

# FMAX

FEED MAXIMUM

MILLING CUTTER FOR ULTRA EFFICIENT,  
HIGH ACCURACY FINISHING



# FMAX

## HIGH FEED MILLING CUTTER FOR FINISHING

### ULTRA HIGH EFFICIENCY MACHINING

The ultra fine pitch design is ideal for high efficiency machining ( $F \geq 20 \text{ m/min}$ ). Internal coolant and a special chipbreaker wall (body protector) provide ideal chip discharge performance.

### LIGHT WEIGHT, HIGH RIGIDITY BODY

A special alloy steel and aluminium body combine to provide rigidity and light weight.

..... Aluminium alloy

..... Special alloy steel

### HIGH PRECISION, EASY SETTING

A combination of fine and ultra-fine pitch threads provides precise run-out adjustment ( $\leq 5 \mu$ ).

..... Fine pitch adjustment screw

..... Micro adjustment nut

### ECONOMICAL, MULTI-USE

A re-grinding allowance of up to 0.6 mm is possible on both the peripheral and bottom cutting edges.

..... PCD grades for machining aluminium alloys

A.R.+5° ..... New CBN grade for grey cast iron machining

..... Internal coolant

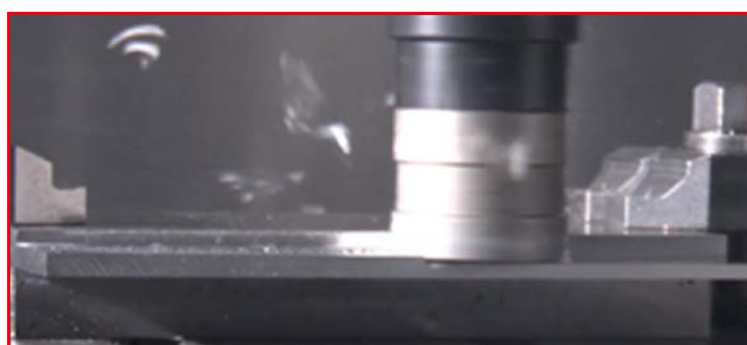
..... Body protector

# CLASSIFICATION

| Series        | Use                                   | Specification                       | DCON<br>MS | Minimum |      |      | Maximum |      |      |
|---------------|---------------------------------------|-------------------------------------|------------|---------|------|------|---------|------|------|
|               |                                       |                                     |            | DC      | ZEFP | WT   | DC      | ZEFP | WT   |
| FMAX          | High feed<br>finish milling cutter    | Light weight,<br>High rigidity body | mm         | —       | —    | —    | 160     | 16   | 3.30 |
|               |                                       | Alloy steel and<br>aluminium body   | mm         | 80      | 14   | 1.08 | 125     | 24   | 3.39 |
|               |                                       |                                     |            |         |      |      |         |      |      |
| FMAX-LW       | High feed finish milling cutter       | Light weight, High rigidity body    | mm         | 100     | 10   | 1.06 | 125     | 14   | 1.44 |
|               | Compact and smaller machining centres | Alloy steel and aluminium body      | mm         |         | 16   | 1.11 |         | 20   | 1.48 |
| FMAX-40/50/63 | High feed finish milling cutter       | Alloy steel body                    | mm         | 40      | 4    | 0.24 | 63      | 10   | 0.67 |
|               | Small Diameter                        |                                     |            |         | 6    | 0.23 |         | 12   | 0.66 |
| FMAX-MB       | For Low Rigidity Conditions           | Coarse pitch type                   | mm         | 50      | 4    | 0.38 | 125     | 6    | 3.81 |

## FMAX-MB

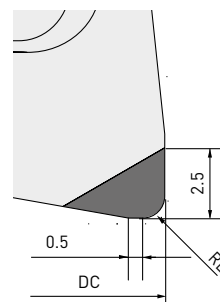
By reducing the number of teeth, finishing can be easily performed even if the machine or work material is not rigid. Tool installation costs can also be reduced while maintaining the existing insert mounting and cutting edge adjustment functions.



# INSERTS FOR SPECIAL APPLICATIONS

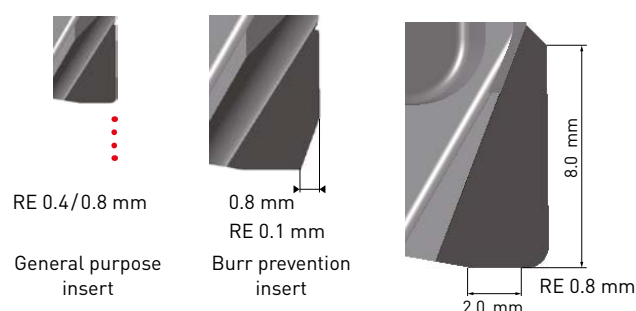
## GENERAL PURPOSE INSERTS

CBN inserts for gray cast iron reduce the length of the wiper edge and provide excellent surface finishes with low cutting forces. These inserts are disposable and therefore economical because they don't require re-grinding.



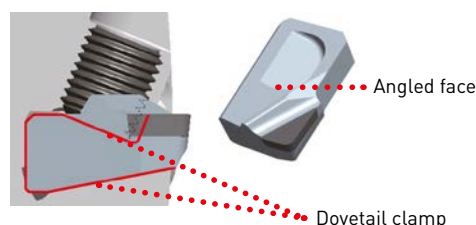
## LONG EDGE INSERTS

The long edge insert is capable of finish cutting castings with a gate. This makes it possible to reduce the number of cutter passes, thereby shortening cycle times.



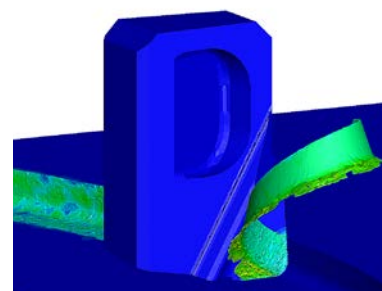
## DESIGNED FOR HIGH SPEEDS

Anti-fly dovetail clamping mechanism.



## IDEAL CHIP DISPOSAL

The body protector on the rake face forms chip shapes that are ideal for efficient dispersal. Internal coolant also aids this process. The body is compatible with all through centre coolant arbors.



Graphical representation



### BENEFITS

- Light weight, High rigidity body
- Designed for high speeds
- PCD grade for machining aluminium alloys
- New CBN grade for grey cast iron machining
- High precision

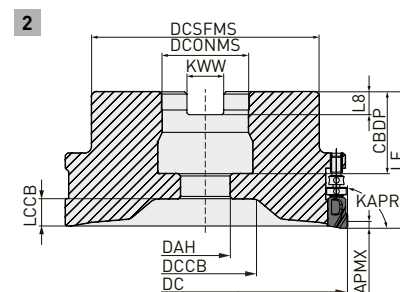
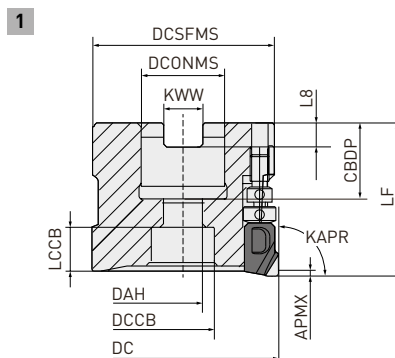
# FMAX-MB



## FOR LOW RIGIDITY CONDITIONS



Coarse pitch type



Right hand tool holder only

### ARBOR TYPE

| Order number   | Stock | DC  | DCONMS | LF | RPMX  | WT   | ZEFP* |   | Type |
|----------------|-------|-----|--------|----|-------|------|-------|---|------|
| FMAX-050A04R   | ●     | 50  | 22     | 40 | 30000 | 0.38 | 4     | ○ | 1    |
| FMAX-063A04R   | ●     | 63  | 22     | 40 | 30000 | 0.70 | 4     | ○ | 1    |
| FMAX-080B04RMB | ●     | 80  | 27     | 45 | 24500 | 1.12 | 4     | ○ | 2    |
| FMAX-100B04RMB | ●     | 100 | 32     | 50 | 22000 | 2.00 | 4     | ○ | 2    |
| FMAX-125B06RMB | ●     | 125 | 40     | 60 | 19600 | 3.81 | 6     | ○ | 2    |
|                |       |     |        |    |       |      |       |   | 1/1  |

\* For the maximum depth of cut (APMX), please refer to the recommended cutting conditions (ap).



### MOUNTING DIMENSIONS

| Order number   | CBDP | DAH | DCCB | DCFSMS | KWW  | LCCB | L8  | Type |
|----------------|------|-----|------|--------|------|------|-----|------|
| FMAX-050A04R   | 20   | 11  | 17   | 47     | 10.4 | 12   | 6.3 | 1    |
| FMAX-063A04R   | 20   | 11  | 17   | 60     | 10.4 | 12   | 6.3 | 1    |
| FMAX-080B04RMB | 24   | 13  | 30   | 55     | 12.4 | 11   | 7   | 2    |
| FMAX-100B04RMB | 32   | 17  | 39   | 75     | 14.4 | 10   | 8   | 2    |
| FMAX-125B06RMB | 36   | 22  | 45   | 100    | 16.4 | 12   | 9   | 2    |
| 1/             |      |     |      |        |      |      |     |      |

# FMAX

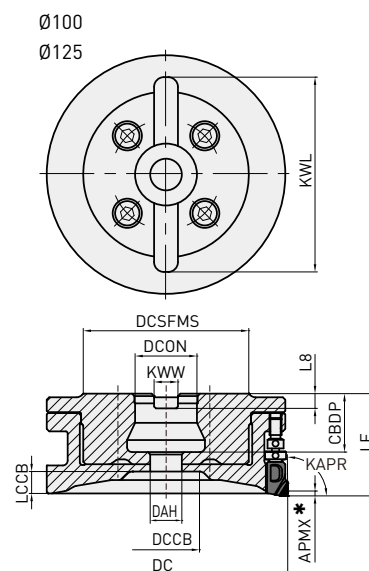


## REDUCED WEIGHT MILLING CUTTER FOR USE ON SMALLER MACHINING CENTRES

N



GAMP : +5°  
GAMF : 0°



Right hand tool holder only

### ARBOR TYPE

| Order number  | Stock | DC  | DCON | LF | RPMX  | WT   | ZEFP |
|---------------|-------|-----|------|----|-------|------|------|
| FMAXR10010CLW | ●     | 100 | 25.4 | 42 | 22000 | 1.06 | 10   |
| FMAXR10016CLW | ●     | 100 | 25.4 | 42 | 22000 | 1.11 | 16   |
| FMAXR12514CLW | ●     | 125 | 25.4 | 42 | 19600 | 1.44 | 14   |
| FMAXR12520CLW | ●     | 125 | 25.4 | 42 | 19600 | 1.48 | 20   |

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\* For the maximum depth of cut, please refer to recommended cutting conditions (ap).

1. 2 mm or less is the recommended maximum depth of cut for ultra high efficiency machining.



### MOUNTING DIMENSIONS

| Order number  | CBDB | DAH | DCCB | DCFSMS | KWW | LCCB | L8 | C | KWL |
|---------------|------|-----|------|--------|-----|------|----|---|-----|
| FMAXR10010CLW | 24   | 13  | 27   | 68     | 9.5 | 9    | 6  | – | 80  |
| FMAXR10016CLW | 24   | 13  | 27   | 68     | 9.5 | 9    | 6  | – | 80  |
| FMAXR12514CLW | 24   | 13  | 52   | 68     | 9.5 | 9    | 6  | – | 80  |
| FMAXR12520CLW | 24   | 13  | 52   | 68     | 9.5 | 9    | 6  | – | 80  |

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# FMAX



## HIGH FEED MILLING CUTTER FOR FINISHING

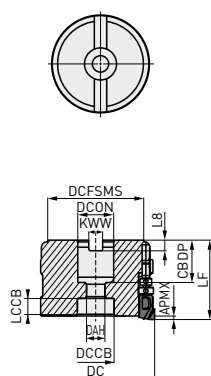
N



KAPR : 90°  
CH : 0°  
GAMP : +5°  
GAMF Ø40 - Ø63 : -6° - -3°  
GAMF Ø80 - Ø125 : 0°

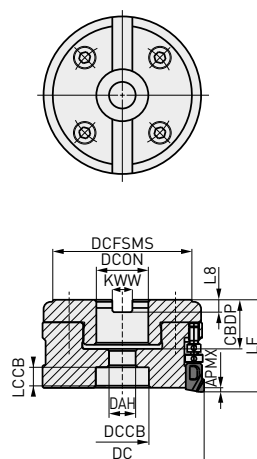
1

Ø40  
Ø50  
Ø63



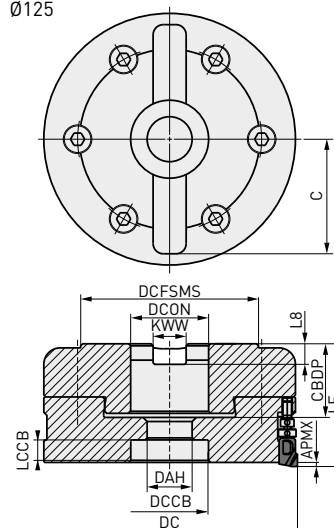
2

Ø80



3

Ø100  
Ø125



### ARBOR TYPE

| Order number | Stock | DC  | DCON | LF | RPMX  | WT   | ZEFP | Type |
|--------------|-------|-----|------|----|-------|------|------|------|
| FMAX-040A04R | ★     | 40  | 16   | 40 | 30000 | 0.24 | 4    | 1    |
| FMAX-040A06R | ★     | 40  | 16   | 40 | 30000 | 0.23 | 6    | 1    |
| FMAX-050A08R | ★     | 50  | 22   | 40 | 30000 | 0.37 | 8    | 1    |
| FMAX-050A10R | ●     | 50  | 22   | 40 | 30000 | 0.35 | 10   | 1    |
| FMAX-063A10R | ★     | 63  | 22   | 40 | 27000 | 0.67 | 10   | 1    |
| FMAX-063A12R | ●     | 63  | 22   | 40 | 27000 | 0.66 | 12   | 1    |
| FMAX-080B14R | ●     | 80  | 27   | 45 | 24500 | 1.08 | 14   | 2    |
| FMAX-100B18R | ●     | 100 | 32   | 50 | 22000 | 1.81 | 18   | 3    |
| FMAX-125B24R | ●     | 125 | 40   | 60 | 19600 | 3.26 | 24   | 3    |

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1. 2 mm or less is the recommended maximum depth of cut for ultra high efficiency machining.

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**FMAX – HIGH FEED MILLING CUTTER FOR FINISHING****MOUNTING DIMENSIONS**

| Order number | CBDP | DAH | DCCB | DCFSMS | KWW  | LCCB | L8  | C  | Type |
|--------------|------|-----|------|--------|------|------|-----|----|------|
| FMAX-040A04R | 18   | 9   | 14   | 37     | 8.4  | 10   | 5.6 | –  | 1    |
| FMAX-040A06R | 18   | 9   | 14   | 37     | 8.4  | 10   | 5.6 | –  | 1    |
| FMAX-050A08R | 20   | 11  | 17   | 47     | 10.4 | 12   | 6.3 | –  | 1    |
| FMAX-050A10R | 20   | 11  | 17   | 47     | 10.4 | 12   | 6.3 | –  | 1    |
| FMAX-063A10R | 20   | 11  | 17   | 60     | 10.4 | 12   | 6.3 | –  | 1    |
| FMAX-063A12R | 20   | 11  | 17   | 60     | 10.4 | 12   | 6.3 | –  | 1    |
| FMAX-080B14R | 24   | 13  | 26   | 68     | 12.4 | 11   | 7   | –  | 2    |
| FMAX-100B18R | 32   | 17  | 32   | 79     | 14.4 | 10   | 8   | 45 | 3    |
| FMAX-125B24R | 36   | 22  | 38   | 88     | 16.4 | 12   | 9   | 56 | 3    |

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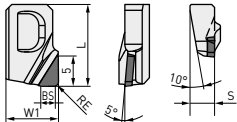
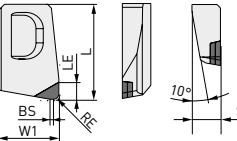
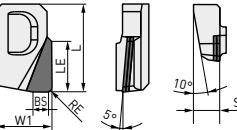
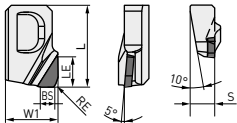


# SPARE PARTS

| Tool holder number                                                                         |  |  |  |  |  |  |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                                            | Insert clamp screw                                                                | Micro adjustment nut                                                              | Fine pitch adjustment screw                                                       | Cutter clamp bolt                                                                  | Wrench                                                                              | Adjustment pin                                                                      |
| FMAX-040  | TSS04505S                                                                         | KSN2<br>KSN3                                                                      | KSS2                                                                              | HSC08030H                                                                          | TKY10T                                                                              | RKY25S                                                                              |
| FMAX-050  |                                                                                   |                                                                                   |                                                                                   | HSC10030H                                                                          |                                                                                     |                                                                                     |
| FMAX-063  |                                                                                   |                                                                                   |                                                                                   | HSC10030H                                                                          |                                                                                     |                                                                                     |
| FMAX-080  |                                                                                   |                                                                                   |                                                                                   | HSCX12030H                                                                         |                                                                                     |                                                                                     |
| FMAX-100  |                                                                                   |                                                                                   |                                                                                   | HSCX16035H                                                                         |                                                                                     |                                                                                     |
| FMAX-125  |                                                                                   |                                                                                   |                                                                                   | HSCX20035H                                                                         |                                                                                     |                                                                                     |

1. Clamp torque TSS04505S = 3.5 Nm
2. Please refer to the manual included for instructions how to seat the insert and adjust the run out.

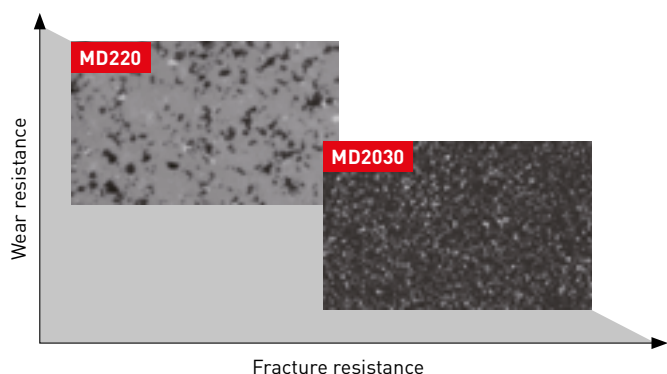
# INSERTS

| Order number      | MD2030 | MD220 | MB4120 | L    | LE  | W1  | S   | BS  | RE  | Figure                                                                                                                                                                      |
|-------------------|--------|-------|--------|------|-----|-----|-----|-----|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GOER1404PXFR2     | ●      | ●     |        | 14.0 | 5.0 | 9.0 | 4.2 | 2.0 | 0.4 |   |
| GOER1408PXFR2     | ●      | ●     |        | 14.0 | 5.0 | 9.0 | 4.2 | 2.0 | 0.8 |                                                                                                                                                                             |
| General purpose   |        |       |        |      |     |     |     |     |     |                                                                                                                                                                             |
| NP-GOEN1404PXSR05 |        |       | ★      | 14.0 | 2.5 | 9.0 | 4.2 | 0.5 | 0.4 |   |
| NP-GOEN1408PXSR05 |        |       | ★      | 14.0 | 2.5 | 9.0 | 4.2 | 0.5 | 0.8 |                                                                                                                                                                             |
| General purpose   |        |       |        |      |     |     |     |     |     |                                                                                                                                                                             |
| GOER1408PXFR2-8   |        | ★     |        | 14.0 | 8.0 | 9.0 | 4.2 | 2.0 | 0.8 |   |
|                   |        |       |        |      |     |     |     |     |     |                                                                                                                                                                             |
| Long cutting edge |        |       |        |      |     |     |     |     |     |                                                                                                                                                                             |
| GOER1401ZXFR2     | ●      |       |        | 14.0 | 5.0 | 9.0 | 4.2 | 2.0 | 0.1 |   |
|                   |        |       |        |      |     |     |     |     |     |                                                                                                                                                                             |
| Burr prevention   |        |       |        |      |     |     |     |     |     |                                                                                                                                                                             |

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1. If general-purpose inserts (RE = 0.4 mm, 0.8 mm) and burr prevention inserts are used together, they will not be able to achieve full performance.
2. Inserts of the same geometry should be used for all teeth.

## FEATURES OF PCD GRADES

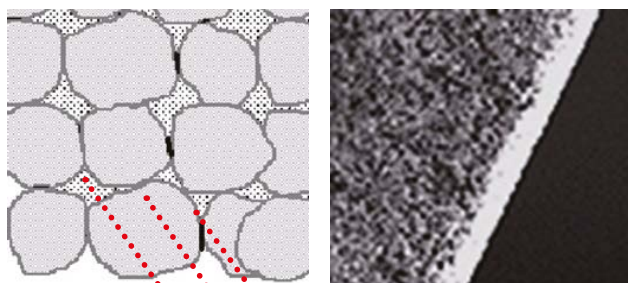


### MD220

- Focused on wear resistance
- Prevention of burrs for longer tool life

### MD2030

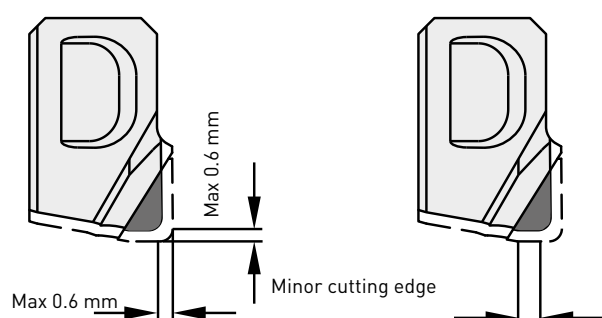
- Diamond sintered grade containing ultra microparticle diamond
- Optimised for milling
- Improved fracture resistance during interrupted cutting
- Offers a highly stable cutting edge that prevents burrs and gives an excellent surface finish



### BONDING OF DIAMOND PARTICLES

The strong bonding of the diamond particles provides a highly stable cutting edge.

Bond  
Diamond particles  
Binding material



### RE-MANUFACTURING

- The maximum material to be removed is 0.6 mm.
- Use similar inserts at similar stages of refurbishing to maintain the balance of the cutter.
- After refurbishment, the minor edge will reduce in size and may affect surface finishes.

Please contact us about the optimum conditions for re-grinding.

## CBN GRADE HIGH FRACTURE RESISTANCE

### FEATURES OF MB4120

Fine CBN particles increase edge toughness and the high fracture resistance provides stability. The ideal grade for preventing fracturing, edge chipping and thermal cracks. Also capable of use when there is coolant remaining on the component from the preceding machining operation.

# FMAX

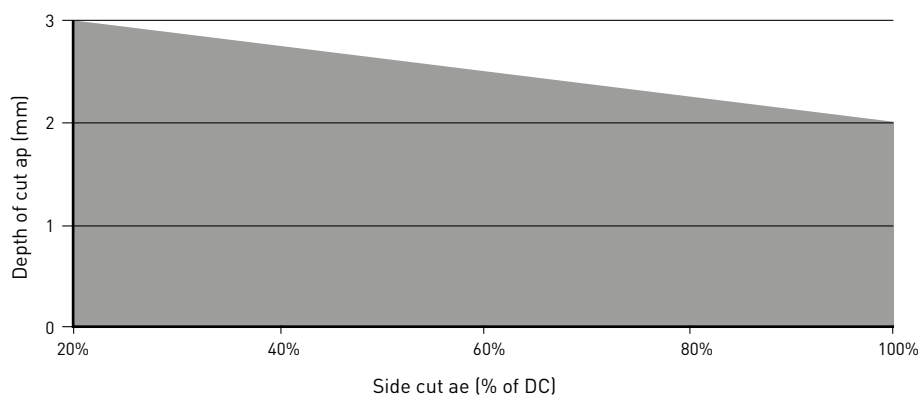
## RECOMMENDED CUTTING CONDITIONS

| Material | Properties       | Grade           | Vc                    | ae      | ap                  | fz                    | Cutting mode                                                                          |
|----------|------------------|-----------------|-----------------------|---------|---------------------|-----------------------|---------------------------------------------------------------------------------------|
| K        | Gray cast iron   | MB4120          | 1000<br>(700 – 1300)  | ≤0.8 DC | ≤0.5                | 0.07<br>(0.05 – 0.15) |    |
|          |                  |                 |                       | ≤0.2 DC | ≤3.0<br>(0.5 – 3.0) |                       |                                                                                       |
|          |                  |                 |                       | ≤0.5 DC | ≤2.5<br>(0.5 – 2.5) |                       |                                                                                       |
|          | Si < 5 %         | MD2030<br>MD220 | 2500<br>(2000 – 3000) | ≤0.8 DC | ≤2.0<br>(0.5 – 2.0) | 0.08<br>(0.05 – 0.2)  |    |
|          |                  |                 |                       | ≤0.2 DC | ≤3.0<br>(0.5 – 3.0) |                       |                                                                                       |
|          |                  |                 |                       | ≤0.5 DC | ≤2.5<br>(0.5 – 2.5) |                       |                                                                                       |
| N        | Aluminium alloy  | MD2030<br>MD220 | 2500<br>(2000 – 3000) | ≤0.8 DC | ≤2.0<br>(0.5 – 2.0) | 0.08<br>(0.05 – 0.2)  |    |
|          |                  |                 |                       | ≤0.2 DC | ≤3.0<br>(0.5 – 3.0) |                       |                                                                                       |
|          |                  |                 |                       | ≤0.5 DC | ≤2.5<br>(0.5 – 2.5) |                       |                                                                                       |
|          | 10 % < Si < 15 % | MD220<br>MD2030 | 600<br>(400 – 800)    | ≤0.8 DC | ≤2.0<br>(0.5 – 2.0) | 0.08<br>(0.05 – 0.2)  |  |
|          |                  |                 |                       | ≤0.2 DC | ≤3.0<br>(0.5 – 3.0) |                       |                                                                                       |
|          |                  |                 |                       | ≤0.5 DC | ≤2.5<br>(0.5 – 2.5) |                       |                                                                                       |
|          | Si ≥ 15 %        | MD220<br>MD2030 | 600<br>(400 – 800)    | ≤0.8 DC | ≤2.0<br>(0.5 – 2.0) | 0.08<br>(0.05 – 0.2)  |  |
|          |                  |                 |                       | ≤0.2 DC | ≤3.0<br>(0.5 – 3.0) |                       |                                                                                       |
|          |                  |                 |                       | ≤0.5 DC | ≤2.5<br>(0.5 – 2.5) |                       |                                                                                       |

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1. Please adjust the depth of cut ap depending on the width of cut ae.
2. When using the long edge insert, please select the conditions depending on depths of cut (ap) excluding the depth of the gate.

## EFFECTIVE CHIP DISPOSAL RANGE

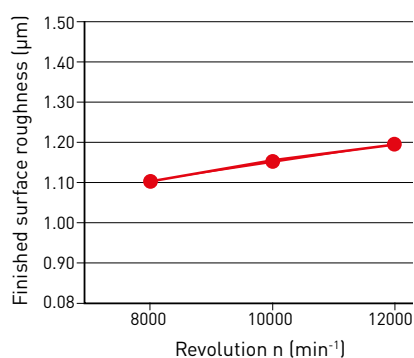


## FINISHED SURFACE ROUGHNESS (RZ) CHART IN RELATION TO REVOLUTION

|                        |                                |
|------------------------|--------------------------------|
| Cutter body            | FMAX-125B24R                   |
| Insert (Grade)         | GOER1408PXFR2 (MD2030)         |
| Workpiece              | ADC12 cylinder head            |
| n (min <sup>-1</sup> ) | 8.000 – 12.000                 |
| Vc (m/min)             | 3.140 – 4.710                  |
| fz (mm/tooth)          | 0.08                           |
| Vf (mm/min)            | 15.360 – 23.040                |
| ap (mm)                | 2.0                            |
| ae (mm)                | 68 x 3 passes                  |
| Cutting mode           | Internal through coolant 4 MPa |
| Machine                | Horizontal machining centre    |

### Results

The FMAX cutter offered a smooth finishing operation with predictable wear and no burrs. Even at high revolutions the FMAX cutter achieves a top quality surface finish.



# APPLICATION EXAMPLES

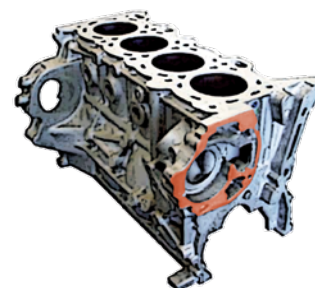
## HIGH SPEED FINISHING OF CYLINDER HEAD - EXHAUST SIDE

|                          |                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cutter body              | FMAX-100B18R                                                                                                                                                      |
| Insert (Grade)           | GOER1408PXFR2(MD2030)                                                                                                                                             |
| Workpiece                | Aluminium alloy                                                                                                                                                   |
| $n$ (min <sup>-1</sup> ) | 8.000                                                                                                                                                             |
| $V_c$ (m/min)            | 2.513                                                                                                                                                             |
| $f_z$ (mm/tooth)         | 0.2                                                                                                                                                               |
| $V_f$ (mm/min)           | 28.800                                                                                                                                                            |
| $a_p$ (mm)               | 1.5                                                                                                                                                               |
| $a_e$ (mm)               | 50                                                                                                                                                                |
| Cutting mode             | Wet                                                                                                                                                               |
| Machine                  | Horizontal machining centre                                                                                                                                       |
| Results                  | More than double table feed provided increased efficiency.<br>FMAX gave improved stability and achieved good surface finishes.<br>Flat surface and minimal burrs. |



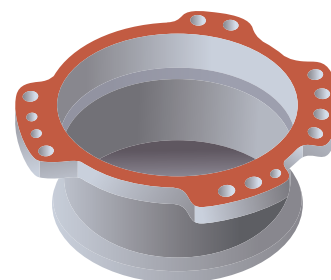
## FINISHING OF ENGINE BLOCK - SIDE FLANGE

|                          |                                                                                  |
|--------------------------|----------------------------------------------------------------------------------|
| Cutter body              | FMAX-080B14R                                                                     |
| Insert (Grade)           | GOER1408PXFR2 (MD2030)                                                           |
| Workpiece                | Aluminium alloy                                                                  |
| $n$ (min <sup>-1</sup> ) | 8.000                                                                            |
| $V_c$ (m/min)            | 2.011                                                                            |
| $f_z$ (mm/tooth)         | 0.13                                                                             |
| $V_f$ (mm/min)           | 14.560                                                                           |
| $a_p$ (mm)               | 2.5                                                                              |
| $a_e$ (mm)               | 20                                                                               |
| Cutting mode             | Wet                                                                              |
| Machine                  | Horizontal machining centre                                                      |
| Results                  | Consistent, high accuracy machining combined with reliability and long tool life |



## BURR FREE FINISHING OF FLANGE SURFACE

|                          |                                                                                                                                                                                                                    |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cutter body              | FMAX-050A08R                                                                                                                                                                                                       |
| Insert (Grade)           | GOER1401ZXFR2 (MD220)                                                                                                                                                                                              |
| Workpiece                | ADC12                                                                                                                                                                                                              |
| $n$ (min <sup>-1</sup> ) | 7.000                                                                                                                                                                                                              |
| $V_c$ (m/min)            | 1.099                                                                                                                                                                                                              |
| $f_z$ (mm/tooth)         | 0.06                                                                                                                                                                                                               |
| $a_p$ (mm)               | 0.3                                                                                                                                                                                                                |
| $a_e$ (mm)               | 20 – 30                                                                                                                                                                                                            |
| Cutting mode             | Wet                                                                                                                                                                                                                |
| Machine                  | Vertical Type (BT30)                                                                                                                                                                                               |
| Results                  | Burr prevention inserts can ensure smooth finished surfaces and maintain their effective burr prevention capabilities over long periods. Thereby enabling tool life three times longer than conventional products. |





# MEMO



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