

GÜHRING

N

Strong in aluminium

- process-reliable machining of aluminium, non ferrous-metals and plastics
- unique cooling system and carbo-coating for longer tool life, improved chip evacuation and perfect surface finish quality

Aluminium end mills

GÜHRING – YOUR WORLDWIDE PARTNER

ISO code

P	Steel, high-alloyed steel
M	Stainless steel
K	Grey cast iron, spheroidal graphite iron and malleable cast iron
N	Aluminium and other non-ferrous metals
S	Special, super and titanium-alloys
H	Hardened steel and chilled cast iron

On the programme pages you will find for every tool recommendations regarding suitability for the application groups and details of max. tensile strength and hardness.

- optimal suitability
- limited suitability

Coatings

- bright
- Cb Carbo

Pictograms

Tool material

VHM

Solid carbide finest grain (carbide-UF)

Shank form



to DIN 6535

Standard



to DIN



to Gühring standard

Type

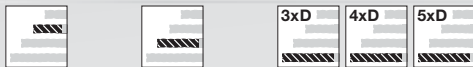


Application area similar to DIN 1836

Applications



Length



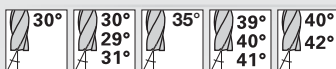
long (DIN) medium length extra length

Number of cutting edges



Number of major cutting edges

Helix angle



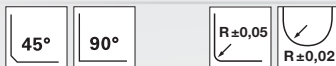
Size of helix angle/number of different helix angles

Rake angle



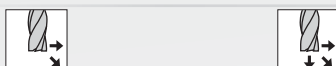
Rake angle of circumference cutting edges

Cutting edge form



Corner chamfer Radius with tolerance

Feed

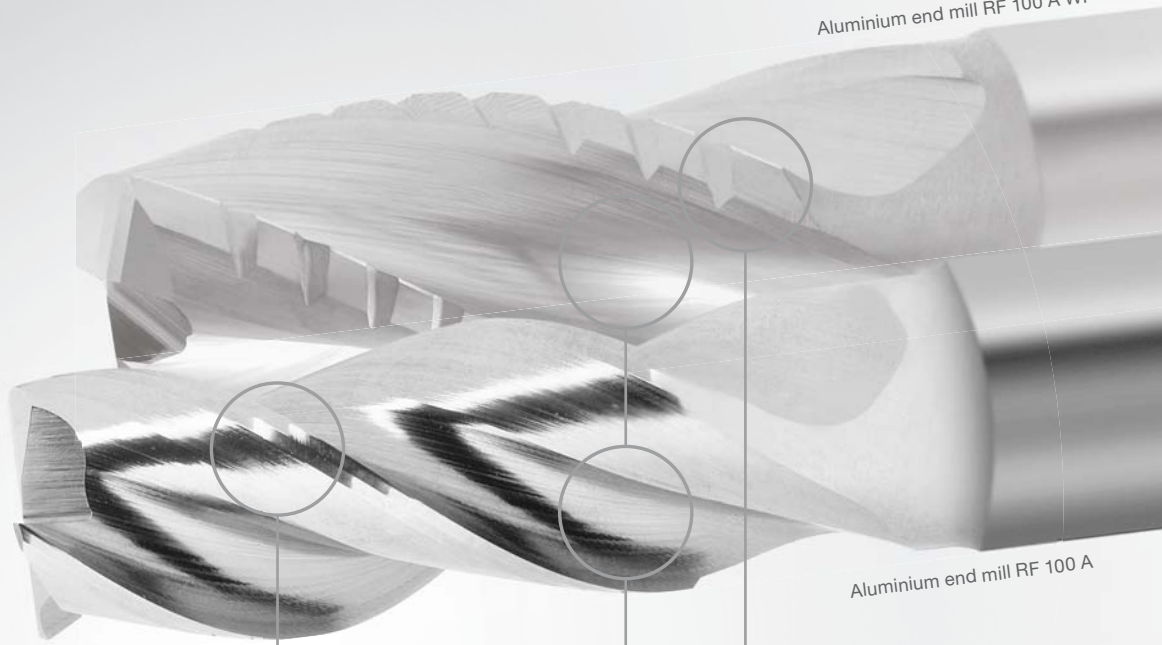


for lateral feed and oblique plunging for lateral feed, oblique plunging and drilling

ALUENDMILLS

Ratio®

Aluminium end mill RF 100 A WF



Aluminium end mill RF 100 A

short chips thanks to innovative roughing geometry

optimal surface finish and low-vibration milling thanks to nano-polished cutting edges with micro guide chamfers

larger flutes for optimal chip evacuation

roughing geometry reduces the cutting pressure in comparison to smooth cutting milling cutters



For all aluminium cutters a symmetrical face geometry with increased chip space is standard, therefore ideal even for plunging operations.





P M K N S H						Tool illustration	Z	Shank form	Length	Helix angle °	Tool material	Surface	d1/mm	Article no.	Page	
					•		NEW	3	HA			VHM	Cb	5.000 - 20.000	6980	6
					•		NEW	3	HB			VHM	Cb	5.000 - 20.000	6981	6
					•		NEW	3	HA			VHM	Cb	3.000 - 20.000	6978	7
					•		NEW	3	HB			VHM	Cb	3.000 - 20.000	6979	7
					•			3	HA			VHM	○	3.000 - 20.000	3472	8
					•			3	HB			VHM	○	3.000 - 20.000	6702	8
					•		NEW	3	HA			VHM	Cb	6.000 - 20.000	6982	9
					•		NEW	3	HB			VHM	Cb	6.000 - 20.000	6983	9
					•			3	HA			VHM	○	6.000 - 25.000	3599	10
					•			3	HB			VHM	○	6.000 - 25.000	6729	10
					•			3	HA			VHM	○	6.000 - 20.000	3473	11
					•			3	HB			VHM	○	6.000 - 20.000	6703	11
					•			3	HA			VHM	○	5.000 - 20.000	6730	12
					•			3	HB			VHM	○	5.000 - 20.000	6731	12
					•			3	HA			VHM	○	6.000 - 20.000	6732	13
					•			3	HB			VHM	○	6.000 - 20.000	6733	13
					•			3	HA			VHM	○	6.000 - 20.000	6734	14
					•			3	HB			VHM	○	6.000 - 20.000	6735	14
				○	• ○			4	HA			VHM	○	4.000 - 20.000	3202	15
				○	• ○			4	HB			VHM	○	4.000 - 20.000	3319	15
					•			4	HA			VHM	○	3.000 - 20.000	6762	16
					•		NEW	3	HA			VHM	Cb	6.000 - 20.000	6974	17
					•		NEW	3	HB			VHM	Cb	6.000 - 20.000	6975	17



P	M	K	N	S	H	Tool illustration	Z	Shank form	Length	Helix angle °	Tool material	Surface	d1/mm	Article no.	Page
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Ratio end mills Alu RF 100 A

							NEW		HA			VHM	Cb	6.000 - 20.000	6976	18
							NEW		HB			VHM	Cb	6.000 - 20.000	6977	18
							NEW		HA	5xD		VHM	Cb	10.000 - 25.000	6866	19
									HA			VHM	○	6.000 - 25.000	6868	20
									HB			VHM	○	6.000 - 25.000	6869	20
									HA			VHM	○	6.000 - 20.000	6870	21
									HB			VHM	○	6.000 - 20.000	6871	21

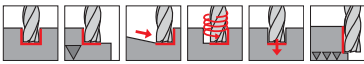
Ball nose hard profile cutters GA 200 A

							NEW		HA			VHM	Cb	3.000 - 16.000	6984	22
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End mills (single-fluted)

									HA			VHM	○	2.000 - 16.000	6793	23
--	--	--	--	--	--	--	--	--	----	--	--	-----	---	----------------	------	----

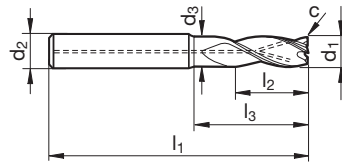
Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**
M Cutting data page 24

- K**
 - N** •
 - S**
 - H**
- with internal cooling: Radial and axial exits
 - nano polished cutting edges
 - neck clearance
 - centre cutting

Tool material	Solid carbide	
Surface	Ⓞ _{cb}	Ⓞ _{cb}
Type	W	W
Shank form	HA	HB

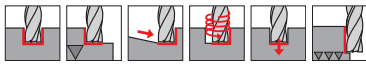


										Article no.	6980	6981
										Discount group	106	106
d1 e8	d2 h6	d3	l1	l2	l3	c	Z	Code no.		Availability		
mm	mm	mm	mm	mm	mm	mm x 45°						
5.00	6.00	4.80	57	13.0	18.0	0.05	3	5.00		•	•	
6.00	6.00	5.70	57	13.0	20.0	0.06	3	6.00		•	•	
8.00	8.00	7.70	63	19.0	26.0	0.08	3	8.00		•	•	
10.00	10.00	9.50	72	22.0	30.0	0.10	3	10.00		•	•	
12.00	12.00	11.50	83	26.0	36.0	0.12	3	12.00		•	•	
16.00	16.00	15.50	92	32.0	42.0	0.16	3	16.00		•	•	
20.00	20.00	19.50	104	38.0	52.0	0.20	3	20.00		•	•	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	500	0,020	0,039	0,052	0,080	0,10	0,13	0,16	750	0,025	0,051	0,068	0,104	0,12	0,17	0,21
	≥ 5% Si	230	0,017	0,033	0,044	0,060	0,07	0,10	0,12		345	0,021	0,043	0,057	0,078	0,09	0,12
NE	≤ 850 N/mm ²	250	0,017	0,033	0,044	0,060	0,07	0,10	0,12	375	0,021	0,043	0,057	0,078	0,09	0,12	0,16



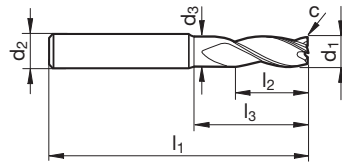
Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**
M Cutting data page 24

- K**
- N** •
- S** • nano polished cutting edges
- H** • neck clearance
- centre cutting

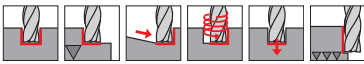
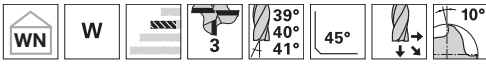
Tool material	Solid carbide	
Surface	ⓐ	ⓐ
Type	W	W
Shank form	HA	HB



									Article no.	6978	6979
									Discount group	106	106
d1 e8	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
3.000	6.000	2.800	57.000	8.000	15.000	0.030	3	3.000	•	•	
4.000	6.000	3.800	57.000	11.000	18.000	0.040	3	4.000	•	•	
5.000	6.000	4.800	57.000	13.000	18.000	0.050	3	5.000	•	•	
6.000	6.000	5.700	57.000	13.000	20.000	0.060	3	6.000	•	•	
8.000	8.000	7.700	63.000	19.000	26.000	0.080	3	8.000	•	•	
10.000	10.000	9.500	72.000	22.000	30.000	0.100	3	10.000	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	0.120	3	12.000	•	•	
16.000	16.000	15.500	92.000	32.000	42.000	0.160	3	16.000	•	•	
20.000	20.000	19.500	104.000	38.000	52.000	0.200	3	20.000	•	•	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø							
			3	6	8	10	12	16	20		3	6	8	10	12	16	20	
N	≤ 5% Si	500	0,020	0,039	0,052	0,080	0,10	0,13	0,16		750	0,025	0,051	0,068	0,104	0,12	0,17	0,21
	≥ 5% Si	230	0,017	0,033	0,044	0,060	0,07	0,10	0,12			345	0,021	0,043	0,057	0,078	0,09	0,12
NE	≤ 850 N/mm²	250	0,017	0,033	0,044	0,060	0,07	0,10	0,12		375	0,021	0,043	0,057	0,078	0,09	0,12	0,16

Ratio end mills Alu RF 100 A



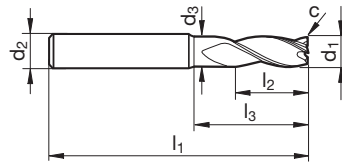
P **GÜHRING NAVIGATOR**

M Cutting data page 24

- K**
- N** •
- S**
- H**

- nano polished cutting edges
- neck clearance
- centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	W	W
Shank form	HA	HB



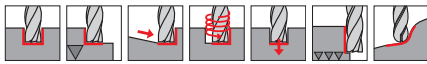
									Article no.	3472	6702
									Discount group	106	106
d1 e8	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
3.000	6.000	2.800	57.000	8.000	15.000	0.030	3	3.000	•	•	
4.000	6.000	3.800	57.000	11.000	18.000	0.040	3	4.000	•	•	
5.000	6.000	4.800	57.000	13.000	18.000	0.050	3	5.000	•	•	
6.000	6.000	5.700	57.000	13.000	20.000	0.060	3	6.000	•	•	
8.000	8.000	7.700	63.000	19.000	26.000	0.080	3	8.000	•	•	
10.000	10.000	9.500	72.000	22.000	30.000	0.100	3	10.000	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	0.120	3	12.000	•	•	
16.000	16.000	15.500	92.000	32.000	42.000	0.160	3	16.000	•	•	
20.000	20.000	19.500	104.000	38.000	52.000	0.200	3	20.000	•	•	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	500	0,020	0,039	0,052	0,080	0,10	0,13	0,16	750	0,025	0,051	0,068	0,104	0,12	0,17	0,21
	≥ 5% Si	230	0,017	0,033	0,044	0,060	0,07	0,10	0,12		345	0,021	0,043	0,057	0,078	0,09	0,12
NE	≤ 850 N/mm²	250	0,017	0,033	0,044	0,060	0,07	0,10	0,12	375	0,021	0,043	0,057	0,078	0,09	0,12	0,16

Our Carbo-coating is available as an option to improve chip flow and tool life



Ratio end mills Alu RF 100 A

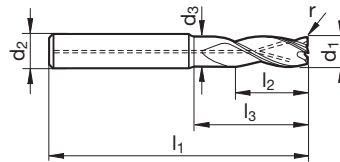


P **GÜHRING NAVIGATOR**
M Cutting data page 24

- K**
- N** •
- S**
- H**

- with internal cooling: Radial and axial exits
- nano polished cutting edges
- neck clearance
- centre cutting

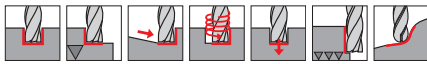
Tool material	Solid carbide	
Surface	Ⓞ _{Cb}	Ⓞ _{Cb}
Type	W	W
Shank form	HA	HB



									Article no.	6982	6983
									Discount group	106	106
d1 e8	d2 h6	d3	l1	l2	l3	r	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm					
6.000	6.000	5.700	57.000	13.000	20.000	0.500	3	6.005	•	•	
6.000	6.000	5.700	57.000	13.000	20.000	1.000	3	6.010	•	•	
8.000	8.000	7.700	63.000	19.000	26.000	0.500	3	8.005	•	•	
8.000	8.000	7.700	63.000	19.000	26.000	1.000	3	8.010	•	•	
10.000	10.000	9.500	72.000	22.000	30.000	0.500	3	10.005	•	•	
10.000	10.000	9.500	72.000	22.000	30.000	1.000	3	10.010	•	•	
10.000	10.000	9.500	72.000	22.000	30.000	1.500	3	10.015	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	0.500	3	12.005	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	1.000	3	12.010	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	1.500	3	12.015	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	2.000	3	12.020	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	2.500	3	12.025	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	3.000	3	12.030	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	4.000	3	12.040	•	•	
16.000	16.000	15.500	92.000	32.000	42.000	1.000	3	16.010	•	•	
16.000	16.000	15.500	92.000	32.000	42.000	2.000	3	16.020	•	•	
16.000	16.000	15.500	92.000	32.000	42.000	2.500	3	16.025	•	•	
16.000	16.000	15.500	92.000	32.000	42.000	3.000	3	16.030	•	•	
16.000	16.000	15.500	92.000	32.000	42.000	4.000	3	16.040	•	•	
20.000	20.000	19.500	104.000	38.000	52.000	1.000	3	20.010	•	•	
20.000	20.000	19.500	104.000	38.000	52.000	2.000	3	20.020	•	•	
20.000	20.000	19.500	104.000	38.000	52.000	3.000	3	20.030	•	•	
20.000	20.000	19.500	104.000	38.000	52.000	4.000	3	20.040	•	•	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø							
			3	6	8	10	12	16	20		3	6	8	10	12	16	20	
N	≤ 5% Si	500	0,020	0,039	0,052	0,080	0,10	0,13	0,16		750	0,025	0,051	0,068	0,104	0,12	0,17	0,21
	≥ 5% Si	230	0,017	0,033	0,044	0,060	0,07	0,10	0,12			345	0,021	0,043	0,057	0,078	0,09	0,12
NE	≤ 850 N/mm ²	250	0,017	0,033	0,044	0,060	0,07	0,10	0,12		375	0,021	0,043	0,057	0,078	0,09	0,12	0,16

Ratio end mills Alu RF 100 A



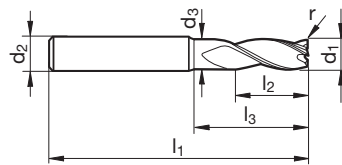
P	
M	
K	
N	•
S	
H	

GÜHRING NAVIGATOR

Cutting data page 24

- nano polished cutting edges
- neck clearance
- centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	W	W
Shank form	HA	HB



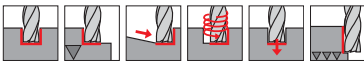
									Article no.	3599	6729
									Discount group	106	106
d1 e8	d2 h6	d3	l1	l2	l3	r	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm					
6.000	6.000	5.700	57.000	13.000	20.000	0.500	3	6.005	•		•
6.000	6.000	5.700	57.000	13.000	20.000	1.000	3	6.010	•		•
8.000	8.000	7.700	63.000	19.000	26.000	0.500	3	8.005	•		•
8.000	8.000	7.700	63.000	19.000	26.000	1.000	3	8.010	•		•
10.000	10.000	9.500	72.000	22.000	30.000	0.500	3	10.005	•		•
10.000	10.000	9.500	72.000	22.000	30.000	1.000	3	10.010	•		•
10.000	10.000	9.500	72.000	22.000	30.000	1.500	3	10.015	•		•
12.000	12.000	11.500	83.000	26.000	36.000	0.500	3	12.005	•		•
12.000	12.000	11.500	83.000	26.000	36.000	1.000	3	12.010	•		•
12.000	12.000	11.500	83.000	26.000	36.000	1.500	3	12.015	•		•
12.000	12.000	11.500	83.000	26.000	36.000	2.000	3	12.020	•		•
12.000	12.000	11.500	83.000	26.000	36.000	2.500	3	12.025	•		•
12.000	12.000	11.500	83.000	26.000	36.000	3.000	3	12.030	•		•
12.000	12.000	11.500	83.000	26.000	36.000	4.000	3	12.040	•		•
16.000	16.000	15.500	92.000	32.000	42.000	1.000	3	16.010	•		•
16.000	16.000	15.500	92.000	32.000	42.000	2.000	3	16.020	•		•
16.000	16.000	15.500	92.000	32.000	42.000	2.500	3	16.025	•		•
16.000	16.000	15.500	92.000	32.000	42.000	3.000	3	16.030	•		•
16.000	16.000	15.500	92.000	32.000	42.000	4.000	3	16.040	•		•
20.000	20.000	19.500	104.000	38.000	52.000	1.000	3	20.010	•		•
20.000	20.000	19.500	104.000	38.000	52.000	2.000	3	20.020	•		•
20.000	20.000	19.500	104.000	38.000	52.000	2.500	3	20.025	•		•
20.000	20.000	19.500	104.000	38.000	52.000	3.000	3	20.030	•		•
20.000	20.000	19.500	104.000	38.000	52.000	4.000	3	20.040	•		•
25.000	25.000	24.000	121.000	45.000	63.000	2.000	3	25.020	•		•
25.000	25.000	24.000	121.000	45.000	63.000	3.000	3	25.030	•		•
25.000	25.000	24.000	121.000	45.000	63.000	4.000	3	25.040	•		•

ISO	Hardness	vc	fz (mm/z) / Ø								vc	fz (mm/z) / Ø							
			3	6	8	10	12	16	20	3		6	8	10	12	16	20		
N	≤ 5% Si	500	0,020	0,039	0,052	0,080	0,10	0,13	0,16		750	0,025	0,051	0,068	0,104	0,12	0,17	0,21	
	≥ 5% Si	230	0,017	0,033	0,044	0,060	0,07	0,10	0,12			345	0,021	0,043	0,057	0,078	0,09	0,12	0,16
NE	≤ 850 N/mm²	250	0,017	0,033	0,044	0,060	0,07	0,10	0,12		375	0,021	0,043	0,057	0,078	0,09	0,12	0,16	

Our Carbo-coating is available as an option to improve chip flow and tool life

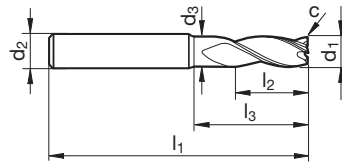


Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**
M Cutting data page 24
K
N ●
S ● nano polished cutting edges
H ● neck clearance
 ● centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	W	W
Shank form	HA	HB

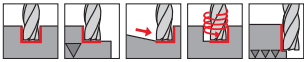
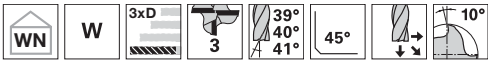


									Article no.	3473	6703
									Discount group	106	106
d1 e8	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
6.000	6.000	5.500	65.000	13.000	28.000	0.060	3	6.000	●		●
8.000	8.000	7.500	75.000	19.000	38.000	0.080	3	8.000	●		●
10.000	10.000	9.200	80.000	22.000	38.000	0.100	3	10.000	●		●
12.000	12.000	11.200	93.000	26.000	46.000	0.120	3	12.000	●		●
16.000	16.000	15.000	108.000	32.000	58.000	0.160	3	16.000	●		●
20.000	20.000	19.000	126.000	38.000	74.000	0.200	3	20.000	●		●

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	500	0,020	0,039	0,052	0,080	0,10	0,13	0,16	750	0,025	0,051	0,068	0,104	0,12	0,17	0,21
	≥ 5% Si	230	0,017	0,033	0,044	0,060	0,07	0,10	0,12		345	0,021	0,043	0,057	0,078	0,09	0,12
NE	≤ 850 N/mm²	250	0,017	0,033	0,044	0,060	0,07	0,10	0,12	375	0,021	0,043	0,057	0,078	0,09	0,12	0,16

Our Carbo-coating is available as an option to improve chip flow and tool life

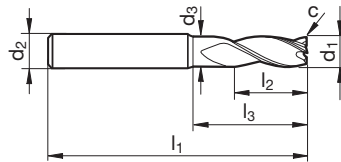
Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**
M Cutting data page 24
K
N •
S
H

- nano polished cutting edges
- re-inforced core
- neck clearance
- centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	W	W
Shank form	HA	HB



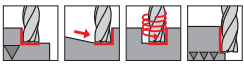
									Article no.	6730	6731
									Discount group	106	106
d1 e8	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
5.000	6.000	4.800	57.000	15.000	19.400	0.050	3	5.000	●	●	
6.000	6.000	5.700	65.000	18.000	28.000	0.060	3	6.000	●	●	
8.000	8.000	7.700	75.000	24.000	38.000	0.080	3	8.000	●	●	
10.000	10.000	9.500	80.000	30.000	38.000	0.100	3	10.000	●	●	
12.000	12.000	11.500	93.000	36.000	46.000	0.120	3	12.000	●	●	
16.000	16.000	15.500	108.000	48.000	58.000	0.160	3	16.000	●	●	
20.000	20.000	19.500	126.000	60.000	74.000	0.200	3	20.000	●	●	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	900	0,045	0,090	0,120	0,184	0,221	0,294	0,368	1000	0,021	0,043	0,057	0,088	0,106	0,141	0,176
	≥ 5% Si	400	0,038	0,076	0,101	0,138	0,166	0,221	0,276		460	0,018	0,036	0,048	0,066	0,079	0,106
NE	≤ 850 N/mm ²	470	0,038	0,076	0,101	0,138	0,166	0,221	0,276	500	0,018	0,030	0,036	0,048	0,066	0,079	0,106

Our Carbo-coating is available as an option to improve chip flow and tool life



Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**

M Cutting data page 24

K

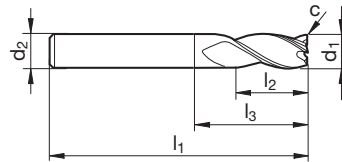
N •

S

H

- nano polished cutting edges
- re-inforced core
- centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	W	W
Shank form	HA	HB



Article no. **6732** **6733**

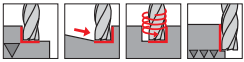
Discount group **106** **106**

d1 e8	d2 h6	l1	l2	l3	c	Z	Code no.	Availability	
mm	mm	mm	mm	mm	mm x 45°				
6.00	6.00	65	24.0	29.0	0.06	3	6.000	•	•
8.00	8.00	75	32.0	39.0	0.08	3	8.000	•	•
10.00	10.00	100	40.0	60.0	0.10	3	10.000	•	•
12.00	12.00	100	48.0	55.0	0.12	3	12.000	•	•
16.00	16.00	125	64.0	77.0	0.16	3	16.000	•	•
20.00	20.00	150	80.0	100.0	0.20	3	20.000	•	•

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	400	0,016	0,031	0,042	0,064	0,08	0,10	0,13	450	0,010	0,020	0,026	0,040	0,048	0,064	0,080
	≥ 5% Si	200	0,013	0,027	0,035	0,048	0,06	0,08	0,10		210	0,008	0,017	0,022	0,030	0,036	0,048
NE	≤ 850 N/mm ²	190	0,013	0,027	0,035	0,048	0,06	0,08	0,10	220	0,008	0,017	0,022	0,030	0,036	0,048	0,060

Our Carbo-coating is available as an option to improve chip flow and tool life

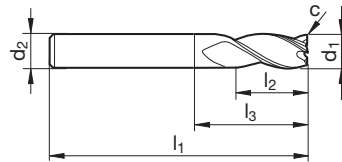
Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**
M Cutting data page 24
K
N ●
S
H

- nano polished cutting edges
- re-inforced core
- centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	W	W
Shank form	HA	HB



Article no. **6734** **6735**
 Discount group **106** **106**

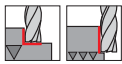
d1 e8	d2 h6	l1	l2	l3	c	Z	Code no.	Availability	
mm	mm	mm	mm	mm	mm x 45°				
6.00	6.00	75	30.0	39.0	0.06	3	6.000	●	●
8.00	8.00	86	40.0	50.0	0.08	3	8.000	●	●
10.00	10.00	100	50.0	60.0	0.10	3	10.000	●	●
12.00	12.00	120	60.0	75.0	0.12	3	12.000	●	●
16.00	16.00	150	80.0	102.0	0.16	3	16.000	●	●
20.00	20.00	175	100.0	125.0	0.20	3	20.000	●	●

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	400	0,016	0,031	0,042	0,064	0,08	0,10	0,13	450	0,010	0,020	0,026	0,040	0,048	0,064	0,080
	≥ 5% Si	200	0,013	0,027	0,035	0,048	0,06	0,08	0,10		210	0,008	0,017	0,022	0,030	0,036	0,048
NE	≤ 850 N/mm ²	190	0,013	0,027	0,035	0,048	0,06	0,08	0,10	220	0,008	0,017	0,022	0,030	0,036	0,048	0,060

Our Carbo-coating is available as an option to improve chip flow and tool life

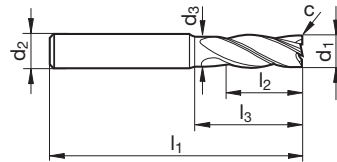


Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**
M ○ Cutting data page 24
K
N ●
S ○
H
 ● neck clearance
 ● centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	W	W
Shank form	HA	HB

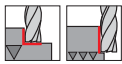


									Article no.	3202	3319
									Discount group	106	106
d1 h10	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
4.000	6.000	3.800	57.000	11.000	18.000	0.100	4	4.000	●	●	
5.000	6.000	4.800	57.000	13.000	18.000	0.100	4	5.000	●	●	
6.000	6.000	5.700	57.000	13.000	20.000	0.150	4	6.000	●	●	
8.000	8.000	7.700	63.000	19.000	26.000	0.150	4	8.000	●	●	
10.000	10.000	9.500	72.000	22.000	30.000	0.200	4	10.000	●	●	
12.000	12.000	11.500	83.000	26.000	36.000	0.200	4	12.000	●	●	
16.000	16.000	15.500	92.000	32.000	42.000	0.350	4	16.000	●	●	
20.000	20.000	19.500	104.000	38.000	52.000	0.450	4	20.000	●	●	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	400	0,016	0,031	0,042	0,064	0,08	0,10	0,13	450	0,010	0,020	0,026	0,040	0,048	0,064	0,080
	≥ 5% Si	200	0,013	0,027	0,035	0,048	0,06	0,08	0,10		210	0,008	0,017	0,022	0,030	0,036	0,048
NE	≤ 850 N/mm²	190	0,013	0,027	0,035	0,048	0,06	0,08	0,10	220	0,008	0,017	0,022	0,030	0,036	0,048	0,060

Our Carbo-coating is available as an option to improve chip flow and tool life

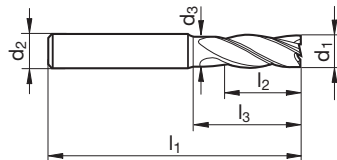
Ratio end mills Alu RF 100 A 90°



P **GÜHRING NAVIGATOR**
M Cutting data page 24
K
N ●
S
H

- without corner protection chamfer
- neck clearance
- centre cutting

Tool material	Solid carbide
Surface	○
Type	W
Shank form	HA



Article no. **6762**

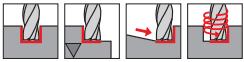
Discount group **106**

d1 h10	d2 h6	d3	l1	l2	l3	Z	Code no.	Availability
mm	mm	mm	mm	mm	mm			
3.00	6.00	2.80	57	8.0	15.0	4	3.000	●
4.00	6.00	3.80	57	11.0	18.0	4	4.000	●
5.00	6.00	4.80	57	13.0	18.0	4	5.000	●
6.00	6.00	5.70	57	13.0	20.0	4	6.000	●
8.00	8.00	7.70	63	19.0	26.0	4	8.000	●
10.00	10.00	9.50	72	22.0	30.0	4	10.000	●
12.00	12.00	11.50	83	26.0	36.0	4	12.000	●
16.00	16.00	15.50	92	32.0	42.0	4	16.000	●
20.00	20.00	19.50	104	38.0	52.0	4	20.000	●

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	400	0,016	0,031	0,042	0,064	0,08	0,10	0,13	450	0,010	0,020	0,026	0,040	0,048	0,064	0,080
	≥ 5% Si	200	0,013	0,027	0,035	0,048	0,06	0,08	0,10		210	0,008	0,017	0,022	0,030	0,036	0,048
NE	≤ 850 N/mm ²	190	0,013	0,027	0,035	0,048	0,06	0,08	0,10	220	0,008	0,017	0,022	0,030	0,036	0,048	0,060



Ratio end mills Alu RF 100 A



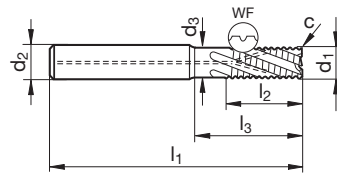
P **GÜHRING** NAVIGATOR

M Cutting data page 24

K	
N	•
S	
H	

- with internal cooling: Radial and axial exits
- neck clearance
- centre cutting

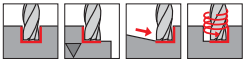
Tool material	Solid carbide	
Surface	ⓐ	ⓑ
Type	WF	WF
Shank form	HA	HB



									Article no.	6974	6975
									Discount group	106	106
d1 js9	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
6.000	6.000	5.700	57.000	13.000	20.000	0.060	3	6.000	•	•	
8.000	8.000	7.700	63.000	19.000	26.000	0.080	3	8.000	•	•	
10.000	10.000	9.500	72.000	22.000	30.000	0.100	3	10.000	•	•	
12.000	12.000	11.500	83.000	26.000	36.000	0.120	3	12.000	•	•	
16.000	16.000	15.500	92.000	32.000	42.000	0.160	3	16.000	•	•	
20.000	20.000	19.500	104.000	38.000	52.000	0.200	3	20.000	•	•	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	375	0,011	0,021	0,028	0,037	0,044	0,059	0,074	440	0,012	0,024	0,032	0,043	0,051	0,068	0,085
	≥ 5% Si	180	0,010	0,019	0,026	0,035	0,042	0,056	0,070		210	0,011	0,022	0,029	0,040	0,048	0,064
NE	≤ 850 N/mm ²	200	0,010	0,019	0,026	0,035	0,042	0,056	0,070	230	0,011	0,022	0,029	0,040	0,048	0,064	0,081

Ratio end mills Alu RF 100 A



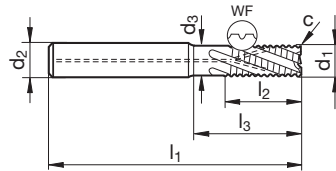
P **GÜHRING NAVIGATOR**

M Cutting data page 24

K	
N	•
S	
H	

- with internal cooling: Radial and axial exits
- neck clearance
- centre cutting

Tool material	Solid carbide	
Surface	Ⓞ _{cb}	Ⓞ _{cb}
Type	WF	W
Shank form	HA	HB

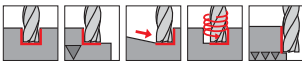


									Article no.	6976	6977
									Discount group	106	106
d1 js9	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
6.000	6.000	5.700	65.000	13.000	28.000	0.060	3	6.000	•	•	
8.000	8.000	7.700	75.000	19.000	38.000	0.080	3	8.000	•	•	
10.000	10.000	9.500	80.000	22.000	38.000	0.100	3	10.000	•	•	
12.000	12.000	11.500	93.000	26.000	46.000	0.120	3	12.000	•	•	
16.000	16.000	15.500	108.000	32.000	58.000	0.160	3	16.000	•	•	
20.000	20.000	19.500	126.000	38.000	74.000	0.200	3	20.000	•	•	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	375	0,011	0,021	0,028	0,037	0,044	0,059	0,074	440	0,012	0,024	0,032	0,043	0,051	0,068	0,085
	≥ 5% Si	180	0,010	0,019	0,026	0,035	0,042	0,056	0,070		210	0,011	0,022	0,029	0,040	0,048	0,064
NE	≤ 850 N/mm ²	200	0,010	0,019	0,026	0,035	0,042	0,056	0,070	230	0,011	0,022	0,029	0,040	0,048	0,064	0,081



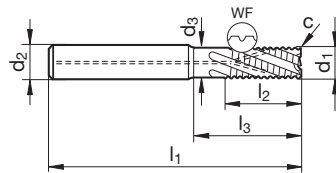
Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**
M Cutting data page 24
K
N ●
S
H

- with internal cooling: Radial and axial exits
- neck clearance
- centre cutting

Tool material	Solid carbide
Surface	ⓐ
Type	WF
Shank form	HA



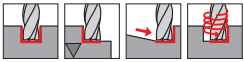
Article no. **6866**

Discount group **106**

d1 js9	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability
mm	mm	mm	mm	mm	mm	mm x 45°			
10.000	10.000	9.500	100.000	22.000	58.000	0.100	3	10.000	●
12.000	12.000	11.500	108.000	26.000	61.000	0.120	3	12.000	●
16.000	16.000	15.500	132.000	32.000	82.000	0.160	3	16.000	●
20.000	20.000	19.500	154.000	38.000	102.000	0.200	3	20.000	●
25.000	25.000	24.000	185.000	45.000	127.000	0.250	3	25.000	●

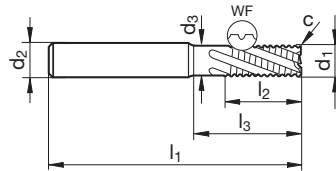
ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	375	0,011	0,021	0,028	0,037	0,044	0,059	0,074	440	0,012	0,024	0,032	0,043	0,051	0,068	0,085
	≥ 5% Si	180	0,010	0,019	0,026	0,035	0,042	0,056	0,070		210	0,011	0,022	0,029	0,040	0,048	0,064
NE	≤ 850 N/mm ²	200	0,010	0,019	0,026	0,035	0,042	0,056	0,070	230	0,011	0,022	0,029	0,040	0,048	0,064	0,081

Ratio end mills Alu RF 100 A



P **GÜHRING NAVIGATOR**
M Cutting data page 24
K
N ●
S
H ● neck clearance
 ● centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	WF	WF
Shank form	HA	HB



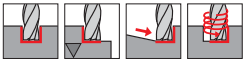
									Article no.	6868	6869
									Discount group	106	106
d1 js9	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
6.000	6.000	5.700	57.000	13.000	20.000	0.060	3	6.000	●		●
8.000	8.000	7.700	63.000	19.000	26.000	0.080	3	8.000	●		●
10.000	10.000	9.500	72.000	22.000	30.000	0.100	3	10.000	●		●
12.000	12.000	11.500	83.000	26.000	36.000	0.120	3	12.000	●		●
16.000	16.000	15.500	92.000	32.000	42.000	0.160	3	16.000	●		●
20.000	20.000	19.500	104.000	38.000	52.000	0.200	3	20.000	●		●
25.000	25.000	24.000	121.000	45.000	63.000	0.250	3	25.000	●		●

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	375	0,011	0,021	0,028	0,037	0,044	0,059	0,074	440	0,012	0,024	0,032	0,043	0,051	0,068	0,085
	≥ 5% Si	180	0,010	0,019	0,026	0,035	0,042	0,056	0,070		210	0,011	0,022	0,029	0,040	0,048	0,064
NE	≤ 850 N/mm²	200	0,010	0,019	0,026	0,035	0,042	0,056	0,070	230	0,011	0,022	0,029	0,040	0,048	0,064	0,081

Our Carbo-coating is available as an option to improve chip flow and tool life

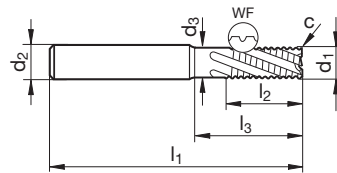


Ratio end mills Alu RF 100 A



P **GÜHRING** NAVIGATOR
M Cutting data page 24
K
N ●
S
H ● neck clearance
 ● centre cutting

Tool material	Solid carbide	
Surface	○	○
Type	WF	WF
Shank form	HA	HB

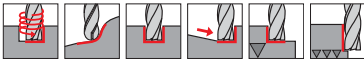


									Article no.	6870	6871
									Discount group	106	106
d1 js9	d2 h6	d3	l1	l2	l3	c	Z	Code no.	Availability		
mm	mm	mm	mm	mm	mm	mm x 45°					
6.000	6.000	5.700	65.000	13.000	28.000	0.060	3	6.000	●	●	
8.000	8.000	7.700	75.000	19.000	38.000	0.080	3	8.000	●	●	
10.000	10.000	9.500	80.000	22.000	38.000	0.100	3	10.000	●	●	
12.000	12.000	11.500	93.000	26.000	46.000	0.120	3	12.000	●	●	
16.000	16.000	15.500	108.000	32.000	58.000	0.160	3	16.000	●	●	
20.000	20.000	19.500	126.000	38.000	74.000	0.200	3	20.000	●	●	

ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 5% Si	375	0,011	0,021	0,028	0,037	0,044	0,059	0,074	440	0,012	0,024	0,032	0,043	0,051	0,068	0,085
	≥ 5% Si	180	0,010	0,019	0,026	0,035	0,042	0,056	0,070		210	0,011	0,022	0,029	0,040	0,048	0,064
NE	≤ 850 N/mm²	200	0,010	0,019	0,026	0,035	0,042	0,056	0,070	230	0,011	0,022	0,029	0,040	0,048	0,064	0,081

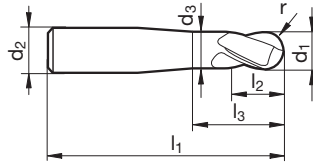
Our Carbo-coating is available as an option to improve chip flow and tool life

Ball nose hard profile cutters GA 200 A



P **GÜHRING NAVIGATOR**
M Cutting data page 24
K
N ●
S
H ● neck clearance
 ● centre cutting

Tool material	Solid carbide
Surface	Ⓢ
Type	W
Shank form	HA



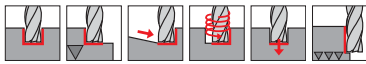
Article no. **6984**

Discount group **106**

d1 h10	d2 h6	d3	l1	l2	l3	r	Z	Code no.	Availability
mm	mm	mm	mm	mm	mm	mm			
3.000	6.000	2.800	57.000	4.000	15.000	1.500	2	3.000	●
4.000	6.000	3.800	57.000	5.000	18.000	2.000	2	4.000	●
5.000	6.000	4.800	57.000	6.000	18.000	2.500	2	5.000	●
6.000	6.000	5.700	57.000	7.000	20.000	3.000	2	6.000	●
8.000	8.000	7.700	63.000	9.000	26.000	4.000	2	8.000	●
10.000	10.000	9.500	72.000	11.000	30.000	5.000	2	10.000	●
12.000	12.000	11.500	83.000	12.000	36.000	6.000	2	12.000	●
16.000	16.000	15.500	92.000	16.000	42.000	8.000	2	16.000	●

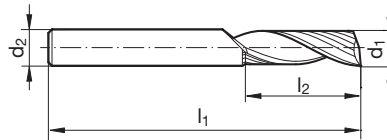


End mills (single-fluted)



P **GÜHRING NAVIGATOR**
M Cutting data page 24
K
N •
S
H • polished flutes
 • centre cutting

Tool material	Solid carbide
Surface	○
Type	W
Shank form	HA



Article no. **6793**




Discount group **117**

d1 h10	d2 h6	l1	l2	Z	Code no.	Availability
mm	mm	mm	mm			
2.000	2.000	38.000	10.000	1	2.000	●
3.000	3.000	39.000	12.000	1	3.000	●
4.000	4.000	40.000	15.000	1	4.000	●
5.000	5.000	50.000	16.000	1	5.000	●
6.000	6.000	57.000	20.000	1	6.000	●
8.000	8.000	63.000	22.000	1	8.000	●
10.000	10.000	73.000	25.000	1	10.000	●
12.000	12.000	83.000	30.000	1	12.000	●
16.000	16.000	92.000	35.000	1	16.000	●





ISO	Hardness	vc	fz (mm/z) / Ø							vc	fz (mm/z) / Ø						
			3	6	8	10	12	16	20		3	6	8	10	12	16	20
N	≤ 7% Si	300	0,019	0,037	0,050	0,065	0,08	0,10	0,13	350	0,021	0,043	0,057	0,075	0,09	0,12	0,15
	≥ 7% Si	160	0,013	0,025	0,034	0,046	0,06	0,07	0,09		190	0,018	0,036	0,048	0,064	0,08	0,10
NE	≤ 850 N/mm ²	175	0,013	0,025	0,034	0,046	0,06	0,07	0,09	290	0,014	0,029	0,039	0,053	0,06	0,08	0,11

Our Carbo-coating is available as an option to improve chip flow and tool life

Milling conditions:

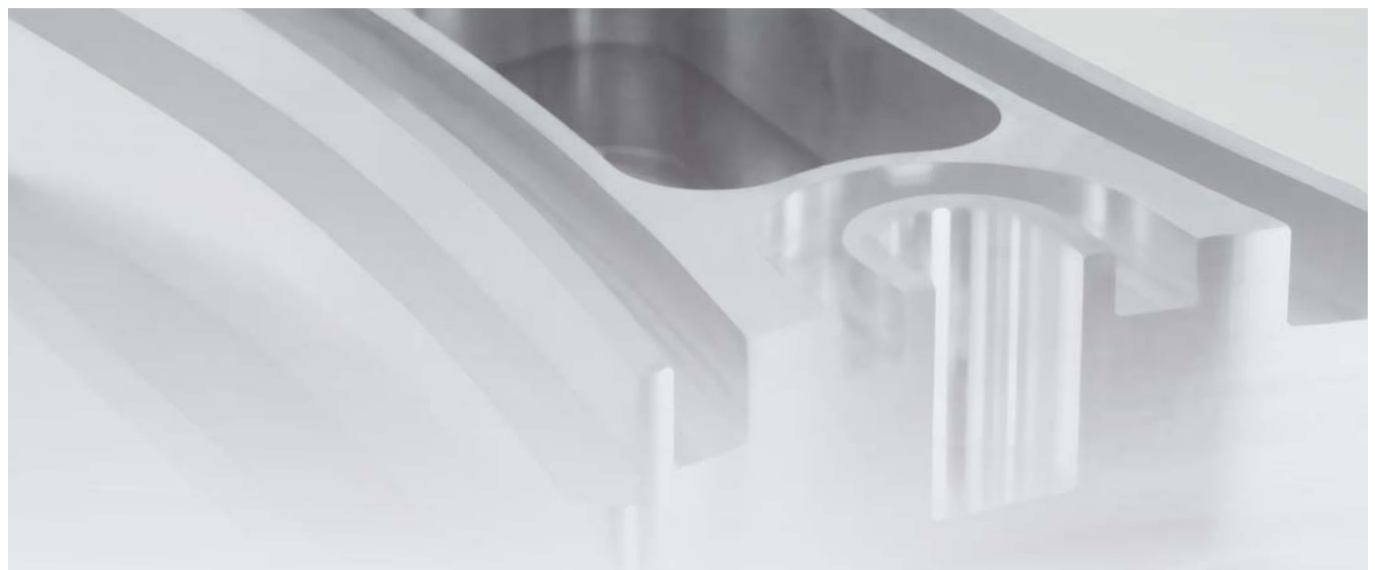
 HPC	stable machining conditions high drive power
	short tools
	long tools

Correction factors:

	a_p roughing > 1.5xD	v_c -25%	f_z -25%
	medium length tools	v_c -40%	f_z -40%
	extra length tools	v_c -60%	f_z -55%
	uncoated tools	v_c -50%	f_z -25%



Material	Hardness	RF 100 Type	Application	a_e max	v_c	f_z (mm/z) with nom. Ø									
						3	4	6	8	10	12	16	20	25	
Aluminium, Al-wrought alloys, Al-alloys 3.0255 Al99,5, 3.2315 AlMgSi1, 3.3515 AlMg1 3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1,5	≤ 7 % Si	A	Slotting	1xD	500	0.020	0.026	0.039	0.052	0.080	0.096	0.13	0.16	0.20	
		A	Roughing	0.75xD	600	0.022	0.030	0.045	0.060	0.092	0.110	0.15	0.18	0.23	
		A / SF	Finishing	0.02xD	1000	0.021	0.029	0.043	0.057	0.088	0.106	0.14	0.18	0.22	
Aluminium-cast alloys 3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9 3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≥ 7 % Si	A	Slotting	1xD	230	0.017	0.022	0.033	0.044	0.060	0.072	0.10	0.12	0.15	
		A	Roughing	0.75xD	300	0.019	0.025	0.038	0.051	0.069	0.083	0.11	0.14	0.17	
		A / SF	Finishing	0.02xD	460	0.018	0.024	0.036	0.048	0.066	0.079	0.11	0.13	0.17	
Magnesium-alloys MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	-	A	Slotting	1xD	180	0.015	0.020	0.030	0.040	0.055	0.066	0.09	0.11	0.14	
		A	Roughing	0.75xD	210	0.017	0.023	0.035	0.046	0.063	0.076	0.10	0.13	0.16	
		A / SF	Finishing	0.02xD	360	0.017	0.022	0.033	0.044	0.061	0.073	0.10	0.12	0.15	
Non-ferr. met. (copper, short-/long-chipp. brass/bronze) 2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb 2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 ... 2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0,5 2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176 ... 2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10	≤ 850 N/mm ²	A	Slotting	1xD	250	0.017	0.022	0.033	0.044	0.060	0.072	0.10	0.12	0.15	
		A	Roughing	0.75xD	290	0.019	0.025	0.038	0.051	0.069	0.083	0.11	0.14	0.17	
		A / SF	Finishing	0.02xD	500	0.018	0.024	0.036	0.048	0.066	0.079	0.11	0.13	0.17	



Application example

RF 100 A, Ø20.0 mm

Slot milling in AlMg4.5Mn

$a_e = 20 \text{ mm} / a_p = 11 \text{ mm}$

$v_c = 753 \text{ m/min}$

$f_z = 0.195 \text{ mm}$

$v_f = 7000 \text{ mm/min}$

Metal removal rate Q = 1540 cm³/min

RF 100 A, Ø16.0 mm

Slot milling in AlMgSi1

$a_e = 7 \text{ mm} / a_p = 30 \text{ mm}$

$v_c = 666 \text{ m/min}$



$f_z = 0.23 \text{ mm}$

$v_f = 9140 \text{ mm/min}$





Metal removal rate Q = 1919 cm³/min



Milling conditions:

	unstable machining conditions low drive power
	long tools

Correction factors:

	a_p roughing > 1.5xD	v_c -25%	f_z -25%
	medium length tools	v_c -40%	f_z -40%
	extra length tools	v_c -60%	f_z -55%
	uncoated tools	v_c -50%	f_z -25%



Material	Hardness	Type	Application	a_e max	v_c	f_z (mm/z) with nom. Ø								
						3	4	6	8	10	12	16	20	25
Aluminium, Al-wrought alloys, Al-alloys 3.0255 Al99,5, 3.2315 AlMgSi1, 3.3515 AlMg1 3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1,5	≤ 7 % Si	A / WF	Slotting	1xD	375	0.011	0.014	0.021	0.028	0.037	0.044	0.06	0.07	0.09
		A / WF	Roughing	0.75xD	440	0.012	0.016	0.024	0.032	0.043	0.051	0.07	0.09	0.11
Aluminium-cast alloys 3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9 3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≥ 7 % Si	A / WF	Slotting	1xD	180	0.010	0.013	0.019	0.026	0.035	0.042	0.06	0.07	0.09
		A / WF	Roughing	0.75xD	210	0.011	0.015	0.022	0.029	0.040	0.048	0.06	0.08	0.10
Magnesium-alloys MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	-	VA / A	Slotting	1xD	140	0.010	0.013	0.019	0.026	0.035	0.042	0.06	0.07	0.09
		VA / A	Roughing	0.75xD	170	0.011	0.015	0.022	0.029	0.040	0.048	0.06	0.08	0.10
Non-ferr. met. (copper, short-/long-chipp. brass/bronze) 2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb 2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 ... 2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0,5 2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176 ... 2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10	≤ 850 N/mm ²	VA / A	Slotting	1xD	200	0.010	0.013	0.019	0.026	0.035	0.042	0.06	0.07	0.09
		VA / A	Roughing	0.75xD	230	0.011	0.015	0.022	0.029	0.040	0.048	0.06	0.08	0.10



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