



**NEW IN THE PFERD
PRODUCT RANGE**



Cutting tools for stationary applications

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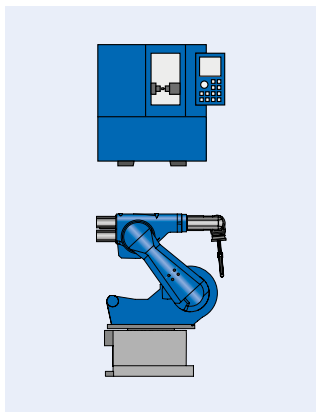
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PFERD



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SCM solid carbide end mills



Universal solid carbide end mills

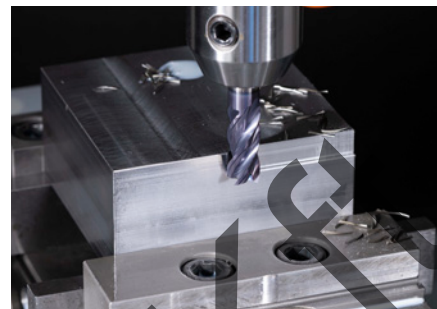
- Universal end mill with two cutting edges UC2 7
- Universal end mill with three cutting edges UC3 7
- Universal end mill with four cutting edges UC4 8
- Universal end mill with four cutting edges UC4 9
- Universal end mill with six/eight cutting edges UC6/8 10
- Universal deburring end mill UD 10
- Universal ball nose end mill UB 11



Cutting tools for stationary applications from PFERD

PFERD offers a range of cutting tools for the most common stationary applications.

PFERD solid carbide end mills are suitable for a wide range of milling operations on milling machines, machining centres and lathes with driven tool units. The tools' high stock removal rate ensures high productivity.



Technical customer support

If you have any questions about the optimization of your applications, our sales representatives and technical advisers will be happy to help or visit you. PFERD works alongside you to provide application engineering solutions for working with diverse materials. Please do not hesitate to contact us for further information. You can find our worldwide sales addresses at: www.pferd.com.



PFERD quality

PFERD solid carbide end mills are made from tungsten carbide optimized for specific applications and with very narrow manufacturing tolerances, and achieve the very highest quality standards. The quality of PFERD tools has been certified according to ISO 9001.



Custom-made products

If you cannot find the solution for your particular application in our catalogue range, we are happy to produce tools to meet your wishes and requirements. Our sales representatives and technical advisers will be happy to assist you in analyzing your task.

1. Process analysis

Make an appointment with our experienced sales representatives and technical advisers. **You can find our worldwide sales addresses at www.pferd.com.**

2. Production

Our production teams subsequently create a technical drawing with which your made-to-order product will be produced.

3. Application

See the quality, performance and economic value of PFERD tools for yourself!

Resharpener

All PFERD cutting tools for stationary applications can be reground. Please contact us for further information.



Cutting tools for stationary applications

Material suitability overview



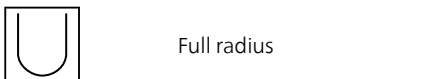
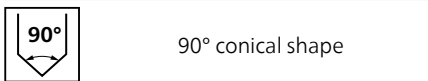
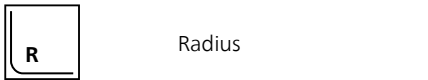
Material group			Universal ball nose end mill UB	Universal deburring end mill UD	Universal end mill with two cutting edges UC2	Universal end mill with three cutting edges UC3	Universal end mill with four cutting edges UC4	Universal end mill with six/eight cutting edges UC6/8
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	●	●	●	●	●	●
M	Stainless steel	Ferritic and martensitic	●	●	●	●	○	●
		Austenitic	●	●	●	●	○	●
		High-temperature-resistant and ferritic-austenitic (duplex)	○	●	○	○	○	○
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron)	●	●	●	●	●	●
		Cast iron with nodular graphite (GJS, GGG)	●	●	●	●	●	●
N	Non-ferrous metals	Aluminium	○	●	○	○	○	○
		Copper, brass, bronze, red brass	●	●	○	○	○	○
S	Super and titanium alloys	Heat-resistant super alloys based on Fe, Ni and Co		○		○	○	●
		Pure titanium		○		○	○	●
		Titanium alloys		○		○	○	●
H	Hard steels and chilled cast iron	Tempered and hardened steels up to 50 HRC	●	○	○	○	○	○
		Hardened steels up to 58 HRC	○					
		Hardened steels over 58 HRC						
O	Other (Non-ISO)	Thermoplastics	○	○	○	○	○	○
		Thermosetting plastics						
		GRP/CRP reinforced plastics, graphite						

● = Very well suited ○ = Suitable

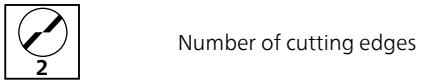


Geometry

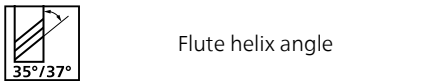
Corner design



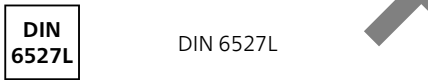
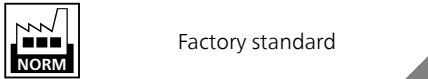
Number of cutting edges



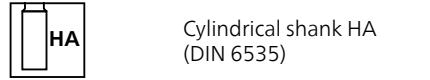
Flute helix



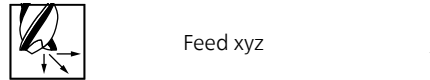
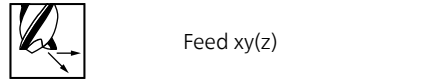
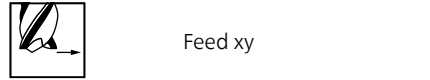
Standard



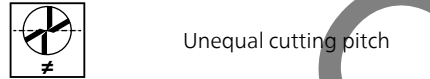
Shank type



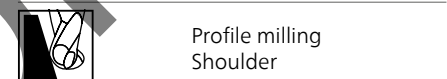
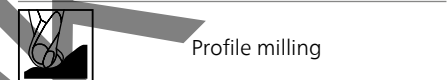
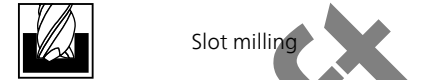
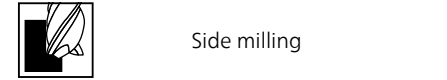
Feed direction



Unequal pitch



Applications



Formulae for cut data calculation

Rotational speed:

$$n = \frac{V_c \times 1.000}{DC \times \pi} \text{ min}^{-1}$$

Cutting speed:

$$V_c = \frac{DC \times \pi \times n}{1.000} \text{ m/min}$$

Table feed:

$$V_f = f_z \times ZEPF \times n \text{ mm/min}$$

Explanation of abbreviations:

DC	Cutting diameter in [mm]
f_z	Feed per tooth in [mm/tooth]
n	Spindle rotational speed in [U/min]
V_c	Cutting speed in [m/min]
V_f	Table feed in [mm/min]
ZEPF	Cutting edge count



Cutting tools for stationary applications

Explanation of item designation



SCM - UC4 - M100C - M72HB AL40

① Tool group

SCM = Solid carbide mill

② Product line

U = Universal Line

③ Shape

B = Ball nose
D = Deburring/Chamfering
C = Cylindrical with centre cut

④ Number of cutting edges

⑤ Material group

ISO groups P, M, K, N, S, H
Blank, unless specified.

⑥ Units

M = Metric

⑦ Cutting diameter

Metric: mm x 10

Example: D 10.5 mm = 105

⑧ Corner design

A = Angled
Example: A90°
C = Chamfer
R = Radius with size
Example: R40 for 4.0 mm
S = Sharp

⑨ Cut length class

XS: APMX < 1 x DC
S: APMX 1-2 x DC
M: APMX 2-2.5 x DC
L: APMX 2.5-3 x DC
XL: APMX > 3 x DC

⑩ Total length

Metric: Total length LF in mm.

Not specified for deburring end mills.

⑪ Shank type

HA = Cylindrical
HB = Weldon shank (DIN 6535)
Additional shank diameter for design with
DC < 6 mm and DCON = 6 mm

⑫ *

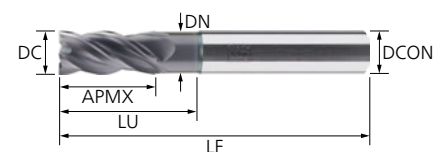
⑬ *

⑭ Grade

*Optional

Explanation of short names in accordance with ISO 13399

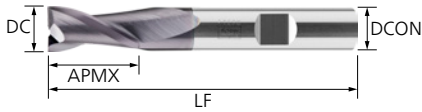
DIN ISO 13399 short name	Designation
APMX	Maximum depth of cut
CHW	Chamfer width
DC	Cutting diameter
DCON	Shank diameter
DN	Neck diameter
KAPR	Tool cutting edge angle
LF	Total/Functional length
LU	Usable length
RE	Corner radius
ZEFP	Cutting edge count





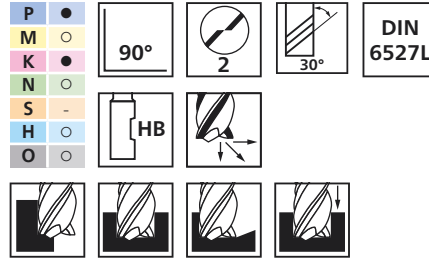
Universal solid carbide end mills

Universal end mill with two cutting edges UC2



Sharp corner design

End mills for full slot milling, drill slot milling and for roughing with high contact widths. The solid tungsten carbide end mills are suitable for universal use on a variety of materials.

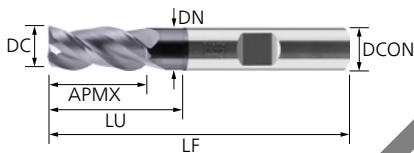


Special features:

- High productivity due to optimum stock removal rate.
- Long tool life due to modern tool coating.
- Good chip removal due to very large chip space.

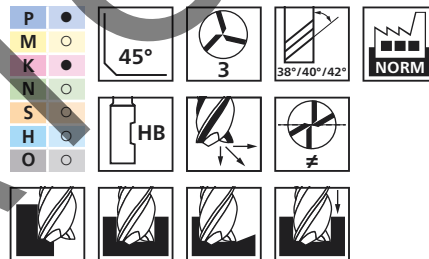
DC [mm]	DCON [mm]	APMX [mm]	LF [mm]	ZEFP		Item no.	Designation
Long HB							
4	6	8	57	2	1	23000124	SCM-UC2-M040S-S57HB6 AL40
5	6	10	57	2	1	23000125	SCM-UC2-M050S-S57HB6 AL40
6	6	10	57	2	1	23000126	SCM-UC2-M060S-S57HB6 AL40
8	8	16	63	2	1	23000127	SCM-UC2-M080S-S63HB6 AL40
10	10	19	72	2	1	23000128	SCM-UC2-M100S-S72HB6 AL40
12	12	22	83	2	1	23000129	SCM-UC2-M120S-S83HB6 AL40
16	16	26	92	2	1	23000130	SCM-UC2-M160S-S92HB6 AL40

Universal end mill with three cutting edges UC3



Chamfer corner design

End mills for full slot milling, drill slot milling and for a wide range of roughing tasks. The solid tungsten carbide end mills are suitable for universal use on a variety of materials.



Special features:

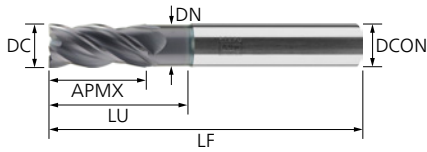
- High productivity due to optimum stock removal rate.
- Long tool life due to modern tool coating.
- Design with neck chip channel.

DC [mm]	DCON [mm]	DN [mm]	APMX [mm]	LF [mm]	LU [mm]	CHW [mm]	ZEFP		Item no.	Designation
Long HB										
3	6	2.8	8	57	11	0.1	3	1	23000131	SCM-UC3-M030C-M57HB6 AL40
4	6	3.7	11	57	16	0.1	3	1	23000132	SCM-UC3-M040C-M57HB6 AL40
5	6	4.7	13	57	18	0.15	3	1	23000133	SCM-UC3-M050C-M57HB6 AL40
6	6	5.6	13	57	18	0.2	3	1	23000134	SCM-UC3-M060C-M57HB6 AL40
8	8	7.5	19	63	26	0.2	3	1	23000135	SCM-UC3-M080C-M63HB6 AL40
10	10	9.5	22	72	32	0.2	3	1	23000136	SCM-UC3-M100C-M72HB6 AL40
12	12	11	26	83	36	0.3	3	1	23000137	SCM-UC3-M120C-M83HB6 AL40
16	16	15	32	92	42	0.3	3	1	23000138	SCM-UC3-M160C-M92HB6 AL40



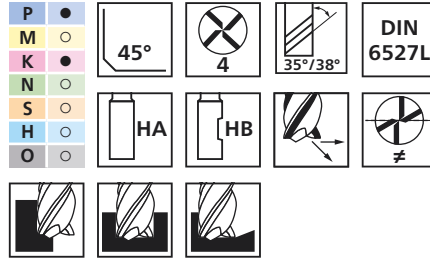
Universal solid carbide end mills

Universal end mill with four cutting edges UC4



Chamfer corner design

End mills for various applications, from roughing through to finishing and ramping. The solid tungsten carbide end mills are suitable for universal use on a variety of materials.

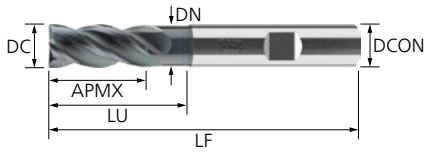


Special features:

- High productivity due to optimum stock removal rate.
- Long tool life due to modern tool coating.
- Design with neck chip channel.

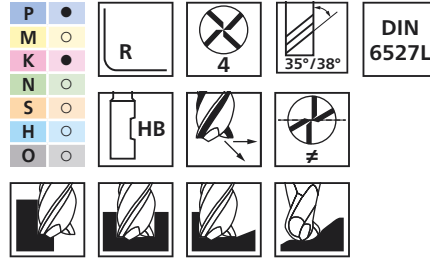
DC [mm]	DCON [mm]	DN [mm]	APMX [mm]	LF [mm]	LU [mm]	CHW [mm]	ZEFP		Item no.	Designation
Long HA										
3	6	2.8	8	57	18	0.13	4	1	23000148	SCM-UC4-M030C-M57HA6 AL40
4	6	3.6	11	57	21	0.13	4	1	23000149	SCM-UC4-M040C-M57HA6 AL40
5	6	4.6	13	57	21	0.2	4	1	23000150	SCM-UC4-M050C-M57HA6 AL40
6	6	5.5	13	57	21	0.2	4	1	23000151	SCM-UC4-M060C-M57HA AL40
8	8	7.5	19	63	27	0.2	4	1	23000152	SCM-UC4-M080C-M63HA AL40
10	10	9.5	22	72	32	0.2	4	1	23000153	SCM-UC4-M100C-M72HA AL40
12	12	11.5	26	83	38	0.3	4	1	23000154	SCM-UC4-M120C-M83HA AL40
16	16	15.5	32	92	44	0.3	4	1	23000155	SCM-UC4-M160C-M92HA AL40
20	20	19.5	38	104	54	0.4	4	1	23000156	SCM-UC4-M200C-M104HA AL40
Long HB										
3	6	2.8	8	57	18	0.13	4	1	23000139	SCM-UC4-M030C-M57HB6 AL40
4	6	3.6	11	57	21	0.13	4	1	23000140	SCM-UC4-M040C-M57HB6 AL40
5	6	4.6	13	57	21	0.2	4	1	23000141	SCM-UC4-M050C-M57HB6 AL40
6	6	5.5	13	57	21	0.2	4	1	23000142	SCM-UC4-M060C-M57HB AL40
8	8	7.5	19	63	27	0.2	4	1	23000143	SCM-UC4-M080C-M63HB AL40
10	10	9.5	22	72	32	0.2	4	1	23000144	SCM-UC4-M100C-M72HB AL40
12	12	11.5	26	83	38	0.3	4	1	23000145	SCM-UC4-M120C-M83HB AL40
16	16	15.5	32	92	44	0.3	4	1	23000146	SCM-UC4-M160C-M92HB AL40
20	20	19.5	38	104	54	0.4	4	1	23000147	SCM-UC4-M200C-M104HB AL40





Radius corner design

End mills for various applications, from roughing through to finishing. The radius design is also suitable for free-form profile cutting. The solid tungsten carbide end mills can be used universally on a large number of materials.



Special features:

- High productivity due to optimum stock removal rate.
- Long tool life due to modern tool coating.
- Design with neck chip channel.

DC [mm]	DCON [mm]	DN [mm]	APMX [mm]	LF [mm]	LU [mm]	RE [mm]	ZEPF		Item no.	Designation
Long HB										
8	8	7.5	19	63	27	0.5	4	1	23000157	SCM-UC4-M080R05-M63HB AL40
						1	4	1	23000158	SCM-UC4-M080R10-M63HB AL40
						1.5	4	1	23000159	SCM-UC4-M080R15-M63HB AL40
						2	4	1	23000160	SCM-UC4-M080R20-M63HB AL40
10	10	9.5	22	72	32	0.5	4	1	23000161	SCM-UC4-M100R05-M72HB AL40
						1	4	1	23000162	SCM-UC4-M100R10-M72HB AL40
						1.5	4	1	23000163	SCM-UC4-M100R15-M72HB AL40
						2	4	1	23000164	SCM-UC4-M100R20-M72HB AL40
12	12	11.5	26	83	38	0.5	4	1	23000165	SCM-UC4-M120R05-M83HB AL40
						1	4	1	23000166	SCM-UC4-M120R10-M83HB AL40
						1.5	4	1	23000167	SCM-UC4-M120R15-M83HB AL40
						2	4	1	23000168	SCM-UC4-M120R20-M83HB AL40
16	16	15.5	32	92	44	1	4	1	23000169	SCM-UC4-M160R10-M92HB AL40
						1.5	4	1	23000170	SCM-UC4-M160R15-M92HB AL40
						2	4	1	23000171	SCM-UC4-M160R20-M92HB AL40
						1	4	1	23000172	SCM-UC4-M200R10-M104HB AL40
20	20	19.5	38	104	54	1	4	1	23000172	SCM-UC4-M200R10-M104HB AL40
						2	4	1	23000173	SCM-UC4-M200R20-M104HB AL40

LEGAT



Universal solid carbide end mills

Universal end mill with six/eight cutting edges UC6/8



Sharp corner design

End mills for finishing and for trimming of workpiece contours. The low tool deflection allows very precise working. The solid tungsten carbide end mills are suitable for universal use on a variety of materials.

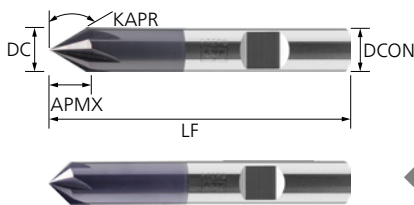
P ●	○	90°	6-8	45°	NORM
M ●	○				
K ●	○				
N ●	○				
S ●	○				
H ●	○	HA			
O ●	○				

Special features:

- High surface quality.
- High productivity due to optimum stock removal rate.
- Long tool life due to modern tool coating.

DC [mm]	DCON [mm]	APMX [mm]	LF [mm]	ZEFP		Item no.	Designation
Long HA							
6	6	13	57	6	1	23000174	SCM-UC6-M060S-M57HA AL40
8	8	19	63	6	1	23000175	SCM-UC6-M080S-M63HA AL40
10	10	22	72	6	1	23000176	SCM-UC6-M100S-M72HA AL40
12	12	26	83	6	1	23000177	SCM-UC6-M120S-M83HA AL40
16	16	32	92	6	1	23000178	SCM-UC6-M160S-S92HA AL40
20	20	38	104	8	1	23000179	SCM-UC8-M200S-S104HA AL40

Universal deburring end mill UD



Conical shape

End mills for deburring and chamfering. The solid tungsten carbide end mills are suitable for universal use on a variety of materials.

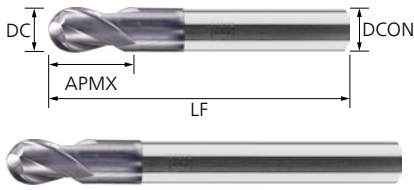
P ●	○	60°	90°	4-6	0°
M ●	○				
K ●	○				
N ●	○				
S ●	○				
H ●	○	NORM	HB		
O ●	○				

Special features:

- High productivity due to optimum stock removal rate.
- Long tool life due to modern tool coating.

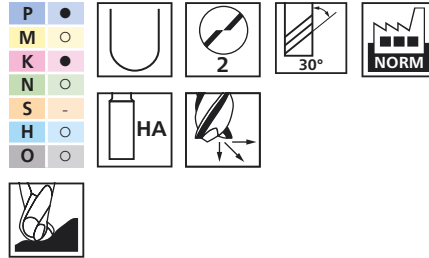
DC [mm]	DCON [mm]	APMX [mm]	LF [mm]	KAPR	ZEFP		Item no.	Designation
60° HB								
6	6	5.2	57	60	4	1	23000116	SCM-UD4-M060A60°-HB AL40
8	8	6.9	63	60	5	1	23000117	SCM-UD5-M080A60°-HB AL40
10	10	8.7	72	60	6	1	23000118	SCM-UD6-M100A60°-HB AL40
12	12	10.4	83	60	6	1	23000119	SCM-UD6-M120A60°-HB AL40
90° HB								
6	6	3	57	45	4	1	23000120	SCM-UD4-M060A90°-HB AL40
8	8	4	63	45	5	1	23000121	SCM-UD5-M080A90°-HB AL40
10	10	5	72	45	6	1	23000122	SCM-UD6-M100A90°-HB AL40
12	12	6	83	45	6	1	23000123	SCM-UD6-M120A90°-HB AL40






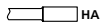

Full radius

End mills for free-form profile cutting. The solid tungsten carbide end mills are suitable for universal use on a variety of materials.



Special features:

- High productivity due to optimum stock removal rate.
- Long tool life due to modern tool coating.

DC [mm]	DCON [mm]	APMX [mm]	LF [mm]	RE [mm]	ZEFP		Item no.	Designation
Long HA 								
3	6	5	54	1.5	2	1	23000100	SCM-UB2-M030R-S54HA6 AL40
4	6	8	54	2	2	1	23000101	SCM-UB2-M040R-S54HA6 AL40
5	6	9	54	2.5	2	1	23000102	SCM-UB2-M050R-S54HA6 AL40
6	6	10	54	3	2	1	23000103	SCM-UB2-M060R-S54HA AL40
8	8	12	58	4	2	1	23000104	SCM-UB2-M080R-S58HA AL40
10	10	14	66	5	2	1	23000105	SCM-UB2-M100R-S66HA AL40
12	12	16	73	6	2	1	23000106	SCM-UB2-M120R-S73HA AL40
16	16	22	82	8	2	1	23000107	SCM-UB2-M160R-S82HA AL40
Extra long HA 								
3	6	5	80	1.5	2	1	23000108	SCM-UB2-M030R-S80HA6 AL40
4	6	8	80	2	2	1	23000109	SCM-UB2-M040R-S80HA6 AL40
5	6	9	100	2.5	2	1	23000110	SCM-UB2-M050R-S100HA6 AL40
6	6	10	100	3	2	1	23000111	SCM-UB2-M060R-S100HA AL40
8	8	12	100	4	2	1	23000112	SCM-UB2-M080R-S100HA AL40
10	10	14	100	5	2	1	23000113	SCM-UB2-M100R-S100HA AL40
12	12	16	100	6	2	1	23000114	SCM-UB2-M120R-S100HA AL40
16	16	22	150	8	2	1	23000115	SCM-UB2-M160R-S150HA AL40




Cutting tools for stationary applications

Universal solid carbide end mills

Ask your PFERD advisor now about our solid carbide end mills for general use.

Recommended cutting speeds [m/min]

Material group			Specification/ example material	Suitability	Full slot milling $a_p = 1 \times D$; $a_e = 1 \times D$ 									
					Cutting speed v_c [m/min]	Feed per tooth f_z [mm/tooth] for cutting diameter DC [mm]								
						4	5	6	8	10	12	16	20	
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	90	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
			500 to 700 N/mm ²	•	85	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
			700 to 1,000 N/mm ²	•	80	0.02	0.02	0.02	0.03	0.04	0.045	0.055	0.07	
			1,000 to 1,400 N/mm ²	•	70	0.02	0.02	0.02	0.03	0.04	0.045	0.055	0.07	
M	Stainless steel	Ferritic and martensitic	e.g. 1.4105, 1.4122	•	55	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
			Austenitic	e.g. 1.4301, 1.4571	•	55	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13
			High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4362, 1.4462	◦	45	0.018	0.018	0.02	0.025	0.03	0.04	0.05	0.065
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron)	Up to 180 HB	•	80	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
			Cast iron with nodular graphite (GJS, GGG)	160 to 260 HB	•	65	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13
N	Non-ferrous metals	Aluminium	Al up to 10% Si	◦	135	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
			Alu > 10% Si	◦	110	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
			Copper, brass, bronze and red brass		◦	90	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13
S	Super and titanium alloys	Heat-resistant super alloys	Fe, Ni, or Co-based											
		Pure titanium												
		Titanium alloys												
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	◦	60	0.02	0.02	0.02	0.03	0.04	0.055	0.06	0.07	
			Up to 58 HRC > 58 HRC											
O	Other (Non-ISO)	Thermoplastics		◦	90	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
		Thermosetting plastics												
		GRP/CRP reinforced plastics, graphite												

• = Very well suited ◦ = Suitable




Universal solid carbide end mills

Universal end mill with two cutting edges UC2




Recommended cutting speeds [m/min]

Material group			Specification/ example material	Suitability	Side milling $a_p = 1 \times D$; $a_e = 0.1 \times D$ 									
					Cutting speed v_c [m/min]	Feed per tooth f_z [mm/tooth] for cutting diameter DC [mm]								
						4	5	6	8	10	12	16	20	
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	210	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2	
			500 to 700 N/mm ²	•	190	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2	
			700 to 1,000 N/mm ²	•	170	0.025	0.025	0.035	0.045	0.06	0.07	0.08	0.1	
			1,000 to 1,400 N/mm ²	•	150	0.025	0.025	0.035	0.045	0.06	0.07	0.08	0.1	
M	Stainless steel	Ferritic and martensitic	e.g. 1.4105, 1.4122	•	120	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2	
			Austenitic	e.g. 1.4301, 1.4571	•	120	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2
			High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4362, 1.4462	◦	90	0.025	0.025	0.033	0.038	0.045	0.06	0.08	0.1
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron)	Up to 180 HB	•	180	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2	
			Cast iron with nodular graphite (GJS, GGG)	160 to 260 HB	•	140	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2
N	Non-ferrous metals	Aluminium	Al up to 10% Si	◦	250	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2	
			Alu > 10% Si	◦	200	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2	
			Copper, brass, bronze and red brass	◦	200	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2	
S	Super and titanium alloys	Heat-resistant super alloys	Fe, Ni, or Co-based											
		Pure titanium												
		Titanium alloys												
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	◦	75	0.025	0.025	0.035	0.045	0.06	0.07	0.08	0.1	
			Up to 58 HRC											
O	Other (Non-ISO)	Thermoplastics		◦	200	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2	
		Thermosetting plastics												
		GRP/CRP reinforced plastics, graphite												

• = Very well suited ◦ = Suitable



Recommended cutting speeds [m/min]

Material group			Specification/ example material	Suitability	Full slot milling $a_p = 1 \times D$; $a_e = 1 \times D$ 										
					Cutting speed v_c [m/min]	Feed per tooth f_z [mm/tooth] for cutting diameter DC [mm]									
						3	4	5	6	8	10	12	16	20	
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	130	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1	
			500 to 700 N/mm ²	•	120	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1	
			700 to 1,000 N/mm ²	•	100	0.01	0.016	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
			1,000 to 1,400 N/mm ²	•	80	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
M	Stainless steel	Ferritic and martensitic Austenitic High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4105,1.4122	•	45	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
			e.g. 1.4301,1.4571	•	50	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
			e.g. 1.4362,1.4462	◦	40	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron) Cast iron with nodular graphite (GJS, GGG)	Up to 180 HB	•	130	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1	
			160 to 260 HB	•	100	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1	
N	Non-ferrous metals	Aluminium Copper, brass, bronze and red brass	Al up to 10% Si	◦	135	0.03	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
			Alu > 10% Si	◦	110	0.03	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
				◦	90	0.03	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
S	Super and titanium alloys	Heat-resistant super alloys Pure titanium Titanium alloys	Fe, Ni, or Co-based	◦	35	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
				◦	100	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
				◦	50	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	◦	60	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07	
			Up to 58 HRC												
			> 58 HRC												
O	Other (Non-ISO)	Thermoplastics Thermosetting plastics GRP/CRP reinforced plastics, graphite		◦	110	0.025	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	

• = Very well suited ◦ = Suitable




Universal solid carbide end mills

Universal end mill with three cutting edges UC3




Recommended cutting speeds [m/min]

Material group		Specification/ example material	Suitability	Side milling $a_p = 1 \times D$; $a_e = 0.4 \times D$ 										
				Cutting speed v_c [m/min]	Feed per tooth f_z [mm/tooth] for cutting diameter DC [mm]									
					3	4	5	6	8	10	12	16	20	
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	180	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12
			500 to 700 N/mm ²	•	160	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12
			700 to 1,000 N/mm ²	•	150	0.01	0.016	0.025	0.025	0.035	0.055	0.055	0.07	0.085
			1,000 to 1,400 N/mm ²	•	110	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
M	Stainless steel	Ferritic and martensitic	e.g. 1.4105, 1.4122	•	70	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
			Austenitic	•	75	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
			High-temperature-resistant and ferritic-austenitic (duplex)	○	60	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron)	Up to 180 HB	•	180	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12
			Cast iron with nodular graphite (GJS, GGG)	•	140	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12
N	Non-ferrous metals	Aluminium	Al up to 10% Si	○	250	0.04	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2
			Alu > 10% Si	○	200	0.04	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2
			Copper, brass, bronze and red brass	○	200	0.04	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2
S	Super and titanium alloys	Heat-resistant super alloys	Fe, Ni, or Co-based	○	45	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
			Pure titanium	○	110	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
			Titanium alloys	○	60	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	○	75	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
			Up to 58 HRC											
			> 58 HRC											
O	Other (Non-ISO)	Thermoplastics		○	200	0.04	0.05	0.05	0.065	0.075	0.09	0.12	0.16	0.2
			Thermosetting plastics											
			GRP/CRP reinforced plastics, graphite											

• = Very well suited ○ = Suitable



Recommended cutting speeds [m/min]

Material group			Specification/ example material	Suitability	Full slot milling $a_p = 1 \times D$; $a_e = 1 \times D$ 									
					Cutting speed v_c [m/min]	Feed per tooth f_z [mm/tooth] for cutting diameter DC [mm]								
						3	4	5	6	8	10	12	16	20
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	135	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1
			500 to 700 N/mm ²	•	130	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1
			700 to 1,000 N/mm ²	•	110	0.01	0.016	0.02	0.02	0.03	0.045	0.045	0.06	0.07
			1,000 to 1,400 N/mm ²	•	80	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07
M	Stainless steel	Ferritic and martensitic Austenitic High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4105,1.4122	○	70	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07
			e.g. 1.4301,1.4571	○	60	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07
			e.g. 1.4362,1.4462	○	50	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron) Cast iron with nodular graphite (GJS, GGG)	Up to 180 HB	•	130	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1
			160 to 260 HB	•	100	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1
N	Non-ferrous metals	Aluminium Alu > 10% Si Copper, brass, bronze and red brass	Al up to 10% Si	○	105	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.1	0.11
			Alu > 10% Si	○	180	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.1	0.11
				○	200	0.01	0.016	0.03	0.03	0.04	0.06	0.06	0.085	0.1
S	Super and titanium alloys	Heat-resistant super alloys Pure titanium Titanium alloys	Fe, Ni, or Co-based	○	35	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07
				○	100	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07
				○	50	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	○	60	0.01	0.012	0.02	0.02	0.03	0.045	0.045	0.06	0.07
			Up to 58 HRC											
			> 58 HRC											
O	Other (Non-ISO)	Thermoplastics Thermosetting plastics GRP/CRP reinforced plastics, graphite		○	180	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.1	0.11

• = Very well suited ○ = Suitable




Universal solid carbide end mills

Universal end mill with four cutting edges UC4



Recommended cutting speeds [m/min]

Material group		Specification/ example material	Suitability	Side milling $a_p = 2 \times D$; $a_e = 0.4 \times D$ 											
				Cutting speed v_c [m/min]	Feed per tooth f_z [mm/tooth] for cutting diameter DC [mm]										
					3	4	5	6	8	10	12	16	20		
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	180	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12	
			500 to 700 N/mm ²	•	160	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12	
			700 to 1,000 N/mm ²	•	150	0.01	0.016	0.025	0.025	0.035	0.055	0.055	0.07	0.085	
			1,000 to 1,400 N/mm ²	•	110	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085	
M	Stainless steel	Ferritic and martensitic	e.g. 1.4105, 1.4122	◦	85	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085	
			Austenitic	e.g. 1.4301, 1.4571	◦	75	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
			High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4362, 1.4462	◦	65	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron)	Up to 180 HB	•	180	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12	
			Cast iron with nodular graphite (GJS, GGG)	160 to 260 HB	•	140	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12
N	Non-ferrous metals	Aluminium	Al up to 10% Si	◦	135	0.03	0.035	0.035	0.04	0.05	0.06	0.08	0.1	0.13	
			Alu > 10% Si	◦	210	0.04	0.04	0.06	0.06	0.07	0.07	0.085	0.1	0.12	
			Copper, brass, bronze and red brass		◦	230	0.01	0.016	0.035	0.035	0.045	0.075	0.075	0.1	0.12
S	Super and titanium alloys	Heat-resistant super alloys	Fe, Ni, or Co-based	◦	45	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085	
			Pure titanium		◦	120	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
			Titanium alloys		◦	70	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	◦	75	0.01	0.012	0.025	0.025	0.035	0.055	0.055	0.07	0.085	
			Up to 58 HRC												
O	Other (Non-ISO)	Thermoplastics	Up to 58 HRC												
			> 58 HRC												
O	Other (Non-ISO)	Thermosetting plastics													
			GRP/CRP reinforced plastics, graphite												

• = Very well suited ◦ = Suitable



Recommended cutting speeds [m/min]

Material group			Specification/ example material	Suitability	Side milling $a_p = 1.5 \times D$; $a_e = 0.05 \times D$ 							
					Cutting speed v_c [m/min]	Feed per tooth f_z [mm/tooth] for cutting diameter DC [mm]						
						6	8	10	12	16	20	
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	200	0.035	0.04	0.055	0.065	0.08	0.1	
			500 to 700 N/mm ²	•	160	0.035	0.04	0.055	0.065	0.08	0.1	
			700 to 1,000 N/mm ²	•	120	0.035	0.04	0.055	0.065	0.08	0.1	
			1,000 to 1,400 N/mm ²	•	100	0.025	0.03	0.04	0.05	0.065	0.08	
M	Stainless steel	Ferritic and martensitic	e.g. 1.4105, 1.4122	•	80	0.025	0.025	0.04	0.05	0.065	0.08	
			Austenitic	e.g. 1.4301, 1.4571	•	100	0.025	0.03	0.04	0.05	0.065	0.08
			High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4362, 1.4462	◦	65	0.02	0.025	0.03	0.04	0.05	0.065
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron)	Up to 180 HB	•	170	0.03	0.04	0.055	0.065	0.08	0.1	
			Cast iron with nodular graphite (GJS, GGG)	160 to 260 HB	•	140	0.03	0.04	0.055	0.065	0.08	0.1
N	Non-ferrous metals	Aluminium	Al up to 10% Si	◦	300	0.03	0.04	0.055	0.065	0.08	0.1	
			Alu > 10% Si	◦	340	0.03	0.04	0.055	0.065	0.08	0.1	
S	Super and titanium alloys	Heat-resistant super alloys	Fe, Ni, or Co-based	•	40	0.02	0.025	0.03	0.035	0.045	0.065	
			Pure titanium	•	80	0.02	0.025	0.03	0.035	0.045	0.065	
			Titanium alloys	•	70	0.02	0.025	0.03	0.035	0.045	0.065	
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	◦	60	0.025	0.03	0.03	0.035	0.045	0.065	
			Up to 58 HRC > 58 HRC									
O	Other (Non-ISO)	Thermoplastics		◦	300	0.03	0.04	0.055	0.065	0.08	0.1	
		Thermosetting plastics										
		GRP/CRP reinforced plastics, graphite										

• = Very well suited ◦ = Suitable




Universal solid carbide end mills

Universal deburring end mill UD



Recommended cutting speeds [m/min]

Material group			Specification/ example material	Suitability	Chamfering / deburring $a_p = 0.2 \times D$; $a_e = 0.1 \times D$ 				
					Cutting speed v_c [m/min]	Feed per tooth f_z [mm/tooth] for cutting diameter DC [mm]			
				6		8	10	12	
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	180	0.045	0.065	0.085	0.14
			500 to 700 N/mm ²	•	160	0.045	0.065	0.085	0.14
			700 to 1,000 N/mm ²	•	140	0.025	0.04	0.045	0.075
			1,000 to 1,400 N/mm ²	•	120	0.025	0.04	0.045	0.075
M	Stainless steel	Ferritic and martensitic	e.g. 1.4105, 1.4122	•	75	0.025	0.04	0.045	0.075
		Austenitic	e.g. 1.4301, 1.4571	•	100	0.025	0.04	0.045	0.075
		High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4362, 1.4462	•	60	0.025	0.04	0.045	0.075
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron)	Up to 180 HB	•	180	0.045	0.065	0.085	0.14
		Cast iron with nodular graphite (GJS, GGG)	160 to 260 HB	•	140	0.025	0.04	0.045	0.075
N	Non-ferrous metals	Aluminium	Al up to 10% Si	•	300	0.045	0.065	0.085	0.14
			Alu > 10% Si	•	260	0.045	0.065	0.085	0.14
		Copper, brass, bronze and red brass	•	300	0.045	0.065	0.085	0.14	
S	Super and titanium alloys	Heat-resistant super alloys	Fe, Ni, or Co-based	○	50	0.025	0.04	0.045	0.075
		Pure titanium		○	140	0.025	0.04	0.045	0.075
		Titanium alloys		○	70	0.025	0.04	0.045	0.075
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	○	70	0.025	0.04	0.045	0.075
			Up to 58 HRC						
			> 58 HRC						
O	Other (Non-ISO)	Thermoplastics		○	300	0.045	0.065	0.085	0.14
		Thermosetting plastics							
		GRP/CRP reinforced plastics, graphite							

• = Very well suited ○ = Suitable





Recommended cutting speeds [m/min]

Material group			Specification/ example ma- terial	Suitability	Centre cut 										
					ap	ae	Cutting speed v _c [m/min]	Feed per tooth f _z [mm/tooth] for cutting diameter DC [mm]							
								3	4	5	6	8	10	12	16
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	Up to 0.1 x D	Up to 0.3 x D	900	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
			500 to 700 N/mm ²	•	Up to 0.1 x D	Up to 0.3 x D	700	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
			700 to 1,000 N/mm ²	•	Up to 0.1 x D	Up to 0.3 x D	550	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
			1,000 to 1,400 N/mm ²	•	Up to 0.06 x D	Up to 0.3 x D	400	0.015	0.025	0.03	0.04	0.045	0.055	0.065	0.08
M	Stainless steel	Ferritic and martensitic Austenitic High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4105, 1.4122	•	Up to 0.06 x D	Up to 0.3 x D	180	0.015	0.025	0.03	0.04	0.045	0.055	0.065	0.08
			e.g. 1.4301, 1.4571	•	Up to 0.06 x D	Up to 0.3 x D	130	0.015	0.025	0.03	0.04	0.045	0.055	0.065	0.08
			e.g. 1.4362, 1.4462	◦	Up to 0.06 x D	Up to 0.3 x D	100	0.01	0.018	0.02	0.03	0.04	0.05	0.06	0.07
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron) Cast iron with nodular graphite (GJS, GGG)	Up to 180 HB	•	Up to 0.1 x D	Up to 0.3 x D	800	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
			160 to 260 HB	•	Up to 0.1 x D	Up to 0.3 x D	750	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
N	Non-ferrous metals	Aluminium Alu > 10% Si Copper, brass, bronze and red brass	Al up to 10% Si	◦	Up to 0.1 x D	Up to 0.3 x D	1,200	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
			Alu > 10% Si	•	Up to 0.1 x D	Up to 0.3 x D	850	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
			Copper, brass, bronze and red brass	•	Up to 0.1 x D	Up to 0.3 x D	1,100	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
S	Super and titanium alloys	Heat-resistant super alloys Pure titanium Titanium alloys	Fe, Ni, or Co-based												
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	•	Up to 0.06 x D	Up to 0.3 x D	200	0.01	0.018	0.02	0.03	0.04	0.05	0.06	0.07
			Up to 58 HRC	◦	Up to 0.06 x D	Up to 0.3 x D	150	0.01	0.018	0.02	0.03	0.04	0.05	0.06	0.07
			> 58 HRC												
O	Other (Non-ISO)	Thermoplastics		◦	Up to 0.1 x D	Up to 0.3 x D	1,200	0.025	0.04	0.055	0.065	0.075	0.08	0.09	0.12
		Thermosetting plastics													
		GRP/CRP reinforced plastics, graphite													

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Universal solid carbide end mills

Universal ball nose end mill UB



Recommended cutting speeds [m/min]

Material group			Specification/ example material	Suitability	Side working 											
					ap	ae	Cutting speed v _c [m/min]	Feed per tooth f _z [mm/tooth] for cutting diameter DC [mm]								
								3	4	5	6	8	10	12	16	
P	Steel	All types of steel and cast steel up to 1,400 N/mm ²	Up to 500 N/mm ²	•	Up to 0.1 x D	Up to 0.45 x D	570	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18	
			500 to 700 N/mm ²	•	Up to 0.1 x D	Up to 0.45 x D	450	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18	
			700 to 1,000 N/mm ²	•	Up to 0.1 x D	Up to 0.45 x D	350	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18	
			1,000 to 1,400 N/mm ²	•	Up to 0.1 x D	Up to 0.45 x D	250	0.02	0.04	0.05	0.06	0.07	0.08	0.1	0.12	
M	Stainless steel	Ferritic and martensitic	e.g. 1.4105, 1.4122	•	Up to 0.1 x D	Up to 0.45 x D	130	0.02	0.04	0.05	0.06	0.07	0.08	0.1	0.12	
			Austenitic	e.g. 1.4301, 1.4571	•	Up to 0.1 x D	Up to 0.45 x D	80	0.02	0.04	0.05	0.06	0.07	0.08	0.1	0.12
			High-temperature-resistant and ferritic-austenitic (duplex)	e.g. 1.4362, 1.4462	○	Up to 0.1 x D	Up to 0.45 x D	60	0.015	0.03	0.04	0.05	0.06	0.07	0.08	0.1
K	Cast iron	Cast iron with flake graphite (GJL, GG, grey cast iron)	Up to 180 HB	•	Up to 0.1 x D	Up to 0.45 x D	550	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18	
			Cast iron with nodular graphite (GJS, GGG)	160 to 260 HB	•	Up to 0.1 x D	Up to 0.45 x D	500	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18
N	Non-ferrous metals	Aluminium	Al up to 10% Si	○	Up to 0.1 x D	Up to 0.45 x D	750	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18	
			Alu > 10% Si	•	Up to 0.1 x D	Up to 0.45 x D	600	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18	
		Copper, brass, bronze and red brass	•	Up to 0.1 x D	Up to 0.45 x D	700	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18		
S	Super and titanium alloys	Heat-resistant super alloys	Fe, Ni, or Co-based													
			Pure titanium													
			Titanium alloys													
H	Hard steels and chilled cast iron	Tempered and hardened steels	Up to 50 HRC	•	Up to 0.1 x D	Up to 0.45 x D	150	0.02	0.04	0.05	0.06	0.07	0.08	0.1	0.12	
			Up to 58 HRC	○	Up to 0.1 x D	Up to 0.45 x D	110	0.02	0.04	0.05	0.06	0.07	0.08	0.1	0.12	
			> 58 HRC													
O	Other (Non-ISO)	Thermoplastics		○	Up to 0.1 x D	Up to 0.45 x D	750	0.04	0.06	0.08	0.1	0.11	0.12	0.14	0.18	
			Thermosetting plastics													
			GRP/CRP reinforced plastics, graphite													

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