

# evolute

faster machining



Technology Inside



2014 Catalogue V1.0

Evolute (Australia) specialises on high performance solid carbide cutting tools through new milling design technologies, superior material quality high standard of manufacturing.

We provide special tailored made carbide cutting tool solutions for all component applications and our performance is guaranteed by our modern grinding machines coatings.

This catalogue list our carbide cutting tools of the following varieties:

- General purpose endmills for roughing, semi-finishing and finishing with Corner radius, Ball nose and square end.
- Aluminium and aluminium alloys.  
Mild to alloy steels.  
Aerospace titanium alloys and heat resistance steels.  
Tool steels and high alloy steels
- High performance roughing endmills in various materials
- Endmills for Hardened steels up to 65 Hrc  
We can designed tools upon our customers demanding applications and our advantage is to deliver value in tailor made solution.

Our company's flexibility allows for fast delivery times and our machines have capacity for production volumes.

For special tool design from non-standard geometries see the request for on page 54 or contact us: [info@evolute.com.au](mailto:info@evolute.com.au)

**V 1 4 F 040 C 040 T C**

1 2 3 4 5 6 7 8 9

**1 Mill Type Code**

- V** : High performance mills, roughing and finishing
- R** : High performance roughing endmills with chip breakers
- B** : General purpose roughing mills
- C** : General purpose roughing and finishing mills
- M** : General purpose finishing mills
- A** : High performance roughing and finishing mills for Aluminium
- H** : High performance roughing and finishing mills for hardened materials
- F** : High performance finishing and super-finishing mills
- O** : General purpose form tools, roughing and finishing

**2 Tool length**

- 1** : Short
- 2** : Long
- 3** : Extra long
- N** : With necking

**4 End geometry**

- F** : Flat
- B** : Spherical

**6 Corner radius / chamfer**

- C** : Chamfer 45°
- R** : Corner radius

**8 Shank**

- T** : Cylindrical
- W** : Weldon

**3 Number of teeth**

- 1** : 1 tooth
- 2** : 2 teeth
- 3** : 3 teeth
- 4** : 4 teeth
- 6** : 6 teeth
- 8** : 8 teeth

**5 Tool diameter**

- 040** : 4 mm
- 060** : 6 mm

**7 Corner radius / chamfer dimension**

- 040** : 0.4 mm
- 100** : 1 mm

**9 Coating**

- C** : With coating
- P** : Without coating

**! Note:** Tolerance on shank according to h6

## Table of contence

| Code                                                                          | Picture                                                                             | No coating | Coated TiAlN | Application                         | Maximum depth of cut (D-tool diameter) |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------|--------------|-------------------------------------|----------------------------------------|
| High performance solid carbide endmills for high to medium strength materials |                                                                                     |            |              |                                     |                                        |
| <b>V14F</b>                                                                   |    |            | ●            | Slotting and finishing side milling | 2xD                                    |
| <b>R14F</b>                                                                   |    | ●          | ●            | Roughing                            | 2xD                                    |
| <b>F18F</b>                                                                   |   |            | ●            | Precision side milling              | 2xD                                    |
| High performance solid carbide endmills for high to medium strength materials |                                                                                     |            |              |                                     |                                        |
| <b>H14B</b>                                                                   |  |            | ●            | Rough and finish 3D milling         | 1xD                                    |
| <b>H34F</b>                                                                   |  |            | ●            | Precision side milling              | 3xD                                    |
| High performance solid carbide endmills for aluminium                         |                                                                                     |            |              |                                     |                                        |
| <b>AN1F</b>                                                                   |  | ●          |              | Slotting and finishing side milling | 2xD-4xD                                |
| <b>A12F</b>                                                                   |  | ●          |              | Slotting and finishing side milling | 2xD                                    |
| <b>A13F</b>                                                                   |  | ●          |              | Slotting and finishing side milling | 2xD                                    |
| <b>A23F</b>                                                                   |  | ●          |              | Slotting and finishing side milling | 3.5xD                                  |

## Table of contence

| Number of teeth | Center cutting | Cutting diameter<br>$\varnothing_{\text{MIN}}\text{---}\varnothing_{\text{max}}$ , [mm] | Material to cut |                 |           |                    |                                |                | Catalog page |
|-----------------|----------------|-----------------------------------------------------------------------------------------|-----------------|-----------------|-----------|--------------------|--------------------------------|----------------|--------------|
|                 |                |                                                                                         | P               | M               | K         | N                  | S                              | H              |              |
|                 |                |                                                                                         | Steel           | Stainless steel | Cast iron | Non-ferrous metals | Heat resistant Steel, Titanium | Hardened Steel |              |
|                 |                |                                                                                         |                 |                 |           |                    |                                |                |              |
| 4               | Yes            | 4 - 25                                                                                  | ●               | ●               | ●         |                    | ●                              | ●              | 8            |
| 4               | Yes            | 6 - 25                                                                                  | ●               | ●               | ●         | ●                  | ●                              | ●              | 10           |
| 4/6/8           | Yes            | 4 - 25                                                                                  | ●               | ●               | ●         |                    | ●                              |                | 38           |
|                 |                |                                                                                         |                 |                 |           |                    |                                |                |              |
| 4               | Yes            | 3 - 20                                                                                  | ●               | ●               | ●         |                    | ●                              | ●              | 36           |
| 4               | Yes            | 6 - 25                                                                                  | ●               | ●               | ●         |                    | ●                              | ●              | 40           |
|                 |                |                                                                                         |                 |                 |           |                    |                                |                |              |
| 1               | Yes            | 3 - 6                                                                                   |                 |                 |           | ●                  |                                |                | 53           |
| 2               | Yes            | 6 - 25                                                                                  |                 |                 |           | ●                  |                                |                | 44           |
| 3               | Yes            | 6 - 25                                                                                  |                 |                 |           | ●                  |                                |                | 28           |
| 3               | Yes            | 6 - 25                                                                                  |                 |                 |           | ●                  |                                |                | 47           |

## Table of contence

| Code                                   | Picture                                                                             | No coating | Coating TiAIN | Application                                    | Maximum depth of cut (D-tool diameter) |
|----------------------------------------|-------------------------------------------------------------------------------------|------------|---------------|------------------------------------------------|----------------------------------------|
| General Purpose Solid Carbide Endmills |                                                                                     |            |               |                                                |                                        |
| <b>B12F</b>                            |    | ●          | ●             | Slotting and finishing side milling            | 2xD                                    |
| <b>B22F</b>                            |    | ●          | ●             | Slotting and finishing side milling            | 3xD                                    |
| <b>B32F</b>                            |   | ●          | ●             | Long reach slotting and finishing side milling | 4xD-6xD                                |
| <b>O12B</b>                            |  | ●          | ●             | Rough and finishing 3D milling                 | 2xD                                    |
| <b>O22B</b>                            |  | ●          | ●             | Rough and finish 3D milling                    | 3xD                                    |
| <b>O32B</b>                            |  | ●          | ●             | Long reach finishing 3D Milling                | 4xD-6xD                                |
| <b>C13F</b>                            |  | ●          | ●             | Slotting and finishing side milling            | 2xD                                    |
| <b>C23F</b>                            |  | ●          | ●             | Slotting and finishing side milling            | 3xD                                    |
| <b>M14F</b>                            |  | ●          | ●             | Slotting and finishing side milling            | 2xD                                    |
| <b>M24F</b>                            |  | ●          | ●             | Finishing side milling                         | 3xD                                    |
| <b>M34F</b>                            |  | ●          | ●             | Long reach finishing side milling              | 4xD-6xD                                |

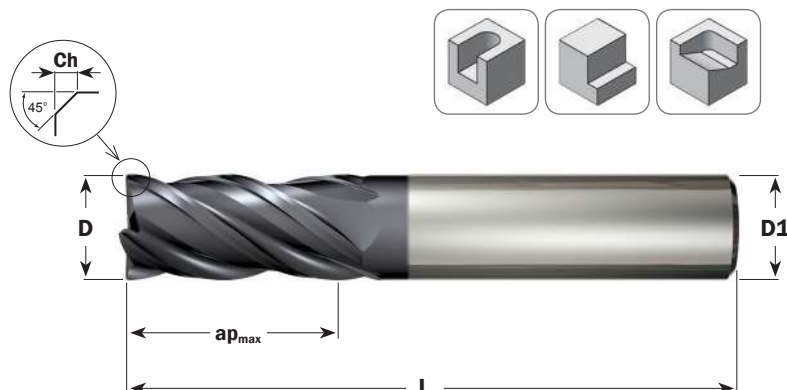
## Table of contence

| Number of teeth | Center cutting | Cutting diameter range, [mm] | Materials |                 |           |                    |                                |                | Catalog page |
|-----------------|----------------|------------------------------|-----------|-----------------|-----------|--------------------|--------------------------------|----------------|--------------|
|                 |                |                              | P         | M               | K         | N                  | S                              | H              |              |
|                 |                |                              | Steel     | Stainless steel | Cast iron | Non-ferrous metals | Heat resistant steel, Titanium | Hardened Steel |              |
|                 |                |                              |           |                 |           |                    |                                |                |              |
| 2               | Yes            | 3 - 20                       | ●         | ●               | ●         | ●                  |                                |                | 12           |
| 2               | Yes            | 3 - 25                       | ●         | ●               | ●         | ●                  |                                |                | 14           |
| 2               | Yes            | 3 - 20                       | ●         | ●               | ●         | ●                  |                                |                | 16           |
| 2               | Yes            | 1 - 20                       | ●         | ●               | ●         | ●                  |                                |                | 30           |
| 2               | Yes            | 4 - 20                       | ●         | ●               | ●         | ●                  |                                |                | 32           |
| 2               | Yes            | 3 - 20                       | ●         | ●               | ●         | ●                  |                                |                | 34           |
| 3               | Yes            | 3 - 25                       | ●         | ●               | ●         | ●                  |                                |                | 18           |
| 3               | Yes            | 3 - 25                       | ●         | ●               | ●         | ●                  |                                |                | 20           |
| 4               | Yes            | 3 - 25                       | ●         | ●               | ●         | ●                  |                                |                | 22           |
| 4               | Yes            | 3 - 25                       | ●         | ●               | ●         | ●                  |                                |                | 24           |
| 4               | Yes            | 3 - 25                       | ●         | ●               | ●         | ●                  |                                |                | 26           |

# V14F series

## High performance 4 flute solid carbide mills for roughing and finishing

- Square end
- Unequal indexing
- Center cutting
- Helix angle 38°
- Chamfer
- PVD coating TiAlN
- Diameter tolerance e8



### Formulas

Speed of cut  $V_c = \frac{D \times \pi \times n}{1000}$

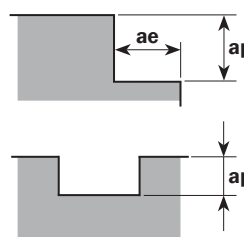
Spindle RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Infeed per tooth  $f_z = \frac{V_f}{z \times n}$

Infeed  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Tolerances

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |
| > or 18 to 30   | -0.040 / -0.073   |

### Recommended feeds and speeds

| Material group | Material                               | Milling |       |       | V <sub>c</sub> - Cutting speed [m/min] | f <sub>z</sub> - Feed per tooth, [mm] at 1 D, [mm] |       |       |       |       |       |       |       |       |       |
|----------------|----------------------------------------|---------|-------|-------|----------------------------------------|----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |                                        | side    | slot  |       |                                        | 4                                                  | 5     | 6     | 8     | 10    | 12    | 16    | 18    | 20    | 25    |
| <b>P</b>       | Мякая Steel                            | 1xD     | 0.5xD | 1xD   | 150-180                                | 0.025                                              | 0.030 | 0.040 | 0.060 | 0.060 | 0.070 | 0.075 | 0.080 | 0.090 | 0.100 |
| <b>M</b>       | Free machining stainless steel         | 1xD     | 0.5xD | 1xD   | 90-115                                 | 0.025                                              | 0.030 | 0.040 | 0.050 | 0.060 | 0.065 | 0.070 | 0.072 | 0.075 | 0.075 |
| <b>M</b>       | Midrange stainless steel               | 1xD     | 0.5xD | 1xD   | 70-85                                  | 0.020                                              | 0.025 | 0.035 | 0.045 | 0.050 | 0.055 | 0.060 | 0.065 | 0.065 | 0.070 |
| <b>M</b>       | Труднообрабатываемая нержавеющая Steel | 1xD     | 0.5xD | 1xD   | 60-80                                  | 0.015                                              | 0.025 | 0.030 | 0.040 | 0.045 | 0.050 | 0.055 | 0.060 | 0.060 | 0.060 |
| <b>K</b>       | Cast iron                              | 1xD     | 0.5xD | 1xD   | 120-150                                | 0.025                                              | 0.030 | 0.040 | 0.060 | 0.060 | 0.070 | 0.075 | 0.080 | 0.090 | 0.100 |
| <b>S</b>       | Heat resistant steel                   | 1xD     | 0.2xD | 0.3xD | 25-35                                  | 0.011                                              | 0.011 | 0.017 | 0.027 | 0.027 | 0.038 | 0.049 | 0.055 | 0.055 | 0.055 |
| <b>S</b>       | Titanium                               | 1xD     | 0.5xD | 1xD   | 40-50                                  | 0.012                                              | 0.015 | 0.020 | 0.030 | 0.030 | 0.040 | 0.045 | 0.050 | 0.060 | 0.070 |

| Code            | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap_max [mm] | L [mm] | Ch [mm] | Coating |
|-----------------|-------------|----------|-----------|---|-------------|--------|---------|---------|
| V14F 040C010 TC | Cylindrical | 4        | 6         | 4 | 12          | 55     | 0.4     | TiAlN   |
| V14F 040C010 WC | Weldon      | 4        | 6         | 4 | 12          | 55     | 0.4     | TiAlN   |
| V14F 050C040 TC | Cylindrical | 5        | 6         | 4 | 13          | 57     | 0.4     | TiAlN   |
| V14F 050C040 WC | Weldon      | 5        | 6         | 4 | 13          | 57     | 0.4     | TiAlN   |
| V14F 060C040 TC | Cylindrical | 6        | 6         | 4 | 13          | 57     | 0.4     | TiAlN   |
| V14F 060C040 WC | Weldon      | 6        | 6         | 4 | 13          | 57     | 0.4     | TiAlN   |
| V14F 080C040 TC | Cylindrical | 8        | 8         | 4 | 16          | 63     | 0.4     | TiAlN   |
| V14F 080C040 WC | Weldon      | 8        | 8         | 4 | 16          | 63     | 0.4     | TiAlN   |
| V14F 100C050 TC | Cylindrical | 10       | 10        | 4 | 22          | 72     | 0.5     | TiAlN   |
| V14F 100C050 WC | Weldon      | 10       | 10        | 4 | 22          | 72     | 0.5     | TiAlN   |

[ continued ]



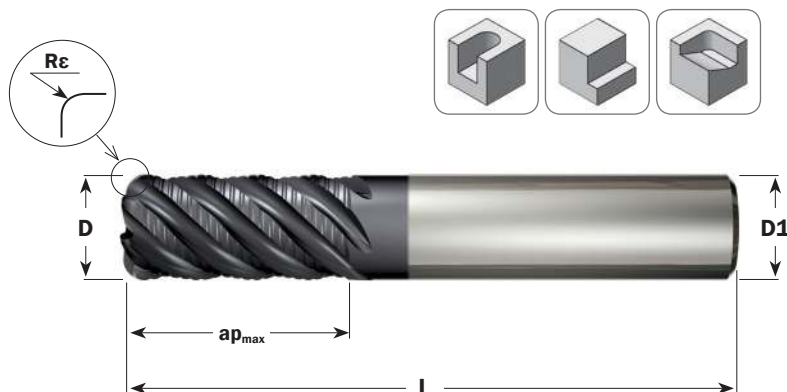
[ continued ]

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Ch<br>[mm] | Coating |
|-----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|---------|
| V14F 120C050 TC | Cylindrical | 12          | 12           | 4 | 26                        | 83        | 0.5        | TiAIN   |
| V14F 120C050 WC | Weldon      | 12          | 12           | 4 | 26                        | 83        | 0.5        | TiAIN   |
| V14F 140C050 TC | Cylindrical | 14          | 14           | 4 | 26                        | 83        | 0.5        | TiAIN   |
| V14F 140C050 WC | Weldon      | 14          | 14           | 4 | 26                        | 83        | 0.5        | TiAIN   |
| V14F 160C050 TC | Cylindrical | 16          | 16           | 4 | 32                        | 92        | 0.5        | TiAIN   |
| V14F 160C050 WC | Weldon      | 16          | 16           | 4 | 32                        | 92        | 0.5        | TiAIN   |
| V14F 180C050 TC | Cylindrical | 18          | 18           | 4 | 32                        | 92        | 0.5        | TiAIN   |
| V14F 180C050 WC | Weldon      | 18          | 18           | 4 | 32                        | 92        | 0.5        | TiAIN   |
| V14F 200C050 TC | Cylindrical | 20          | 20           | 4 | 38                        | 104       | 0.5        | TiAIN   |
| V14F 200C050 WC | Weldon      | 20          | 20           | 4 | 38                        | 104       | 0.5        | TiAIN   |
| V14F 250C050 TC | Cylindrical | 25          | 25           | 4 | 45                        | 121       | 0.5        | TiAIN   |
| V14F 250C050 WC | Weldon      | 25          | 25           | 4 | 45                        | 121       | 0.5        | TiAIN   |

# R14F High performance multifluted solid carbide roughing mills, normal length

## series

- Square end
- Chip breakers on cutting edge
- Center cutting
- Helix angle 45°
- Corner radius
- Available without coating and TiAlN coated
- Tool diameter according to tolerance d11



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter

**z** - Number of teeth

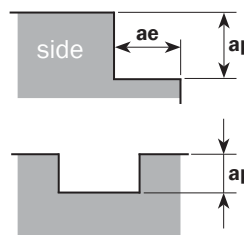
**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [mm/min] - Feedrate

**π** - 3.1416



### Manufacturing tolerance

| Ø D<br>[mm]    | Tolerance<br>d11<br>[mm] |
|----------------|--------------------------|
| ≤ 3            | -0.020 / -0.080          |
| > from 3 to 6  | -0.030 / -0.105          |
| > from 6 to 10 | -0.040 / -0.130          |

### Recommended feeds and speeds

| Material group | Material                       | Milling |       |       | V <sub>c</sub> – Cutting speed<br>[m/min] |         | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|-------|-------|-------------------------------------------|---------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |       | slot  |                                           |         | 6                                                     | 8     | 10    | 12    | 16    | 20    | 25    |  |
|                |                                | ap      | ae    | ap    |                                           |         |                                                       |       |       |       |       |       |       |  |
| <b>P</b>       | Alloy Steel                    | 1xD     | 0.5xD | 0.5xD | 60-85                                     | 100-140 | 0.030                                                 | 0.040 | 0.050 | 0.060 | 0.075 | 0.100 | 0.110 |  |
| <b>P</b>       | High alloy steel               | 1xD     | 0.3xD | 0.4xD | 50-75                                     | 80-120  | 0.025                                                 | 0.040 | 0.045 | 0.055 | 0.065 | 0.085 | 0.095 |  |
| <b>M</b>       | Free machining stainless steel | 1xD     | 0.5xD | 0.5xD | 50-65                                     | 80-100  | 0.030                                                 | 0.040 | 0.050 | 0.060 | 0.075 | 0.100 | 0.110 |  |
| <b>M</b>       | Midrange stainless steel       | 1xD     | 0.5xD | 0.5xD | 40-50                                     | 60-80   | 0.025                                                 | 0.035 | 0.040 | 0.050 | 0.060 | 0.080 | 0.090 |  |
| <b>M</b>       | Tough stainless steel          | 1xD     | 0.5xD | 0.5xD | 40-50                                     | 60-80   | 0.020                                                 | 0.030 | 0.035 | 0.040 | 0.050 | 0.065 | 0.070 |  |
| <b>K</b>       | Cast iron                      | 1xD     | 0.5xD | 0.5xD | 60-85                                     | 100-140 | 0.030                                                 | 0.040 | 0.050 | 0.060 | 0.075 | 0.100 | 0.110 |  |
| <b>S</b>       | Heat resistant steel           | 1xD     | 0.3xD | 0.3xD | 20-35                                     | 20-30   | 0.015                                                 | 0.020 | 0.025 | 0.030 | 0.040 | 0.050 | 0.055 |  |
| <b>S</b>       | Titanium                       | 1xD     | 0.4xD | 0.4xD | 15-20                                     | 30-50   | 0.025                                                 | 0.030 | 0.035 | 0.045 | 0.060 | 0.075 | 0.080 |  |
| <b>H</b>       | Hardened Steel 38-45 HRC       | 1xD     | 0.3xD | 0.3xD | 50-70                                     | 80-120  | 0.020                                                 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.070 |  |
| <b>H</b>       | Hardened Steel 45-55 HRC       | 1xD     | 0,2xD | 0,2xD | 40-50                                     | 60-100  | 0.015                                                 | 0.020 | 0.025 | 0.030 | 0.040 | 0.050 | 0.055 |  |

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|------------|
| R14F 060R025 TP | Cylindrical | 6           | 6            | 4 | 13                        | 57        | 0.25       | no coating |
| R14F 060R025 WP | Weldon      | 6           | 6            | 4 | 13                        | 57        | 0.25       | no coating |
| R14F 060R025 TC | Cylindrical | 6           | 6            | 4 | 13                        | 57        | 0.25       | TiAlN      |
| R14F 060R025 WC | Weldon      | 6           | 6            | 4 | 13                        | 57        | 0.25       | TiAlN      |
| R14F 080R025 TP | Cylindrical | 8           | 8            | 4 | 16                        | 63        | 0.25       | no coating |
| R14F 080R025 WP | Weldon      | 8           | 8            | 4 | 16                        | 63        | 0.25       | no coating |
| R14F 080R025 TC | Cylindrical | 8           | 8            | 4 | 16                        | 63        | 0.25       | TiAlN      |
| R14F 080R025 WC | Weldon      | 8           | 8            | 4 | 16                        | 63        | 0.25       | TiAlN      |
| R14F 100R025 TP | Cylindrical | 10          | 10           | 4 | 22                        | 72        | 0.25       | no coating |
| R14F 100R025 WP | Weldon      | 10          | 10           | 4 | 22                        | 72        | 0.25       | no coating |

[ continued ]

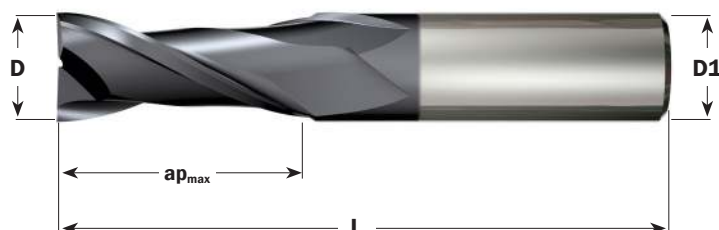
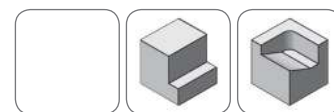
[ continued ]

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|------------|
| R14F 100R025 TC | Cylindrical | 10          | 10           | 4 | 22                        | 72        | 0.25       | TiAlN      |
| R14F 100R025 WC | Weldon      | 10          | 10           | 4 | 22                        | 72        | 0.25       | TiAlN      |
| R14F 120R035 TP | Cylindrical | 12          | 12           | 4 | 26                        | 83        | 0.35       | no coating |
| R14F 120R035 WP | Weldon      | 12          | 12           | 4 | 26                        | 83        | 0.35       | no coating |
| R14F 120R035 TC | Cylindrical | 12          | 12           | 4 | 26                        | 83        | 0.35       | TiAlN      |
| R14F 120R035 WC | Weldon      | 12          | 12           | 4 | 26                        | 83        | 0.35       | TiAlN      |
| R14F 160R035 TP | Cylindrical | 16          | 16           | 6 | 32                        | 92        | 0.35       | no coating |
| R14F 160R035 WP | Weldon      | 16          | 16           | 6 | 32                        | 92        | 0.35       | no coating |
| R14F 160R035 TC | Cylindrical | 16          | 16           | 6 | 32                        | 92        | 0.35       | TiAlN      |
| R14F 160R035 WC | Weldon      | 16          | 16           | 6 | 32                        | 92        | 0.35       | TiAlN      |
| R14F 160R035 TP | Cylindrical | 16          | 16           | 4 | 32                        | 92        | 0.35       | no coating |
| R14F 160R035 WP | Weldon      | 16          | 16           | 4 | 32                        | 92        | 0.35       | no coating |
| R14F 160R035 TC | Cylindrical | 16          | 16           | 4 | 32                        | 92        | 0.35       | TiAlN      |
| R14F 160R035 WC | Weldon      | 16          | 16           | 4 | 32                        | 92        | 0.35       | TiAlN      |
| R14F 200R035 TP | Cylindrical | 20          | 20           | 6 | 38                        | 104       | 0.35       | no coating |
| R14F 200R035 WP | Weldon      | 20          | 20           | 6 | 38                        | 104       | 0.35       | no coating |
| R14F 200R035 TC | Cylindrical | 20          | 20           | 6 | 38                        | 104       | 0.35       | TiAlN      |
| R14F 200R035 WC | Weldon      | 20          | 20           | 6 | 38                        | 104       | 0.35       | TiAlN      |
| R14F 200R035 TP | Cylindrical | 20          | 20           | 4 | 38                        | 104       | 0.35       | no coating |
| R14F 200R035 WP | Weldon      | 20          | 20           | 4 | 38                        | 104       | 0.35       | no coating |
| R14F 200R035 TC | Cylindrical | 20          | 20           | 4 | 38                        | 104       | 0.35       | TiAlN      |
| R14F 200R035 WC | Weldon      | 20          | 20           | 4 | 38                        | 104       | 0.35       | TiAlN      |
| R14F 250R050 TP | Cylindrical | 25          | 25           | 6 | 45                        | 121       | 0.5        | no coating |
| R14F 250R050 WP | Weldon      | 25          | 25           | 6 | 45                        | 121       | 0.5        | no coating |
| R14F 250R050 TC | Cylindrical | 25          | 25           | 6 | 45                        | 121       | 0.5        | TiAlN      |
| R14F 250R050 WC | Weldon      | 25          | 25           | 6 | 45                        | 121       | 0.5        | TiAlN      |

# B12F Short series solid carbide 2 flute slot drill

## series

- Square end
- Center cutting
- Helix angle 30°
- Available without coating TiAlN coated
- Diameter tolerance e8



### Formulas

$$\text{Speed of cut } V_c = \frac{D \times \pi \times n}{1000}$$

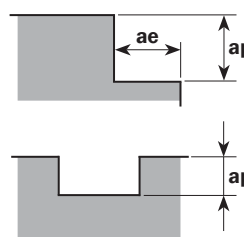
$$\text{Spindle RPM } n = \frac{V_c \times 1000}{\pi \times D}$$

$$\text{Infeed per tooth } f_z = \frac{V_f}{z \times n}$$

$$\text{Infeed } V_f = f_z \times z \times n$$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Manufacturing tolerance

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |

### Recommended feeds and speeds

| Material group | Material                       | Milling |       |       | V <sub>c</sub> - Cutting speed [m/min] |         | f <sub>z</sub> - Feed per tooth, [mm] at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|-------|-------|----------------------------------------|---------|----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |       | slot  |                                        |         |                                                    |       |       |       |       |       |       |       |       |  |
|                |                                | ap      | ae    | ap    | no coating                             | TiAlN   | 2                                                  | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 20    |  |
| <b>P</b>       | Alloy steels <48HRC            | 1.25xD  | 0.1xD | 0.5xD | 70-90                                  | 120-160 | 0.010                                              | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.075 | 0.085 | 0.100 |  |
| <b>M</b>       | Free machining stainless steel | 1.25xD  | 0.1xD | 0.5xD | -                                      | 85-110  | 0.010                                              | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.075 | 0.085 | 0.100 |  |
| <b>M</b>       | Midrange stainless steel       | 1.25xD  | 0.1xD | 0.5xD | -                                      | 60-80   | 0.008                                              | 0.015 | 0.030 | 0.035 | 0.045 | 0.055 | 0.060 | 0.070 | 0.080 |  |
| <b>K</b>       | Cast iron                      | 1.25xD  | 0.1xD | 0.5xD | -                                      | 110-130 | 0.010                                              | 0.020 | 0.030 | 0.045 | 0.055 | 0.065 | 0.750 | 0.085 | 0.100 |  |
| <b>N</b>       | Aluminium and Aluminium alloys | 1.25xD  | 0.1xD | 0.5xD | 250-750                                | -       | 0.015                                              | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.105 | 0.120 | 0.150 |  |
| <b>N</b>       | Copper and copper alloys       | 1.25xD  | 0.1xD | 0.5xD | 125-350                                | 250-600 | 0.015                                              | 0.035 | 0.050 | 0.070 | 0.085 | 0.105 | 0.120 | 0.140 | 0.170 |  |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap_max [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|-------------|--------|------------|
| B12F 030R00 TP | Cylindrical | 3        | 3         | 2 | 9.5         | 38     | no coating |
| B12F 030R00 WP | Weldon      | 3        | 3         | 2 | 9.5         | 38     | no coating |
| B12F 030R00 TC | Cylindrical | 3        | 3         | 2 | 9.5         | 38     | TiAlN      |
| B12F 030R00 WC | Weldon      | 3        | 3         | 2 | 9.5         | 38     | TiAlN      |
| B12F 040R00 TP | Cylindrical | 4        | 4         | 2 | 12          | 50     | no coating |
| B12F 040R00 WP | Weldon      | 4        | 4         | 2 | 12          | 50     | no coating |
| B12F 040R00 TC | Cylindrical | 4        | 4         | 2 | 12          | 50     | TiAlN      |
| B12F 040R00 WC | Weldon      | 4        | 4         | 2 | 12          | 50     | TiAlN      |
| B12F 050R00 TP | Cylindrical | 5        | 6         | 2 | 14          | 50     | no coating |
| B12F 050R00 WP | Weldon      | 5        | 6         | 2 | 14          | 50     | no coating |

[ continued ]

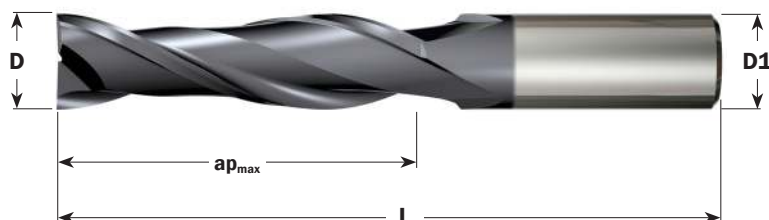
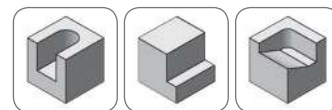
[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| B12F 050R00 TC | Cylindrical | 5           | 6            | 2 | 14                        | 50        | TiAlN      |
| B12F 050R00 WC | Weldon      | 5           | 6            | 2 | 14                        | 50        | TiAlN      |
| B12F 060R00 TP | Cylindrical | 6           | 6            | 2 | 16                        | 50        | no coating |
| B12F 060R00 WP | Weldon      | 6           | 6            | 2 | 16                        | 50        | no coating |
| B12F 060R00 TC | Cylindrical | 6           | 6            | 2 | 16                        | 50        | TiAlN      |
| B12F 060R00 WC | Weldon      | 6           | 6            | 2 | 16                        | 50        | TiAlN      |
| B12F 080R00 TP | Cylindrical | 8           | 8            | 2 | 20                        | 63        | no coating |
| B12F 080R00 WP | Weldon      | 8           | 8            | 2 | 20                        | 63        | no coating |
| B12F 080R00 TC | Cylindrical | 8           | 8            | 2 | 20                        | 63        | TiAlN      |
| B12F 080R00 WC | Weldon      | 8           | 8            | 2 | 20                        | 63        | TiAlN      |
| B12F 100R00 TP | Cylindrical | 10          | 10           | 2 | 22                        | 76        | no coating |
| B12F 100R00 WP | Weldon      | 10          | 10           | 2 | 22                        | 76        | no coating |
| B12F 100R00 TC | Cylindrical | 10          | 10           | 2 | 22                        | 76        | TiAlN      |
| B12F 100R00 WC | Weldon      | 10          | 10           | 2 | 22                        | 76        | TiAlN      |
| B12F 120R00 TP | Cylindrical | 12          | 12           | 2 | 25                        | 76        | no coating |
| B12F 120R00 WP | Weldon      | 12          | 12           | 2 | 25                        | 76        | no coating |
| B12F 120R00 TC | Cylindrical | 12          | 12           | 2 | 25                        | 76        | TiAlN      |
| B12F 120R00 WC | Weldon      | 12          | 12           | 2 | 25                        | 76        | TiAlN      |
| B12F 140R00 TP | Cylindrical | 14          | 14           | 2 | 32                        | 83        | no coating |
| B12F 140R00 WP | Weldon      | 14          | 14           | 2 | 32                        | 83        | no coating |
| B12F 140R00 TC | Cylindrical | 14          | 14           | 2 | 32                        | 83        | TiAlN      |
| B12F 140R00 WC | Weldon      | 14          | 14           | 2 | 32                        | 83        | TiAlN      |
| B12F 160R00 TP | Cylindrical | 16          | 16           | 2 | 32                        | 92        | no coating |
| B12F 160R00 WP | Weldon      | 16          | 16           | 2 | 32                        | 92        | no coating |
| B12F 160R00 TC | Cylindrical | 16          | 16           | 2 | 32                        | 92        | TiAlN      |
| B12F 160R00 WC | Weldon      | 16          | 16           | 2 | 32                        | 92        | TiAlN      |
| B12F 180R00 TP | Cylindrical | 18          | 18           | 2 | 38                        | 100       | no coating |
| B12F 180R00 WP | Weldon      | 18          | 18           | 2 | 38                        | 100       | no coating |
| B12F 180R00 TC | Cylindrical | 18          | 18           | 2 | 38                        | 100       | TiAlN      |
| B12F 180R00 WC | Weldon      | 18          | 18           | 2 | 38                        | 100       | TiAlN      |
| B12F 200R00 TP | Cylindrical | 20          | 20           | 2 | 38                        | 104       | no coating |
| B12F 200R00 WP | Weldon      | 20          | 20           | 2 | 38                        | 104       | no coating |
| B12F 200R00 TC | Cylindrical | 20          | 20           | 2 | 38                        | 104       | TiAlN      |
| B12F 200R00 WC | Weldon      | 20          | 20           | 2 | 38                        | 104       | TiAlN      |

# B22F Long series solid carbide 2 flute slot drill

## series

- Square end
- Center cutting
- Helix angle 30°
- Available without coating TiAlN coated
- Diameter tolerance e8



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter

**z** - Number of teeth

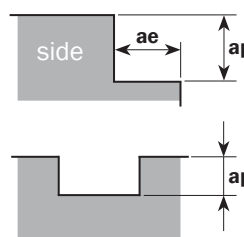
**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [m/min] - Feedrate

**π** - 3.1415696



### Manufacturing tolerance

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |

### Recommended feeds and speeds

| Material group | Material                       | Milling |       |        | V <sub>c</sub> - Cutting speed [m/min] |         | f <sub>z</sub> - Feed per tooth, [mm] at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|-------|--------|----------------------------------------|---------|----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |       | slot   |                                        |         |                                                    |       |       |       |       |       |       |       |       |  |
|                |                                | ap      | ae    | ap     | no coating                             | TiAlN   | 2                                                  | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 20    |  |
| <b>P</b>       | Alloy steel<48HRC              | 2xD     | 0.1xD | 0.25xD | 70-90                                  | 120-160 | 0.010                                              | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.075 | 0.085 | 0.010 |  |
| <b>M</b>       | Free machining stainless steel | 2xD     | 0.1xD | 0.25xD | -                                      | 85-110  | 0.010                                              | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.075 | 0.085 | 0.010 |  |
| <b>M</b>       | Midrange stainless steel       | 2xD     | 0.1xD | 0.25xD | -                                      | 60-80   | 0.008                                              | 0.015 | 0.030 | 0.035 | 0.045 | 0.055 | 0.060 | 0.070 | 0.080 |  |
| <b>K</b>       | Cast iron                      | 2xD     | 0.1xD | 0.25xD | -                                      | 110-130 | 0.010                                              | 0.020 | 0.030 | 0.045 | 0.055 | 0.065 | 0.750 | 0.085 | 0.100 |  |
| <b>N</b>       | Aluminium and Aluminium alloys | 2xD     | 0.1xD | 0.25xD | 250-750                                | -       | 0.015                                              | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.105 | 0.120 | 0.150 |  |
| <b>N</b>       | Copper and copper alloys       | 2xD     | 0.1xD | 0.25xD | 125-350                                | 250-600 | 0.015                                              | 0.035 | 0.050 | 0.070 | 0.085 | 0.105 | 0.120 | 0.140 | 0.170 |  |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|------------------------|--------|------------|
| B22F 030R00 TP | Cylindrical | 3        | 3         | 2 | 19                     | 63     | no coating |
| B22F 030R00 WP | Weldon      | 3        | 3         | 2 | 19                     | 63     | no coating |
| B22F 030R00 TC | Cylindrical | 3        | 3         | 2 | 19                     | 63     | TiAlN      |
| B22F 030R00 WC | Weldon      | 3        | 3         | 2 | 19                     | 63     | TiAlN      |
| B22F 040R00 TP | Cylindrical | 4        | 4         | 2 | 19                     | 63     | no coating |
| B22F 040R00 WP | Weldon      | 4        | 4         | 2 | 19                     | 63     | no coating |
| B22F 040R00 TC | Cylindrical | 4        | 4         | 2 | 19                     | 63     | TiAlN      |
| B22F 040R00 WC | Weldon      | 4        | 4         | 2 | 19                     | 63     | TiAlN      |
| B22F 050R00 TP | Cylindrical | 5        | 5         | 2 | 20                     | 63     | no coating |
| B22F 050R00 WP | Weldon      | 5        | 5         | 2 | 20                     | 63     | no coating |

[ continued ]

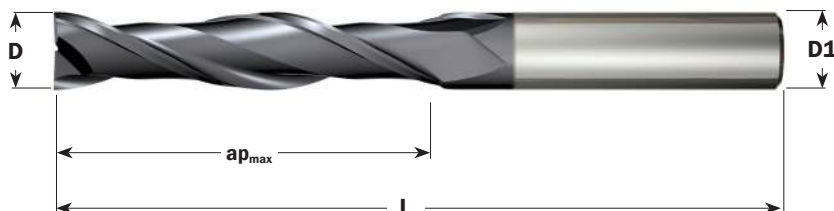
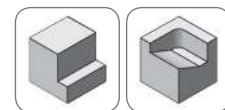
[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| B22F 050R00 TC | Cylindrical | 5           | 5            | 2 | 20                        | 63        | TiAlN      |
| B22F 050R00 WC | Weldon      | 5           | 5            | 2 | 20                        | 63        | TiAlN      |
| B22F 060R00 TP | Cylindrical | 6           | 6            | 2 | 28                        | 76        | no coating |
| B22F 060R00 WP | Weldon      | 6           | 6            | 2 | 28                        | 76        | no coating |
| B22F 060R00 TC | Cylindrical | 6           | 6            | 2 | 28                        | 76        | TiAlN      |
| B22F 060R00 WC | Weldon      | 6           | 6            | 2 | 28                        | 76        | TiAlN      |
| B22F 080R00 TP | Cylindrical | 8           | 8            | 2 | 28                        | 76        | no coating |
| B22F 080R00 WP | Weldon      | 8           | 8            | 2 | 28                        | 76        | no coating |
| B22F 080R00 TC | Cylindrical | 8           | 8            | 2 | 28                        | 76        | TiAlN      |
| B22F 080R00 WC | Weldon      | 8           | 8            | 2 | 28                        | 76        | TiAlN      |
| B22F 100R00 TP | Cylindrical | 10          | 10           | 2 | 32                        | 89        | no coating |
| B22F 100R00 WP | Weldon      | 10          | 10           | 2 | 32                        | 89        | no coating |
| B22F 100R00 TC | Cylindrical | 10          | 10           | 2 | 32                        | 89        | TiAlN      |
| B22F 100R00 WC | Weldon      | 10          | 10           | 2 | 32                        | 89        | TiAlN      |
| B22F 120R00 TP | Cylindrical | 12          | 12           | 2 | 45                        | 100       | no coating |
| B22F 120R00 WP | Weldon      | 12          | 12           | 2 | 45                        | 100       | no coating |
| B22F 120R00 TC | Cylindrical | 12          | 12           | 2 | 45                        | 100       | TiAlN      |
| B22F 120R00 WC | Weldon      | 12          | 12           | 2 | 45                        | 100       | TiAlN      |
| B22F 140R00 TP | Cylindrical | 14          | 14           | 2 | 50                        | 100       | no coating |
| B22F 140R00 WP | Weldon      | 14          | 14           | 2 | 50                        | 100       | no coating |
| B22F 140R00 TC | Cylindrical | 14          | 14           | 2 | 50                        | 100       | TiAlN      |
| B22F 140R00 WC | Weldon      | 14          | 14           | 2 | 50                        | 100       | TiAlN      |
| B22F 160R00 TP | Cylindrical | 16          | 16           | 2 | 56                        | 110       | no coating |
| B22F 160R00 WP | Weldon      | 16          | 16           | 2 | 56                        | 110       | no coating |
| B22F 160R00 TC | Cylindrical | 16          | 16           | 2 | 56                        | 110       | TiAlN      |
| B22F 160R00 WC | Weldon      | 16          | 16           | 2 | 56                        | 110       | TiAlN      |
| B22F 180R00 TP | Cylindrical | 18          | 18           | 2 | 60                        | 125       | no coating |
| B22F 180R00 WP | Weldon      | 18          | 18           | 2 | 60                        | 125       | no coating |
| B22F 180R00 TC | Cylindrical | 18          | 18           | 2 | 60                        | 125       | TiAlN      |
| B22F 180R00 WC | Weldon      | 18          | 18           | 2 | 60                        | 125       | TiAlN      |
| B22F 200R00 TP | Cylindrical | 20          | 20           | 2 | 60                        | 125       | no coating |
| B22F 200R00 WP | Weldon      | 20          | 20           | 2 | 56                        | 125       | no coating |
| B22F 200R00 TC | Cylindrical | 20          | 20           | 2 | 56                        | 125       | TiAlN      |
| B22F 200R00 WC | Weldon      | 20          | 20           | 2 | 56                        | 125       | TiAlN      |
| B22F 250R00 TP | Cylindrical | 25          | 25           | 2 | 62                        | 140       | no coating |
| B22F 250R00 WP | Weldon      | 25          | 25           | 2 | 62                        | 140       | no coating |
| B22F 250R00 TC | Cylindrical | 25          | 25           | 2 | 62                        | 140       | TiAlN      |
| B22F 250R00 WC | Weldon      | 25          | 25           | 2 | 62                        | 140       | TiAlN      |

# B32F Extra long series solid carbide 2 flute slot drill

## series

- Square end
- Center cutting
- Helix angle 30°
- Available without coating TiAlN coated
- Diameter tolerance e8



### Formulas

$$\text{Cutting speed } V_c = \frac{D \times \pi \times n}{1000}$$

$$\text{RPM } n = \frac{V_c \times 1000}{\pi \times D}$$

$$\text{Feed per tooth } f_z = \frac{V_f}{z \times n}$$

$$\text{Feedrate } V_f = f_z \times z \times n$$

### Notation

**D**, [mm] - diameter

**z** - Number of teeth

**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [m/min] - Feedrate

**π** - 3.1415696



### Manufacturing tolerance

| Ø D<br>[mm]     | Tolerance e8<br>[mm] |
|-----------------|----------------------|
| ≤ 3             | -0.014 / -0.028      |
| > from 3 to 6   | -0.020 / -0.038      |
| > from 6 to 10  | -0.025 / -0.047      |
| > from 10 to 18 | -0.032 / -0.059      |

### Recommended feeds and speeds

| Material group | Material                       | Milling |        | V <sub>c</sub> – Cutting speed<br>[m/min] |         | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|--------|-------------------------------------------|---------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |        |                                           |         |                                                       |       |       |       |       |       |       |       |       |  |
|                |                                | ap      | ae     | no coating                                | TiAlN   | 2                                                     | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 20    |  |
| P              | Alloy steel<48HRC              | 3xD     | 0.05xD | 70-90                                     | 120-160 | 0.010                                                 | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.075 | 0.085 | 0.010 |  |
| M              | Free machining stainless steel | 3xD     | 0.05xD | -                                         | 85-110  | 0.010                                                 | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.075 | 0.085 | 0.010 |  |
| M              | Midrange stainless steel       | 3xD     | 0.05xD | -                                         | 60-80   | 0.008                                                 | 0.015 | 0.030 | 0.035 | 0.045 | 0.055 | 0.060 | 0.070 | 0.080 |  |
| K              | Cast iron                      | 3xD     | 0.05xD | -                                         | 110-130 | 0.010                                                 | 0.020 | 0.030 | 0.045 | 0.055 | 0.065 | 0.750 | 0.085 | 0.100 |  |
| N              | Aluminium and Aluminium alloys | 3xD     | 0.05xD | 250-750                                   | -       | 0.015                                                 | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.105 | 0.120 | 0.150 |  |
| N              | Copper and copper alloys       | 3xD     | 0.05xD | 125-350                                   | 250-600 | 0.015                                                 | 0.035 | 0.050 | 0.070 | 0.085 | 0.105 | 0.120 | 0.140 | 0.170 |  |

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| B32F 030R00 TP | Cylindrical | 3           | 3            | 2 | 25                        | 75        | no coating |
| B32F 030R00 WP | Weldon      | 3           | 3            | 2 | 25                        | 75        | no coating |
| B32F 030R00 TC | Cylindrical | 3           | 3            | 2 | 25                        | 75        | TiAlN      |
| B32F 030R00 WC | Weldon      | 3           | 3            | 2 | 25                        | 75        | TiAlN      |
| B32F 040R00 TP | Cylindrical | 4           | 4            | 2 | 31                        | 75        | no coating |
| B32F 040R00 WP | Weldon      | 4           | 4            | 2 | 31                        | 75        | no coating |
| B32F 040R00 TC | Cylindrical | 4           | 4            | 2 | 31                        | 75        | TiAlN      |
| B32F 040R00 WC | Weldon      | 4           | 4            | 2 | 31                        | 75        | TiAlN      |
| B32F 050R00 TP | Cylindrical | 5           | 5            | 2 | 31                        | 100       | no coating |
| B32F 050R00 WP | Weldon      | 5           | 5            | 2 | 31                        | 100       | no coating |

[ continued ]



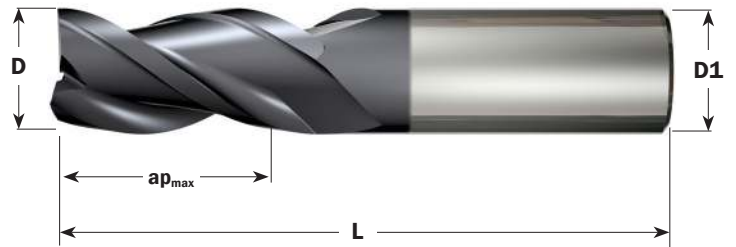
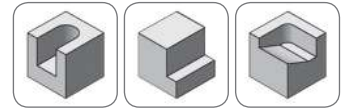
[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| B32F 050R00 TC | Cylindrical | 5           | 5            | 2 | 31                        | 100       | TiAlN      |
| B32F 050R00 WC | Weldon      | 5           | 5            | 2 | 31                        | 100       | TiAlN      |
| B32F 060R00 TP | Cylindrical | 6           | 6            | 2 | 38                        | 100       | no coating |
| B32F 060R00 WP | Weldon      | 6           | 6            | 2 | 38                        | 100       | no coating |
| B32F 060R00 TC | Cylindrical | 6           | 6            | 2 | 38                        | 100       | TiAlN      |
| B32F 060R00 WC | Weldon      | 6           | 6            | 2 | 38                        | 100       | TiAlN      |
| B32F 080R00 TP | Cylindrical | 8           | 8            | 2 | 41                        | 100       | no coating |
| B32F 080R00 WP | Weldon      | 8           | 8            | 2 | 41                        | 100       | no coating |
| B32F 080R00 TC | Cylindrical | 8           | 8            | 2 | 41                        | 100       | TiAlN      |
| B32F 080R00 WC | Weldon      | 8           | 8            | 2 | 41                        | 100       | TiAlN      |
| B32F 100R00 TP | Cylindrical | 10          | 10           | 2 | 45                        | 100       | no coating |
| B32F 100R00 WP | Weldon      | 10          | 10           | 2 | 45                        | 100       | no coating |
| B32F 100R00 TC | Cylindrical | 10          | 10           | 2 | 45                        | 100       | TiAlN      |
| B32F 100R00 WC | Weldon      | 10          | 10           | 2 | 45                        | 100       | TiAlN      |
| B32F 120R00 TP | Cylindrical | 12          | 12           | 2 | 75                        | 150       | no coating |
| B32F 120R00 WP | Weldon      | 12          | 12           | 2 | 75                        | 150       | no coating |
| B32F 120R00 TC | Cylindrical | 12          | 12           | 2 | 75                        | 150       | TiAlN      |
| B32F 120R00 WC | Weldon      | 12          | 12           | 2 | 75                        | 150       | TiAlN      |
| B32F 140R00 TP | Cylindrical | 14          | 14           | 2 | 75                        | 150       | no coating |
| B32F 140R00 WP | Weldon      | 14          | 14           | 2 | 75                        | 150       | no coating |
| B32F 140R00 TC | Cylindrical | 14          | 14           | 2 | 75                        | 150       | TiAlN      |
| B32F 140R00 WC | Weldon      | 14          | 14           | 2 | 75                        | 150       | TiAlN      |
| B32F 160R00 TP | Cylindrical | 16          | 16           | 2 | 75                        | 150       | no coating |
| B32F 160R00 WP | Weldon      | 16          | 16           | 2 | 75                        | 150       | no coating |
| B32F 160R00 TC | Cylindrical | 16          | 16           | 2 | 75                        | 150       | TiAlN      |
| B32F 160R00 WC | Weldon      | 16          | 16           | 2 | 75                        | 150       | TiAlN      |
| B32F 180R00 TP | Cylindrical | 18          | 18           | 2 | 75                        | 150       | no coating |
| B32F 180R00 WP | Weldon      | 18          | 18           | 2 | 75                        | 150       | no coating |
| B32F 180R00 TC | Cylindrical | 18          | 18           | 2 | 75                        | 150       | TiAlN      |
| B32F 180R00 WC | Weldon      | 18          | 18           | 2 | 75                        | 150       | TiAlN      |
| B32F 200R00 TP | Cylindrical | 20          | 20           | 2 | 75                        | 150       | no coating |
| B32F 200R00 WP | Weldon      | 20          | 20           | 2 | 75                        | 150       | no coating |
| B32F 200R00 TC | Cylindrical | 20          | 20           | 2 | 75                        | 150       | TiAlN      |
| B32F 200R00 WC | Weldon      | 20          | 20           | 2 | 75                        | 150       | TiAlN      |

# C13F Solid carbide 3 flute general purpose mills

## series

- Square end
- Center cutting
- Helix angle 37°
- Available without coating or TiAlN coated
- Diameter tolerance e8



### Formulas

Speed of cut  $V_c = \frac{D \times \pi \times n}{1000}$

Spindle RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Infeed per tooth  $f_z = \frac{V_f}{z \times n}$

Infeed  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter

**z** - Number of teeth

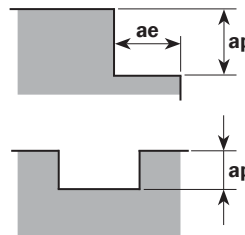
**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [m/min] - Feedrate

**π** - 3.1415696



### Tolerances

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |
| > or 18 to 30   | -0.040 / -0.073   |

### Recommended feeds and speeds

| Material group | Material                       | Milling |       |        | V <sub>c</sub> - Cutting speed [m/min] |         | f <sub>z</sub> - Feed per tooth, [mm] at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|-------|--------|----------------------------------------|---------|----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |       | slot   |                                        |         |                                                    |       |       |       |       |       |       |       |       |  |
|                |                                | ap      | ae    | ap     | no coating                             | TiAlN   | 2                                                  | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 20    |  |
| <b>P</b>       | Alloy steel<48HRC              | 0.75xD  | 0.1xD | 0.25xD | 60-80                                  | 120-160 | 0.010                                              | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| <b>M</b>       | Free machining stainless steel | 0.75xD  | 0.1xD | 0.25xD | -                                      | 85-110  | 0.010                                              | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| <b>M</b>       | Midrange stainless steel       | 0.75xD  | 0.1xD | 0.25xD | -                                      | 60-80   | 0.008                                              | 0.015 | 0.025 | 0.030 | 0.040 | 0.050 | 0.055 | 0.060 | 0.080 |  |
| <b>K</b>       | Cast iron                      | 0.75xD  | 0.1xD | 0.25xD | -                                      | 110-130 | 0.010                                              | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| <b>N</b>       | Aluminium and Aluminium alloys | 0.75xD  | 0.1xD | 0.25xD | 250-750                                | -       | 0.015                                              | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.105 | 0.120 | 0.150 |  |
| <b>N</b>       | Copper and copper alloys       | 0.75xD  | 0.1xD | 0.25xD | 125-350                                | 250-600 | 0.015                                              | 0.035 | 0.050 | 0.070 | 0.085 | 0.105 | 0.120 | 0.140 | 0.170 |  |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|------------------------|--------|------------|
| C13F 030R00 TP | Cylindrical | 3        | 3         | 3 | 9.5                    | 38     | no coating |
| C13F 030R00 WP | Weldon      | 3        | 3         | 3 | 9.5                    | 38     | no coating |
| C13F 030R00 TC | Cylindrical | 3        | 3         | 3 | 9.5                    | 38     | TiAlN      |
| C13F 030R00 WC | Weldon      | 3        | 3         | 3 | 9.5                    | 38     | TiAlN      |
| C13F 040R00 TP | Cylindrical | 4        | 4         | 3 | 12                     | 50     | no coating |
| C13F 040R00 WP | Weldon      | 4        | 4         | 3 | 12                     | 50     | no coating |
| C13F 040R00 TC | Cylindrical | 4        | 4         | 3 | 12                     | 50     | TiAlN      |
| C13F 040R00 WC | Weldon      | 4        | 4         | 3 | 12                     | 50     | TiAlN      |
| C13F 050R00 TP | Cylindrical | 5        | 6         | 3 | 14                     | 50     | no coating |
| C13F 050R00 WP | Weldon      | 5        | 6         | 3 | 14                     | 50     | no coating |

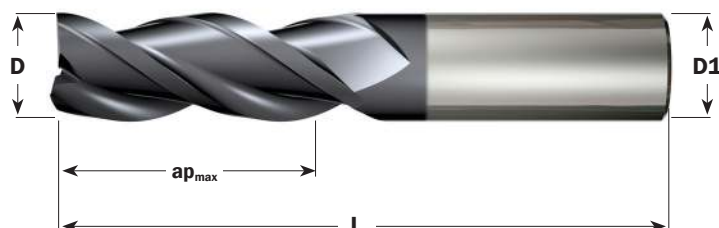
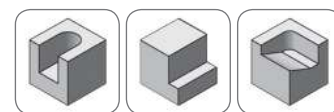
[ continued ]

[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| C13F 050R00 TC | Cylindrical | 5           | 6            | 3 | 14                        | 50        | TiAlN      |
| C13F 050R00 WC | Weldon      | 5           | 6            | 3 | 14                        | 50        | TiAlN      |
| C13F 060R00 TP | Cylindrical | 6           | 6            | 3 | 16                        | 50        | no coating |
| C13F 060R00 WP | Weldon      | 6           | 6            | 3 | 16                        | 50        | no coating |
| C13F 060R00 TC | Cylindrical | 6           | 6            | 3 | 16                        | 50        | TiAlN      |
| C13F 060R00 WC | Weldon      | 6           | 6            | 3 | 16                        | 50        | TiAlN      |
| C13F 080R00 TP | Cylindrical | 8           | 8            | 3 | 20                        | 63        | no coating |
| C13F 080R00 WP | Weldon      | 8           | 8            | 3 | 20                        | 63        | no coating |
| C13F 080R00 TC | Cylindrical | 8           | 8            | 3 | 20                        | 63        | TiAlN      |
| C13F 080R00 WC | Weldon      | 8           | 8            | 3 | 20                        | 63        | TiAlN      |
| C13F 100R00 TP | Cylindrical | 10          | 10           | 3 | 22                        | 76        | no coating |
| C13F 100R00 WP | Weldon      | 10          | 10           | 3 | 22                        | 76        | no coating |
| C13F 100R00 TC | Cylindrical | 10          | 10           | 3 | 22                        | 76        | TiAlN      |
| C13F 100R00 WC | Weldon      | 10          | 10           | 3 | 22                        | 76        | TiAlN      |
| C13F 120R00 TP | Cylindrical | 12          | 12           | 3 | 25                        | 76        | no coating |
| C13F 120R00 WP | Weldon      | 12          | 12           | 3 | 25                        | 76        | no coating |
| C13F 120R00 TC | Cylindrical | 12          | 12           | 3 | 25                        | 76        | TiAlN      |
| C13F 120R00 WC | Weldon      | 12          | 12           | 3 | 25                        | 76        | TiAlN      |
| C13F 140R00 TP | Cylindrical | 14          | 14           | 3 | 32                        | 83        | no coating |
| C13F 140R00 WP | Weldon      | 14          | 14           | 3 | 32                        | 83        | no coating |
| C13F 140R00 TC | Cylindrical | 14          | 14           | 3 | 32                        | 83        | TiAlN      |
| C13F 140R00 WC | Weldon      | 14          | 14           | 3 | 32                        | 83        | TiAlN      |
| C13F 160R00 TP | Cylindrical | 16          | 16           | 3 | 32                        | 92        | no coating |
| C13F 160R00 WP | Weldon      | 16          | 16           | 3 | 32                        | 92        | no coating |
| C13F 160R00 TC | Cylindrical | 16          | 16           | 3 | 32                        | 92        | TiAlN      |
| C13F 160R00 WC | Weldon      | 16          | 16           | 3 | 32                        | 92        | TiAlN      |
| C13F 180R00 TP | Cylindrical | 18          | 18           | 3 | 38                        | 100       | no coating |
| C13F 180R00 WP | Weldon      | 18          | 18           | 3 | 38                        | 100       | no coating |
| C13F 180R00 TC | Cylindrical | 18          | 18           | 3 | 38                        | 100       | TiAlN      |
| C13F 180R00 WC | Weldon      | 18          | 18           | 3 | 38                        | 100       | TiAlN      |
| C13F 200R00 TP | Cylindrical | 20          | 20           | 3 | 38                        | 104       | no coating |
| C13F 200R00 WP | Weldon      | 20          | 20           | 3 | 38                        | 104       | no coating |
| C13F 200R00 TC | Cylindrical | 20          | 20           | 3 | 38                        | 104       | TiAlN      |
| C13F 200R00 WC | Weldon      | 20          | 20           | 3 | 38                        | 104       | TiAlN      |

# C23F Solid carbide 3 flute general purpose mills, long series

- Square end
- Center cutting
- Helix angle 37°
- Available without coating or TiAlN coated
- Diameter tolerance e8



## Formulas

$$\text{Speed of cut } V_c = \frac{D \times \pi \times n}{1000}$$

$$\text{Spindle RPM } n = \frac{V_c \times 1000}{\pi \times D}$$

$$\text{Infeed per tooth } f_z = \frac{V_f}{z \times n}$$

$$\text{Infeed } V_f = f_z \times z \times n$$

## Notation

**D**, [mm] - diameter

**z** - Number of teeth

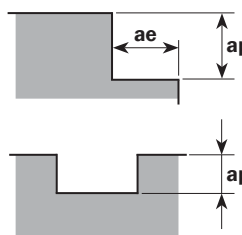
**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [m/min] - Feedrate

**π** - 3.1415696



## Tolerances

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |
| > or 18 to 30   | -0.040 / -0.073   |

## Recommended feeds and speeds

| Material group | Material                       | Milling |       |        | V <sub>c</sub> - Cutting speed [m/min] |         | f <sub>z</sub> - Feed per tooth, [mm] at 1 D, [mm] |       |       |       |       |       |       |       |       |
|----------------|--------------------------------|---------|-------|--------|----------------------------------------|---------|----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |                                | side    |       | slot   |                                        |         |                                                    |       |       |       |       |       |       |       |       |
|                |                                | ap      | ae    | ap     | no coating                             | TiAlN   | 2                                                  | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 20    |
| <b>P</b>       | Alloy steel<48HRC              | 1.5xD   | 0.1xD | 0.25xD | 60-80                                  | 120-160 | 0.010                                              | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |
| <b>M</b>       | Free machining stainless steel | 1.5xD   | 0.1xD | 0.25xD | -                                      | 85-110  | 0.010                                              | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |
| <b>M</b>       | Midrange stainless steel       | 1.5xD   | 0.1xD | 0.25xD | -                                      | 60-80   | 0.008                                              | 0.015 | 0.025 | 0.030 | 0.040 | 0.050 | 0.055 | 0.060 | 0.080 |
| <b>K</b>       | Cast iron                      | 1.5xD   | 0.1xD | 0.25xD | -                                      | 110-130 | 0.010                                              | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |
| <b>N</b>       | Aluminium and Aluminium alloys | 1.5xD   | 0.1xD | 0.25xD | 250-750                                | -       | 0.015                                              | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.105 | 0.120 | 0.150 |
| <b>N</b>       | Copper and copper alloys       | 1.5xD   | 0.1xD | 0.25xD | 125-350                                | 250-600 | 0.015                                              | 0.035 | 0.050 | 0.070 | 0.085 | 0.105 | 0.120 | 0.140 | 0.170 |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|------------------------|--------|------------|
| C23F 030R00 TP | Cylindrical | 3        | 3         | 3 | 19                     | 63     | no coating |
| C23F 030R00 WP | Weldon      | 3        | 3         | 3 | 19                     | 63     | no coating |
| C23F 030R00 TC | Cylindrical | 3        | 3         | 3 | 19                     | 63     | TiAlN      |
| C23F 030R00 WC | Weldon      | 3        | 3         | 3 | 19                     | 63     | TiAlN      |
| C23F 040R00 TP | Cylindrical | 4        | 4         | 3 | 19                     | 63     | no coating |
| C23F 040R00 WP | Weldon      | 4        | 4         | 3 | 19                     | 63     | no coating |
| C23F 040R00 TC | Cylindrical | 4        | 4         | 3 | 19                     | 63     | TiAlN      |
| C23F 040R00 WC | Weldon      | 4        | 4         | 3 | 19                     | 63     | TiAlN      |
| C23F 050R00 TP | Cylindrical | 5        | 5         | 3 | 20                     | 63     | no coating |
| C23F 050R00 WP | Weldon      | 5        | 5         | 3 | 20                     | 63     | no coating |

[ continued ]

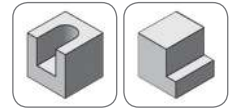
[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| C23F 050R00 TC | Cylindrical | 5           | 5            | 3 | 20                        | 63        | TiAlN      |
| C23F 050R00 WC | Weldon      | 5           | 5            | 3 | 20                        | 63        | TiAlN      |
| C23F 060R00 TP | Cylindrical | 6           | 6            | 3 | 28                        | 76        | no coating |
| C23F 060R00 WP | Weldon      | 6           | 6            | 3 | 28                        | 76        | no coating |
| C23F 060R00 TC | Cylindrical | 6           | 6            | 3 | 28                        | 76        | TiAlN      |
| C23F 060R00 WC | Weldon      | 6           | 6            | 3 | 28                        | 76        | TiAlN      |
| C23F 080R00 TP | Cylindrical | 8           | 8            | 3 | 28                        | 76        | no coating |
| C23F 080R00 WP | Weldon      | 8           | 8            | 3 | 28                        | 76        | no coating |
| C23F 080R00 TC | Cylindrical | 8           | 8            | 3 | 28                        | 76        | TiAlN      |
| C23F 080R00 WC | Weldon      | 8           | 8            | 3 | 28                        | 76        | TiAlN      |
| C23F 100R00 TP | Cylindrical | 10          | 10           | 3 | 32                        | 89        | no coating |
| C23F 100R00 WP | Weldon      | 10          | 10           | 3 | 32                        | 89        | no coating |
| C23F 100R00 TC | Cylindrical | 10          | 10           | 3 | 32                        | 89        | TiAlN      |
| C23F 100R00 WC | Weldon      | 10          | 10           | 3 | 32                        | 89        | TiAlN      |
| C23F 120R00 TP | Cylindrical | 12          | 12           | 3 | 45                        | 100       | no coating |
| C23F 120R00 WP | Weldon      | 12          | 12           | 3 | 45                        | 100       | no coating |
| C23F 120R00 TC | Cylindrical | 12          | 12           | 3 | 45                        | 100       | TiAlN      |
| C23F 120R00 WC | Weldon      | 12          | 12           | 3 | 45                        | 100       | TiAlN      |
| C23F 160R00 TP | Cylindrical | 16          | 16           | 3 | 56                        | 110       | no coating |
| C23F 160R00 WP | Weldon      | 16          | 16           | 3 | 56                        | 110       | no coating |
| C23F 160R00 TC | Cylindrical | 16          | 16           | 3 | 56                        | 110       | TiAlN      |
| C23F 160R00 WC | Weldon      | 16          | 16           | 3 | 56                        | 110       | TiAlN      |
| C23F 200R00 TP | Cylindrical | 20          | 20           | 3 | 56                        | 125       | no coating |
| C23F 200R00 WP | Weldon      | 20          | 20           | 3 | 56                        | 125       | no coating |
| C23F 200R00 TC | Cylindrical | 20          | 20           | 3 | 56                        | 125       | TiAlN      |
| C23F 200R00 WC | Weldon      | 20          | 20           | 3 | 56                        | 125       | TiAlN      |
| C23F 250R00 TP | Cylindrical | 25          | 25           | 3 | 62                        | 140       | no coating |
| C23F 250R00 WP | Weldon      | 25          | 25           | 3 | 62                        | 140       | no coating |
| C23F 250R00 TC | Cylindrical | 25          | 25           | 3 | 62                        | 140       | TiAlN      |
| C23F 250R00 WC | Weldon      | 25          | 25           | 3 | 62                        | 140       | TiAlN      |

# M14F Solid carbide 4 flute general purpose mills, normal length

## series

- Square end
- Center cutting
- Helix angle 30°
- Available without coating TiAlN coated
- Diameter tolerance e8



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

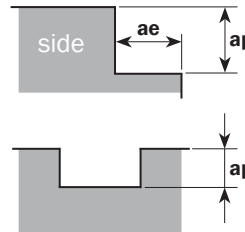
RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Manufacturing tolerance

| Ø D<br>[mm]     | Tolerance e8<br>[mm] |
|-----------------|----------------------|
| ≤ 3             | -0.014 / -0.028      |
| > from 3 to 6   | -0.020 / -0.038      |
| > from 6 to 10  | -0.025 / -0.047      |
| > from 10 to 18 | -0.032 / -0.059      |

### Recommended feeds and speeds

| Material group | Material                       | Milling |       |       | V <sub>c</sub> – Cutting speed<br>[m/min] |         | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|-------|-------|-------------------------------------------|---------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |       | slot  |                                           |         |                                                       |       |       |       |       |       |       |       |       |  |
|                |                                | ap      | ae    | ap    | no coating                                | TiAlN   | 2                                                     | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 20    |  |
| P              | Alloy steel<48HRC              | 1.5xD   | 0.1xD | 0.5xD | 60-80                                     | 120-160 | 0.010                                                 | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| M              | Free machining stainless steel | 1.5xD   | 0.1xD | 0.5xD | -                                         | 85-110  | 0.010                                                 | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| M              | Midrange stainless steel       | 1.5xD   | 0.1xD | 0.5xD | -                                         | 60-80   | 0.005                                                 | 0.015 | 0.025 | 0.035 | 0.040 | 0.050 | 0.060 | 0.075 | 0.085 |  |
| K              | Cast iron                      | 1.5xD   | 0.1xD | 0.5xD | -                                         | 110-130 | 0.010                                                 | 0.025 | 0.040 | 0.050 | 0.070 | 0.080 | 0.090 | 0.100 | 0.110 |  |

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| M14F 030R00 TP | Cylindrical | 3           | 3            | 4 | 9.5                       | 38        | no coating |
| M14F 030R00 WP | Weldon      | 3           | 3            | 4 | 9.5                       | 38        | no coating |
| M14F 030R00 TC | Cylindrical | 3           | 3            | 4 | 9.5                       | 38        | TiAlN      |
| M14F 030R00 WC | Weldon      | 3           | 3            | 4 | 9.5                       | 38        | TiAlN      |
| M14F 040R00 TP | Cylindrical | 4           | 4            | 4 | 12                        | 50        | no coating |
| M14F 040R00 WP | Weldon      | 4           | 4            | 4 | 12                        | 50        | no coating |
| M14F 040R00 TC | Cylindrical | 4           | 4            | 4 | 12                        | 50        | TiAlN      |
| M14F 040R00 WC | Weldon      | 4           | 4            | 4 | 12                        | 50        | TiAlN      |
| M14F 045R00 TP | Cylindrical | 4.5         | 6            | 4 | 14                        | 50        | no coating |
| M14F 045R00 WP | Weldon      | 4.5         | 6            | 4 | 14                        | 50        | no coating |

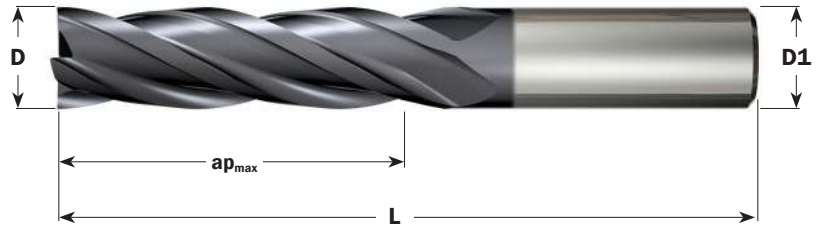
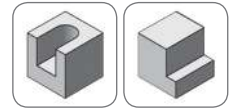
[ continued ]

[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| M14F 045R00 TC | Cylindrical | 4.5         | 6            | 4 | 14                        | 50        | TiAlN      |
| M14F 045R00 WC | Weldon      | 4.5         | 6            | 4 | 14                        | 50        | TiAlN      |
| M14F 050R00 TP | Cylindrical | 5           | 5            | 4 | 14                        | 50        | no coating |
| M14F 050R00 WP | Weldon      | 5           | 5            | 4 | 14                        | 50        | no coating |
| M14F 050R00 TC | Cylindrical | 5           | 5            | 4 | 14                        | 50        | TiAlN      |
| M14F 050R00 WC | Weldon      | 5           | 5            | 4 | 14                        | 50        | TiAlN      |
| M14F 060R00 TP | Cylindrical | 6           | 6            | 4 | 16                        | 50        | no coating |
| M14F 060R00 WP | Weldon      | 6           | 6            | 4 | 16                        | 50        | no coating |
| M14F 060R00 TC | Cylindrical | 6           | 6            | 4 | 16                        | 50        | TiAlN      |
| M14F 060R00 WC | Weldon      | 6           | 6            | 4 | 16                        | 50        | TiAlN      |
| M14F 080R00 TP | Cylindrical | 8           | 8            | 4 | 20                        | 63        | no coating |
| M14F 080R00 WP | Weldon      | 8           | 8            | 4 | 20                        | 63        | no coating |
| M14F 080R00 TC | Cylindrical | 8           | 8            | 4 | 20                        | 63        | TiAlN      |
| M14F 080R00 WC | Weldon      | 8           | 8            | 4 | 20                        | 63        | TiAlN      |
| M14F 100R00 TP | Cylindrical | 10          | 10           | 4 | 22                        | 76        | no coating |
| M14F 100R00 WP | Weldon      | 10          | 10           | 4 | 22                        | 76        | no coating |
| M14F 100R00 TC | Cylindrical | 10          | 10           | 4 | 22                        | 76        | TiAlN      |
| M14F 100R00 WC | Weldon      | 10          | 10           | 4 | 22                        | 76        | TiAlN      |
| M14F 120R00 TP | Cylindrical | 12          | 12           | 4 | 25                        | 76        | no coating |
| M14F 120R00 WP | Weldon      | 12          | 12           | 4 | 25                        | 76        | no coating |
| M14F 120R00 TC | Cylindrical | 12          | 12           | 4 | 25                        | 76        | TiAlN      |
| M14F 120R00 WC | Weldon      | 12          | 12           | 4 | 25                        | 76        | TiAlN      |
| M14F 140R00 TP | Cylindrical | 14          | 14           | 4 | 32                        | 83        | no coating |
| M14F 140R00 WP | Weldon      | 14          | 14           | 4 | 32                        | 83        | no coating |
| M14F 140R00 TC | Cylindrical | 14          | 14           | 4 | 32                        | 83        | TiAlN      |
| M14F 140R00 WC | Weldon      | 14          | 14           | 4 | 32                        | 83        | TiAlN      |
| M14F 160R00 TP | Cylindrical | 16          | 16           | 4 | 32                        | 92        | no coating |
| M14F 160R00 WP | Weldon      | 16          | 16           | 4 | 32                        | 92        | no coating |
| M14F 160R00 TC | Cylindrical | 16          | 16           | 4 | 32                        | 92        | TiAlN      |
| M14F 160R00 WC | Weldon      | 16          | 16           | 4 | 32                        | 92        | TiAlN      |
| M14F 180R00 TP | Cylindrical | 18          | 18           | 4 | 38                        | 100       | no coating |
| M14F 180R00 WP | Weldon      | 18          | 18           | 4 | 38                        | 100       | no coating |
| M14F 180R00 TC | Cylindrical | 18          | 18           | 4 | 38                        | 100       | TiAlN      |
| M14F 180R00 WC | Weldon      | 18          | 18           | 4 | 38                        | 100       | TiAlN      |
| M14F 200R00 TP | Cylindrical | 20          | 20           | 4 | 38                        | 104       | no coating |
| M14F 200R00 WP | Weldon      | 20          | 20           | 4 | 38                        | 104       | no coating |
| M14F 200R00 TC | Cylindrical | 20          | 20           | 4 | 38                        | 104       | TiAlN      |
| M14F 200R00 WC | Weldon      | 20          | 20           | 4 | 38                        | 104       | TiAlN      |

# M24F Solid carbide 4 flute general purpose mills, long series

- Square end
- Center cutting
- Helix angle 30°
- Available without coating or TiAlN coated
- Diameter tolerance e8



## Formulas

Speed of cut  $V_c = \frac{D \times \pi \times n}{1000}$

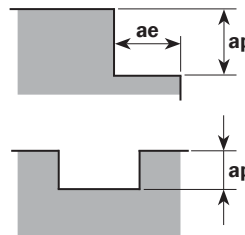
Spindle RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Infeed per tooth  $f_z = \frac{V_f}{z \times n}$

Infeed  $V_f = f_z \times z \times n$

## Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



## Tolerances

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |
| > or 18 to 30   | -0.040 / -0.073   |

## Recommended feeds and speeds

| Material group | Material                       | Milling |       |       | V <sub>c</sub> - Cutting speed [m/min] |         | f <sub>z</sub> - Feed per tooth, [mm] at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|-------|-------|----------------------------------------|---------|----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |       | slot  |                                        |         |                                                    |       |       |       |       |       |       |       |       |  |
|                |                                | ap      | ae    | ap    | no coating                             | TiAlN   | 2                                                  | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 20    |  |
| <b>P</b>       | Alloy steel<48HRC              | 1.5xD   | 0.1xD | 0.5xD | 60-80                                  | 120-160 | 0.010                                              | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| <b>M</b>       | Free machining stainless steel | 1.5xD   | 0.1xD | 0.5xD | -                                      | 85-110  | 0.010                                              | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| <b>M</b>       | Midrange stainless steel       | 1.5xD   | 0.1xD | 0.5xD | -                                      | 60-80   | 0.005                                              | 0.015 | 0.025 | 0.035 | 0.040 | 0.050 | 0.060 | 0.075 | 0.085 |  |
| <b>K</b>       | Cast iron                      | 1.5xD   | 0.1xD | 0.5xD | -                                      | 110-130 | 0.010                                              | 0.025 | 0.040 | 0.050 | 0.070 | 0.080 | 0.090 | 0.100 | 0.110 |  |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|------------------------|--------|------------|
| M24F 030R00 TP | Cylindrical | 3        | 3         | 4 | 19                     | 63     | no coating |
| M24F 030R00 WP | Weldon      | 3        | 3         | 4 | 19                     | 63     | no coating |
| M24F 030R00 TC | Cylindrical | 3        | 3         | 4 | 19                     | 63     | TiAlN      |
| M24F 030R00 WC | Weldon      | 3        | 3         | 4 | 19                     | 63     | TiAlN      |
| M24F 040R00 TP | Cylindrical | 4        | 4         | 4 | 19                     | 63     | no coating |
| M24F 040R00 WP | Weldon      | 4        | 4         | 4 | 19                     | 63     | no coating |
| M24F 040R00 TC | Cylindrical | 4        | 4         | 4 | 19                     | 63     | TiAlN      |
| M24F 040R00 WC | Weldon      | 4        | 4         | 4 | 19                     | 63     | TiAlN      |
| M24F 050R00 TP | Cylindrical | 5        | 5         | 4 | 20                     | 63     | no coating |
| M24F 050R00 WP | Weldon      | 5        | 5         | 4 | 20                     | 63     | no coating |

[ continued ]

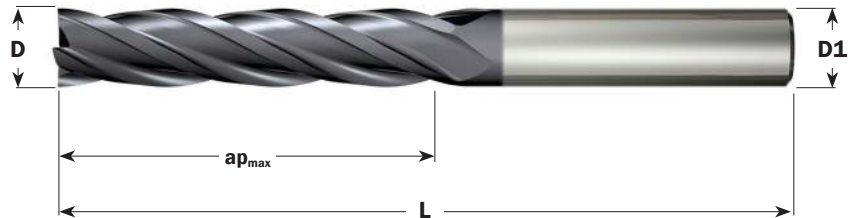


[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| M24F 050R00 TC | Cylindrical | 5           | 5            | 4 | 20                        | 63        | TiAlN      |
| M24F 050R00 WC | Weldon      | 5           | 5            | 4 | 20                        | 63        | TiAlN      |
| M24F 060R00 TP | Cylindrical | 6           | 6            | 4 | 28                        | 76        | no coating |
| M24F 060R00 WP | Weldon      | 6           | 6            | 4 | 28                        | 76        | no coating |
| M24F 060R00 TC | Cylindrical | 6           | 6            | 4 | 28                        | 76        | TiAlN      |
| M24F 060R00 WC | Weldon      | 6           | 6            | 4 | 28                        | 76        | TiAlN      |
| M24F 080R00 TP | Cylindrical | 8           | 8            | 4 | 28                        | 76        | no coating |
| M24F 080R00 WP | Weldon      | 8           | 8            | 4 | 28                        | 76        | no coating |
| M24F 080R00 TC | Cylindrical | 8           | 8            | 4 | 28                        | 76        | TiAlN      |
| M24F 080R00 WC | Weldon      | 8           | 8            | 4 | 28                        | 76        | TiAlN      |
| M24F 100R00 TP | Cylindrical | 10          | 10           | 4 | 32                        | 89        | no coating |
| M24F 100R00 WP | Weldon      | 10          | 10           | 4 | 32                        | 89        | no coating |
| M24F 100R00 TC | Cylindrical | 10          | 10           | 4 | 32                        | 89        | TiAlN      |
| M24F 100R00 WC | Weldon      | 10          | 10           | 4 | 32                        | 89        | TiAlN      |
| M24F 120R00 TP | Cylindrical | 12          | 12           | 4 | 45                        | 100       | no coating |
| M24F 120R00 WP | Weldon      | 12          | 12           | 4 | 45                        | 100       | no coating |
| M24F 120R00 TC | Cylindrical | 12          | 12           | 4 | 45                        | 100       | TiAlN      |
| M24F 120R00 WC | Weldon      | 12          | 12           | 4 | 45                        | 100       | TiAlN      |
| M24F 140R00 TP | Cylindrical | 14          | 14           | 4 | 50                        | 100       | no coating |
| M24F 140R00 WP | Weldon      | 14          | 14           | 4 | 50                        | 100       | no coating |
| M24F 140R00 TC | Cylindrical | 14          | 14           | 4 | 50                        | 100       | TiAlN      |
| M24F 140R00 WC | Weldon      | 14          | 14           | 4 | 50                        | 100       | TiAlN      |
| M24F 160R00 TP | Cylindrical | 16          | 16           | 4 | 56                        | 110       | no coating |
| M24F 160R00 WP | Weldon      | 16          | 16           | 4 | 56                        | 110       | no coating |
| M24F 160R00 TC | Cylindrical | 16          | 16           | 4 | 56                        | 110       | TiAlN      |
| M24F 160R00 WC | Weldon      | 16          | 16           | 4 | 56                        | 110       | TiAlN      |
| M24F 180R00 TP | Cylindrical | 18          | 18           | 4 | 60                        | 125       | no coating |
| M24F 180R00 WP | Weldon      | 18          | 18           | 4 | 60                        | 125       | no coating |
| M24F 180R00 TC | Cylindrical | 18          | 18           | 4 | 60                        | 125       | TiAlN      |
| M24F 180R00 WC | Weldon      | 18          | 18           | 4 | 60                        | 125       | TiAlN      |
| M24F 200R00 TP | Cylindrical | 20          | 20           | 4 | 56                        | 125       | no coating |
| M24F 200R00 WP | Weldon      | 20          | 20           | 4 | 56                        | 125       | no coating |
| M24F 200R00 TC | Cylindrical | 20          | 20           | 4 | 56                        | 125       | TiAlN      |
| M24F 200R00 WC | Weldon      | 20          | 20           | 4 | 56                        | 125       | TiAlN      |
| M24F 250R00 TP | Cylindrical | 25          | 25           | 4 | 62                        | 140       | no coating |
| M24F 250R00 WP | Weldon      | 25          | 25           | 4 | 62                        | 140       | no coating |
| M24F 250R00 TC | Cylindrical | 25          | 25           | 4 | 62                        | 140       | TiAlN      |
| M24F 250R00 WC | Weldon      | 25          | 25           | 4 | 62                        | 140       | TiAlN      |

# M34F Solid carbide 4 flute general purpose mills, extra long

- Square end
- Center cutting
- Helix angle 30°
- Available without coating or TiAlN coated
- Diameter tolerance e8



## Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

## Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



## Manufacturing tolerance

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |

## Recommended feeds and speeds

| Material group | Material                       | Milling |        | V <sub>c</sub> – Cutting speed<br>[m/min] |         | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|--------|-------------------------------------------|---------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |        |                                           |         | 2                                                     | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 20    |  |
|                |                                | ap      | ae     | no coating                                | TiAlN   |                                                       |       |       |       |       |       |       |       |       |  |
| P              | Alloy steel<48HRC              | 3xD     | 0.1xD  | 60-80                                     | 120-160 | 0.010                                                 | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| M              | Free machining stainless steel | 3xD     | 0.05xD | -                                         | 85-110  | 0.010                                                 | 0.020 | 0.030 | 0.040 | 0.050 | 0.060 | 0.070 | 0.080 | 0.100 |  |
| M              | Midrange stainless steel       | 3xD     | 0.05xD | -                                         | 60-80   | 0.005                                                 | 0.015 | 0.025 | 0.035 | 0.040 | 0.050 | 0.060 | 0.075 | 0.085 |  |
| K              | Cast iron                      | 3xD     | 0.1xD  | -                                         | 110-130 | 0.010                                                 | 0.025 | 0.040 | 0.050 | 0.070 | 0.080 | 0.090 | 0.100 | 0.110 |  |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|------------------------|--------|------------|
| M34F 030R00 TP | Cylindrical | 3        | 3         | 4 | 25                     | 75     | no coating |
| M34F 030R00 WP | Weldon      | 3        | 3         | 4 | 25                     | 75     | no coating |
| M34F 030R00 TC | Cylindrical | 3        | 3         | 4 | 25                     | 75     | TiAlN      |
| M34F 030R00 WC | Weldon      | 3        | 3         | 4 | 25                     | 75     | TiAlN      |
| M34F 040R00 TP | Cylindrical | 4        | 4         | 4 | 31                     | 75     | no coating |
| M34F 040R00 WP | Weldon      | 4        | 4         | 4 | 31                     | 75     | no coating |
| M34F 040R00 TC | Cylindrical | 4        | 4         | 4 | 31                     | 75     | TiAlN      |
| M34F 040R00 WC | Weldon      | 4        | 4         | 4 | 31                     | 75     | TiAlN      |
| M34F 050R00 TP | Cylindrical | 5        | 5         | 4 | 31                     | 100    | no coating |
| M34F 050R00 WP | Weldon      | 5        | 5         | 4 | 31                     | 100    | no coating |

[ continued ]

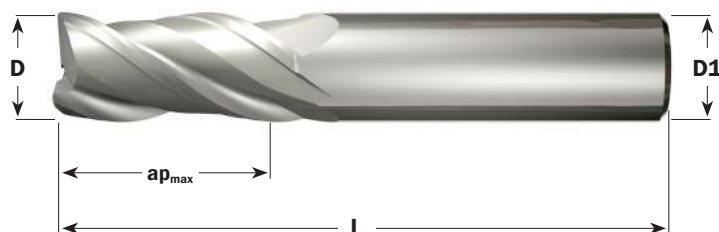
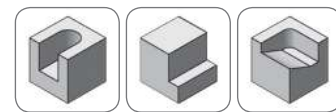
[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| M34F 050R00 TC | Cylindrical | 5           | 5            | 4 | 31                        | 100       | TiAlN      |
| M34F 050R00 WC | Weldon      | 5           | 5            | 4 | 31                        | 100       | TiAlN      |
| M34F 060R00 TP | Cylindrical | 6           | 6            | 4 | 38                        | 100       | no coating |
| M34F 060R00 WP | Weldon      | 6           | 6            | 4 | 38                        | 100       | no coating |
| M34F 060R00 TC | Cylindrical | 6           | 6            | 4 | 38                        | 100       | TiAlN      |
| M34F 060R00 WC | Weldon      | 6           | 6            | 4 | 38                        | 100       | TiAlN      |
| M34F 080R00 TP | Cylindrical | 8           | 8            | 4 | 41                        | 100       | no coating |
| M34F 080R00 WP | Weldon      | 8           | 8            | 4 | 41                        | 100       | no coating |
| M34F 080R00 TC | Cylindrical | 8           | 8            | 4 | 41                        | 100       | TiAlN      |
| M34F 080R00 WC | Weldon      | 8           | 8            | 4 | 41                        | 100       | TiAlN      |
| M34F 100R00 TP | Cylindrical | 10          | 10           | 4 | 45                        | 100       | no coating |
| M34F 100R00 WP | Weldon      | 10          | 10           | 4 | 45                        | 100       | no coating |
| M34F 100R00 TC | Cylindrical | 10          | 10           | 4 | 45                        | 100       | TiAlN      |
| M34F 100R00 WC | Weldon      | 10          | 10           | 4 | 45                        | 100       | TiAlN      |
| M34F 120R00 TP | Cylindrical | 12          | 12           | 4 | 75                        | 150       | no coating |
| M34F 120R00 WP | Weldon      | 12          | 12           | 4 | 75                        | 150       | no coating |
| M34F 120R00 TC | Cylindrical | 12          | 12           | 4 | 75                        | 150       | TiAlN      |
| M34F 120R00 WC | Weldon      | 12          | 12           | 4 | 75                        | 150       | TiAlN      |
| M34F 140R00 TP | Cylindrical | 14          | 14           | 4 | 75                        | 150       | no coating |
| M34F 140R00 WP | Weldon      | 14          | 14           | 4 | 75                        | 150       | no coating |
| M34F 140R00 TC | Cylindrical | 14          | 14           | 4 | 75                        | 150       | TiAlN      |
| M34F 140R00 WC | Weldon      | 14          | 14           | 4 | 75                        | 150       | TiAlN      |
| M34F 160R00 TP | Cylindrical | 16          | 16           | 4 | 75                        | 150       | no coating |
| M34F 160R00 WP | Weldon      | 16          | 16           | 4 | 75                        | 150       | no coating |
| M34F 160R00 TC | Cylindrical | 16          | 16           | 4 | 75                        | 150       | TiAlN      |
| M34F 160R00 WC | Weldon      | 16          | 16           | 4 | 75                        | 150       | TiAlN      |
| M34F 180R00 TP | Cylindrical | 18          | 18           | 4 | 75                        | 150       | no coating |
| M34F 180R00 WP | Weldon      | 18          | 18           | 4 | 75                        | 150       | no coating |
| M34F 180R00 TC | Cylindrical | 18          | 18           | 4 | 75                        | 150       | TiAlN      |
| M34F 180R00 WC | Weldon      | 18          | 18           | 4 | 75                        | 150       | TiAlN      |
| M34F 200R00 TP | Cylindrical | 20          | 20           | 4 | 75                        | 150       | no coating |
| M34F 200R00 WP | Weldon      | 20          | 20           | 4 | 75                        | 150       | no coating |
| M34F 200R00 TC | Cylindrical | 20          | 20           | 4 | 75                        | 150       | TiAlN      |
| M34F 200R00 WC | Weldon      | 20          | 20           | 4 | 75                        | 150       | TiAlN      |

# A13F High performance solid carbide 3 flute mills for Aluminium and Aluminium alloys, normal length

## series

- Square end
- Unequal indexing
- Center cutting
- Helix angle 38°
- No coating guarantees sharp cutting edge
- Diameter tolerance e8



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

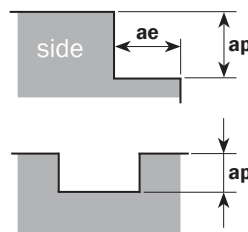
RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Manufacturing tolerance

| Ø D [mm]        | Tolerance [mm] +/- | h6, |
|-----------------|--------------------|-----|
| ≤ 3             | 0 / 0.006          |     |
| > from 3 to 6   | 0 / 0.008          |     |
| > from 6 to 10  | 0 / 0.009          |     |
| > from 10 to 18 | 0 / 0.011          |     |

### Recommended feeds and speeds

| Material group | Material                        | Milling |       |      | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |
|----------------|---------------------------------|---------|-------|------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
|                |                                 | side    |       | slot |                                           |                                                       |       |       |       |       |       |       |       |
|                |                                 | ap      | ae    | ap   |                                           | no coating                                            | 3     | 4     | 6     | 8     | 10    | 12    | 16    |
| N              | Free machining aluminium alloys | 1.5xD   | 0.5xD | 1xD  | 500-1500                                  | 0.025                                                 | 0.035 | 0.050 | 0.065 | 0.085 | 0.100 | 0.135 | 0.160 |
| N              | Aluminium alloys Si<12%         | 1.5xD   | 0.5xD | 1xD  | 500-1300                                  | 0.020                                                 | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.125 | 0.150 |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|------------------------|--------|------------|
| A13F 030R00 TP | Cylindrical | 3        | 3         | 3 | 12                     | 38     | no coating |
| A13F 030R00 WP | Weldon      | 3        | 3         | 3 | 12                     | 38     | no coating |
| A13F 040R00 TP | Cylindrical | 4        | 4         | 3 | 12                     | 50     | no coating |
| A13F 040R00 WP | Weldon      | 4        | 4         | 3 | 12                     | 50     | no coating |
| A13F 050R00 TP | Cylindrical | 5        | 5         | 3 | 14                     | 50     | no coating |
| A13F 050R00 WP | Weldon      | 5        | 5         | 3 | 14                     | 50     | no coating |
| A13F 060R00 TP | Cylindrical | 6        | 6         | 3 | 16                     | 50     | no coating |
| A13F 060R00 WP | Weldon      | 6        | 6         | 3 | 16                     | 50     | no coating |
| A13F 080R00 TP | Cylindrical | 8        | 8         | 3 | 20                     | 63     | no coating |
| A13F 080R00 WP | Weldon      | 8        | 8         | 3 | 20                     | 63     | no coating |

[ continued ]

[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| A13F 100R00 TP | Cylindrical | 10          | 10           | 3 | 22                        | 76        | no coating |
| A13F 100R00 WP | Weldon      | 10          | 10           | 3 | 22                        | 76        | no coating |
| A13F 120R00 TP | Cylindrical | 12          | 12           | 3 | 25                        | 76        | no coating |
| A13F 120R00 WP | Weldon      | 12          | 12           | 3 | 25                        | 76        | no coating |
| A13F 160R00 TP | Cylindrical | 16          | 16           | 3 | 32                        | 92        | no coating |
| A13F 160R00 WP | Weldon      | 16          | 16           | 3 | 32                        | 92        | no coating |
| A13F 200R00 TP | Cylindrical | 20          | 20           | 3 | 38                        | 104       | no coating |
| A13F 200R00 WP | Weldon      | 20          | 20           | 3 | 38                        | 104       | no coating |

# O12B Solid carbide 2 flute general purpose ball nose end mills, normal length

## series

- Ball nose
- Center cutting
- Helix angle 30°
- Supplied without coating or TiAlN coated
- Diameter tolerance e8



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

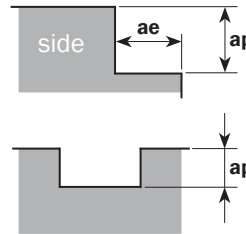
RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Manufacturing tolerance

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |

### Recommended feeds and speeds

| Material group | Material                       | Milling |        |        | V <sub>c</sub> – Cutting speed<br>[m/min] |         | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |       |
|----------------|--------------------------------|---------|--------|--------|-------------------------------------------|---------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |                                | side    |        | slot   |                                           |         | 1                                                     | 2     | 3     | 4     | 6     | 8     | 10    | 12    | 16    | 20    |
|                |                                | ap      | ae     | ap     | no coating                                | TiAlN   |                                                       |       |       |       |       |       |       |       |       |       |
| P              | Alloy steel<48HRC              | 1.25xD  | 0.25xD | 0.5xD  | 60-80                                     | 120-160 | 0.005                                                 | 0.010 | 0.015 | 0.020 | 0.030 | 0.040 | 0.050 | 0.055 | 0.070 | 0.080 |
| M              | Free machining stainless steel | 1.25xD  | 0.25xD | 0.5xD  | -                                         | 85-110  | 0.006                                                 | 0.010 | 0.015 | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.085 | 0.100 |
| M              | Midrange stainless steel       | 1.25xD  | 0.25xD | 0.5xD  | -                                         | 60-80   | 0.005                                                 | 0.008 | 0.013 | 0.018 | 0.027 | 0.040 | 0.047 | 0.055 | 0.070 | 0.080 |
| K              | Cast iron                      | 1.25xD  | 0.25xD | 0.5xD  | -                                         | 110-130 | 0.006                                                 | 0.010 | 0.015 | 0.023 | 0.036 | 0.050 | 0.061 | 0.070 | 0.085 | 0.100 |
| N              | Aluminium and Aluminium alloys | 1.25xD  | 0.15xD | 0.25xD | 500-1500                                  | -       | 0.008                                                 | 0.015 | 0.023 | 0.030 | 0.045 | 0.060 | 0.080 | 0.090 | 0.120 | 0.155 |
| N              | Copper and copper alloys       | 1.25xD  | 0.15xD | 0.25xD | 125-375                                   | 250-750 | 0.009                                                 | 0.018 | 0.025 | 0.035 | 0.050 | 0.070 | 0.090 | 0.100 | 0.140 | 0.175 |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|------------------------|--------|------------|
| O12B 010R00 TP | Cylindrical | 1        | 3         | 2 | 4                      | 38     | no coating |
| O12B 010R00 WP | Weldon      | 1        | 3         | 2 | 4                      | 38     | no coating |
| O12B 010R00 TC | Cylindrical | 1        | 3         | 2 | 4                      | 38     | TiAlN      |
| O12B 010R00 WC | Weldon      | 1        | 3         | 2 | 4                      | 38     | TiAlN      |
| O12B 030R00 TP | Cylindrical | 3        | 3         | 2 | 9.5                    | 38     | no coating |
| O12B 030R00 WP | Weldon      | 3        | 3         | 2 | 9.5                    | 38     | no coating |
| O12B 030R00 TC | Cylindrical | 3        | 3         | 2 | 9.5                    | 38     | TiAlN      |
| O12B 030R00 WC | Weldon      | 3        | 3         | 2 | 9.5                    | 38     | TiAlN      |
| O12B 040R00 TP | Cylindrical | 4        | 4         | 2 | 12                     | 50     | no coating |
| O12B 040R00 WP | Weldon      | 4        | 4         | 2 | 12                     | 50     | no coating |

[ continued ]

[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| O12B 040R00 TC | Cylindrical | 4           | 4            | 2 | 12                        | 50        | TiAlN      |
| O12B 040R00 WC | Weldon      | 4           | 4            | 2 | 12                        | 50        | TiAlN      |
| O12B 050R00 TP | Cylindrical | 5           | 5            | 2 | 14                        | 50        | no coating |
| O12B 050R00 WP | Weldon      | 5           | 5            | 2 | 14                        | 50        | no coating |
| O12B 050R00 TC | Cylindrical | 5           | 5            | 2 | 14                        | 50        | TiAlN      |
| O12B 050R00 WC | Weldon      | 5           | 5            | 2 | 14                        | 50        | TiAlN      |
| O12B 060R00 TP | Cylindrical | 6           | 6            | 2 | 16                        | 50        | no coating |
| O12B 060R00 WP | Weldon      | 6           | 6            | 2 | 16                        | 50        | no coating |
| O12B 060R00 TC | Cylindrical | 6           | 6            | 2 | 16                        | 50        | TiAlN      |
| O12B 060R00 WC | Weldon      | 6           | 6            | 2 | 16                        | 50        | TiAlN      |
| O12B 080R00 TP | Cylindrical | 8           | 8            | 2 | 20                        | 63        | no coating |
| O12B 080R00 WP | Weldon      | 8           | 8            | 2 | 20                        | 63        | no coating |
| O12B 080R00 TC | Cylindrical | 8           | 8            | 2 | 20                        | 63        | TiAlN      |
| O12B 080R00 WC | Weldon      | 8           | 8            | 2 | 20                        | 63        | TiAlN      |
| O12B 100R00 TP | Cylindrical | 10          | 10           | 2 | 22                        | 76        | no coating |
| O12B 100R00 WP | Weldon      | 10          | 10           | 2 | 22                        | 76        | no coating |
| O12B 100R00 TC | Cylindrical | 10          | 10           | 2 | 22                        | 76        | TiAlN      |
| O12B 100R00 WC | Weldon      | 10          | 10           | 2 | 22                        | 76        | TiAlN      |
| O12B 120R00 TP | Cylindrical | 12          | 12           | 2 | 25                        | 76        | no coating |
| O12B 120R00 WP | Weldon      | 12          | 12           | 2 | 25                        | 76        | no coating |
| O12B 120R00 TC | Cylindrical | 12          | 12           | 2 | 25                        | 76        | TiAlN      |
| O12B 120R00 WC | Weldon      | 12          | 12           | 2 | 25                        | 76        | TiAlN      |
| O12B 140R00 TP | Cylindrical | 14          | 14           | 2 | 32                        | 83        | no coating |
| O12B 140R00 WP | Weldon      | 14          | 14           | 2 | 32                        | 83        | no coating |
| O12B 140R00 TC | Cylindrical | 14          | 14           | 2 | 32                        | 83        | TiAlN      |
| O12B 140R00 WC | Weldon      | 14          | 14           | 2 | 32                        | 83        | TiAlN      |
| O12B 160R00 TP | Cylindrical | 16          | 16           | 2 | 32                        | 92        | no coating |
| O12B 160R00 WP | Weldon      | 16          | 16           | 2 | 32                        | 92        | no coating |
| O12B 160R00 TC | Cylindrical | 16          | 16           | 2 | 32                        | 92        | TiAlN      |
| O12B 160R00 WC | Weldon      | 16          | 16           | 2 | 32                        | 92        | TiAlN      |
| O12B 180R00 TP | Cylindrical | 18          | 18           | 2 | 38                        | 100       | no coating |
| O12B 180R00 WP | Weldon      | 18          | 18           | 2 | 38                        | 100       | no coating |
| O12B 180R00 TC | Cylindrical | 18          | 18           | 2 | 38                        | 100       | TiAlN      |
| O12B 180R00 WC | Weldon      | 18          | 18           | 2 | 38                        | 100       | TiAlN      |
| O12B 200R00 TP | Cylindrical | 20          | 20           | 2 | 38                        | 104       | no coating |
| O12B 200R00 WP | Weldon      | 20          | 20           | 2 | 38                        | 104       | no coating |
| O12B 200R00 TC | Cylindrical | 20          | 20           | 2 | 38                        | 104       | TiAlN      |
| O12B 200R00 WC | Weldon      | 20          | 20           | 2 | 38                        | 104       | TiAlN      |

# 022B Solid carbide 2 flute general purpose ball nose end mills, long

## series

- Ball nose
- Center cutting
- Helix angle 30°
- Available without coating TiAlN coated
- Diameter tolerance e8



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

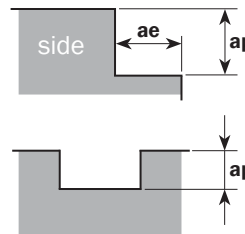
RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Manufacturing tolerance

| Ø D<br>[mm]     | Tolerance e8<br>[mm] |
|-----------------|----------------------|
| ≤ 3             | -0.014 / -0.028      |
| > from 3 to 6   | -0.020 / -0.038      |
| > from 6 to 10  | -0.025 / -0.047      |
| > from 10 to 18 | -0.032 / -0.059      |

### Recommended feeds and speeds

| Material group | Material                       | Milling |        |        | V <sub>c</sub> – Cutting speed<br>[m/min] |         | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |       |  |
|----------------|--------------------------------|---------|--------|--------|-------------------------------------------|---------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                                | side    |        | slot   |                                           |         |                                                       |       |       |       |       |       |       |       |       |       |  |
|                |                                | ap      | ae     | ap     | no coating                                | TiAlN   | 1                                                     | 2     | 3     | 4     | 6     | 8     | 10    | 12    | 16    | 20    |  |
| P              | Alloy steel<48HRC              | 2xD     | 0.15xD | 0.25xD | 60-80                                     | 120-160 | 0.005                                                 | 0.010 | 0.015 | 0.020 | 0.030 | 0.040 | 0.050 | 0.055 | 0.070 | 0.080 |  |
| M              | Free machining stainless steel | 2xD     | 0.15xD | 0.25xD | -                                         | 85-110  | 0.006                                                 | 0.010 | 0.015 | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.085 | 0.100 |  |
| M              | Midrange stainless steel       | 2xD     | 0.15xD | 0.25xD | -                                         | 60-80   | 0.005                                                 | 0.008 | 0.013 | 0.018 | 0.027 | 0.040 | 0.047 | 0.055 | 0.070 | 0.080 |  |
| K              | Cast iron                      | 2xD     | 0.15xD | 0.25xD | -                                         | 110-130 | 0.006                                                 | 0.010 | 0.015 | 0.023 | 0.036 | 0.050 | 0.061 | 0.070 | 0.085 | 0.100 |  |
| N              | Aluminium and Aluminium alloys | 2xD     | 0.15xD | 0.25xD | 500-1500                                  | -       | 0.008                                                 | 0.015 | 0.023 | 0.030 | 0.045 | 0.060 | 0.080 | 0.090 | 0.120 | 0.155 |  |
| N              | Copper and copper alloys       | 2xD     | 0.15xD | 0.25xD | 125-375                                   | 250-750 | 0.009                                                 | 0.018 | 0.025 | 0.035 | 0.050 | 0.070 | 0.090 | 0.100 | 0.140 | 0.175 |  |

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| O22B 040R00 TP | Cylindrical | 4           | 4            | 2 | 19                        | 63        | no coating |
| O22B 040R00 WP | Weldon      | 4           | 4            | 2 | 19                        | 63        | no coating |
| O22B 040R00 TC | Cylindrical | 4           | 4            | 2 | 19                        | 63        | TiAlN      |
| O22B 040R00 WC | Weldon      | 4           | 4            | 2 | 19                        | 63        | TiAlN      |
| O22B 050R00 TP | Cylindrical | 5           | 5            | 2 | 20                        | 63        | no coating |
| O22B 050R00 WP | Weldon      | 5           | 5            | 2 | 20                        | 63        | no coating |
| O22B 050R00 TC | Cylindrical | 5           | 5            | 2 | 20                        | 63        | TiAlN      |
| O22B 050R00 WC | Weldon      | 5           | 5            | 2 | 20                        | 63        | TiAlN      |
| O22B 060R00 TP | Cylindrical | 6           | 6            | 2 | 28                        | 76        | no coating |
| O22B 060R00 WP | Weldon      | 6           | 6            | 2 | 28                        | 76        | no coating |

[ continued ]



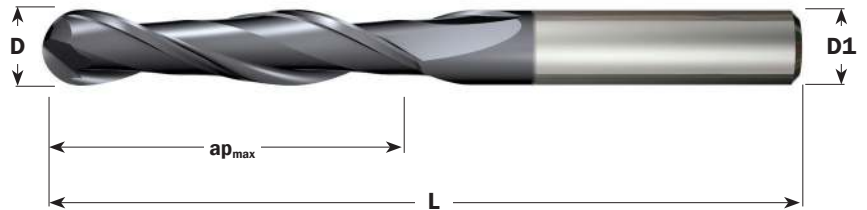
[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| O22B 060R00 TC | Cylindrical | 6           | 6            | 2 | 28                        | 76        | TiAlN      |
| O22B 060R00 WC | Weldon      | 6           | 6            | 2 | 28                        | 76        | TiAlN      |
| O22B 080R00 TP | Cylindrical | 8           | 8            | 2 | 28                        | 76        | no coating |
| O22B 080R00 WP | Weldon      | 8           | 8            | 2 | 28                        | 76        | no coating |
| O22B 080R00 TC | Cylindrical | 8           | 8            | 2 | 28                        | 76        | TiAlN      |
| O22B 080R00 WC | Weldon      | 8           | 8            | 2 | 28                        | 76        | TiAlN      |
| O22B 100R00 TP | Cylindrical | 10          | 10           | 2 | 32                        | 89        | no coating |
| O22B 100R00 WP | Weldon      | 10          | 10           | 2 | 32                        | 89        | no coating |
| O22B 100R00 TC | Cylindrical | 10          | 10           | 2 | 32                        | 89        | TiAlN      |
| O22B 100R00 WC | Weldon      | 10          | 10           | 2 | 32                        | 89        | TiAlN      |
| O22B 120R00 TP | Cylindrical | 12          | 12           | 2 | 45                        | 100       | no coating |
| O22B 120R00 WP | Weldon      | 12          | 12           | 2 | 45                        | 100       | no coating |
| O22B 120R00 TC | Cylindrical | 12          | 12           | 2 | 45                        | 100       | TiAlN      |
| O22B 120R00 WC | Weldon      | 12          | 12           | 2 | 45                        | 100       | TiAlN      |
| O22B 140R00 TP | Cylindrical | 14          | 14           | 2 | 50                        | 100       | no coating |
| O22B 140R00 WP | Weldon      | 14          | 14           | 2 | 50                        | 100       | no coating |
| O22B 140R00 TC | Cylindrical | 14          | 14           | 2 | 50                        | 100       | TiAlN      |
| O22B 140R00 WC | Weldon      | 14          | 14           | 2 | 50                        | 100       | TiAlN      |
| O22B 160R00 TP | Cylindrical | 16          | 16           | 2 | 56                        | 110       | no coating |
| O22B 160R00 WP | Weldon      | 16          | 16           | 2 | 56                        | 110       | no coating |
| O22B 160R00 TC | Cylindrical | 16          | 16           | 2 | 56                        | 110       | TiAlN      |
| O22B 160R00 WC | Weldon      | 16          | 16           | 2 | 56                        | 110       | TiAlN      |
| O22B 200R00 TP | Cylindrical | 20          | 20           | 2 | 56                        | 125       | no coating |
| O22B 200R00 WP | Weldon      | 20          | 20           | 2 | 56                        | 125       | no coating |
| O22B 200R00 TC | Cylindrical | 20          | 20           | 2 | 56                        | 125       | TiAlN      |
| O22B 200R00 WC | Weldon      | 20          | 20           | 2 | 56                        | 125       | TiAlN      |

# 032B Solid carbide 2 flute general purpose ball nose end mills, extra long

## series

- Ball nose
- Center cutting
- Helix angle 30°
- Available without coating TiAlN coated
- Diameter tolerance e8



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

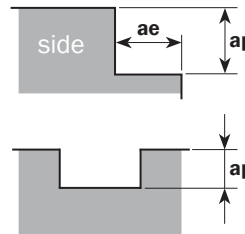
RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Manufacturing tolerance

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |

### Recommended feeds and speeds

| Material group | Material                       | Milling |        | V <sub>c</sub> - Cutting speed [m/min] |            | f <sub>z</sub> - Feed per tooth, [mm] at 1 D, [mm] |       |       |       |       |       |       |       |       |       |       |
|----------------|--------------------------------|---------|--------|----------------------------------------|------------|----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |                                | side    | slot   |                                        |            |                                                    |       |       |       |       |       |       |       |       |       |       |
|                |                                | ap      | ae     | ap                                     | no coating | TiAlN                                              | 1     | 2     | 3     | 4     | 6     | 8     | 10    | 12    | 16    | 20    |
| <b>P</b>       | Alloy steel<48HRC              | 3xD     | 0.05xD | 0.2xD                                  | 60-80      | 120-160                                            | 0.005 | 0.010 | 0.015 | 0.020 | 0.030 | 0.040 | 0.050 | 0.055 | 0.070 | 0.080 |
| <b>M</b>       | Free machining stainless steel | 3xD     | 0.05xD | 0.2xD                                  | -          | 85-110                                             | 0.006 | 0.010 | 0.015 | 0.020 | 0.035 | 0.050 | 0.060 | 0.070 | 0.085 | 0.100 |
| <b>M</b>       | Midrange stainless steel       | 3xD     | 0.05xD | 0.2xD                                  | -          | 60-80                                              | 0.005 | 0.008 | 0.013 | 0.018 | 0.027 | 0.040 | 0.047 | 0.055 | 0.070 | 0.080 |
| <b>K</b>       | Cast iron                      | 3xD     | 0.05xD | 0.2xD                                  | -          | 110-130                                            | 0.006 | 0.010 | 0.015 | 0.023 | 0.036 | 0.050 | 0.061 | 0.070 | 0.085 | 0.100 |
| <b>N</b>       | Aluminium and Aluminium alloys | 3xD     | 0.05xD | 0.2xD                                  | 500-1500   | -                                                  | 0.008 | 0.015 | 0.023 | 0.030 | 0.045 | 0.060 | 0.080 | 0.090 | 0.120 | 0.155 |
| <b>N</b>       | Copper and copper alloys       | 3xD     | 0.05xD | 0.2xD                                  | 125-375    | 250-750                                            | 0.009 | 0.018 | 0.025 | 0.035 | 0.050 | 0.070 | 0.090 | 0.100 | 0.140 | 0.175 |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating    |
|----------------|-------------|----------|-----------|---|------------------------|--------|------------|
| O32B 030R00 TP | Cylindrical | 3        | 3         | 2 | 25                     | 75     | no coating |
| O32B 030R00 WP | Weldon      | 3        | 3         | 2 | 25                     | 75     | no coating |
| O32B 030R00 TC | Cylindrical | 3        | 3         | 2 | 25                     | 75     | TiAlN      |
| O32B 030R00 WC | Weldon      | 3        | 3         | 2 | 25                     | 75     | TiAlN      |
| O32B 040R00 TP | Cylindrical | 4        | 4         | 2 | 31                     | 75     | no coating |
| O32B 040R00 WP | Weldon      | 4        | 4         | 2 | 31                     | 75     | no coating |
| O32B 040R00 TC | Cylindrical | 4        | 4         | 2 | 31                     | 75     | TiAlN      |
| O32B 040R00 WC | Weldon      | 4        | 4         | 2 | 31                     | 75     | TiAlN      |
| O32B 050R00 TP | Cylindrical | 5        | 5         | 2 | 31                     | 100    | no coating |
| O32B 050R00 WP | Weldon      | 5        | 5         | 2 | 31                     | 100    | no coating |

[ continued ]

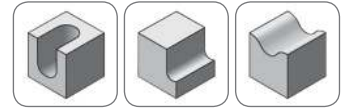
[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|
| O32B 050R00 TC | Cylindrical | 5           | 5            | 2 | 31                        | 100       | TiAlN      |
| O32B 050R00 WC | Weldon      | 5           | 5            | 2 | 31                        | 100       | TiAlN      |
| O32B 060R00 TP | Cylindrical | 6           | 6            | 2 | 38                        | 100       | no coating |
| O32B 060R00 WP | Weldon      | 6           | 6            | 2 | 38                        | 100       | no coating |
| O32B 060R00 TC | Cylindrical | 6           | 6            | 2 | 38                        | 100       | TiAlN      |
| O32B 060R00 WC | Weldon      | 6           | 6            | 2 | 38                        | 100       | TiAlN      |
| O32B 080R00 TP | Cylindrical | 8           | 8            | 2 | 41                        | 100       | no coating |
| O32B 080R00 WP | Weldon      | 8           | 8            | 2 | 41                        | 100       | no coating |
| O32B 080R00 TC | Cylindrical | 8           | 8            | 2 | 41                        | 100       | TiAlN      |
| O32B 080R00 WC | Weldon      | 8           | 8            | 2 | 41                        | 100       | TiAlN      |
| O32B 100R00 TP | Cylindrical | 10          | 10           | 2 | 45                        | 100       | no coating |
| O32B 100R00 WP | Weldon      | 10          | 10           | 2 | 45                        | 100       | no coating |
| O32B 100R00 TC | Cylindrical | 10          | 10           | 2 | 45                        | 100       | TiAlN      |
| O32B 100R00 WC | Weldon      | 10          | 10           | 2 | 45                        | 100       | TiAlN      |
| O32B 120R00 TP | Cylindrical | 12          | 12           | 2 | 75                        | 150       | no coating |
| O32B 120R00 WP | Weldon      | 12          | 12           | 2 | 75                        | 150       | no coating |
| O32B 120R00 TC | Cylindrical | 12          | 12           | 2 | 75                        | 150       | TiAlN      |
| O32B 120R00 WC | Weldon      | 12          | 12           | 2 | 75                        | 150       | TiAlN      |
| O32B 140R00 TP | Cylindrical | 14          | 14           | 2 | 75                        | 150       | no coating |
| O32B 140R00 WP | Weldon      | 14          | 14           | 2 | 75                        | 150       | no coating |
| O32B 140R00 TC | Cylindrical | 14          | 14           | 2 | 75                        | 150       | TiAlN      |
| O32B 140R00 WC | Weldon      | 14          | 14           | 2 | 75                        | 150       | TiAlN      |
| O32B 160R00 TP | Cylindrical | 16          | 16           | 2 | 75                        | 150       | no coating |
| O32B 160R00 WP | Weldon      | 16          | 16           | 2 | 75                        | 150       | no coating |
| O32B 160R00 TC | Cylindrical | 16          | 16           | 2 | 75                        | 150       | TiAlN      |
| O32B 160R00 WC | Weldon      | 16          | 16           | 2 | 75                        | 150       | TiAlN      |
| O32B 180R00 TP | Cylindrical | 18          | 18           | 2 | 75                        | 150       | no coating |
| O32B 180R00 WP | Weldon      | 18          | 18           | 2 | 75                        | 150       | no coating |
| O32B 180R00 TC | Cylindrical | 18          | 18           | 2 | 75                        | 150       | TiAlN      |
| O32B 180R00 WC | Weldon      | 18          | 18           | 2 | 75                        | 150       | TiAlN      |
| O32B 200R00 TP | Cylindrical | 20          | 20           | 2 | 75                        | 150       | no coating |
| O32B 200R00 WP | Weldon      | 20          | 20           | 2 | 75                        | 150       | no coating |
| O32B 200R00 TC | Cylindrical | 20          | 20           | 2 | 75                        | 150       | TiAlN      |
| O32B 200R00 WC | Weldon      | 20          | 20           | 2 | 75                        | 150       | TiAlN      |

# H14B series

## High performance solid carbide 4 flute ball nose end mills for hardened steel up to 65 HRC, normal length

- Ball noseCenter cutting
- Helix angle 15°
- Available without coating TiAlN coated
- Diameter tolerance e8



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

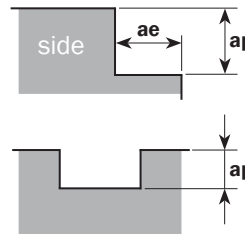
RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Manufacturing tolerance

| Ø D<br>[mm]     | Tolerance e8<br>[mm] |
|-----------------|----------------------|
| ≤ 3             | -0.014 / -0.028      |
| > from 3 to 6   | -0.020 / -0.038      |
| > from 6 to 10  | -0.025 / -0.047      |
| > from 10 to 18 | -0.032 / -0.059      |

### Recommended feeds and speeds for finishing

| Material group | Material                | Milling (чистовое) |        | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|-------------------------|--------------------|--------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                         | side               |        |                                           | 2                                                     | 3     | 4     | 6     | 8     | 10    | 12    | 16    | 20    |  |
|                |                         | ap                 | ae     |                                           |                                                       |       |       |       |       |       |       |       |       |  |
| P              | Steel <36HRC            | 0.04xD             | 0.04xD | 400-450                                   | 0.012                                                 | 0.015 | 0.025 | 0.030 | 0.040 | 0.600 | 0.080 | 0.100 | 0.120 |  |
| P              | Steel 36~48HRC          | 0.04xD             | 0.04xD | 350-400                                   | 0.090                                                 | 0.015 | 0.180 | 0.030 | 0.360 | 0.550 | 0.065 | 0.095 | 0.100 |  |
| H              | Hardened Steel <48HRC   | 0.03xD             | 0.03xD | 290-350                                   | 0.015                                                 | 0.025 | 0.030 | 0.050 | 0.060 | 0.100 | 0.110 | 0.140 | 0.160 |  |
| H              | Hardened Steel 48~55HRC | 0.03xD             | 0.03xD | 200-300                                   | 0.020                                                 | 0.030 | 0.040 | 0.060 | 0.080 | 0.110 | 0.125 | 0.160 | 0.180 |  |
| H              | Hardened Steel 55~60HRC | 0.02xD             | 0.02xD | 180-250                                   | 0.025                                                 | 0.035 | 0.050 | 0.070 | 0.100 | 0.120 | 0.145 | 0.180 | 0.210 |  |
| H              | Hardened Steel >60HRC   | 0.02xD             | 0.02xD | 140-200                                   | 0.015                                                 | 0.020 | 0.030 | 0.040 | 0.060 | 0.085 | 0.100 | 0.115 | 0.140 |  |

### Recommended feeds and speeds for semi-finishing

| Material group | Material                | Milling (semi-finishing) |        | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |  |
|----------------|-------------------------|--------------------------|--------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |                         | side                     |        |                                           | 2                                                     | 3     | 4     | 6     | 8     | 10    | 12    | 16    | 20    |  |
|                |                         | ap                       | ae     |                                           |                                                       |       |       |       |       |       |       |       |       |  |
| <b>P</b>       | Steel <36HRC            | 0.1xD                    | 0.05xD | 250-290                                   | 0.027                                                 | 0.045 | 0.060 | 0.100 | 0.140 | 0.160 | 0.195 | 0,240 | 0,280 |  |
| <b>P</b>       | Steel 36~48HRC          | 0.1xD                    | 0.05xD | 220-260                                   | 0.025                                                 | 0.040 | 0.055 | 0.090 | 0.120 | 0.140 | 0.160 | 0,210 | 0,240 |  |
| <b>H</b>       | Hardened Steel <48HRC   | 0.07xD                   | 0.1xD  | 180-250                                   | 0.030                                                 | 0.050 | 0.070 | 0.110 | 0.150 | 0.190 | 0.210 | 0.260 | 0.310 |  |
| <b>H</b>       | Hardened Steel 48~55HRC | 0.05xD                   | 0.04xD | 140-250                                   | 0.027                                                 | 0.045 | 0.060 | 0.100 | 0.120 | 0.160 | 0.185 | 0.220 | 0.260 |  |
| <b>H</b>       | Hardened Steel 55~60HRC | 0.03xD                   | 0.03xD | 130-240                                   | 0.025                                                 | 0.040 | 0.055 | 0.085 | 0.110 | 0.140 | 0.160 | 0,205 | 0,240 |  |
| <b>H</b>       | Hardened Steel >60HRC   | 0.03xD                   | 0.03xD | 120-180                                   | 0.017                                                 | 0.025 | 0.035 | 0.055 | 0.700 | 0.950 | 0.110 | 0.130 | 0.150 |  |

## Recommended feeds and speeds for roughing

| Material group | Material                | Milling (roughing) |         | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |
|----------------|-------------------------|--------------------|---------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |                         | side               |         |                                           | 2                                                     | 3     | 4     | 6     | 8     | 10    | 12    | 16    | 20    |
|                |                         | ap                 | ae      |                                           |                                                       |       |       |       |       |       |       |       |       |
| P              | Steel <36HRC            | 0,2xD              | 0.1xD   | 190-220                                   | 0.052                                                 | 0.070 | 0.100 | 0.140 | 0.200 | 0.250 | 0.280 | 0.380 | 0.420 |
| P              | Steel 36~48HRC          | 0,2xD              | 0.1xD   | 170-190                                   | 0.048                                                 | 0.060 | 0.090 | 0.120 | 0.180 | 0.220 | 0.240 | 0.320 | 0.380 |
| H              | Hardened Steel <48HRC   | 0.15xD             | 0.1xD   | 130-180                                   | 0.052                                                 | 0.068 | 0.100 | 0.136 | 0.200 | 0.250 | 0.272 | 0.360 | 0.400 |
| H              | Hardened Steel 48~55HRC | 0.1xD              | 0.075xD | 110-190                                   | 0.039                                                 | 0.050 | 0.070 | 0.100 | 0.140 | 0.170 | 0.200 | 0.250 | 0.280 |
| H              | Hardened Steel 55~60HRC | 0.05xD             | 0.05xD  | 120-190                                   | 0.033                                                 | 0.450 | 0.060 | 0.900 | 0.120 | 0.150 | 0.180 | 0.200 | 0.240 |
| H              | Hardened Steel >60HRC   | 0.05xD             | 0.05xD  | 105-150                                   | 0.022                                                 | 0.300 | 0.040 | 0.600 | 0.800 | 0.100 | 0.120 | 0.140 | 0.160 |

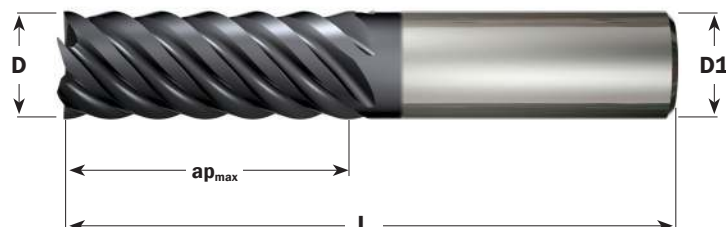
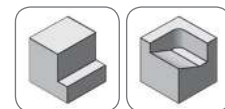
| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|---------|
| H14B 030R00 WC | Weldon      | 3           | 3            | 4 | 3                         | 38        | TiAlN   |
| H14B 030R00 TC | Cylindrical | 3           | 3            | 4 | 3                         | 38        | TiAlN   |
| H14B 040R00 WC | Weldon      | 4           | 4            | 4 | 4                         | 50        | TiAlN   |
| H14B 040R00 TC | Cylindrical | 4           | 4            | 4 | 4                         | 50        | TiAlN   |
| H14B 050R00 WC | Weldon      | 5           | 5            | 4 | 5                         | 50        | TiAlN   |
| H14B 050R00 TC | Cylindrical | 5           | 5            | 4 | 5                         | 50        | TiAlN   |
| H14B 060R00 WC | Weldon      | 6           | 6            | 4 | 6                         | 50        | TiAlN   |
| H14B 060R00 TC | Cylindrical | 6           | 6            | 4 | 6                         | 50        | TiAlN   |
| H14B 080R00 WC | Weldon      | 8           | 8            | 4 | 8                         | 63        | TiAlN   |
| H14B 080R00 TC | Cylindrical | 8           | 8            | 4 | 8                         | 63        | TiAlN   |
| H14B 100R00 WC | Weldon      | 10          | 10           | 4 | 10                        | 76        | TiAlN   |
| H14B 100R00 TC | Cylindrical | 10          | 10           | 4 | 10                        | 76        | TiAlN   |
| H14B 120R00 WC | Weldon      | 12          | 12           | 4 | 12                        | 76        | TiAlN   |
| H14B 120R00 TC | Cylindrical | 12          | 12           | 4 | 12                        | 76        | TiAlN   |
| H14B 160R00 WC | Weldon      | 16          | 16           | 4 | 16                        | 92        | TiAlN   |
| H14B 160R00 TC | Cylindrical | 16          | 16           | 4 | 16                        | 92        | TiAlN   |
| H14B 200R00 WC | Weldon      | 20          | 20           | 4 | 20                        | 104       | TiAlN   |
| H14B 200R00 TC | Cylindrical | 20          | 20           | 4 | 20                        | 104       | TiAlN   |

# F18F series

High performance multiflute solid carbide mill for superfinishing with OD, normal length



- Square end
- Center cutting
- Helix angle 50°
- PVD coating TiAlN
- Diameter tolerance e8



## Formulas

$$\text{Cutting speed } V_c = \frac{D \times \pi \times n}{1000}$$

$$\text{RPM } n = \frac{V_c \times 1000}{\pi \times D}$$

$$\text{Feed per tooth } f_z = \frac{V_f}{z \times n}$$

$$\text{Feedrate } V_f = f_z \times z \times n$$

## Notation

**D**, [mm] - diameter

**z** - Number of teeth

**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [m/min] - Feedrate

**π** - 3.1415696



## Manufacturing tolerance

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |

## Recommended feeds and speeds

| Material group | Material                       | Milling |        | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |
|----------------|--------------------------------|---------|--------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
|                |                                | side    |        |                                           |                                                       |       |       |       |       |       |       |       |
|                |                                | ap      | ae     |                                           | TiAlN                                                 | 4     | 6     | 8     | 10    | 12    | 16    | 20    |
| <b>P</b>       | Free-machining steel           | 1.5xD   | 0.05xD | 140-180                                   | 0.023                                                 | 0.036 | 0.050 | 0.061 | 0.070 | 0.087 | 0.101 | 0.114 |
| <b>P</b>       | Low-alloy Steel                | 1.5xD   | 0.05xD | 100-140                                   | 0.021                                                 | 0.033 | 0.045 | 0.054 | 0.062 | 0.077 | 0.088 | 0.098 |
| <b>P</b>       | High-alloy Steel               | 1.5xD   | 0.05xD | 70-120                                    | 0.019                                                 | 0.029 | 0.040 | 0.048 | 0.056 | 0.070 | 0.081 | 0.091 |
| <b>M</b>       | Free machining stainless steel | 1.5xD   | 0.05xD | 80-100                                    | 0.023                                                 | 0.036 | 0.050 | 0.061 | 0.070 | 0.087 | 0.101 | 0.114 |
| <b>M</b>       | Midrange stainless steel       | 1.5xD   | 0.05xD | 60-80                                     | 0.019                                                 | 0.029 | 0.040 | 0.048 | 0.056 | 0.070 | 0.081 | 0.091 |
| <b>M</b>       | Tough stainless steel          | 1.5xD   | 0.05xD | 60-80                                     | 0.016                                                 | 0.025 | 0.034 | 0.040 | 0.047 | 0.057 | 0.065 | 0.071 |
| <b>K</b>       | Cast iron                      | 1.5xD   | 0.05xD | 110-140                                   | 0.023                                                 | 0.036 | 0.050 | 0.061 | 0.070 | 0.087 | 0.101 | 0.114 |
| <b>S</b>       | Heat resistant steel           | 1.5xD   | 0.05xD | 20-40                                     | 0.013                                                 | 0.019 | 0.026 | 0.032 | 0.037 | 0.046 | 0.054 | 0.061 |
| <b>S</b>       | Titanium                       | 1.5xD   | 0.05xD | 45-65                                     | 0.016                                                 | 0.026 | 0.037 | 0.045 | 0.052 | 0.064 | 0.074 | 0.084 |
| <b>H</b>       | Hardened Steel                 | 1.5xD   | 0.05xD | 80-100                                    | 0.021                                                 | 0.033 | 0.045 | 0.054 | 0.062 | 0.077 | 0.088 | 0.098 |

| Code           | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Coating |
|----------------|-------------|----------|-----------|---|------------------------|--------|---------|
| F14F 040R00 TC | Cylindrical | 4        | 6         | 4 | 11                     | 57     | TiAlN   |
| F14F 040R00 WC | Weldon      | 4        | 6         | 4 | 11                     | 57     | TiAlN   |
| F14F 050R00 TC | Cylindrical | 5        | 6         | 4 | 13                     | 57     | TiAlN   |
| F14F 050R00 WC | Weldon      | 5        | 6         | 4 | 13                     | 57     | TiAlN   |
| F16F 060R00 TC | Cylindrical | 6        | 6         | 6 | 13                     | 57     | TiAlN   |
| F16F 060R00 WC | Weldon      | 6        | 6         | 6 | 13                     | 57     | TiAlN   |

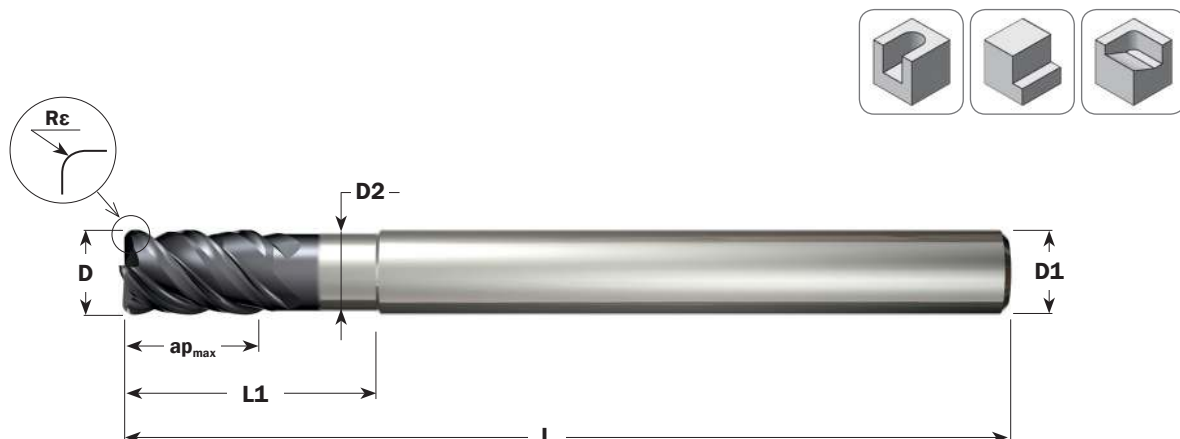
[ continued ]

[ continued ]

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Coating |
|----------------|-------------|-------------|--------------|---|---------------------------|-----------|---------|
| F16F 080R00 TC | Cylindrical | 8           | 8            | 6 | 19                        | 63        | TiAlN   |
| F16F 080R00 WC | Weldon      | 8           | 8            | 6 | 19                        | 63        | TiAlN   |
| F16F 090R00 TC | Cylindrical | 9           | 10           | 6 | 19                        | 72        | TiAlN   |
| F16F 090R00 WC | Weldon      | 9           | 10           | 6 | 19                        | 72        | TiAlN   |
| F16F 100R00 TC | Cylindrical | 10          | 10           | 6 | 22                        | 72        | TiAlN   |
| F16F 100R00 WC | Weldon      | 10          | 10           | 6 | 22                        | 72        | TiAlN   |
| F16F 120R00 TC | Cylindrical | 12          | 12           | 6 | 26                        | 83        | TiAlN   |
| F16F 120R00 WC | Weldon      | 12          | 12           | 6 | 26                        | 83        | TiAlN   |
| F16F 140R00 TC | Cylindrical | 14          | 14           | 6 | 26                        | 83        | TiAlN   |
| F16F 140R00 WC | Weldon      | 14          | 14           | 6 | 26                        | 83        | TiAlN   |
| F18F 160R00 TC | Cylindrical | 16          | 16           | 8 | 32                        | 92        | TiAlN   |
| F18F 160R00 WC | Weldon      | 16          | 16           | 8 | 32                        | 92        | TiAlN   |
| F18F 180R00 TC | Cylindrical | 18          | 18           | 8 | 32                        | 92        | TiAlN   |
| F18F 180R00 WC | Weldon      | 18          | 18           | 8 | 32                        | 92        | TiAlN   |
| F18F 200R00 TC | Cylindrical | 20          | 20           | 8 | 38                        | 104       | TiAlN   |
| F18F 200R00 WC | Weldon      | 20          | 20           | 8 | 38                        | 104       | TiAlN   |
| F18F 250R00 TC | Cylindrical | 25          | 25           | 8 | 45                        | 121       | TiAlN   |
| F18F 250R00 WC | Weldon      | 25          | 25           | 8 | 45                        | 121       | TiAlN   |

# H34F series

High performance solid carbide 4 flute end mills for hardened steel, long



- Square end
- Large selection of corner radii
- Center cutting
- Helix angle 50°
- PVD coating TiAlN
- Diameter tolerance e8

## Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

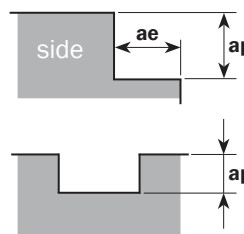
RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

## Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



## Manufacturing tolerance

| Ø D [mm]        | Tolerance e8 [mm] |
|-----------------|-------------------|
| ≤ 3             | -0.014 / -0.028   |
| > from 3 to 6   | -0.020 / -0.038   |
| > from 6 to 10  | -0.025 / -0.047   |
| > from 10 to 18 | -0.032 / -0.059   |

## Recommended feeds and speeds for finishing

| Material group | Material                | Milling (finishing) |        |        | V <sub>c</sub> - Cutting speed [m/min] | f <sub>z</sub> - Feed per tooth, [mm] at 1 D, [mm] |       |       |       |       |       |       |       |       |       |
|----------------|-------------------------|---------------------|--------|--------|----------------------------------------|----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |                         | side                |        | slot   |                                        |                                                    |       |       |       |       |       |       |       |       |       |
|                |                         | ap                  | ae     | ap     |                                        | TiAlN                                              | 3     | 4     | 5     | 6     | 8     | 10    | 12    | 16    | 25    |
| <b>P</b>       | Steel <36HRC            | 1xD                 | 0.4xD  | 1xD    | 160-180                                | 0.015                                              | 0.020 | 0.025 | 0.032 | 0.040 | 0.055 | 0.065 | 0.080 | 0.100 | 0.115 |
| <b>P</b>       | Steel 36~48HRC          | 1xD                 | 0.4xD  | 0.75xD | 140-160                                | 0.013                                              | 0.015 | 0.022 | 0.028 | 0.035 | 0.045 | 0.057 | 0.070 | 0.085 | 0.095 |
| <b>H</b>       | Hardened Steel <48HRC   | 1xD                 | 0.4xD  | 0.75xD | 120-140                                | 0.010                                              | 0.013 | 0.020 | 0.025 | 0.030 | 0.040 | 0.052 | 0.065 | 0.080 | 0.090 |
| <b>H</b>       | Hardened Steel 48~55HRC | 1xD                 | 0.3xD  | 0.5xD  | 80-130                                 | 0.007                                              | 0.010 | 0.015 | 0.020 | 0.025 | 0.032 | 0.040 | 0.055 | 0.060 | 0.065 |
| <b>H</b>       | Hardened Steel 55~60HRC | 1xD                 | 0.25xD | 0.3xD  | 70-100                                 | 0.005                                              | 0.008 | 0.010 | 0.015 | 0.020 | 0.025 | 0.032 | 0.040 | 0.045 | 0.055 |
| <b>H</b>       | Hardened Steel >60HRC   | 1xD                 | 0.25xD | 0.3xD  | 50-70                                  | 0.003                                              | 0.006 | 0.008 | 0.010 | 0.015 | 0.020 | 0.023 | 0.028 | 0.032 | 0.040 |



## Recommended feeds and speeds for semi-finishing

| Material group | Material                | Milling (semi-finishing) |       |        | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |       |
|----------------|-------------------------|--------------------------|-------|--------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |                         | side                     |       | slot   |                                           |                                                       |       |       |       |       |       |       |       |       |       |
|                |                         | ap                       | ae    | ap     |                                           | TiAlN                                                 | 3     | 4     | 5     | 6     | 8     | 10    | 12    | 16    | 20    |
| <b>P</b>       | Steel <36HRC            | 1xD                      | 0,2xD | 0.5xD  | 160-180                                   | 0.030                                                 | 0.035 | 0.040 | 0.045 | 0.060 | 0.080 | 0.100 | 0.130 | 0.150 | 0.170 |
| <b>P</b>       | Steel 36~48HRC          | 1xD                      | 0,2xD | 0.5xD  | 140-160                                   | 0.025                                                 | 0.030 | 0.035 | 0.040 | 0.050 | 0.075 | 0.090 | 0.110 | 0.130 | 0.150 |
| <b>H</b>       | Hardened Steel <48HRC   | 1xD                      | 0,2xD | 0.5xD  | 120-140                                   | 0.020                                                 | 0.023 | 0.027 | 0.030 | 0.045 | 0.060 | 0.070 | 0.090 | 0.110 | 0.130 |
| <b>H</b>       | Hardened Steel 48~55HRC | 1xD                      | 0,2xD | 0.5xD  | 80-130                                    | 0.015                                                 | 0.018 | 0.020 | 0.025 | 0.035 | 0.045 | 0.060 | 0.075 | 0.090 | 0.110 |
| <b>H</b>       | Hardened Steel 55~60HRC | 1xD                      | 0,2xD | 0.5xD  | 70-100                                    | 0.012                                                 | 0.013 | 0.015 | 0.017 | 0.025 | 0.030 | 0.035 | 0.050 | 0.065 | 0.080 |
| <b>H</b>       | Hardened Steel >60HRC   | 1xD                      | 0,2xD | 0.25xD | 50-70                                     | 0.070                                                 | 0.080 | 0.010 | 0.012 | 0.015 | 0.020 | 0.025 | 0.040 | 0.050 | 0.060 |

## Recommended feeds and speeds for roughing

| Material group | Material                | Milling (roughing) |       |         | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |       |       |       |
|----------------|-------------------------|--------------------|-------|---------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |                         | side               |       | slot    |                                           |                                                       |       |       |       |       |       |       |       |       |       |
|                |                         | ap                 | ae    | ap      |                                           | TiAlN                                                 | 3     | 4     | 5     | 6     | 8     | 10    | 12    | 16    | 20    |
| P              | Steel <36HRC            | 1.5xD              | 0.1xD | 160-180 | 160-180                                   | 0.030                                                 | 0.035 | 0.040 | 0.045 | 0.060 | 0.080 | 0.100 | 0.130 | 0.150 | 0.170 |
| P              | Steel 36~48HRC          | 1.5xD              | 0.1xD | 140-160 | 140-160                                   | 0.025                                                 | 0.030 | 0.035 | 0.040 | 0.050 | 0.075 | 0.090 | 0.110 | 0.130 | 0.150 |
| H              | Hardened Steel <48HRC   | 1.5xD              | 0.1xD | 120-140 | 120-140                                   | 0.020                                                 | 0.023 | 0.027 | 0.030 | 0.045 | 0.060 | 0.070 | 0.090 | 0.110 | 0.130 |
| H              | Hardened Steel 48~55HRC | 1.5xD              | 0.1xD | 80-130  | 80-130                                    | 0.015                                                 | 0.018 | 0.020 | 0.025 | 0.035 | 0.045 | 0.060 | 0.075 | 0.090 | 0.110 |
| H              | Hardened Steel 55~60HRC | 1.5xD              | 0.1xD | 70-100  | 70-100                                    | 0.012                                                 | 0.013 | 0.015 | 0.017 | 0.025 | 0.030 | 0.035 | 0.050 | 0.065 | 0.080 |
| H              | Hardened Steel >60HRC   | 1.5xD              | 0.1xD | 50-70   | 50-70                                     | 0.070                                                 | 0.080 | 0.010 | 0.012 | 0.015 | 0.020 | 0.025 | 0.040 | 0.050 | 0.060 |

| Code            | Shank       | Ø D [mm] | Ø D1 [mm] | Ø D2 [mm] | z | ap <sub>max</sub> [mm] | L1 [mm] | L [mm] | Rε [mm] | Coating |
|-----------------|-------------|----------|-----------|-----------|---|------------------------|---------|--------|---------|---------|
| H24F 030R025 TC | Cylindrical | 3        | 6         | 2,7       | 4 | 4.5                    | 9       | 57     | 0.25    | TiAlN   |
| H24F 030R025 WC | Weldon      | 3        | 6         | 2,7       | 4 | 4.5                    | 9       | 57     | 0.25    | TiAlN   |
| H24F 030R050 TC | Cylindrical | 3        | 6         | 2,7       | 4 | 4.5                    | 9       | 57     | 0.5     | TiAlN   |
| H24F 030R050 WC | Weldon      | 3        | 6         | 2,7       | 4 | 4.5                    | 9       | 57     | 0.5     | TiAlN   |
| H24F 040R025 TC | Cylindrical | 4        | 6         | 3,6       | 4 | 6                      | 12      | 57     | 0.25    | TiAlN   |
| H24F 040R025 WC | Weldon      | 4        | 6         | 3,6       | 4 | 6                      | 12      | 57     | 0.25    | TiAlN   |
| H24F 040R050 TC | Cylindrical | 4        | 6         | 3,6       | 4 | 6                      | 12      | 57     | 0.5     | TiAlN   |
| H24F 040R050 WC | Weldon      | 4        | 6         | 3,6       | 4 | 6                      | 12      | 57     | 0.5     | TiAlN   |
| H24F 050R025 TC | Cylindrical | 5        | 6         | 4,6       | 4 | 7.5                    | 15      | 76     | 0.25    | TiAlN   |
| H24F 050R025 WC | Weldon      | 5        | 6         | 4,6       | 4 | 7.5                    | 15      | 76     | 0.25    | TiAlN   |
| H24F 050R050 TC | Cylindrical | 5        | 6         | 4,6       | 4 | 7.5                    | 15      | 76     | 0.5     | TiAlN   |
| H24F 050R050 WC | Weldon      | 5        | 6         | 4,6       | 4 | 7.5                    | 15      | 76     | 0.5     | TiAlN   |
| H24F 060R000 TC | Cylindrical | 6        | 6         | 5.5       | 4 | 9                      | 18      | 76     | -       | TiAlN   |
| H24F 060R000 WC | Weldon      | 6        | 6         | 5.5       | 4 | 9                      | 18      | 76     | -       | TiAlN   |

[ continued ]

# H34F series

## High performance solid carbide 4 flute end mills for hardened steel, long

[ continued ]

| Code             | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | Ø D2<br>[mm] | z | ap <sub>max</sub><br>[mm] | L1<br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating |
|------------------|-------------|-------------|--------------|--------------|---|---------------------------|------------|-----------|------------|---------|
| H24F 060R025 TC  | Cylindrical | 6           | 6            | 5.5          | 4 | 9                         | 18         | 76        | 0.25       | TiAIN   |
| H24F 060R025 WC  | Weldon      | 6           | 6            | 5.5          | 4 | 9                         | 18         | 76        | 0.25       | TiAIN   |
| H24F 060R050 TC  | Cylindrical | 6           | 6            | 5.5          | 4 | 9                         | 18         | 76        | 0.5        | TiAIN   |
| H24F 060R050 WC  | Weldon      | 6           | 6            | 5.5          | 4 | 9                         | 18         | 76        | 0.5        | TiAIN   |
| H24F 060R075 TC  | Cylindrical | 6           | 6            | 5.5          | 4 | 9                         | 18         | 76        | 0.75       | TiAIN   |
| H24F 060R075 WC  | Weldon      | 6           | 6            | 5.5          | 4 | 9                         | 18         | 76        | 0.75       | TiAIN   |
| H24F 060R100 TC  | Cylindrical | 6           | 6            | 5.5          | 4 | 9                         | 18         | 76        | 1          | TiAIN   |
| H24F 060R100 WC  | Weldon      | 6           | 6            | 5.5          | 4 | 9                         | 18         | 76        | 1          | TiAIN   |
| H34F 080R000 TC  | Cylindrical | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | -          | TiAIN   |
| H34F 080R000 WC  | Weldon      | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | -          | TiAIN   |
| H34F 080R050 TC  | Cylindrical | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | 0.5        | TiAIN   |
| H34F 080R050 WC  | Weldon      | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | 0.5        | TiAIN   |
| H34F 080R100 TC  | Cylindrical | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | 1          | TiAIN   |
| H34F 080R100 WC  | Weldon      | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | 1          | TiAIN   |
| H34F 080R150 TC  | Cylindrical | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | 1.5        | TiAIN   |
| H34F 080R0150 WC | Weldon      | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | 1.5        | TiAIN   |
| H34F 080R200 TC  | Cylindrical | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | 2          | TiAIN   |
| H34F 080R200 WC  | Weldon      | 8           | 8            | 7.5          | 4 | 12                        | 24         | 100       | 2          | TiAIN   |
| H34F 100R000 TC  | Cylindrical | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | -          | TiAIN   |
| H34F 100R000 WC  | Weldon      | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | -          | TiAIN   |
| H34F 100R050 TC  | Cylindrical | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | 0.5        | TiAIN   |
| H34F 100R050 WC  | Weldon      | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | 0.5        | TiAIN   |
| H34F 100R100 TC  | Cylindrical | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | 1          | TiAIN   |
| H34F 100R100 WC  | Weldon      | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | 1          | TiAIN   |
| H34F 100R150 TC  | Cylindrical | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | 1.5        | TiAIN   |
| H34F 100R150 WC  | Weldon      | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | 1.5        | TiAIN   |
| H34F 100R200 TC  | Cylindrical | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | 2          | TiAIN   |
| H34F 100R000 WC  | Weldon      | 10          | 10           | 9.5          | 4 | 15                        | 30         | 100       | 2          | TiAIN   |
| H34F 120R000 TC  | Cylindrical | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | -          | TiAIN   |
| H34F 120R000 WC  | Weldon      | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | -          | TiAIN   |
| H34F 120R050 TC  | Cylindrical | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | 0.5        | TiAIN   |
| H34F 120R050 WC  | Weldon      | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | 0.5        | TiAIN   |
| H34F 120R100 TC  | Cylindrical | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | 1          | TiAIN   |
| H34F 120R100 WC  | Weldon      | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | 1          | TiAIN   |
| H34F 120R150 TC  | Cylindrical | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | 1.5        | TiAIN   |
| H34F 120R150 WC  | Weldon      | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | 1.5        | TiAIN   |

[ continued ]

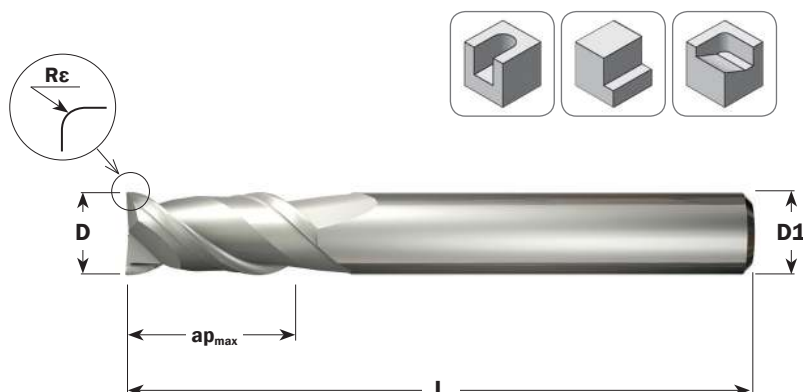
[ continued ]

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | Ø D2<br>[mm] | z | ap <sub>max</sub><br>[mm] | L1<br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating |
|-----------------|-------------|-------------|--------------|--------------|---|---------------------------|------------|-----------|------------|---------|
| H34F 120R200 TC | Cylindrical | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | 2          | TiAIN   |
| H34F 120R200 WC | Weldon      | 12          | 12           | 11.5         | 4 | 18                        | 36         | 125       | 2          | TiAIN   |
| H34F 160R000 TC | Cylindrical | 16          | 16           | 15.5         | 4 | 24                        | 48         | 125       | -          | TiAIN   |
| H34F 160R000 WC | Weldon      | 16          | 16           | 15.5         | 4 | 24                        | 48         | 125       | -          | TiAIN   |
| H34F 160R050 TC | Cylindrical | 16          | 16           | 15.5         | 4 | 24                        | 48         | 125       | 0.5        | TiAIN   |
| H34F 160R050 WC | Weldon      | 16          | 16           | 15.5         | 4 | 24                        | 48         | 125       | 0.5        | TiAIN   |
| H34F 160R150 TC | Cylindrical | 16          | 16           | 15.5         | 4 | 24                        | 48         | 125       | 1.5        | TiAIN   |
| H34F 160R150 WC | Weldon      | 16          | 16           | 15.5         | 4 | 24                        | 48         | 125       | 1.5        | TiAIN   |
| H34F 200R000 TC | Cylindrical | 20          | 20           | 19.5         | 4 | 30                        | 60         | 150       | -          | TiAIN   |
| H34F 200R000 WC | Weldon      | 20          | 20           | 19.5         | 4 | 30                        | 60         | 150       | -          | TiAIN   |
| H34F 200R050 TC | Cylindrical | 20          | 20           | 19.5         | 4 | 30                        | 60         | 150       | 0.5        | TiAIN   |
| H34F 200R050 WC | Weldon      | 20          | 20           | 19.5         | 4 | 30                        | 60         | 150       | 0.5        | TiAIN   |
| H34F 200R200 TC | Cylindrical | 20          | 20           | 19.5         | 4 | 30                        | 60         | 150       | 2          | TiAIN   |
| H34F 200R200 WC | Weldon      | 20          | 20           | 19.5         | 4 | 30                        | 60         | 150       | 2          | TiAIN   |
| H34F 250R000 TC | Cylindrical | 25          | 25           | 24.5         | 4 | 38                        | 75         | 150       | -          | TiAIN   |
| H34F 250R000 WC | Weldon      | 25          | 25           | 24.5         | 4 | 38                        | 75         | 150       | -          | TiAIN   |
| H34F 250R050 TC | Cylindrical | 25          | 25           | 24.5         | 4 | 38                        | 75         | 150       | 0.5        | TiAIN   |
| H34F 250R050 WC | Weldon      | 25          | 25           | 24.5         | 4 | 38                        | 75         | 150       | 0.5        | TiAIN   |
| H34F 250R300 TC | Cylindrical | 25          | 25           | 24.5         | 4 | 38                        | 75         | 150       | 3          | TiAIN   |
| H34F 250R300 WC | Weldon      | 25          | 25           | 24.5         | 4 | 38                        | 75         | 150       | 3          | TiAIN   |

# A12F series

## High performance solid carbide 2 flute mills for Aluminium and Aluminium alloys, normal length

- Square end
- Center cutting
- Helix angle 45°
- Large selection of corner radii
- No coating guarantees sharp cutting edge
- Diameter tolerance e8



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

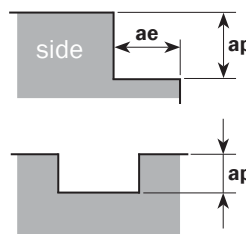
RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter  
**z** - Number of teeth  
**V<sub>c</sub>**, [m/min] - Cutting speed  
**f<sub>z</sub>**, [mm] - Feed per tooth  
**n**, [1/min] - RPM  
**V<sub>f</sub>**, [m/min] - Feedrate  
**π** - 3.1415696



### Manufacturing tolerance

| Ø D [mm]        | Tolerance [mm] +/- | h6, [mm] |
|-----------------|--------------------|----------|
| ≤ 3             | 0 / 0.006          |          |
| > from 3 to 6   | 0 / 0.008          |          |
| > from 6 to 10  | 0 / 0.009          |          |
| > from 10 to 18 | 0 / 0.011          |          |

### Recommended feeds and speeds

| Material group | Material                      | Milling |       |      | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |
|----------------|-------------------------------|---------|-------|------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                |                               | side    |       | slot |                                           |                                                       |       |       |       |       |       |       |
|                |                               | ap      | ae    | ap   |                                           | no coating                                            | 6     | 8     | 10    | 12    | 16    | 20    |
| N              | Free-machining alluminium     | 1.5xD   | 0.5xD | 1xD  | 500-1500                                  | 0.050                                                 | 0.065 | 0.085 | 0.100 | 0.135 | 0.170 | 0.200 |
| N              | Alluminium alloys with Si<12% | 1.5xD   | 0.5xD | 1xD  | 500-1500                                  | 0.045                                                 | 0.060 | 0.075 | 0.090 | 0.125 | 0.155 | 0.170 |

| Code            | Shank       | Ø D [mm] | Ø D1 [mm] | z | ap <sub>max</sub> [mm] | L [mm] | Rε [mm] | Coating    |
|-----------------|-------------|----------|-----------|---|------------------------|--------|---------|------------|
| A12F 060R00 TP  | Cylindrical | 6        | 6         | 2 | 16                     | 50     | -       | no coating |
| A12F 060R00 WP  | Weldon      | 6        | 6         | 2 | 16                     | 50     | -       | no coating |
| A12F 060R050 TP | Cylindrical | 6        | 6         | 2 | 16                     | 50     | 0.5     | no coating |
| A12F 060R050 WP | Weldon      | 6        | 6         | 2 | 16                     | 50     | 0.5     | no coating |
| A12F 060R100 TP | Cylindrical | 6        | 6         | 2 | 16                     | 50     | 1.0     | no coating |
| A12F 060R100 WP | Weldon      | 6        | 6         | 2 | 16                     | 50     | 1.0     | no coating |
| A12F 060R200 TP | Cylindrical | 6        | 6         | 2 | 16                     | 50     | 2.0     | no coating |
| A12F 060R200 WP | Weldon      | 6        | 6         | 2 | 16                     | 50     | 2.0     | no coating |
| A12F 080R00 TP  | Cylindrical | 8        | 8         | 2 | 20                     | 63     | -       | no coating |
| A12F 080R00 WP  | Weldon      | 8        | 8         | 2 | 20                     | 63     | -       | no coating |

[ continued ]

[ continued ]

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Rc<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|------------|
| A12F 080R100 TP | Cylindrical | 8           | 8            | 2 | 20                        | 63        | 1.0        | no coating |
| A12F 080R100 WP | Weldon      | 8           | 8            | 2 | 20                        | 63        | 1.0        | no coating |
| A12F 080R150 TP | Cylindrical | 8           | 8            | 2 | 20                        | 63        | 1.5        | no coating |
| A12F 080R150 WP | Weldon      | 8           | 8            | 2 | 20                        | 63        | 1.5        | no coating |
| A12F 080R200 TP | Cylindrical | 8           | 8            | 2 | 20                        | 63        | 2.0        | no coating |
| A12F 080R200 WP | Weldon      | 8           | 8            | 2 | 20                        | 63        | 2.0        | no coating |
| A12F 100R00 TP  | Cylindrical | 10          | 10           | 2 | 22                        | 76        | -          | no coating |
| A12F 100R00 WP  | Weldon      | 10          | 10           | 2 | 22                        | 76        | -          | no coating |
| A12F 100R100 TP | Cylindrical | 10          | 10           | 2 | 22                        | 76        | 1.0        | no coating |
| A12F 100R100 WP | Weldon      | 10          | 10           | 2 | 22                        | 76        | 1.0        | no coating |
| A12F 100R200 TP | Cylindrical | 10          | 10           | 2 | 22                        | 76        | 2.0        | no coating |
| A12F 100R200 WP | Weldon      | 10          | 10           | 2 | 22                        | 76        | 2.0        | no coating |
| A12F 100R400 TP | Cylindrical | 10          | 10           | 2 | 22                        | 76        | 4.0        | no coating |
| A12F 100R400 WP | Weldon      | 10          | 10           | 2 | 22                        | 76        | 4.0        | no coating |
| A12F 120R00 TP  | Cylindrical | 12          | 12           | 2 | 25                        | 76        | -          | no coating |
| A12F 120R00 WP  | Weldon      | 12          | 12           | 2 | 25                        | 76        | -          | no coating |
| A12F 120R100 TP | Cylindrical | 12          | 12           | 2 | 25                        | 76        | 1.0        | no coating |
| A12F 120R100 WP | Weldon      | 12          | 12           | 2 | 25                        | 76        | 1.0        | no coating |
| A12F 120R200 TP | Cylindrical | 12          | 12           | 2 | 25                        | 76        | 2.0        | no coating |
| A12F 120R200 WP | Weldon      | 12          | 12           | 2 | 25                        | 76        | 2.0        | no coating |
| A12F 120R300 TP | Cylindrical | 12          | 12           | 2 | 25                        | 76        | 3.0        | no coating |
| A12F 120R300 WP | Weldon      | 12          | 12           | 2 | 25                        | 76        | 3.0        | no coating |
| A12F 120R400 TP | Cylindrical | 12          | 12           | 2 | 25                        | 76        | 4.0        | no coating |
| A12F 120R400 WP | Weldon      | 12          | 12           | 2 | 25                        | 76        | 4.0        | no coating |
| A12F 140R00 TP  | Cylindrical | 14          | 14           | 2 | 32                        | 83        | -          | no coating |
| A12F 140R00 WP  | Weldon      | 14          | 14           | 2 | 32                        | 83        | -          | no coating |
| A12F 140R200 TP | Cylindrical | 14          | 14           | 2 | 32                        | 83        | 2.0        | no coating |
| A12F 140R200 WP | Weldon      | 14          | 14           | 2 | 32                        | 83        | 2.0        | no coating |
| A12F 140R400 TP | Cylindrical | 14          | 14           | 2 | 32                        | 83        | 4.0        | no coating |
| A12F 140R400 WP | Weldon      | 14          | 14           | 2 | 32                        | 83        | 4.0        | no coating |
| A12F 160R00 TP  | Cylindrical | 16          | 16           | 2 | 35                        | 92        | -          | no coating |
| A12F 160R00 WP  | Weldon      | 16          | 16           | 2 | 35                        | 92        | -          | no coating |
| A12F 160R100 TP | Cylindrical | 16          | 16           | 2 | 35                        | 92        | 1.0        | no coating |
| A12F 160R100 WP | Weldon      | 16          | 16           | 2 | 35                        | 92        | 1.0        | no coating |
| A12F 160R200 TP | Cylindrical | 16          | 16           | 2 | 35                        | 92        | 2.0        | no coating |
| A12F 160R200 WP | Weldon      | 16          | 16           | 2 | 35                        | 92        | 2.0        | no coating |

[ continued ]

# A12F series

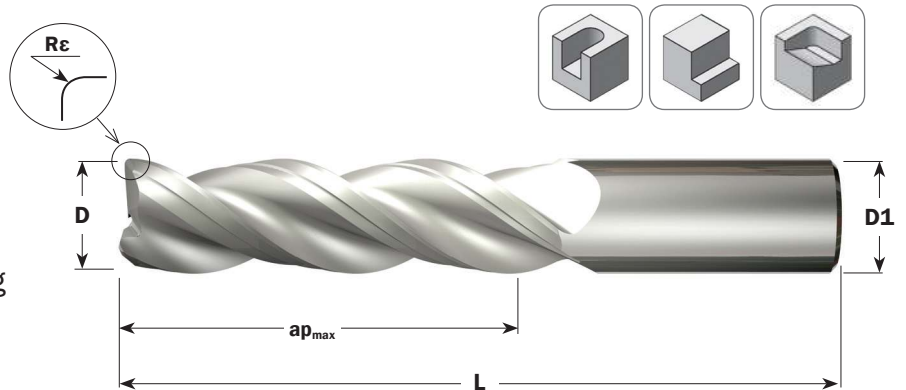
## High performance solid carbide 2 flute mills for Aluminium and Aluminium alloys, normal length



[ continued ]

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|------------|
| A12F 160R400 TP | Cylindrical | 16          | 16           | 2 | 35                        | 92        | 4.0        | no coating |
| A12F 160R400 WP | Weldon      | 16          | 16           | 2 | 35                        | 92        | 4.0        | no coating |
| A12F 160R500 TP | Cylindrical | 16          | 16           | 2 | 35                        | 92        | 5.0        | no coating |
| A12F 160R500 WP | Weldon      | 16          | 16           | 2 | 35                        | 92        | 5.0        | no coating |
| A12F 200R00 TP  | Cylindrical | 20          | 20           | 2 | 40                        | 104       | -          | no coating |
| A12F 200R00 WP  | Weldon      | 20          | 20           | 2 | 40                        | 104       | -          | no coating |
| A12F 200R100 TP | Cylindrical | 20          | 20           | 2 | 40                        | 104       | 1.0        | no coating |
| A12F 200R100 WP | Weldon      | 20          | 20           | 2 | 40                        | 104       | 1.0        | no coating |
| A12F 200R200 TP | Cylindrical | 20          | 20           | 2 | 40                        | 104       | 2.0        | no coating |
| A12F 200R200 WP | Weldon      | 20          | 20           | 2 | 40                        | 104       | 2.0        | no coating |
| A12F 200R400 TP | Cylindrical | 20          | 20           | 2 | 40                        | 104       | 4.0        | no coating |
| A12F 200R400 WP | Weldon      | 20          | 20           | 2 | 40                        | 104       | 4.0        | no coating |
| A12F 200R500 TP | Cylindrical | 20          | 20           | 2 | 40                        | 104       | 5.0        | no coating |
| A12F 200R500 WP | Weldon      | 20          | 20           | 2 | 40                        | 104       | 5.0        | no coating |
| A12F 250R00 TP  | Cylindrical | 25          | 25           | 2 | 50                        | 115       | -          | no coating |
| A12F 250R00 WP  | Weldon      | 25          | 25           | 2 | 50                        | 115       | -          | no coating |
| A12F 250R200 TP | Cylindrical | 25          | 25           | 2 | 50                        | 115       | 2.0        | no coating |
| A12F 250R200 WP | Weldon      | 25          | 25           | 2 | 50                        | 115       | 2.0        | no coating |
| A12F 250R400 TP | Cylindrical | 25          | 25           | 2 | 50                        | 115       | 4.0        | no coating |
| A12F 250R400 WP | Weldon      | 25          | 25           | 2 | 50                        | 115       | 4.0        | no coating |
| A12F 250R500 TP | Cylindrical | 25          | 25           | 2 | 50                        | 115       | 5.0        | no coating |
| A12F 250R500 WP | Weldon      | 25          | 25           | 2 | 50                        | 115       | 5.0        | no coating |
| A12F 250R800 TP | Cylindrical | 25          | 25           | 2 | 50                        | 115       | 5.0        | no coating |
| A12F 250R800 WP | Weldon      | 25          | 25           | 2 | 50                        | 115       | 5.0        | no coating |

- Square end
- Unequal indexing
- Center cutting
- Helix angle 38°
- Large selection of corner radii
- No coating guarantees sharp cutting edge
- Diameter tolerance e8



#### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

#### Notation

**D**, [mm] - diameter

**z** - Number of teeth

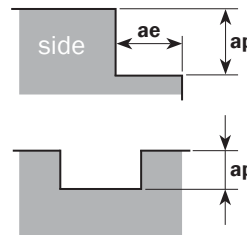
**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [m/min] - Feedrate

**π** - 3.1415696



#### Manufacturing tolerance

| Ø D<br>[mm]        | Tolerance<br>[mm] +/- | h6, |
|--------------------|-----------------------|-----|
| ≤ 3                | 0 / 0.006             |     |
| > from 3 to 6      | 0 / 0.008             |     |
| > from 6 to 10     | 0 / 0.009             |     |
| > from 10<br>to 18 | 0 / 0.011             |     |

#### Recommended feeds and speeds

| Material group | Material                      | Milling |       |        | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |
|----------------|-------------------------------|---------|-------|--------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                |                               | side    |       | slot   |                                           |                                                       |       |       |       |       |       |       |
|                |                               | ap      | ae    | ap     |                                           | no coating                                            | 6     | 8     | 10    | 12    | 16    | 20    |
| N              | Free-machining alluminium     | 1xD     | 0.4xD | 0.75xD | 500-1500                                  | 0.040                                                 | 0.052 | 0.068 | 0.080 | 0.108 | 0.136 | 0.160 |
| N              | Alluminium alloys with Si<12% | 1xD     | 0.4xD | 0.75xD | 500-1500                                  | 0.036                                                 | 0.048 | 0.060 | 0.072 | 0.100 | 0.124 | 0.136 |

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|------------|
| A23F 060R00 TP  | Cylindrical | 6           | 6            | 3 | 21                        | 76        | -          | no coating |
| A23F 060R00 WC  | Weldon      | 6           | 6            | 3 | 21                        | 76        | -          | no coating |
| A23F 060R050 TC | Cylindrical | 6           | 6            | 3 | 21                        | 76        | 0.5        | no coating |
| A23F 060R050 WP | Weldon      | 6           | 6            | 3 | 21                        | 76        | 0.5        | no coating |
| A23F 060R100 TC | Cylindrical | 6           | 6            | 3 | 21                        | 76        | 1.0        | no coating |
| A23F 060R100 WP | Weldon      | 6           | 6            | 3 | 21                        | 76        | 1.0        | no coating |

[ continued ]

# A23F series

## High performance solid carbide 3 flute mills for Aluminium and Aluminium alloys, long

[ continued ]

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|------------|
| A23F 060R200 TC | Cylindrical | 6           | 6            | 3 | 21                        | 76        | 2.0        | no coating |
| A23F 060R200 WP | Weldon      | 6           | 6            | 3 | 21                        | 76        | 2.0        | no coating |
| A23F 080R00 TC  | Cylindrical | 8           | 8            | 3 | 28                        | 84        | -          | no coating |
| A23F 080R00 WP  | Weldon      | 8           | 8            | 3 | 28                        | 84        | -          | no coating |
| A23F 080R100 TC | Cylindrical | 8           | 8            | 3 | 28                        | 84        | 1.0        | no coating |
| A23F 080R100 WP | Weldon      | 8           | 8            | 3 | 28                        | 84        | 1.0        | no coating |
| A23F 080R150 TC | Cylindrical | 8           | 8            | 3 | 28                        | 84        | 1.5        | no coating |
| A23F 080R150 WP | Weldon      | 8           | 8            | 3 | 28                        | 84        | 1.5        | no coating |
| A23F 080R200 TC | Cylindrical | 8           | 8            | 3 | 28                        | 84        | 2.0        | no coating |
| A23F 080R200 WP | Weldon      | 8           | 8            | 3 | 28                        | 84        | 2.0        | no coating |
| A23F 100R00 TC  | Cylindrical | 10          | 10           | 3 | 35                        | 89        | -          | no coating |
| A23F 100R00 WC  | Weldon      | 10          | 10           | 3 | 35                        | 89        | -          | no coating |
| A23F 100R100 TC | Cylindrical | 10          | 10           | 3 | 35                        | 89        | 1.0        | no coating |
| A23F 100R100 WC | Weldon      | 10          | 10           | 3 | 35                        | 89        | 1.0        | no coating |
| A23F 100R200 TC | Cylindrical | 10          | 10           | 3 | 35                        | 89        | 2.0        | no coating |
| A23F 100R200 WC | Weldon      | 10          | 10           | 3 | 35                        | 89        | 2.0        | no coating |
| A23F 100R400 TC | Cylindrical | 10          | 10           | 3 | 35                        | 89        | 4.0        | no coating |
| A23F 100R400 WC | Weldon      | 10          | 10           | 3 | 35                        | 89        | 4.0        | no coating |
| A23F 120R00 TC  | Cylindrical | 12          | 12           | 3 | 42                        | 100       | -          | no coating |
| A23F 120R00 WP  | Weldon      | 12          | 12           | 3 | 42                        | 100       | -          | no coating |
| A23F 120R100 TC | Cylindrical | 12          | 12           | 3 | 42                        | 100       | 1.0        | no coating |
| A23F 120R100 WP | Weldon      | 12          | 12           | 3 | 42                        | 100       | 1.0        | no coating |
| A23F 120R200 TC | Cylindrical | 12          | 12           | 3 | 42                        | 100       | 2.0        | no coating |
| A23F 120R200 WP | Weldon      | 12          | 12           | 3 | 42                        | 100       | 2.0        | no coating |
| A23F 120R300 TC | Cylindrical | 12          | 12           | 3 | 42                        | 100       | 3.0        | no coating |
| A23F 120R300 WP | Weldon      | 12          | 12           | 3 | 42                        | 100       | 3.0        | no coating |
| A23F 120R400 TC | Cylindrical | 12          | 12           | 3 | 42                        | 100       | 4.0        | no coating |
| A23F 120R400 WP | Weldon      | 12          | 12           | 3 | 42                        | 100       | 4.0        | no coating |
| A23F 140R00 TC  | Cylindrical | 14          | 14           | 3 | 49                        | 105       | -          | no coating |
| A23F 140R00 WP  | Weldon      | 14          | 14           | 3 | 49                        | 105       | -          | no coating |
| A23F 140R200 TC | Cylindrical | 14          | 14           | 3 | 49                        | 105       | 2.0        | no coating |
| A23F 140R200 WP | Weldon      | 14          | 14           | 3 | 49                        | 105       | 2.0        | no coating |
| A23F 140R400 TC | Cylindrical | 14          | 14           | 3 | 49                        | 105       | 4.0        | no coating |
| A12F 140R400 WP | Weldon      | 14          | 14           | 3 | 49                        | 105       | 4.0        | no coating |
| A23F 160R00 TC  | Cylindrical | 16          | 16           | 3 | 56                        | 110       | -          | no coating |
| A23F 160R00 WP  | Weldon      | 16          | 16           | 3 | 56                        | 110       | -          | no coating |

[ continued ]

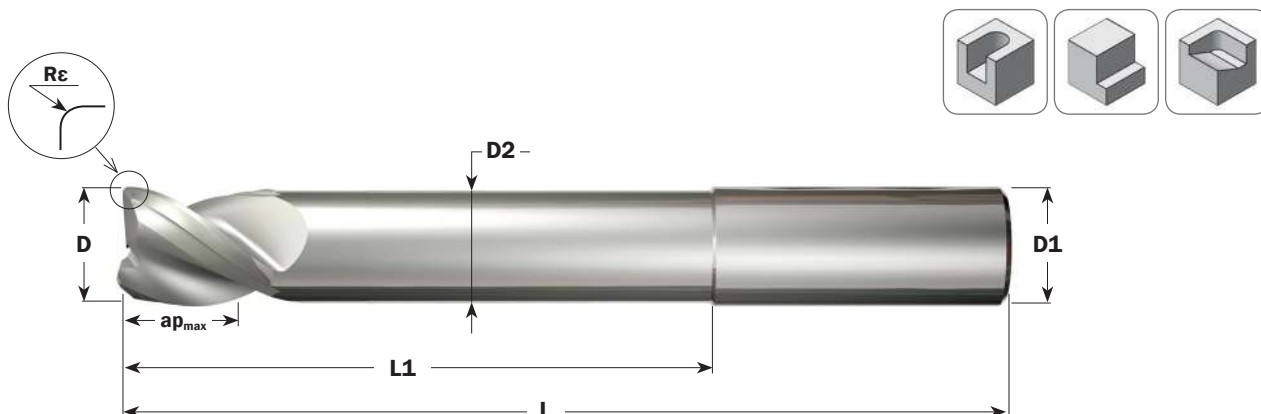


[ continued ]

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | z | ap <sub>max</sub><br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|---|---------------------------|-----------|------------|------------|
| A23F 160R100 TC | Cylindrical | 16          | 16           | 3 | 56                        | 110       | 1.0        | no coating |
| A23F 160R100 WP | Weldon      | 16          | 16           | 3 | 56                        | 110       | 1.0        | no coating |
| A23F 160R200 TC | Cylindrical | 16          | 16           | 3 | 56                        | 110       | 2.0        | no coating |
| A23F 160R200 WP | Weldon      | 16          | 16           | 3 | 56                        | 110       | 2.0        | no coating |
| A23F 160R400 TC | Cylindrical | 16          | 16           | 3 | 56                        | 110       | 4.0        | no coating |
| A23F 160R400 WP | Weldon      | 16          | 16           | 3 | 56                        | 110       | 4.0        | no coating |
| A23F 160R500 TC | Cylindrical | 16          | 16           | 3 | 56                        | 110       | 5.0        | no coating |
| A23F 160R500 WP | Weldon      | 16          | 16           | 3 | 56                        | 110       | 5.0        | no coating |
| A23F 200R00 TC  | Cylindrical | 20          | 20           | 3 | 70                        | 125       | -          | no coating |
| A23F 200R00 WP  | Weldon      | 20          | 20           | 3 | 70                        | 125       | -          | no coating |
| A23F 200R100 TC | Cylindrical | 20          | 20           | 3 | 70                        | 125       | 1.0        | no coating |
| A23F 200R100 WP | Weldon      | 20          | 20           | 3 | 70                        | 125       | 1.0        | no coating |
| A23F 200R200 TC | Cylindrical | 20          | 20           | 3 | 70                        | 125       | 2.0        | no coating |
| A23F 200R200 WP | Weldon      | 20          | 20           | 3 | 70                        | 125       | 2.0        | no coating |
| A23F 200R400 TC | Cylindrical | 20          | 20           | 3 | 70                        | 125       | 4.0        | no coating |
| A23F 200R400 WP | Weldon      | 20          | 20           | 3 | 70                        | 125       | 4.0        | no coating |
| A23F 200R500 TC | Cylindrical | 20          | 20           | 3 | 70                        | 125       | 5.0        | no coating |
| A23F 200R500 WP | Weldon      | 20          | 20           | 3 | 70                        | 125       | 5.0        | no coating |
| A23F 250R00 TC  | Cylindrical | 25          | 25           | 3 | 87                        | 140       | -          | no coating |
| A23F 250R00 WP  | Weldon      | 25          | 25           | 3 | 87                        | 140       | -          | no coating |
| A23F 250R200 TC | Cylindrical | 25          | 25           | 3 | 87                        | 140       | 2.0        | no coating |
| A23F 250R200 WP | Weldon      | 25          | 25           | 3 | 87                        | 140       | 2.0        | no coating |
| A23F 250R400 TC | Cylindrical | 25          | 25           | 3 | 87                        | 140       | 4.0        | no coating |
| A23F 250R400 WP | Weldon      | 25          | 25           | 3 | 87                        | 140       | 4.0        | no coating |
| A23F 250R500 TC | Cylindrical | 25          | 25           | 3 | 87                        | 140       | 5.0        | no coating |
| A23F 250R500 WP | Weldon      | 25          | 25           | 3 | 87                        | 140       | 5.0        | no coating |

# AN3F series

## High performance solid carbide necked 3 flute mills for Aluminium and Aluminium alloys



- Square end
- Unequal indexing
- Center cutting
- Helix angle 38°
- Necking allows using of extra long tools
- Large selection of corner radii
- No coating guarantees sharp cutting edge
- Diameter to tolerance e8

### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter

**z** - Number of teeth

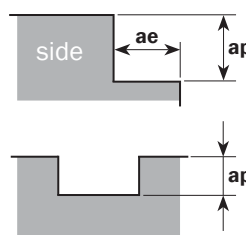
**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [m/min] - Feedrate

**π** - 3.1415696



### Manufacturing tolerance

| Ø D [mm]        | Tolerance h6, [mm] +/- |
|-----------------|------------------------|
| ≤ 3             | 0 / 0.006              |
| > from 3 to 6   | 0 / 0.008              |
| > from 6 to 10  | 0 / 0.009              |
| > from 10 to 18 | 0 / 0.011              |

### Recommended feeds and speeds

| Material group | Material                      | Milling |        |        | V <sub>c</sub> – Cutting speed<br>[m/min] | f <sub>z</sub> – Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |       |       |       |       |
|----------------|-------------------------------|---------|--------|--------|-------------------------------------------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                |                               | side    |        | slot   |                                           |                                                       |       |       |       |       |       |       |
|                |                               | ap      | ae     | ap     |                                           | no coating                                            | 6     | 8     | 10    | 12    | 16    | 20    |
| N              | Free-machining alluminium     | 1xD     | 0.25xD | 0.35xD | 500-1500                                  | 0.030                                                 | 0.039 | 0.051 | 0.060 | 0.081 | 0.102 | 0.120 |
| N              | Alluminium alloys with Si<12% | 1xD     | 0.25xD | 0.35xD | 500-1500                                  | 0.027                                                 | 0.036 | 0.045 | 0.054 | 0.075 | 0.093 | 0.102 |

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | Ø D2<br>[mm] | z | ap <sub>max</sub><br>[mm] | L1<br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|--------------|---|---------------------------|------------|-----------|------------|------------|
| AN3F 060R00 TC  | Cylindrical | 6           | 6            | 5.5          | 3 | 6                         | 0          | 76        | -          | no coating |
| AN3F 060R00 WP  | Weldon      | 6           | 6            | 5.5          | 3 | 6                         | 0          | 76        | -          | no coating |
| AN3F 060R050 TC | Cylindrical | 6           | 6            | 5.5          | 3 | 6                         | 0          | 76        | 0.5        | no coating |
| AN3F 060R050 WP | Weldon      | 6           | 6            | 5.5          | 3 | 6                         | 0          | 76        | 0.5        | no coating |
| AN3F 060R100 TC | Cylindrical | 6           | 6            | 5.5          | 3 | 6                         | 0          | 76        | 1.0        | no coating |
| AN3F 060R100 WP | Weldon      | 6           | 6            | 5.5          | 3 | 6                         | 0          | 76        | 1.0        | no coating |
| AN3F060R0200TC  | Cylindrical | 6           | 6            | 5.5          | 3 | 6                         | 0          | 76        | 2.0        | no coating |
| AN3F060R0200WP  | Weldon      | 6           | 6            | 5.5          | 3 | 6                         | 0          | 76        | 2.0        | no coating |
| AN3F080R00TC    | Cylindrical | 8           | 8            | 7.5          | 3 | 8                         | 40         | 100       | -          | no coating |
| AN3F080R00WP    | Weldon      | 8           | 8            | 7.5          | 3 | 8                         | 40         | 100       | -          | no coating |
| AN3F080R0100TC  | Cylindrical | 8           | 8            | 7.5          | 3 | 8                         | 40         | 100       | 1.0        | no coating |
| AN3F080R0100WP  | Weldon      | 8           | 8            | 7.5          | 3 | 8                         | 40         | 100       | 1.0        | no coating |
| AN3F080R0150TC  | Cylindrical | 8           | 8            | 7.5          | 3 | 8                         | 40         | 100       | 1.5        | no coating |
| AN3F080R0150WP  | Weldon      | 8           | 8            | 7.5          | 3 | 8                         | 40         | 100       | 1.5        | no coating |
| AN3F080R0200TC  | Cylindrical | 8           | 8            | 7.5          | 3 | 8                         | 40         | 100       | 2.0        | no coating |
| AN3F080R0200WP  | Weldon      | 8           | 8            | 7.5          | 3 | 8                         | 40         | 100       | 2.0        | no coating |
| AN3F100R00TC    | Cylindrical | 10          | 10           | 9.5          | 3 | 10                        | 50         | 110       | -          | no coating |
| AN3F100R00WP    | Weldon      | 10          | 10           | 9.5          | 3 | 10                        | 50         | 110       | -          | no coating |
| AN3F100R0100TC  | Cylindrical | 10          | 10           | 9.5          | 3 | 10                        | 50         | 110       | 1.0        | no coating |
| AN3F100R0100WP  | Weldon      | 10          | 10           | 9.5          | 3 | 10                        | 50         | 110       | 1.0        | no coating |
| AN3F100R0200TC  | Cylindrical | 10          | 10           | 9.5          | 3 | 10                        | 50         | 110       | 2.0        | no coating |
| AN3F100R0200WP  | Weldon      | 10          | 10           | 9.5          | 3 | 10                        | 50         | 110       | 2.0        | no coating |
| AN3F100R0400TC  | Cylindrical | 10          | 10           | 9.5          | 3 | 10                        | 50         | 110       | 4.0        | no coating |
| AN3F100R0400WP  | Weldon      | 10          | 10           | 9.5          | 3 | 10                        | 50         | 110       | 4.0        | no coating |
| AN3F120R00TC    | Cylindrical | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | -          | no coating |
| AN3F120R00WC    | Weldon      | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | -          | no coating |
| AN3F120R0100TC  | Cylindrical | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | 1.0        | no coating |
| AN3F120R0100WC  | Weldon      | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | 1.0        | no coating |
| AN3F120R0200TC  | Cylindrical | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | 2.0        | no coating |
| AN3F120R0200WC  | Weldon      | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | 2.0        | no coating |
| AN3F120R0300TC  | Cylindrical | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | 3.0        | no coating |
| AN3F120R0300WC  | Weldon      | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | 3.0        | no coating |
| AN3F120R0400TC  | Cylindrical | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | 4.0        | no coating |
| AN3F120R0400WC  | Weldon      | 12          | 12           | 11.5         | 3 | 12                        | 60         | 125       | 4.0        | no coating |
| AN3F140R00TC    | Cylindrical | 14          | 14           | 13.5         | 3 | 14                        | 70         | 125       | -          | no coating |
| AN3F140R00WC    | Weldon      | 14          | 14           | 13.5         | 3 | 14                        | 70         | 125       | -          | no coating |

[ continued ]

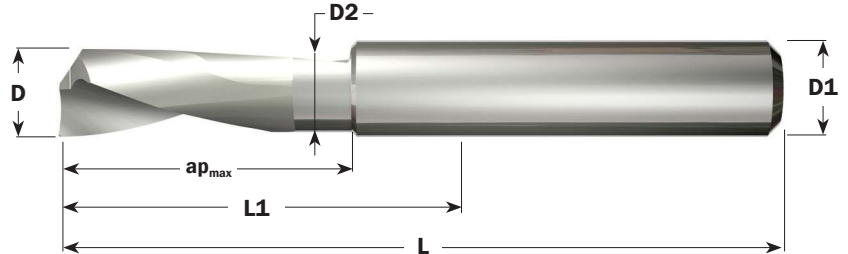
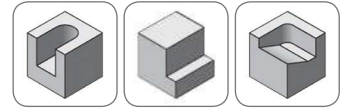
# AN3F series

## High performance solid carbide necked 3 flute mills for Aluminium and Aluminium alloys

[ continued ]

| Code            | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | Ø D2<br>[mm] | z | ap <sub>max</sub><br>[mm] | L1<br>[mm] | L<br>[mm] | Rε<br>[mm] | Coating    |
|-----------------|-------------|-------------|--------------|--------------|---|---------------------------|------------|-----------|------------|------------|
| AN3F 140R200 TC | Cylindrical | 14          | 14           | 13.5         | 3 | 14                        | 70         | 125       | 2.0        | no coating |
| AN3F 140R200 WC | Weldon      | 14          | 14           | 13.5         | 3 | 14                        | 70         | 125       | 2.0        | no coating |
| AN3F 140R400 TC | Cylindrical | 14          | 14           | 13.5         | 3 | 14                        | 70         | 125       | 4.0        | no coating |
| AN3F 140R400 WP | Weldon      | 14          | 14           | 13.5         | 3 | 14                        | 70         | 125       | 4.0        | no coating |
| AN3F 160R00 TC  | Cylindrical | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | -          | no coating |
| AN3F 160R00 WP  | Weldon      | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | -          | no coating |
| AN3F 160R100 TC | Cylindrical | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | 1.0        | no coating |
| AN3F 160R100 WP | Weldon      | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | 1.0        | no coating |
| AN3F 160R200 TC | Cylindrical | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | 2.0        | no coating |
| AN3F 160R200 WP | Weldon      | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | 2.0        | no coating |
| AN3F 160R400 TC | Cylindrical | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | 4.0        | no coating |
| AN3F 160R400 WP | Weldon      | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | 4.0        | no coating |
| AN3F 160R500 TC | Cylindrical | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | 5.0        | no coating |
| AN3F 160R500 WP | Weldon      | 16          | 16           | 15.5         | 3 | 16                        | 80         | 150       | 5.0        | no coating |
| AN3F 200R00 TC  | Cylindrical | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | -          | no coating |
| AN3F 200R00 WC  | Weldon      | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | -          | no coating |
| AN3F 200R100 TC | Cylindrical | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | 1.0        | no coating |
| AN3F 200R100 WC | Weldon      | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | 1.0        | no coating |
| AN3F 200R200 TC | Cylindrical | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | 2.0        | no coating |
| AN3F 200R200 WC | Weldon      | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | 2.0        | no coating |
| AN3F 200R400 TC | Cylindrical | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | 4.0        | no coating |
| AN3F 200R400 WC | Weldon      | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | 4.0        | no coating |
| AN3F 200R500 TC | Cylindrical | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | 5.0        | no coating |
| AN3F 200R500 WC | Weldon      | 20          | 20           | 19.5         | 3 | 20                        | 100        | 150       | 5.0        | no coating |
| AN3F 250R00 TC  | Cylindrical | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | -          | no coating |
| AN3F 250R00 WP  | Weldon      | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | -          | no coating |
| AN3F 250R200 TC | Cylindrical | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | 2.0        | no coating |
| AN3F 250R200 WP | Weldon      | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | 2.0        | no coating |
| AN3F 250R400 TC | Cylindrical | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | 4.0        | no coating |
| AN3F 250R400 WP | Weldon      | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | 4.0        | no coating |
| AN3F 250R500 TC | Cylindrical | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | 5.0        | no coating |
| AN3F 250R500 WP | Weldon      | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | 5.0        | no coating |
| AN3F 250R800 TC | Cylindrical | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | 8,0        | no coating |
| AN3F 250R800 WP | Weldon      | 25          | 25           | 24.5         | 3 | 25                        | 125        | 170       | 8,0        | no coating |

- Center cutting
- Helix angle 30°
- No coating guarantees sharp cutting edge
- Diameter according to tolerance h10



### Formulas

Cutting speed  $V_c = \frac{D \times \pi \times n}{1000}$

RPM  $n = \frac{V_c \times 1000}{\pi \times D}$

Feed per tooth  $f_z = \frac{V_f}{z \times n}$

Feedrate  $V_f = f_z \times z \times n$

### Notation

**D**, [mm] - diameter **z** - Number of teeth

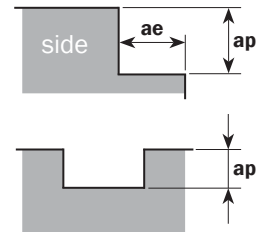
**V<sub>c</sub>**, [m/min] - Cutting speed

**f<sub>z</sub>**, [mm] - Feed per tooth

**n**, [1/min] - RPM

**V<sub>f</sub>**, [m/min] - Feedrate

**π** - 3.1415696



### Manufacturing tolerance

| Ø D1<br>[mm]   | Tolerance<br>[mm]<br>+/- | h10, | Ø D<br>[mm]    | Tolerance<br>[mm]<br>+/- | h6, |
|----------------|--------------------------|------|----------------|--------------------------|-----|
| ≤ 3            | 0 / 0.040                |      | ≤ 3            | 0 / 0.006                |     |
| > from 3 to 6  | 0 / 0.048                |      | > from 3 to 6  | 0 / 0.008                |     |
| > from 6 to 10 | 0 / 0.058                |      | > from 6 to 10 | 0 / 0.009                |     |

### Recommended feeds and speeds

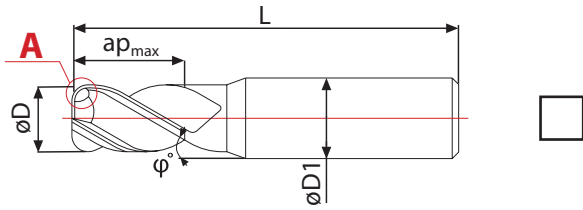
| Material group | Material                     | Milling |       |      | V <sub>c</sub> - Cutting speed<br>[m/min] | f <sub>z</sub> - Feed per tooth, [mm]<br>at 1 D, [mm] |       |       |
|----------------|------------------------------|---------|-------|------|-------------------------------------------|-------------------------------------------------------|-------|-------|
|                |                              | side    |       | slot |                                           |                                                       |       |       |
|                |                              | ap      | ae    | ap   |                                           | 3                                                     | 4     | 6     |
| <b>N</b>       | Free-machining aluminium     | 1,2xD   | 0.5xD | 1xD  | 500-1500                                  | 0.020                                                 | 0.025 | 0.040 |
| <b>N</b>       | Aluminium alloys with Si<12% | 1,2xD   | 0.5xD | 1xD  | 500-1500                                  | 0.015                                                 | 0.020 | 0.030 |

| Code           | Shank       | Ø D<br>[mm] | Ø D1<br>[mm] | Ø D2<br>[mm] | z | ap <sub>max</sub><br>[mm] | L1<br>[mm] | L<br>[mm] | Coating    |
|----------------|-------------|-------------|--------------|--------------|---|---------------------------|------------|-----------|------------|
| AN1F 030R00 TP | Cylindrical | 3           | 6            | 2,7          | 1 | 12                        | 12         | 50        | no coating |
| AN1F 040R00 TP | Cylindrical | 4           | 6            | 3,6          | 1 | 14                        | 14         | 60        | no coating |
| AN1F 060R00 TP | Cylindrical | 6           | 8            | 5.5          | 1 | 10                        | 16         | 50        | no coating |

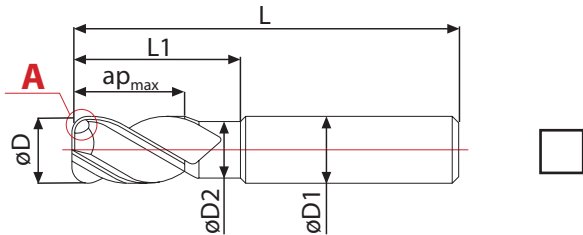
# Special endmill request proforma

## ENDMILL TYPE:

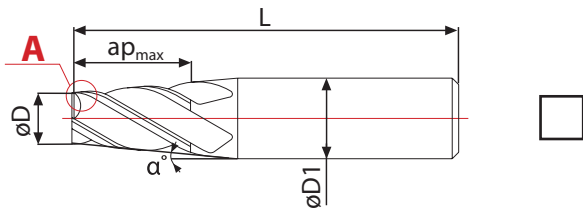
### Basic



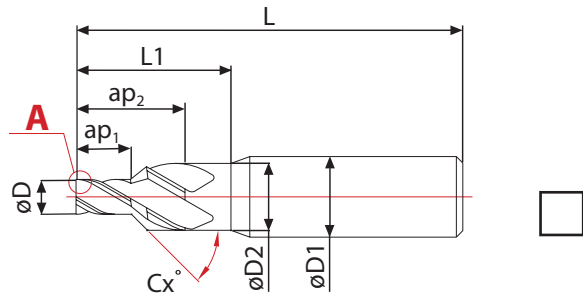
### With necking



### Tapered



### Step tool



## ENDMILL PARAMETERS:

Cutting diameter  $\phi D$  \_\_\_\_\_

Shank diameter  $\phi D1$  \_\_\_\_\_

Overall length  $L$  \_\_\_\_\_

Cutting length  $ap_{max}$  \_\_\_\_\_

Neck diameter  $\phi D2$  \_\_\_\_\_

Neck length  $L1$  \_\_\_\_\_

Taper angle  $\alpha^{\circ}$  \_\_\_\_\_

Number of teeth  $z$  \_\_\_\_\_

Helix angle  $\phi^{\circ}$  \_\_\_\_\_

Full cutting length  $ap_2$  \_\_\_\_\_

1st step cutting length  $ap_1$  \_\_\_\_\_

2-nd step chamfer angle  $Cx^{\circ}$  \_\_\_\_\_

Coating Yes ☐ No ☐

Application ☐ roughing ☐ finishing

Corner radius  $R\epsilon$  \_\_\_\_\_

Chamfer  $Ch$  \_\_\_\_\_

Ballnose  $R$  \_\_\_\_\_

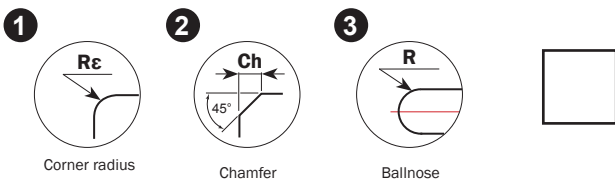
Material to cut \_\_\_\_\_

Sketch attached: ☐ Yes ☐ No

Number of pieces \_\_\_\_\_

Notes: \_\_\_\_\_

## ENDFACE TYPE (View A):



**Note** Optionally, Evolute can manufacture catalogue items with modified sizes. Please specify the series code and the dimensions to modify.

# NOTES

# evolute

faster machining



**LIVETOOLS.**  
Machine Tool People.  
[www.livetools.com.au](http://www.livetools.com.au)