evolute

faster machining

Technology Inside

AUSTRALIAN MADE

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

Endmill coding system

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

3 Number of teeth

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

4 End geometry

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

5 Tool diameter

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

6 Corner radius / chamfer

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

7 Corner radius / chamfer dimension

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

8 Shank

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

9 Coating

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

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

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					
V14F			●	Slotting and finishing side milling	2xD
R14F		●	●	Roughing	2xD
F18F			●	Precision side milling	2xD
High performance solid carbide endmills for high to medium strength materials					
H14B			●	Rough and finish 3D milling	1xD
H34F			●	Precision side milling	3xD
High performance solid carbide endmills for aluminium					
AN1F		●		Slotting and finishing side milling	2xD-4xD
A12F		●		Slotting and finishing side milling	2xD
A13F		●		Slotting and finishing side milling	2xD
A23F		●		Slotting and finishing side milling	3.5xD

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Number of teeth	Center cutting	Cutting diameter $Ø_{MIN}$–$Ø_{max}$, [mm]	Material to cut						Catalogue 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

Code	Picture	No coating	Coating TiAlN	Application	Maximum depth of cut (D-tool diameter)
General Purpose Solid Carbide Endmills					
B12F		●	●	Slotting and finishing side milling	2xD
B22F		●	●	Slotting and finishing side milling	3xD
B32F		●	●	Long reach slotting and finishing side milling	4xD-6xD
012B		●	●	Rough and finishing 3D milling	2xD
022B		●	●	Rough and finish 3D milling	3xD
032B		●	●	Long reach finishing 3D Milling	4xD-6xD
C13F		●	●	Slotting and finishing side milling	2xD
C23F		●	●	Slotting and finishing side milling	3xD
M14F		●	●	Slotting and finishing side milling	2xD
M24F		●	●	Finishing side milling	3xD
M34F		●	●	Long reach finishing side milling	4xD-6xD

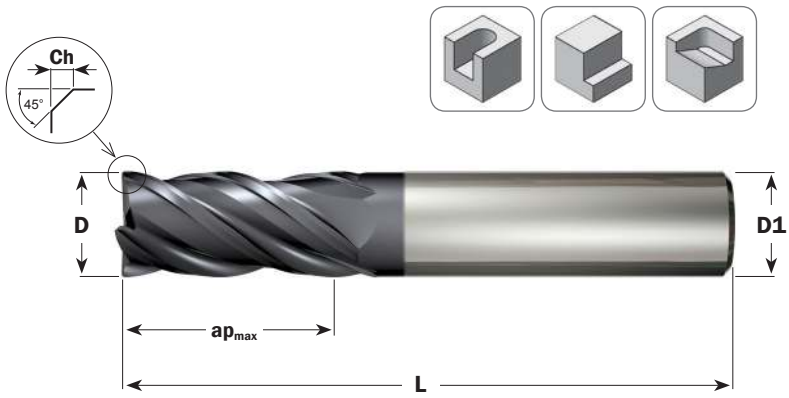
Table of contents

Number of teeth	Center cutting	Cutting diameter range, [mm]	Materials						Catalogue 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 - Number of teeth

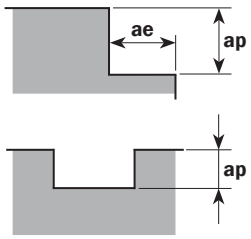
V_c, [m/min] - Cutting speed

f_z, [mm] - Feed per tooth

n, [1/min] - RPM

V_f, [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 to18	-0.032 / -0.059
> от 18 to 30	-0.040 / -0.073

Recommended feeds and speeds

Material group	Material	Milling side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 4	5	6	8	10	12	16	18	20	25
P	Мягкая 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
M	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
M	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
M	Tough stainless 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
K	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
S	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
S	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]

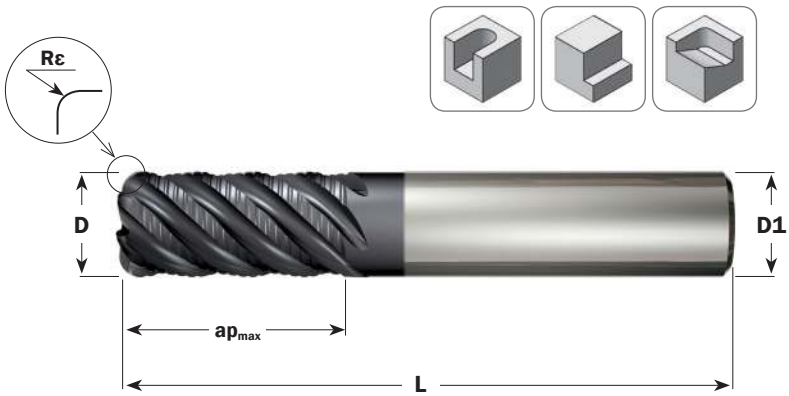
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Ch [mm]	Coating
V14F 120C050 TC	Cylindrical	12	12	4	26	83	0.5	TiAlN
V14F 120C050 WC	Weldon	12	12	4	26	83	0.5	TiAlN
V14F 140C050 TC	Cylindrical	14	14	4	26	83	0.5	TiAlN
V14F 140C050 WC	Weldon	14	14	4	26	83	0.5	TiAlN
V14F 160C050 TC	Cylindrical	16	16	4	32	92	0.5	TiAlN
V14F 160C050 WC	Weldon	16	16	4	32	92	0.5	TiAlN
V14F 180C050 TC	Cylindrical	18	18	4	32	92	0.5	TiAlN
V14F 180C050 WC	Weldon	18	18	4	32	92	0.5	TiAlN
V14F 200C050 TC	Cylindrical	20	20	4	38	104	0.5	TiAlN
V14F 200C050 WC	Weldon	20	20	4	38	104	0.5	TiAlN
V14F 250C050 TC	Cylindrical	25	25	4	45	121	0.5	TiAlN
V14F 250C050 WC	Weldon	25	25	4	45	121	0.5	TiAlN

R14F series

High performance multifluted solid carbide roughing mills, normal length

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

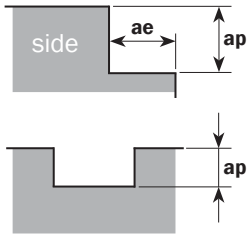
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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$_c$, [m/min] - Cutting speed
f$_z$, [mm] - Feed per tooth
n, [1/min - RPM
V$_f$, [mm/min] - Feedrate
π - 3.1416



Manufacturing tolerance

ø D [mm]	Tolerance d11 [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 side ap	Milling side ae	Milling slot ap	V$_c$ – Cutting speed [m/min] no coating	V$_c$ – Cutting speed [m/min] TiAlN	f$_z$ – Feed per tooth, [mm] at 1 D, [mm] 6	8	10	12	16	20	25
P	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
P	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
M	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
M	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
M	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
K	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
S	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
S	Titanium	1xD	0.4xD	0.4xD	15-20	30-50	0.025	0.030	0.035	0.045	0.060	0.075	0.080
H	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
H	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 [mm]	ø D1 [mm]	z	ap$_{max}$ [mm]	L [mm]	Rε [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]

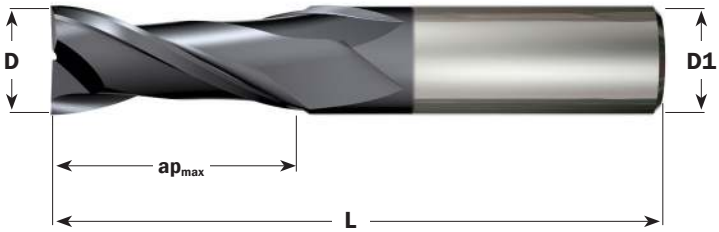
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Rε [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

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

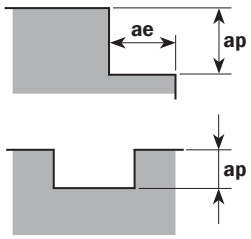
Spindle RPM $$n = \frac{V_c \times 1000}{\pi \times D}$$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 2	4	6	8	10	12	14	16	20
P	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	0.010
M	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	0.010
M	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
K	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
N	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
N	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]

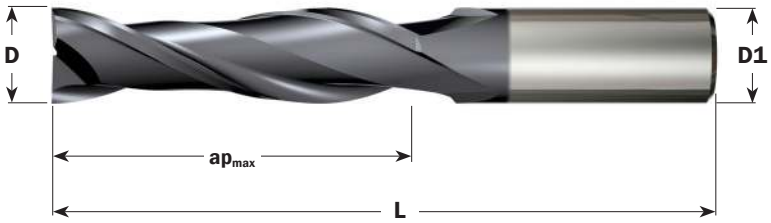
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 $V_c = \frac{D \times \pi \times n}{1000}$

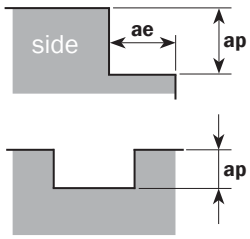
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 2	4	6	8	10	12	14	16	20
P	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
M	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
M	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
K	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
N	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
N	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$_{max}$ [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]

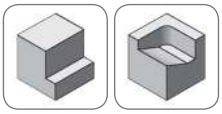
[continued]

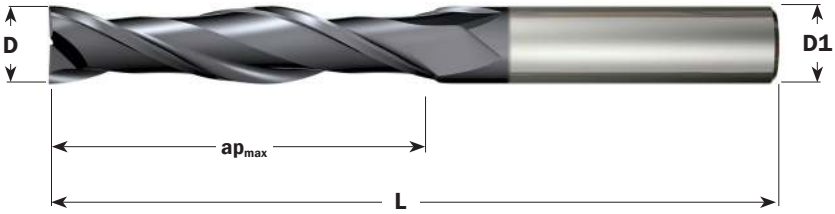
Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Coating
B22F 050R00 TC	Cylindrical	5	5	2	20	63	TiAlN
B22F 050R00 WC	Weldon	5	5	2	20	63	TiAlN
B22F 060R00 TP	Cylindrical	6	6	2	28	76	no coating
B22F 060R00 WP	Weldon	6	6	2	28	76	no coating
B22F 060R00 TC	Cylindrical	6	6	2	28	76	TiAlN
B22F 060R00 WC	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

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

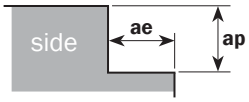
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 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 [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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]

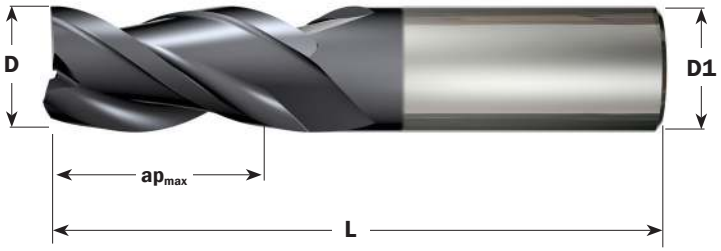
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 $V_c = \frac{D \times \pi \times n}{1000}$

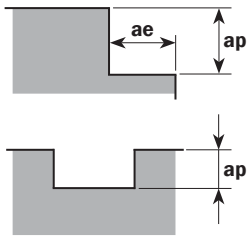
Spindle RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 to18	-0.032 / -0.059
> от 18 to 30	-0.040 / -0.073

Recommended feeds and speeds

Material group	Material	Milling side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 2	4	6	8	10	12	14	16	20
P	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
M	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
M	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
K	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
N	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
N	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_{max} [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]

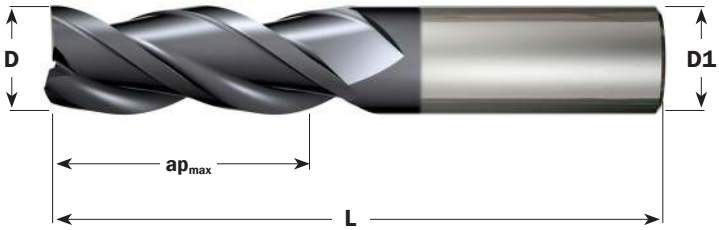
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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

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

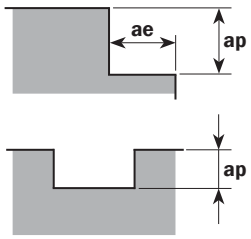
Spindle RPM $$n = \frac{V_c \times 1000}{\pi \times D}$$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 to18	-0.032 / -0.059
> от 18 to 30	-0.040 / -0.073

Recommended feeds and speeds

Material group	Material	Milling side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 2	4	6	8	10	12	14	16	20
P	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
M	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
M	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
K	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
N	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
N	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_{max} [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]

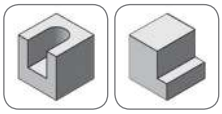
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 series

Solid carbide 4 flute general purpose mills, normal length

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



Formulas

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

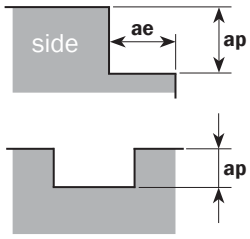
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 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 [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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]

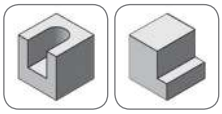
[continued]

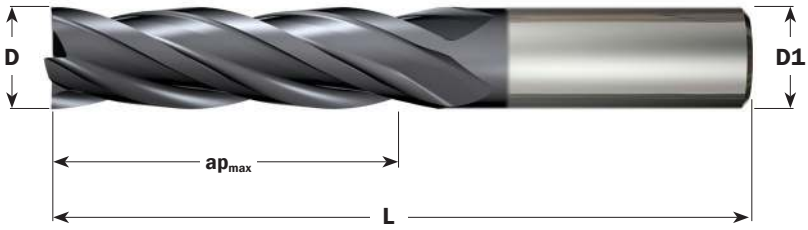
Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Coating
M14F 045R00 TC	Cylindrical	4.5	6	4	14	50	TiAlN
M14F 045R00 WC	Weldon	4.5	6	4	14	50	TiAlN
M14F 050R00 TP	Cylindrical	5	5	4	14	50	no coating
M14F 050R00 WP	Weldon	5	5	4	14	50	no coating
M14F 050R00 TC	Cylindrical	5	5	4	14	50	TiAlN
M14F 050R00 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 $$V_c = \frac{D \times \pi \times n}{1000}$$

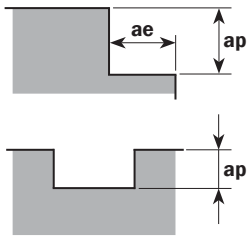
Spindle RPM $$n = \frac{V_c \times 1000}{\pi \times D}$$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 to18	-0.032 / -0.059
> от 18 to 30	-0.040 / -0.073

Recommended feeds and speeds

Material group	Material	Milling side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 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 [mm]	ø D1 [mm]	z	ap_{max} [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]

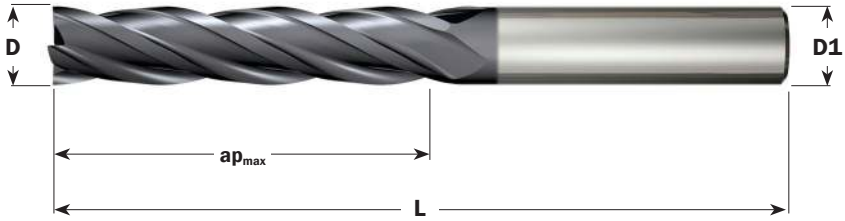
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 series

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

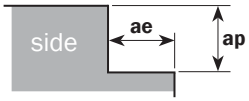
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 2	4	6	8	10	12	14	16	20
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_{max} [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]

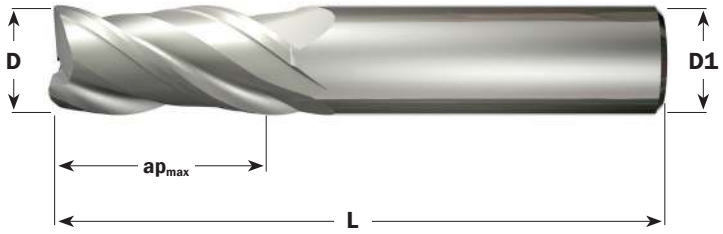
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 series

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

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



Formulas

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

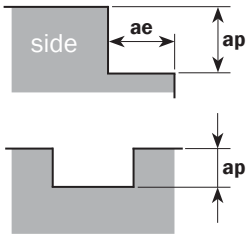
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	f_z – Feed per tooth, [mm] at 1 D, [mm] 3	4	6	8	10	12	16	20
N	Free machining alluminium 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	Alluminium 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_{max} [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]

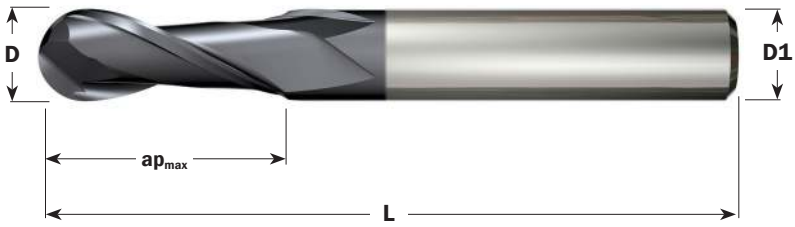
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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

012B series

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

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



Formulas

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

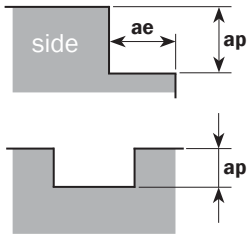
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 1	2	3	4	6	8	10	12	16	20
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_{max} [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]

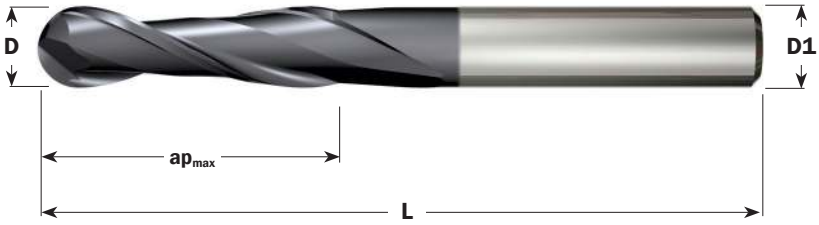
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 series

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

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



Formulas

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

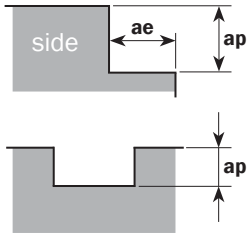
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 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 [mm]	ø D1 [mm]	z	ap$_{max}$ [mm]	L [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]

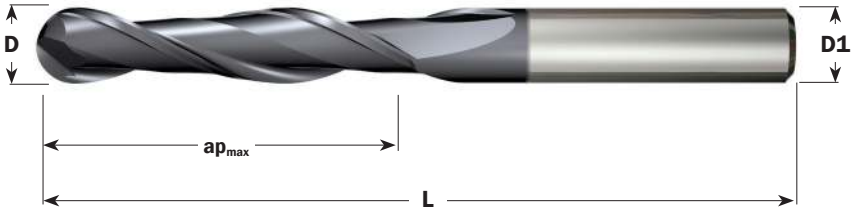
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 series

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

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



Formulas

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

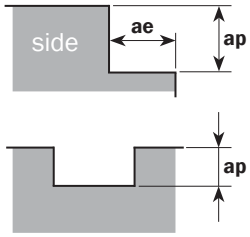
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 1	2	3	4	6	8	10	12	16	20
P	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
M	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
M	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
K	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
N	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
N	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_{max} [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]

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

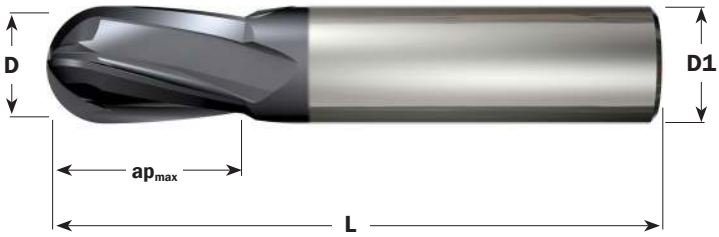
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 $V_c = \frac{D \times \pi \times n}{1000}$

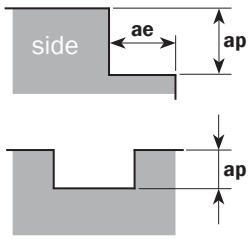
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 to18	-0.032 / -0.059

Recommended feeds and speeds for finishing

Material group	Material	Milling (чистовое) side ap	Milling (чистовое) side ae	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 2	3	4	6	8	10	12	16	20
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) side ap	Milling (semi-finishing) side ae	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 2	3	4	6	8	10	12	16	20
P	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
P	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
H	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
H	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
H	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
H	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

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

H14B series

Recommended feeds and speeds for roughing

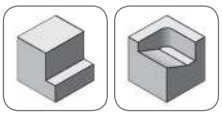
Material group	Material	Milling (roughing) side ap	Milling (roughing) side ae	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 2	3	4	6	8	10	12	16	20
P	Steel <36HRC	0,2xD	0.1xD	190-220	0.052	0.070	0.100	0.140	0,200	0.250	0,280	0.380	0.420
P	Steel 36~48HRC	0,2xD	0.1xD	170-190	0.048	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

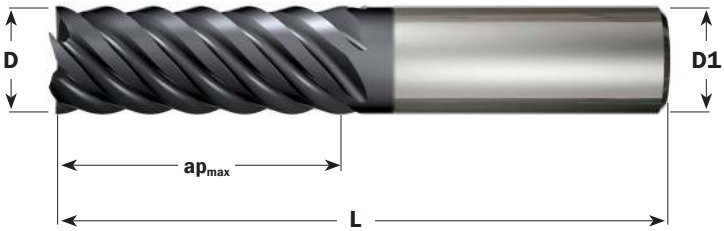
Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Coating
H14B 030R00 WC	Weldon	3	3	4	3	38	TiAlN
H14B 030R00 TC	Cylindrical	3	3	4	3	38	TiAlN
H14B 040R00 WC	Weldon	4	4	4	4	50	TiAlN
H14B 040R00 TC	Cylindrical	4	4	4	4	50	TiAlN
H14B 050R00 WC	Weldon	5	5	4	5	50	TiAlN
H14B 050R00 TC	Cylindrical	5	5	4	5	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

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

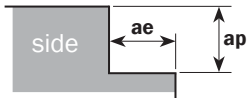
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 4	6	8	10	12	16	20	25
P	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
P	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
P	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
M	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
M	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
M	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
K	Cast iron	1.5xD	0.05xD	110-140	0.023	0.036	0.050	0.061	0.070	0.087	0.101	0.114
S	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
S	Titanium	1.5xD	0.05xD	45-65	0.016	0.026	0.037	0.045	0.052	0.064	0.074	0.084
H	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_{max} [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]

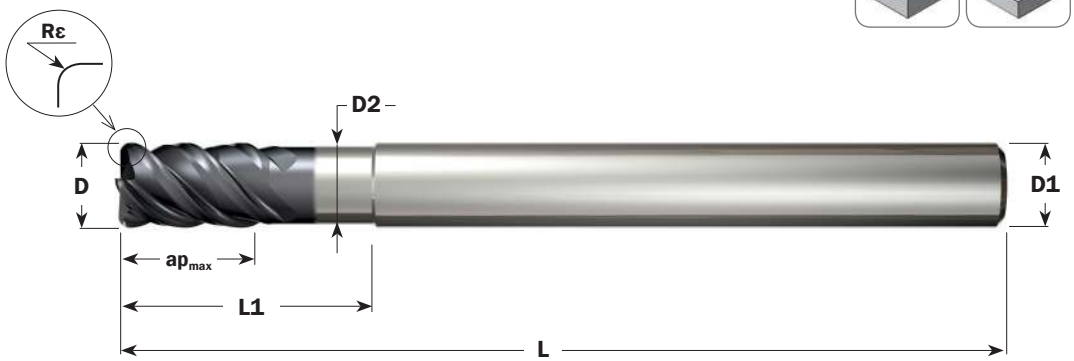
High performance multiflute solid carbide mill for superfinishing with OD, normal length

[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [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 $V_c = \frac{D \times \pi \times n}{1000}$

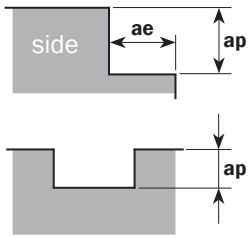
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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) side ap	side ae	slot ap	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 3	4	5	6	8	10	12	16	20	25
P	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
P	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
H	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
H	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
H	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
H	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

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

Recommended feeds and speeds for semi-finishing

Material group	Material	Milling (semi-finishing) side ap	side ae	slot ap	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 3	4	5	6	8	10	12	16	20	25
P	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
P	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
H	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
H	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
H	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
H	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) side ap	side ae	slot ap	V_c – Cutting speed [m/min] TiAlN	f_z – Feed per tooth, [mm] at 1 D, [mm] 3	4	5	6	8	10	12	16	20	25
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_{max} [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]

[continued]

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

[continued]

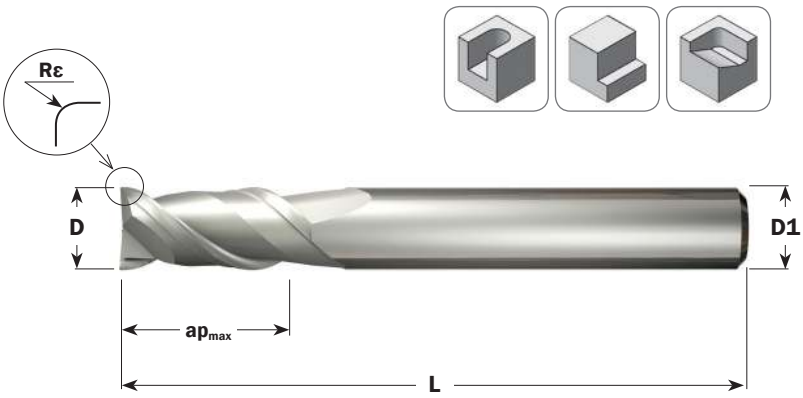
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	ø D2 [mm]	z	ap_{max} [mm]	L1 [mm]	L [mm]	Rε [mm]	Coating
H34F 120R200 TC	Cylindrical	12	12	11.5	4	18	36	125	2	TiAlN
H34F 120R200 WC	Weldon	12	12	11.5	4	18	36	125	2	TiAlN
H34F 160R000 TC	Cylindrical	16	16	15.5	4	24	48	125	-	TiAlN
H34F 160R000 WC	Weldon	16	16	15.5	4	24	48	125	-	TiAlN
H34F 160R050 TC	Cylindrical	16	16	15.5	4	24	48	125	0.5	TiAlN
H34F 160R050 WC	Weldon	16	16	15.5	4	24	48	125	0.5	TiAlN
H34F 160R150 TC	Cylindrical	16	16	15.5	4	24	48	125	1.5	TiAlN
H34F 160R150 WC	Weldon	16	16	15.5	4	24	48	125	1.5	TiAlN
H34F 200R000 TC	Cylindrical	20	20	19.5	4	30	60	150	-	TiAlN
H34F 200R000 WC	Weldon	20	20	19.5	4	30	60	150	-	TiAlN
H34F 200R050 TC	Cylindrical	20	20	19.5	4	30	60	150	0.5	TiAlN
H34F 200R050 WC	Weldon	20	20	19.5	4	30	60	150	0.5	TiAlN
H34F 200R200 TC	Cylindrical	20	20	19.5	4	30	60	150	2	TiAlN
H34F 200R200 WC	Weldon	20	20	19.5	4	30	60	150	2	TiAlN
H34F 250R000 TC	Cylindrical	25	25	24.5	4	38	75	150	-	TiAlN
H34F 250R000 WC	Weldon	25	25	24.5	4	38	75	150	-	TiAlN
H34F 250R050 TC	Cylindrical	25	25	24.5	4	38	75	150	0.5	TiAlN
H34F 250R050 WC	Weldon	25	25	24.5	4	38	75	150	0.5	TiAlN
H34F 250R300 TC	Cylindrical	25	25	24.5	4	38	75	150	3	TiAlN
H34F 250R300 WC	Weldon	25	25	24.5	4	38	75	150	3	TiAlN

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

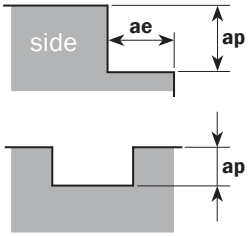
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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 side ap	Milling side ae	Milling slot ap	V_c – Cutting speed [m/min] no coating	f_z – Feed per tooth, [mm] at 1 D, [mm] 6	8	10	12	16	20	25
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_{max} [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 [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Rε [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]

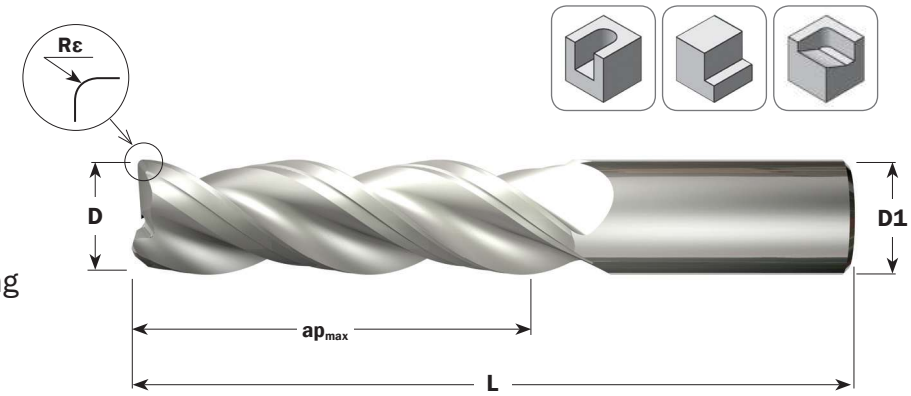
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Rε [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

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

A23F series

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

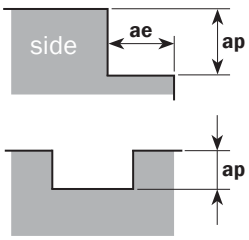
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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: side ap	Milling: side ae	Milling: slot ap	V_c – Cutting speed [m/min] no coating	f_z – Feed per tooth, [mm] at 1 D, [mm] 6	8	10	12	16	20	25
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 [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Rε [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]

[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Rε [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

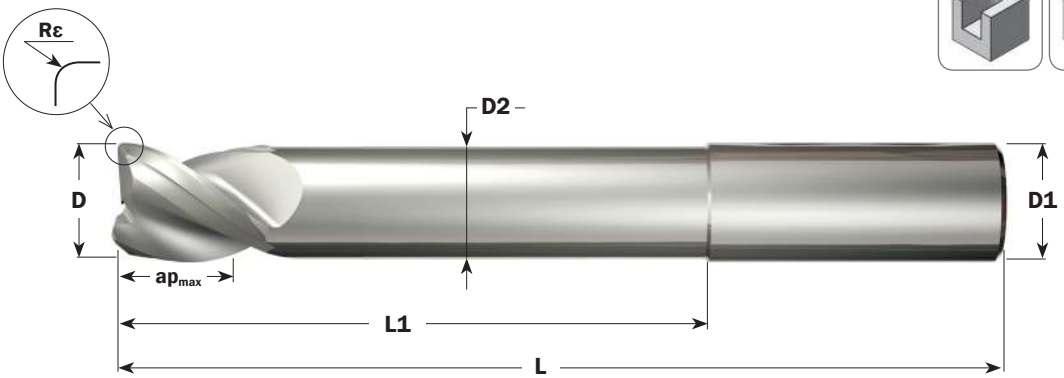
[continued]

[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	z	ap_{max} [mm]	L [mm]	Rε [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 $V_c = \frac{D \times \pi \times n}{1000}$

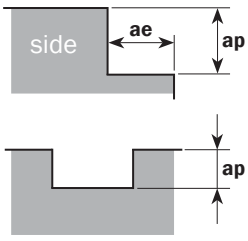
RPM $n = \frac{V_c \times 1000}{\pi \times D}$

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_c, [m/min] - Cutting speed
f_z, [mm] - Feed per tooth
n, [1/min] - RPM
V_f, [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_c – Cutting speed [m/min]	f_z – Feed per tooth, [mm] at 1 D, [mm]						
		side		slot								
		ap	ae	ap	no coating	6	8	10	12	16	20	25
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

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

Code	Shank	ø D [mm]	ø D1 [mm]	ø D2 [mm]	z	ap_{max} [mm]	L1 [mm]	L [mm]	Rε [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]

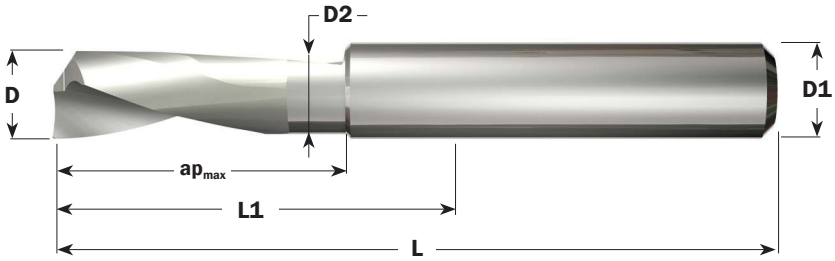
[continued]

Code	Shank	ø D [mm]	ø D1 [mm]	ø D2 [mm]	z	ap_{max} [mm]	L1 [mm]	L [mm]	Rε [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

High performance solid carbide necked single flute mills for Aluminium and Aluminium alloys

AN1F series

- 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

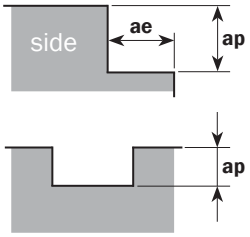
V_c, [m/min] - Cutting speed

f_z, [mm] - Feed per tooth

n, [1/min] - RPM

V_f, [m/min] - Feedrate

π - 3.1415696



Manufacturing tolerance

ø D1 [mm]	Tolerance h10, [mm] +/-	ø D [mm]	Tolerance h6, [mm] +/-
≤ 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

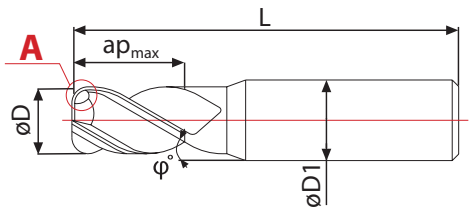
Material group	Material	Milling			V_c – Cutting speed [m/min]	f_z – Feed per tooth, [mm] at 1 D, [mm]		
		side		slot				
		ap	ae	ap	no coating	3	4	6
N	Free-machining alluminium	1,2xD	0.5xD	1xD	500-1500	0.020	0.025	0.040
N	Alluminium alloys with Si<12%	1,2xD	0.5xD	1xD	500-1500	0.015	0.020	0.030

Code	Shank	ø D [mm]	ø D1 [mm]	ø D2 [mm]	z	ap_{max} [mm]	L1 [mm]	L [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



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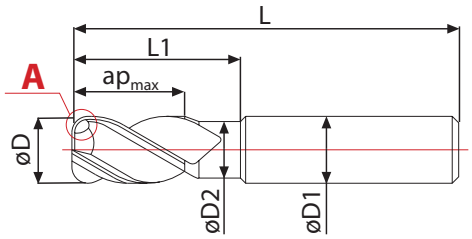
With necking



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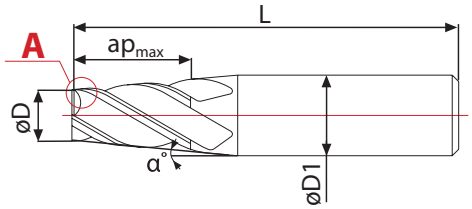
Tapered



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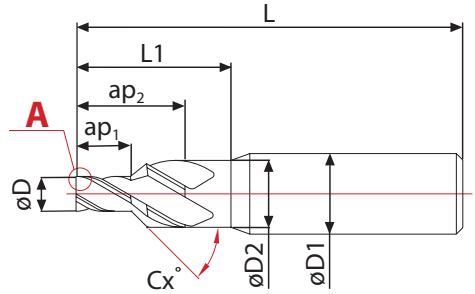
Step tool



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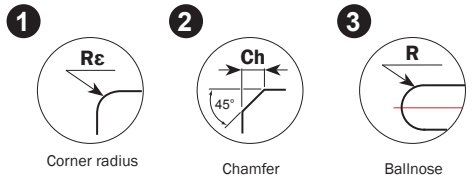
ENDFACE TYPE (View A):



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ENDMILL PARAMETERS:

Cutting diameter **øD** _____

Shank diameter **øD1** _____

Overall length **L** _____

Cutting length **ap_{max}** _____

Neck diameter **øD2** _____

Neck length **L1** _____

Taper angle **α°** _____

Number of teeth **z** _____

Helix angle **φ°** _____

Full cutting length **ap_2** _____

1st step cutting length **ap_1** _____

2-nd step chamfer angle **Cx°** _____

_____

Coating Yes ☐ No ☐

Application ☐ roughing ☐ finishing

Corner radius **Rε** _____

Chamfer **Ch** _____

Ballnose **R** _____

Material to cut

_____

Sketch attached: ☐ Yes ☐ No

Number of pieces _____

Notes: _____

_____

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

NOTES

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