,0  | 15 | 55  | 10 |
|   | SSM 4095 | ●     | 9,5  | 15 | 55  | 10 |
|   | SSM 4100 | ●     | 10,0 | 18 | 65  | 10 |
|   | SSM 4105 |       | 10,5 | 18 | 65  | 12 |
|   | SSM 4110 | ●     | 11,0 | 18 | 70  | 12 |
|   | SSM 4120 | ●     | 12,0 | 18 | 70  | 12 |
|   | SSM 4130 |       | 13,0 | 20 | 80  | 16 |
|   | SSM 4140 | ●     | 14,0 | 20 | 80  | 16 |
|   | SSM 4150 | ●     | 15,0 | 25 | 80  | 16 |
|   | SSM 4160 | ●     | 16,0 | 35 | 90  | 16 |
|   | SSM 4170 | □     | 17,0 | 35 | 90  | 20 |
|   | SSM 4180 | ●     | 18,0 | 40 | 105 | 20 |
|   | SSM 4190 |       | 19,0 | 40 | 105 | 20 |
|   | SSM 4200 | ●     | 20,0 | 40 | 105 | 20 |
|   | SSM 4210 |       | 21,0 | 40 | 105 | 25 |
|   | SSM 4220 |       | 22,0 | 40 | 105 | 25 |
|   | SSM 4230 |       | 23,0 | 45 | 115 | 25 |
|   | SSM 4240 |       | 24,0 | 45 | 115 | 25 |
|   | SSM 4250 | ●     | 25,0 | 50 | 120 | 25 |

Recommended Conditions (Shoulder processing) d<sub>oc</sub> = 1,5 x øD  
w<sub>oc</sub> = 0,1 x øD

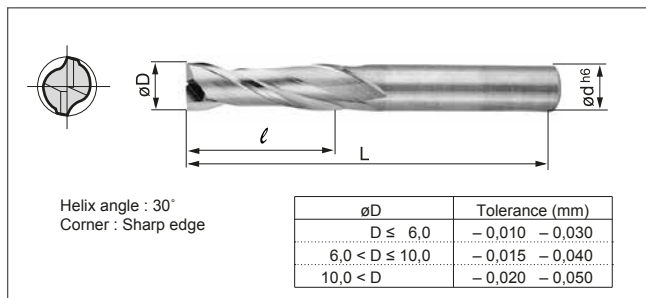
| øD   | Material       | Carbon steel, Alloy steel |              |              | Cast iron   |
|------|----------------|---------------------------|--------------|--------------|-------------|
|      |                | (BelowHRC30)              | (BelowHRC40) | (BelowHRC45) |             |
| 1 ~  | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
| 2,9  | f <sub>t</sub> | 0,004~0,017               | 0,004~0,017  | 0,002~0,008  | 0,008~0,020 |
| 3 ~  | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
| 5,9  | f <sub>t</sub> | 0,018~0,036               | 0,018~0,036  | 0,009~0,018  | 0,027~0,060 |
| 6 ~  | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
| 12,9 | f <sub>t</sub> | 0,038~0,070               | 0,038~0,070  | 0,019~0,035  | 0,065~0,157 |
| 13 ~ | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
| 19,9 | f <sub>t</sub> | 0,075~0,125               | 0,075~0,125  | 0,040~0,075  | 0,160~0,250 |
| 20 ~ | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|      | f <sub>t</sub> | 0,135~0,170               | 0,135~0,170  | 0,085~0,110  | 0,257~0,390 |

v<sub>c</sub> = m/min f<sub>t</sub> = mm/tooth

Uncoated  
Endmills

# Long Spiral Endmills LSM 2000 Type

Carbide grade: A1 (Micrograin)



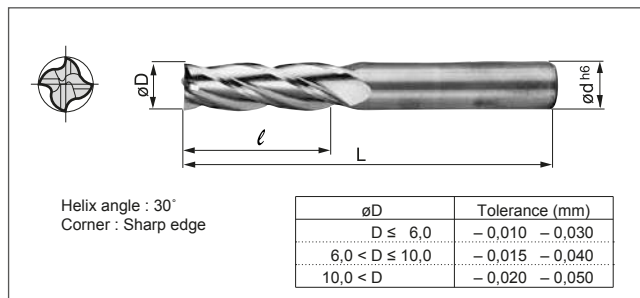
## Endmills

(mm)

|   | Cat. No. | Stock | øD   | ℓ  | L   | ød |
|---|----------|-------|------|----|-----|----|
| 2 | LSM 2030 | ●     | 3,0  | 12 | 50  | 6  |
|   | LSM 2035 | ●     | 3,5  | 12 | 50  | 6  |
|   | LSM 2040 | ●     | 4,0  | 15 | 50  | 6  |
|   | LSM 2045 | ●     | 4,5  | 15 | 50  | 6  |
|   | LSM 2050 | ●     | 5,0  | 18 | 55  | 6  |
|   | LSM 2055 | ●     | 5,5  | 18 | 55  | 6  |
|   | LSM 2060 | ●     | 6,0  | 18 | 55  | 6  |
|   | LSM 2065 | ●     | 6,5  | 18 | 55  | 8  |
|   | LSM 2070 | ●     | 7,0  | 25 | 65  | 8  |
|   | LSM 2075 | ●     | 7,5  | 25 | 65  | 8  |
|   | LSM 2080 | ●     | 8,0  | 25 | 65  | 8  |
|   | LSM 2085 | ●     | 8,5  | 25 | 65  | 10 |
|   | LSM 2090 | ●     | 9,0  | 25 | 65  | 10 |
|   | LSM 2095 | □     | 9,5  | 25 | 65  | 10 |
|   | LSM 2100 | ●     | 10,0 | 30 | 75  | 10 |
|   | LSM 2105 |       | 10,5 | 30 | 80  | 12 |
|   | LSM 2110 | ●     | 11,0 | 30 | 80  | 12 |
|   | LSM 2120 | ●     | 12,0 | 30 | 80  | 12 |
|   | LSM 2130 | ●     | 13,0 | 35 | 95  | 16 |
|   | LSM 2140 | ●     | 14,0 | 40 | 95  | 16 |
|   | LSM 2150 | ●     | 15,0 | 40 | 95  | 16 |
|   | LSM 2160 | ●     | 16,0 | 50 | 105 | 16 |
|   | LSM 2170 |       | 17,0 | 50 | 105 | 20 |
|   | LSM 2180 | ●     | 18,0 | 50 | 115 | 20 |
|   | LSM 2190 |       | 19,0 | 55 | 120 | 20 |
|   | LSM 2200 | ●     | 20,0 | 55 | 120 | 20 |
|   | LSM 2210 |       | 21,0 | 60 | 125 | 25 |
|   | LSM 2220 |       | 22,0 | 60 | 135 | 25 |
|   | LSM 2230 |       | 23,0 | 60 | 135 | 25 |
|   | LSM 2240 |       | 24,0 | 65 | 140 | 25 |
|   | LSM 2250 | □     | 25,0 | 65 | 140 | 25 |

# Long Spiral Endmills LSM 4000 Type

Carbide grade: A1 (Micrograin)



## Endmills

(mm)

|   | Cat. No. | Stock | øD   | ℓ  | L   | ød |
|---|----------|-------|------|----|-----|----|
| 4 | LSM 4030 | ●     | 3,0  | 12 | 50  | 6  |
|   | LSM 4035 | ●     | 3,5  | 12 | 50  | 6  |
|   | LSM 4040 | ●     | 4,0  | 15 | 50  | 6  |
|   | LSM 4045 | □     | 4,5  | 15 | 50  | 6  |
|   | LSM 4050 | ●     | 5,0  | 18 | 55  | 6  |
|   | LSM 4055 | ●     | 5,5  | 18 | 55  | 6  |
|   | LSM 4060 | ●     | 6,0  | 18 | 55  | 6  |
|   | LSM 4065 | ●     | 6,5  | 18 | 55  | 8  |
|   | LSM 4070 | ●     | 7,0  | 25 | 65  | 8  |
|   | LSM 4075 | ●     | 7,5  | 25 | 65  | 8  |
|   | LSM 4080 | ●     | 8,0  | 25 | 65  | 8  |
|   | LSM 4085 | ●     | 8,5  | 25 | 65  | 10 |
|   | LSM 4090 | ●     | 9,0  | 25 | 65  | 10 |
|   | LSM 4095 | □     | 9,5  | 25 | 65  | 10 |
|   | LSM 4100 | ●     | 10,0 | 30 | 75  | 10 |
|   | LSM 4105 |       | 10,5 | 30 | 80  | 12 |
|   | LSM 4110 | ●     | 11,0 | 30 | 80  | 12 |
|   | LSM 4120 | ●     | 12,0 | 30 | 80  | 12 |
|   | LSM 4130 | ●     | 13,0 | 35 | 95  | 16 |
|   | LSM 4140 | ●     | 14,0 | 40 | 95  | 16 |
|   | LSM 4150 | ●     | 15,0 | 40 | 95  | 16 |
|   | LSM 4160 | ●     | 16,0 | 50 | 105 | 16 |
|   | LSM 4170 |       | 17,0 | 50 | 105 | 20 |
|   | LSM 4180 | ●     | 18,0 | 50 | 115 | 20 |
|   | LSM 4190 |       | 19,0 | 55 | 120 | 20 |
|   | LSM 4200 | ●     | 20,0 | 55 | 120 | 20 |
|   | LSM 4210 |       | 21,0 | 60 | 125 | 25 |
|   | LSM 4220 |       | 22,0 | 60 | 135 | 25 |
|   | LSM 4230 |       | 23,0 | 60 | 135 | 25 |
|   | LSM 4240 |       | 24,0 | 65 | 140 | 25 |
|   | LSM 4250 | ●     | 25,0 | 65 | 140 | 25 |

## Recommended Conditions

(Slotting) øD ≥ ø3 ; d<sub>oc</sub> = 1,0 × øD

| øD        | Material       | Carbon steel, Alloy steel |               |               | Cast iron   |
|-----------|----------------|---------------------------|---------------|---------------|-------------|
|           |                | (Below HRC30)             | (Below HRC40) | (Below HRC45) |             |
| 3 ~ 5,9   | v <sub>c</sub> | 40-50-60                  | 30-40-50      | 20-30-40      | 40-50-60    |
|           | f <sub>t</sub> | 0,009~0,018               | 0,009~0,018   | 0,005~0,008   | 0,014~0,030 |
| 6 ~ 12,9  | v <sub>c</sub> | 40-50-60                  | 30-40-50      | 20-30-40      | 40-50-60    |
|           | f <sub>t</sub> | 0,019~0,038               | 0,019~0,038   | 0,009~0,019   | 0,034~0,079 |
| 13 ~ 19,9 | v <sub>c</sub> | 40-50-60                  | 30-40-50      | 20-30-40      | 40-50-60    |
|           | f <sub>t</sub> | 0,041~0,064               | 0,041~0,064   | 0,023~0,038   | 0,083~0,128 |
| 20 ~      | v <sub>c</sub> | 40-50-60                  | 30-40-50      | 20-30-40      | 40-50-60    |
|           | f <sub>t</sub> | 0,071~0,090               | 0,071~0,090   | 0,041~0,052   | 0,139~0,195 |

v<sub>c</sub> = m/min f<sub>t</sub> = mm/tooth

## Recommended Conditions

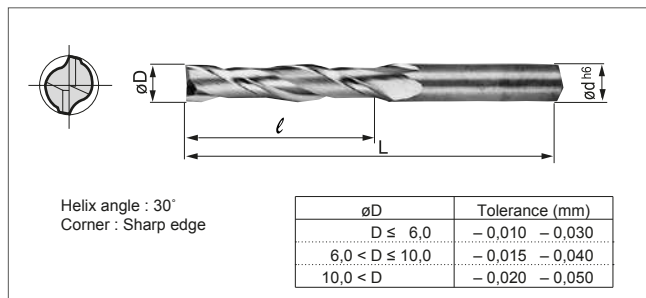
(Shoulder processing) d<sub>oc</sub> = 1,5 × øD  
w<sub>oc</sub> = 0,1 × øD

| øD        | Material       | Carbon steel, Alloy steel |               |               | Cast iron   |
|-----------|----------------|---------------------------|---------------|---------------|-------------|
|           |                | (Below HRC30)             | (Below HRC40) | (Below HRC45) |             |
| 3 ~ 5,9   | v <sub>c</sub> | 40-50-60                  | 30-40-50      | 20-30-40      | 40-50-60    |
|           | f <sub>t</sub> | 0,014~0,027               | 0,014~0,027   | 0,007~0,014   | 0,020~0,045 |
| 6 ~ 12,9  | v <sub>c</sub> | 40-50-60                  | 30-40-50      | 20-30-40      | 40-50-60    |
|           | f <sub>t</sub> | 0,028~0,053               | 0,028~0,053   | 0,014~0,026   | 0,048~0,118 |
| 13 ~ 19,9 | v <sub>c</sub> | 40-50-60                  | 30-40-50      | 20-30-40      | 40-50-60    |
|           | f <sub>t</sub> | 0,056~0,094               | 0,056~0,094   | 0,030~0,056   | 0,120~0,188 |
| 20 ~      | v <sub>c</sub> | 40-50-60                  | 30-40-50      | 20-30-40      | 40-50-60    |
|           | f <sub>t</sub> | 0,101~0,127               | 0,101~0,127   | 0,064~0,082   | 0,193~0,292 |

v<sub>c</sub> = m/min f<sub>t</sub> = mm/tooth

# Extra Long Spiral Endmills ELSM 2000 Type

Carbide grade: A1 (Micrograin)

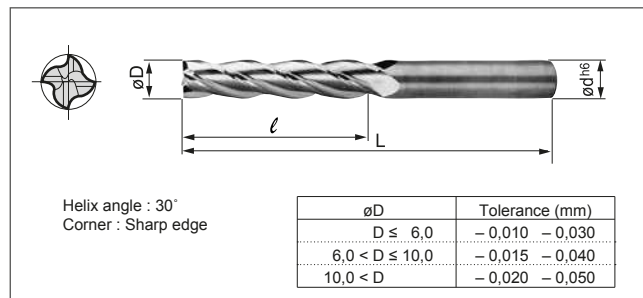


## Endmills

|   | Cat. No.  | Stock | øD   | ℓ   | L   | ød |
|---|-----------|-------|------|-----|-----|----|
| 2 | ELSM 2030 | ●     | 3,0  | 20  | 55  | 6  |
|   | ELSM 2040 | ●     | 4,0  | 25  | 60  | 6  |
|   | ELSM 2050 | ●     | 5,0  | 30  | 65  | 6  |
|   | ELSM 2060 | ●     | 6,0  | 30  | 65  | 6  |
|   | ELSM 2070 | ●     | 7,0  | 40  | 85  | 8  |
|   | ELSM 2080 | ●     | 8,0  | 40  | 85  | 8  |
|   | ELSM 2090 | ●     | 9,0  | 40  | 85  | 10 |
|   | ELSM 2100 | ●     | 10,0 | 50  | 100 | 10 |
|   | ELSM 2110 | ●     | 11,0 | 50  | 100 | 12 |
|   | ELSM 2120 | ●     | 12,0 | 50  | 100 | 12 |
|   | ELSM 2130 | ●     | 13,0 | 70  | 140 | 16 |
|   | ELSM 2140 | ●     | 14,0 | 70  | 140 | 16 |
|   | ELSM 2150 | □     | 15,0 | 70  | 140 | 16 |
|   | ELSM 2160 | □     | 16,0 | 70  | 140 | 16 |
|   | ELSM 2180 | □     | 18,0 | 80  | 160 | 20 |
|   | ELSM 2200 | ●     | 20,0 | 85  | 165 | 20 |
|   | ELSM 2220 | ●     | 22,0 | 95  | 180 | 25 |
|   | ELSM 2250 | □     | 25,0 | 100 | 185 | 25 |

# Extra Long Spiral Endmills ELSM 4000 Type

Carbide grade: A1 (Micrograin)



## Endmills

|   | Cat. No.  | Stock | øD   | ℓ   | L   | ød |
|---|-----------|-------|------|-----|-----|----|
| 4 | ELSM 4030 | ●     | 3,0  | 20  | 55  | 6  |
|   | ELSM 4040 | ●     | 4,0  | 25  | 60  | 6  |
|   | ELSM 4050 | ●     | 5,0  | 30  | 65  | 6  |
|   | ELSM 4060 | ●     | 6,0  | 30  | 65  | 6  |
|   | ELSM 4070 | ●     | 7,0  | 40  | 85  | 8  |
|   | ELSM 4080 | ●     | 8,0  | 40  | 85  | 8  |
|   | ELSM 4090 | ●     | 9,0  | 40  | 85  | 10 |
|   | ELSM 4100 | ●     | 10,0 | 50  | 100 | 10 |
|   | ELSM 4110 | ●     | 11,0 | 50  | 100 | 12 |
|   | ELSM 4120 | ●     | 12,0 | 50  | 100 | 12 |
|   | ELSM 4130 | ●     | 13,0 | 70  | 140 | 16 |
|   | ELSM 4140 | ●     | 14,0 | 70  | 140 | 16 |
|   | ELSM 4150 | ●     | 15,0 | 70  | 140 | 16 |
|   | ELSM 4160 | ●     | 16,0 | 70  | 140 | 16 |
|   | ELSM 4170 | ●     | 17,0 | 80  | 160 | 20 |
|   | ELSM 4180 | ●     | 18,0 | 80  | 160 | 20 |
|   | ELSM 4190 | ●     | 19,0 | 85  | 165 | 20 |
|   | ELSM 4200 | ●     | 20,0 | 85  | 165 | 20 |
|   | ELSM 4210 | ●     | 21,0 | 95  | 180 | 25 |
|   | ELSM 4220 | ●     | 22,0 | 95  | 180 | 25 |
|   | ELSM 4230 | ●     | 23,0 | 95  | 180 | 25 |
|   | ELSM 4240 | ●     | 24,0 | 100 | 180 | 25 |
|   | ELSM 4250 | ●     | 25,0 | 100 | 180 | 25 |

## Recommended Conditions

(Slotting) øD ≥ ø3 ; d<sub>oc</sub> = 1,0 x øD

| øD        | Material       | Carbon steel, Alloy steel |              |              | Cast iron   |
|-----------|----------------|---------------------------|--------------|--------------|-------------|
|           |                | (BelowHRC30)              | (BelowHRC40) | (BelowHRC45) |             |
| 3 ~ 5,9   | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | f <sub>t</sub> | 0,006~0,012               | 0,006~0,012  | 0,003~0,006  | 0,009~0,020 |
| 6 ~ 12,9  | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | f <sub>t</sub> | 0,013~0,025               | 0,013~0,025  | 0,006~0,013  | 0,023~0,053 |
| 13 ~ 19,9 | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | f <sub>t</sub> | 0,028~0,043               | 0,028~0,043  | 0,015~0,025  | 0,055~0,085 |
| 20 ~      | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | f <sub>t</sub> | 0,048~0,060               | 0,048~0,060  | 0,027~0,035  | 0,092~0,130 |

v<sub>c</sub> = m/min f<sub>t</sub> = mm/tooth

## Recommended Conditions

(Shoulder processing) d<sub>oc</sub> = 1,5 x øD  
w<sub>oc</sub> = 0,05 x øD

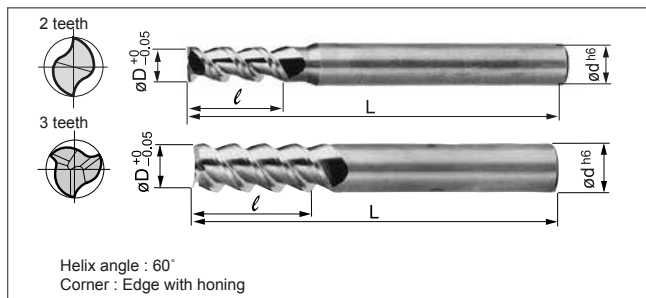
| øD        | Material       | Carbon steel, Alloy steel |              |              | Cast iron   |
|-----------|----------------|---------------------------|--------------|--------------|-------------|
|           |                | (BelowHRC30)              | (BelowHRC40) | (BelowHRC45) |             |
| 3 ~ 5,9   | v <sub>c</sub> | 40-60                     | 30-40-50     | 20-30-40     | 40-50-60    |
|           | f <sub>t</sub> | 0,009~0,018               | 0,009~0,018  | 0,005~0,009  | 0,014~0,030 |
| 6 ~ 12,9  | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | f <sub>t</sub> | 0,019~0,035               | 0,019~0,035  | 0,010~0,018  | 0,033~0,079 |
| 13 ~ 19,9 | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | f <sub>t</sub> | 0,038~0,063               | 0,038~0,063  | 0,020~0,038  | 0,080~0,125 |
| 20 ~      | v <sub>c</sub> | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | f <sub>t</sub> | 0,067~0,085               | 0,067~0,085  | 0,042~0,055  | 0,128~0,195 |

v<sub>c</sub> = m/min f<sub>t</sub> = mm/tooth

# Fast Helix Spiral Endmills

## HSM 2000/3000/4000 Type

Carbide grade: A1 (Micrograin)



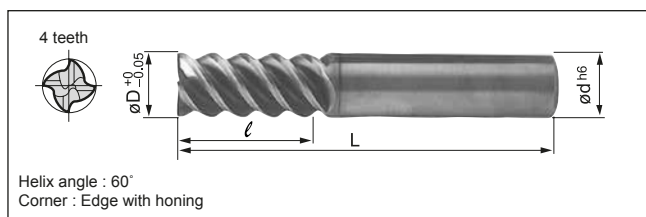
### Endmills

(mm)

|   | Cat. No. | Stock | øD  | ℓ  | L  | ød |
|---|----------|-------|-----|----|----|----|
| 2 | HSM 2020 |       | 2,0 | 6  | 40 | 4  |
|   | HSM 2030 |       | 3,0 | 8  | 45 | 6  |
|   | HSM 2040 |       | 4,0 | 10 | 45 | 6  |
|   | HSM 2050 |       | 5,0 | 12 | 50 | 6  |

|   |          |   |      |    |     |    |
|---|----------|---|------|----|-----|----|
| 3 | HSM 3030 |   | 3,0  | 12 | 45  | 6  |
|   | HSM 3040 |   | 4,0  | 12 | 45  | 6  |
|   | HSM 3045 |   | 4,5  | 12 | 45  | 6  |
|   | HSM 3050 | □ | 5,0  | 12 | 50  | 6  |
|   | HSM 3060 | □ | 6,0  | 12 | 50  | 6  |
|   | HSM 3070 |   | 7,0  | 18 | 60  | 8  |
|   | HSM 3080 |   | 8,0  | 18 | 60  | 8  |
|   | HSM 3090 |   | 9,0  | 20 | 65  | 10 |
|   | HSM 3100 | □ | 10,0 | 25 | 70  | 10 |
|   | HSM 3110 |   | 11,0 | 25 | 75  | 12 |
|   | HSM 3120 | □ | 12,0 | 30 | 75  | 12 |
|   | HSM 3130 |   | 13,0 | 30 | 80  | 16 |
|   | HSM 3140 | □ | 14,0 | 30 | 90  | 16 |
|   | HSM 3150 |   | 15,0 | 30 | 95  | 16 |
|   | HSM 3160 |   | 16,0 | 35 | 95  | 16 |
|   | HSM 3180 |   | 18,0 | 40 | 110 | 20 |
|   | HSM 3200 |   | 20,0 | 40 | 110 | 20 |

|   |          |  |      |    |     |    |
|---|----------|--|------|----|-----|----|
| 4 | HSM 4200 |  | 20,0 | 40 | 110 | 20 |
|   | HSM 4320 |  | 32,0 | 55 | 130 | 32 |

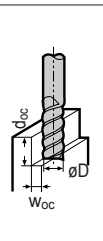


### Recommended Conditions

(Shoulder processing)  $d_{oc} = 1,5 \times \phi D$   
 $w_{oc} = 0,1 \times \phi D$

| øD        | Material | Carbon steel, Alloy steel |              |              | Cast iron   |
|-----------|----------|---------------------------|--------------|--------------|-------------|
|           |          | (BelowHRC30)              | (BelowHRC40) | (BelowHRC45) |             |
| 1 ~ 2,9   | $v_c$    | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | $f_t$    | 0,009~0,024               | 0,009~0,024  | 0,004~0,011  | 0,018~0,040 |
| 3 ~ 5,9   | $v_c$    | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | $f_t$    | 0,040~0,050               | 0,040~0,050  | 0,020~0,025  | 0,060~0,070 |
| 6 ~ 12,9  | $v_c$    | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | $f_t$    | 0,055~0,110               | 0,055~0,110  | 0,028~0,055  | 0,080~0,220 |
| 13 ~ 19,9 | $v_c$    | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | $f_t$    | 0,120~0,180               | 0,120~0,180  | 0,060~0,090  | 0,250~0,350 |
| 20 ~      | $v_c$    | 40-50-60                  | 30-40-50     | 20-30-40     | 40-50-60    |
|           | $f_t$    | 0,216~0,245               | 0,216~0,245  | 0,127~0,132  | 0,321~0,546 |

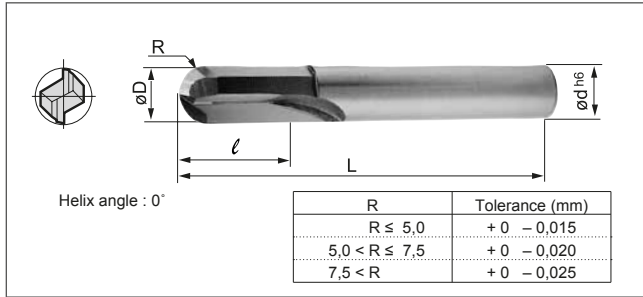
$v_c = m/min$   $f_t = mm/tooth$



▲ = To be replaced by new item  
□ = Delivery on request

# Straight Flute Ball Endmills BSM 2000 Type

Carbide grade: A1 (Micrograin)



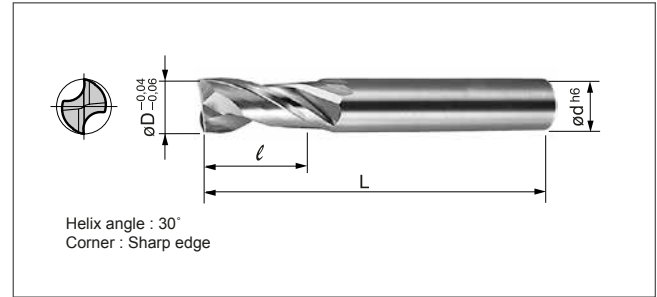
## Endmills

(mm)

|   | Cat. No. | Stock | R    | øD   | ℓ  | L   | ød |
|---|----------|-------|------|------|----|-----|----|
| 2 | BSM 2010 | ▲     | 0,5  | 1,0  | 4  | 40  | 4  |
|   | BSM 2020 |       | 1,0  | 2,0  | 7  | 40  | 4  |
|   | BSM 2030 |       | 1,5  | 3,0  | 9  | 45  | 6  |
|   | BSM 2040 |       | 2,0  | 4,0  | 15 | 45  | 6  |
|   | BSM 2050 |       | 2,5  | 5,0  | 15 | 50  | 6  |
|   | BSM 2060 |       | 3,0  | 6,0  | 20 | 50  | 6  |
|   | BSM 2080 |       | 4,0  | 8,0  | 20 | 60  | 8  |
|   | BSM 2100 |       | 5,0  | 10,0 | 20 | 70  | 10 |
|   | BSM 2120 |       | 6,0  | 12,0 | 25 | 75  | 12 |
|   | BSM 2140 |       | 7,0  | 14,0 | 25 | 90  | 16 |
|   | BSM 2160 |       | 8,0  | 16,0 | 35 | 110 | 16 |
|   | BSM 2200 |       | 10,0 | 20,0 | 35 | 110 | 20 |

# Spiral Endmills for Non-Ferrous Cutting ASM 2000 Type

Carbide grade: H1 (Micrograin)



## Endmills

(mm)

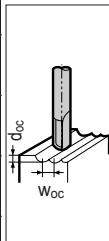
|   | Cat. No. | Stock | øD   | ℓ  | L  | ød |
|---|----------|-------|------|----|----|----|
| 2 | ASM 2020 | □     | 2,0  | 6  | 40 | 4  |
|   | ASM 2030 | □     | 3,0  | 10 | 45 | 6  |
|   | ASM 2040 | □     | 4,0  | 12 | 45 | 6  |
|   | ASM 2050 | □     | 5,0  | 15 | 50 | 6  |
|   | ASM 2060 | □     | 6,0  | 15 | 50 | 6  |
|   | ASM 2080 | □     | 8,0  | 18 | 60 | 8  |
|   | ASM 2100 | □     | 10,0 | 22 | 71 | 10 |
|   | ASM 2120 | □     | 12,0 | 25 | 75 | 12 |
|   | ASM 2160 | □     | 16,0 | 32 | 90 | 16 |

## Recommended Conditions

$d_{oc} = 0,3 \times \phi D$ , (Below R1,0 ;  $0,2 \times \phi D$ )  
 $w_{oc} = \text{Max} 0,7 \times \phi D$ , (Below R1,0 ;  $0,6 \times \phi D$ )

| R            | Material | Carbon steel, Alloy steel |               |               | Cast iron   |
|--------------|----------|---------------------------|---------------|---------------|-------------|
|              |          | (Below HRC30)             | (Below HRC40) | (Below HRC45) |             |
| R0,5 ~ R1,25 | $v_c$    | 40~60                     | 30~40-50      | 20~40         | 40~50-60    |
|              | $f_t$    | 0,004~0,010               | 0,004~0,010   | 0,002~0,005   | 0,008~0,015 |
| R1,5 ~ R2,5  | $v_c$    | 40~50-60                  | 30~50         | 20~30-40      | 40~60       |
|              | $f_t$    | 0,013~0,025               | 0,013~0,025   | 0,007~0,013   | 0,017~0,042 |
| R3 ~ R6      | $v_c$    | 40~50-60                  | 30~50         | 20~30-40      | 40~60       |
|              | $f_t$    | 0,030~0,050               | 0,030~0,050   | 0,017~0,033   | 0,056~0,136 |
| R6,5 ~ R9,5  | $v_c$    | 40~50-60                  | 30~50         | 20~40         | 40~50-60    |
|              | $f_t$    | 0,070~0,100               | 0,070~0,100   | 0,040~0,057   | 0,167~0,238 |
| R10 ~        | $v_c$    | 40~50-60                  | 30~40-50      | 20~30-40      | 40~50-60    |
|              | $f_t$    | 0,118~0,167               | 0,118~0,167   | 0,085~0,095   | 0,250~0,350 |

$v_c = \text{m/min}$   $f_t = \text{mm/tooth}$

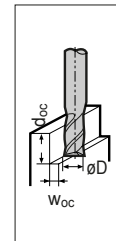


## Recommended Conditions

(Shoulder processing)  $d_{oc} = 1,5 \times \phi D$   
 $w_{oc} = 0,1 \times \phi D$

| øD      | 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 |

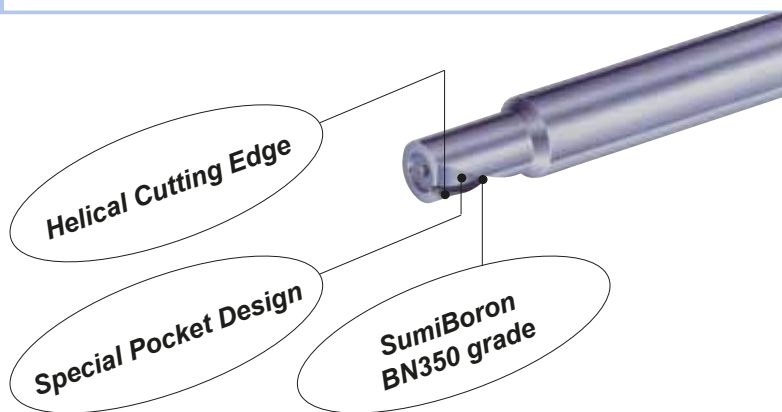
$v_c = \text{m/min}$   $f_t = \text{mm/tooth}$





# SUMIBORON "Helical Master" BNES Type

Spiral CBN Endmill for Hardened Steel



## ■ Endmills BNES Type with 1 Spiral Flute

|  | Cat. No.         | Stock | Dimensions (mm) |          |          |          |    |
|--|------------------|-------|-----------------|----------|----------|----------|----|
|  |                  | BN350 | $\phi D$        | $\phi d$ | $\ell_1$ | $\ell_2$ | L  |
|  | <b>BNES 1060</b> | □     | 6,0             | 10       | 7,0      | 11       | 60 |
|  | <b>BNES 1080</b> | □     | 8,0             | 10       | 10,0     | 14       | 70 |
|  | <b>BNES 1100</b> | □     | 10,0            | 12       | 12,0     | 17       | 75 |
|  | <b>BNES 1120</b> | □     | 12,0            | 12       | 14,0     | 20       | 80 |
|  | <b>BNES 1140</b> | □     | 14,0            | 16       | 16,0     | 21,5     | 80 |
|  | <b>BNES 1160</b> | □     | 16,0            | 16       | 18,0     | 24       | 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)

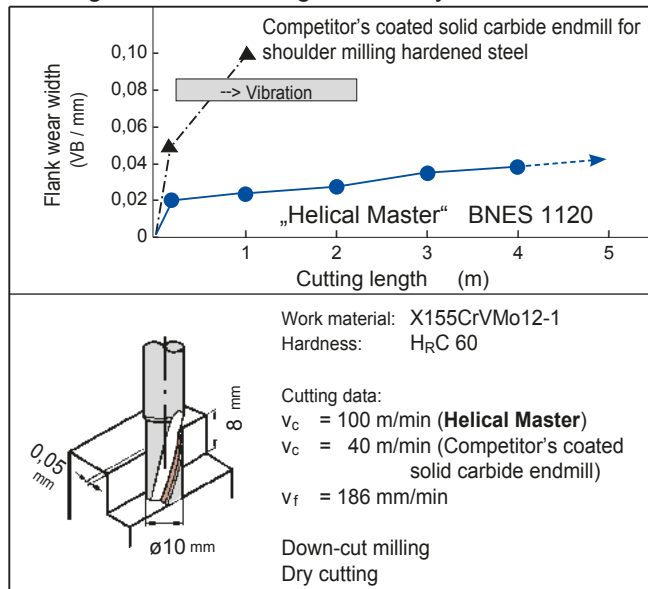
| Tooling example | $\phi D$          | Hardened steel (H <sub>RC</sub> 50 ~ 57) |                      |                            | Hardened steel (H <sub>RC</sub> 58 ~ 65) |                      |                            |
|-----------------|-------------------|------------------------------------------|----------------------|----------------------------|------------------------------------------|----------------------|----------------------------|
|                 |                   | $v_c = 100 \sim 170$ m/min               |                      |                            | $v_c = 80 \sim 150$ m/min                |                      |                            |
|                 | $\phi 6 \sim 8$   | $W_{oc} \leq 0,1$ mm                     | $n = 4000 \sim 9000$ | $V_f$ (mm/min) = 240 ~ 540 | $W_{oc} \leq 0,08$ mm                    | $n = 3200 \sim 8000$ | $V_f$ (mm/min) = 150 ~ 370 |
|                 | $\phi 10 \sim 12$ | $W_{oc} \leq 0,15$ mm                    | $n = 2700 \sim 5400$ | $V_f$ (mm/min) = 180 ~ 360 | $W_{oc} \leq 0,12$ mm                    | $n = 2100 \sim 4800$ | $V_f$ (mm/min) = 120 ~ 270 |
|                 | $\phi 14 \sim 16$ | $W_{oc} \leq 0,2$ mm                     | $n = 2000 \sim 3800$ | $V_f$ (mm/min) = 140 ~ 260 | $W_{oc} \leq 0,15$ mm                    | $n = 1600 \sim 3400$ | $V_f$ (mm/min) = 110 ~ 230 |

Recommendation: Dry cutting (Air coolant)  
Down-cut milling  
Minimise the overhang  
Use a rigid machine

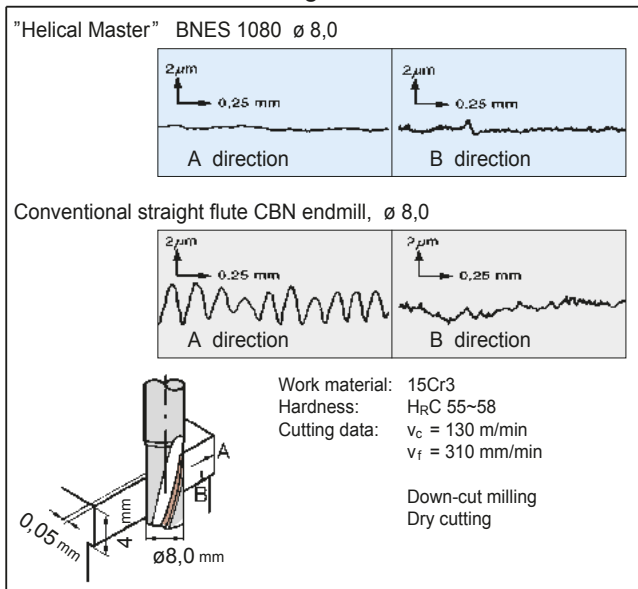
Depth of cut :  $d_{oc} \leq D$

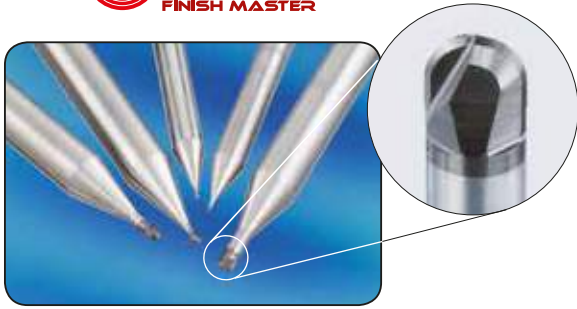
## ■ Performance

### ● Long Tool Life and High Efficiency



### ● Excellent Surface Roughness





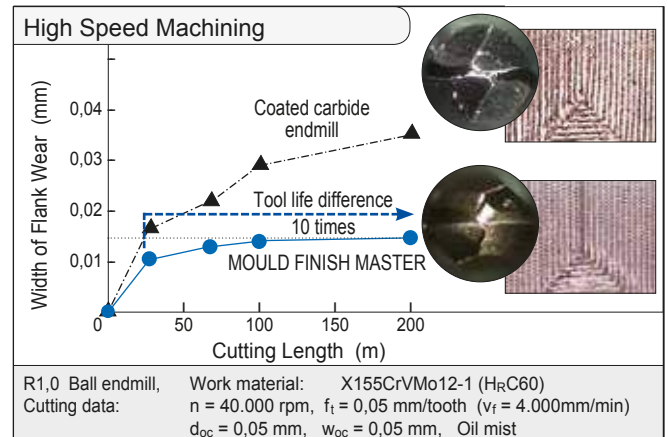
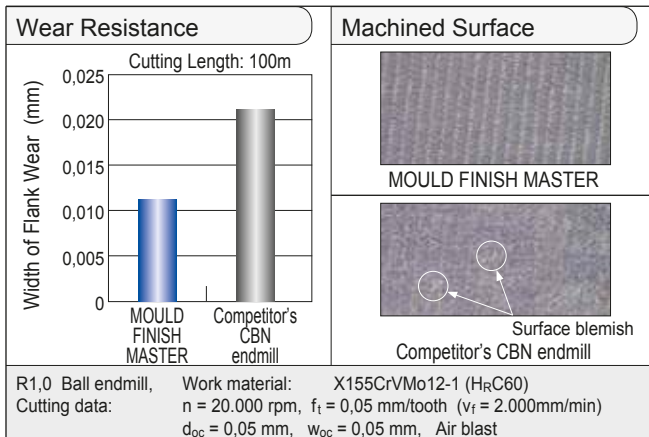
## ■ Characteristics / Application

- High precision machining of hardened steels < HRC70 with long tool life
- Super tough grade SUMIBORON BN350 prevents chipping of the cutting edge
- R accuracy :  $\pm 0,005\text{mm}$

## ■ Endmills

|                      | Cat. No.          | Stock | Dimensions (mm) |          |    |            |          |          |          |
|----------------------|-------------------|-------|-----------------|----------|----|------------|----------|----------|----------|
|                      |                   | BN350 | R               | $\phi D$ | L  | $\phi d_1$ | $\phi d$ | $\ell_1$ | $\ell_2$ |
| 4,0 mm (Shank Diam.) | BNBP 2 R020-012 4 | ●     | 0,2             | 0,4      | 50 | 0,37       | 4        | 0,3      | 1,2      |
|                      | BNBP 2 R030-015 4 | ●     | 0,3             | 0,6      | 50 | 0,57       | 4        | 0,4      | 1,5      |
|                      | BNBP 2 R050-025 4 | ●     | 0,5             | 1,0      | 50 | 0,97       | 4        | 0,6      | 2,5      |
|                      | BNBP 2 R075-040 4 | ●     | 0,75            | 1,5      | 50 | 1,47       | 4        | 0,9      | 4,0      |
|                      | BNBP 2 R100-055 4 | ●     | 1,0             | 2,0      | 50 | 1,97       | 4        | 1,4      | 5,5      |
| 6,0 mm (Shank Diam.) | BNBP 2 R020-012 6 | ●     | 0,2             | 0,4      | 50 | 0,37       | 6        | 0,3      | 1,2      |
|                      | BNBP 2 R030-015 6 | ●     | 0,3             | 0,6      | 50 | 0,57       | 6        | 0,4      | 1,5      |
|                      | BNBP 2 R050-025 6 | ●     | 0,5             | 1,0      | 50 | 0,97       | 6        | 0,6      | 2,5      |
|                      | BNBP 2 R075-040 6 | ●     | 0,75            | 1,5      | 50 | 1,47       | 6        | 0,9      | 4,0      |
|                      | BNBP 2 R100-055 6 | ●     | 1,0             | 2,0      | 50 | 1,97       | 6        | 1,4      | 5,5      |

## ■ Performance



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:  $d_{oc}$  (mm), Wide of cut:  $w_{oc}$  (mm)

| Material<br>Cutting data | Pre-hardened steel, Die steel<br>(~ HRC52) |                     |                  |                  | Die steel<br>(~ HRC62) |                     |                  |                  | High speed tool steel<br>(~ HRC70) |                     |                  |                  |
|--------------------------|--------------------------------------------|---------------------|------------------|------------------|------------------------|---------------------|------------------|------------------|------------------------------------|---------------------|------------------|------------------|
|                          | $n$<br>(rpm)                               | $f_t$<br>(mm/tooth) | $d_{oc}$<br>(mm) | $w_{oc}$<br>(mm) | $n$<br>(rpm)           | $f_t$<br>(mm/tooth) | $d_{oc}$<br>(mm) | $w_{oc}$<br>(mm) | $n$<br>(rpm)                       | $f_t$<br>(mm/tooth) | $d_{oc}$<br>(mm) | $w_{oc}$<br>(mm) |
| R 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             |
| R 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             |
| R 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             |
| R 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             |
| R 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

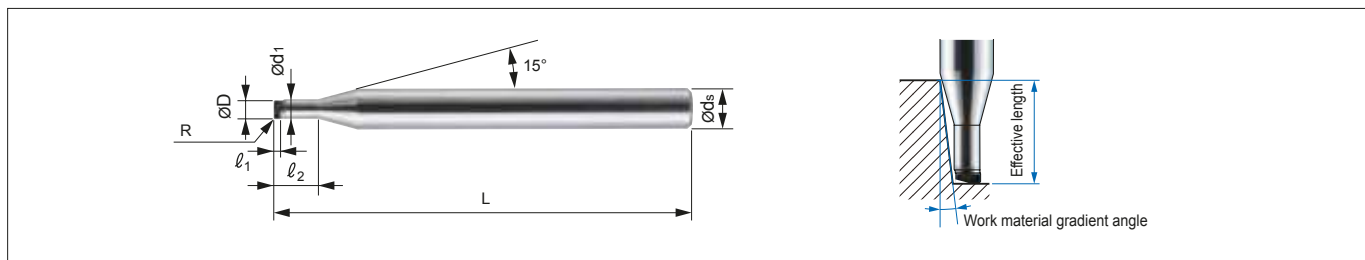
- (1) For stable machining, a more rigid machine is recommended.
- (2) Air blast or oil mist coolant is recommended.
- (3) Shorten overhang as much as possible.



# SUMIDIA "MOULD Finish Master" 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 | ØD              | R    | l <sub>1</sub> | l <sub>2</sub> | L  | Ød1   | Øds | 0,5°                                                               | 1°   | 1,5° | 2°   | 3°   |
| <b>NPDRS 1020 R002-006</b> | ○     | 0,2             | 0,02 | 0,10           | 0,6            | 40 | 0,175 | 4   | 0,61                                                               | 0,62 | 0,63 | 0,64 | 0,66 |
| <b>1020 R005-006</b>       | ○     | 0,2             | 0,05 | 0,10           | 0,6            | 40 | 0,175 | 4   | 0,61                                                               | 0,62 | 0,63 | 0,64 | 0,66 |
| <b>1030 R002-010</b>       | ○     | 0,3             | 0,02 | 0,15           | 1,0            | 40 | 0,27  | 4   | 1,01                                                               | 1,03 | 1,04 | 1,06 | 1,09 |
| <b>1030 R005-010</b>       | ○     | 0,3             | 0,05 | 0,15           | 1,0            | 40 | 0,27  | 4   | 1,01                                                               | 1,03 | 1,04 | 1,06 | 1,09 |
| <b>1050 R005-015</b>       | ○     | 0,5             | 0,05 | 0,25           | 1,5            | 40 | 0,47  | 4   | 1,61                                                               | 1,66 | 1,72 | 1,78 | 1,92 |
| <b>NPDRS 1050 R010-015</b> | ○     | 0,5             | 0,10 | 0,25           | 1,5            | 40 | 0,47  | 4   | 1,61                                                               | 1,66 | 1,71 | 1,77 | 1,91 |
| <b>1100 R005-030</b>       | ○     | 1,0             | 0,05 | 0,55           | 3,0            | 40 | 0,95  | 4   | 3,40                                                               | 3,52 | 3,65 | 3,78 | 4,08 |
| <b>1100 R010-030</b>       | ○     | 1,0             | 0,10 | 0,55           | 3,0            | 40 | 0,95  | 4   | 3,40                                                               | 3,52 | 3,64 | 3,77 | 4,07 |
| <b>1100 R020-030</b>       | ○     | 1,0             | 0,20 | 0,55           | 3,0            | 40 | 0,95  | 4   | 3,40                                                               | 3,51 | 3,63 | 3,76 | 4,05 |
| <b>1200 R005-040</b>       | ○     | 2,0             | 0,05 | 0,55           | 4,0            | 40 | 1,95  | 4   | 4,44                                                               | 4,59 | 4,75 | 4,93 | 5,33 |
| <b>NPDRS 1200 R010-040</b> | ○     | 2,0             | 0,10 | 0,55           | 4,0            | 40 | 1,95  | 4   | 4,43                                                               | 4,59 | 4,75 | 4,92 | 5,31 |
| <b>1200 R020-040</b>       | ○     | 2,0             | 0,20 | 0,55           | 4,0            | 40 | 1,95  | 4   | 4,43                                                               | 4,58 | 4,74 | 4,91 | 5,29 |

### Identification Details

|             |                        |               |                  |               |                   |
|-------------|------------------------|---------------|------------------|---------------|-------------------|
| <b>NPDR</b> | <b>S</b>               | <b>1</b>      | <b>020</b>       | <b>R002</b>   | <b>- 006</b>      |
| Series Code | For standard finishing | No. of flutes | Cutting diameter | Corner radius | Length below neck |

### Cutting Diameter and Nose Radius Combinations

| ØD  | r 0,02 | r 0,05 | r 0,1 | r 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.

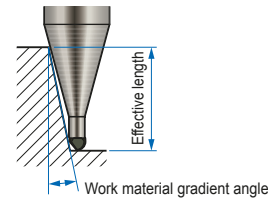
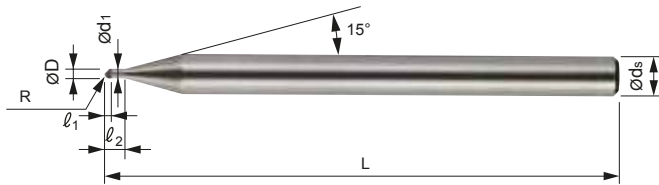
| Work Material |                | Carbide                            |                    |         |         |
|---------------|----------------|------------------------------------|--------------------|---------|---------|
| R (mm)        | l <sub>2</sub> | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | ap (mm) | ae (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   |





# SUMIDIA "MOULD Finish Master" 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 |      |      |      |      |
|-----------------------|--------|-----------------|-----|----------------|----------------|----|-----------------|-----------------|--------------------------------------------------------------------|------|------|------|------|
|                       | NPDB10 | R               | ØD  | l <sub>1</sub> | l <sub>2</sub> | L  | Ød <sub>1</sub> | Ød <sub>s</sub> | 0,5°                                                               | 1°   | 1,5° | 2°   | 3°   |
| <b>NPDBS 1010-004</b> | ○      | 0,1             | 0,2 | 0,1            | 0,4            | 40 | 0,18            | 4               | 0,44                                                               | 0,45 | 0,46 | 0,47 | 0,49 |
| <b>1020-008</b>       | ○      | 0,2             | 0,4 | 0,2            | 0,8            | 40 | 0,38            | 4               | 0,83                                                               | 0,84 | 0,85 | 0,86 | 0,89 |
| <b>1030-010</b>       | ○      | 0,3             | 0,6 | 0,3            | 1,0            | 40 | 0,58            | 4               | 1,05                                                               | 1,08 | 1,10 | 1,13 | 1,20 |
| <b>1050-020</b>       | ○      | 0,5             | 1,0 | 0,5            | 2,0            | 40 | 0,95            | 4               | 2,08                                                               | 2,13 | 2,19 | 2,24 | 2,38 |
| <b>1100-030</b>       | ○      | 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 |      |      |      |      |
|----------------------|--------|-----------------|-----|----------------|----------------|----|-----------------|-----------------|--------------------------------------------------------------------|------|------|------|------|
|                      | NPDB10 | R               | ØD  | l <sub>1</sub> | l <sub>2</sub> | L  | Ød <sub>1</sub> | Ød <sub>s</sub> | 0,5°                                                               | 1°   | 1,5° | 2°   | 3°   |
| <b>NPDB 1010-004</b> | ○      | 0,1             | 0,2 | 0,1            | 0,4            | 40 | 0,18            | 4               | 0,44                                                               | 0,45 | 0,46 | 0,47 | 0,49 |
| <b>1020-008</b>      | ○      | 0,2             | 0,4 | 0,2            | 0,8            | 40 | 0,38            | 4               | 0,83                                                               | 0,84 | 0,85 | 0,86 | 0,89 |
| <b>1030-010</b>      | ○      | 0,3             | 0,6 | 0,3            | 1,0            | 40 | 0,58            | 4               | 1,05                                                               | 1,08 | 1,10 | 1,13 | 1,20 |
| <b>1050-020</b>      | ○      | 0,5             | 1,0 | 0,5            | 2,0            | 40 | 0,95            | 4               | 2,08                                                               | 2,13 | 2,19 | 2,24 | 2,38 |
| <b>1100-030</b>      | ○      | 1,0             | 2,0 | 1,0            | 3,0            | 40 | 1,95            | 4               | 3,13                                                               | 3,20 | 3,27 | 3,35 | 3,53 |

### Identification Details

|             |                        |               |                 |                   |
|-------------|------------------------|---------------|-----------------|-------------------|
| <b>NPDB</b> | <b>(S)</b>             | <b>1</b>      | <b>030</b>      | <b>- 010</b>      |
| 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                            |                    |                     |                     |
|---------------|----------------|------------------------------------|--------------------|---------------------|---------------------|
| R (mm)        | l <sub>2</sub> | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | a <sub>p</sub> (mm) | a <sub>e</sub> (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                            |                    |                     |                     |
|---------------|----------------|------------------------------------|--------------------|---------------------|---------------------|
| R (mm)        | l <sub>2</sub> | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | a <sub>p</sub> (mm) | a <sub>e</sub> (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               |





**CARBIDE - CBN - DIAMOND**

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