

# GÜHRING

PCD Diver for maximum machining rates  
and tool life in aluminium

new

Micro Diver from  $\varnothing$  0.5 mm



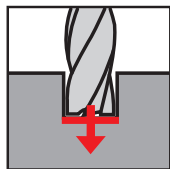
**RF100** *d*iver

The plunge milling cutter  
for 5 milling operations

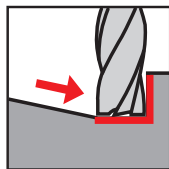
# DIVE INTO IT

## *The plunge milling cutter for 5 milling operations*

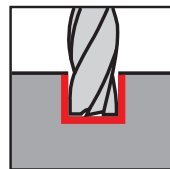
The RF 100 Diver milling cutter family is your best choice for drilling, ramping, slotting, roughing or finishing – in all materials and regardless of the existing milling conditions. As such, the Diver performs effortlessly and efficiently even under difficult machining conditions.



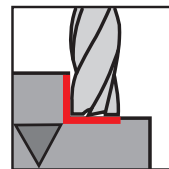
Drilling



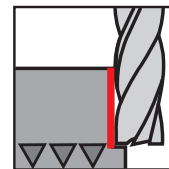
Ramping



Slotting



Roughing



Finishing

**RF 100** *d*iver

## For any application the optimal Diver

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### Micro Diver

new

- for the micro-machining of  $\varnothing$  0.5 – 3.175 mm
- highly versatile
- extremely high cutting values and infeed rates
- available with corner chamfer and corner radius



### 3-fluted RF 100 Diver

- for weaker machines and clamping conditions
- for lathes and driven tools
- especially for slotting with smaller milling cutter diameters



### 4-fluted RF 100 Diver, short

- for more stability with slotting
- up to 25% higher feed rate
- reduced deflection



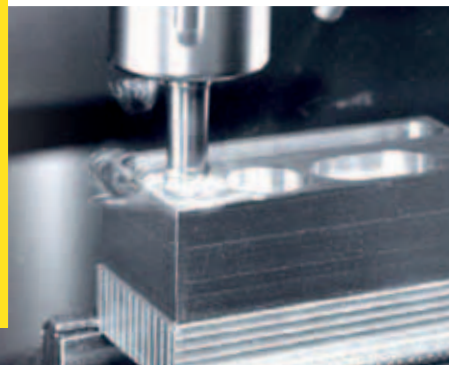
### 4-fluted RF 100 Diver

- high-performance milling with maximum cutting speeds
- for stable machine & clamping conditions

### PCD Diver

new

- all-rounder for maximum machining rates and never-ending tool lives in aluminium
- cost savings due to low-burr profile and structural part processing
- helical hole machining with reduced torque and axial force





## *RF 100 Diver*

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One tool, numerous applications: You can see all cutting parameters in the video.



# UNIVERSALLY USEABLE

## For all materials and milling strategies

The RF 100 Diver not only impresses in different milling operations but also as specialist for various materials and applications.

### Micro Diver

Tool Ø: 1 mm  
 $a_p = 1$  mm  
 $a_e = 1$  mm  
 $v_c = 120$  m/min  
 $v_f = 0.007$  mm/min

#### Application example

Wet machining in 1.4301  
 Slotting and pocket milling  
 Ramping angle = 30°



Application video

### PCD Diver

Tool Ø: 12 mm  
 $a_p = 6$  mm  
 $a_e = 12$  mm  
 $v_c = 754$  m/min  
 $v_f = 0.2$  mm/min

#### Application example

Trockenbearbeitung in AISi1MgMn  
 Ramping, helical and pocket milling  
 Ramping angle = 30°



Application video

### Slotting



Tool Ø: 12 mm  
 $a_p = 12$  mm  
 $a_e = 12$  mm  
 $v_c = 170$  m/min  
 $v_f = 0.045$  mm/min

#### Application example

Dry machining in 42CrMo4  
 Slotting 1xD deep  
 Ramping angle = without



### Roughing



Tool Ø: 12 mm  
 $a_p = 24$  mm  
 $a_e = 2$  mm  
 $v_c = 280$  m/min  
 $v_f = 0.05$  mm/min

#### Application example

Dry machining in 42CrMo4  
 GTC roughing  
 Ramping angle = without



### Finishing



Tool Ø: 12 mm  
 $a_p = 24$  mm  
 $a_e = 0.2$  mm  
 $v_c = 350$  m/min  
 $v_f = 0.05$  mm/min

#### Application example

Dry machining in 42CrMo4  
 HSC finishing  
 Ramping angle = without



### Ramping



Tool Ø: 12 mm  
 $a_p = 12$  mm  
 $a_e = 12$  mm  
 $v_c = 180$  m/min  
 $v_f = 0.036$  mm/min

#### Application example

Dry machining in 42CrMo4  
 Plunging ramping  
 Ramping angle = up to 60°



### Drilling



Tool Ø: 12 mm  
 $a_p = 12$  mm  
 $a_e = 12$  mm  
 $v_c = 180$  m/min  
 $v_f = 0.03$  mm/min

#### Application example

Dry machining in 42CrMo4  
 Drilling  
 Ramping angle = 90°





P	M	K	N	S	H	Tool illustration	Z	Hardness	Cutting edge form	Length	Helix angle °	Tool material	Surface	d1/mm	Article no.	Page
<b>Ratio end mills RF 100 Micro Diver</b>																
•	•	•	•	•	○			48 HRC	45°	2,5xD	40°	VHM	⊗	0.500 - 3.175	6808	9
•	•	•	•	•	○			48 HRC	45°	5xD	40°	VHM	⊗	0.500 - 3.175	6809	9
•	•	•	•	•	○			48 HRC	R=0,01	2,5xD	40°	VHM	⊗	0.500 - 3.000	6691	10
•	•	•	•	•	○			48 HRC	R=0,01	5xD	40°	VHM	⊗	0.500 - 3.000	6692	11
<b>Ratio end mills RF 100 Diver (3-fluted)</b>																
•	•	•	•	•					45°		41° 43° 45°	VHM	⊙	3.000 - 20.000	6797	12
•	•	•	•	•					45°		41° 43° 45°	VHM	⊙	3.000 - 20.000	6798	12
•	•	•	•	•					45°		41° 43° 45°	VHM	⊙	6.000 - 16.000	6799	13
•	•	•	•	•					45°		41° 43° 45°	VHM	⊙	6.000 - 16.000	6800	13
<b>Ratio end mills RF 100 Diver</b>																
•	•	•	•	•	○			48 HRC	45°		36° 38° 37°	VHM	⊙	3.000 - 20.000	6803	14
•	•	•	•	•	○			48 HRC	45°		36° 38° 37°	VHM	⊙	3.000 - 20.000	6804	14
•	•	•	•	•	○			48 HRC	45°		36° 38° 37°	VHM	⊙	4.000 - 20.000	6737	15
•	•	•	•	•	○			48 HRC	45°		36° 38° 37°	VHM	⊙	4.000 - 20.000	6736	15
•	•	•	•	•	○			48 HRC	45°		36° 38° 37°	VHM	⊙	6.000 - 25.000	6801	16
•	•	•	•	•	○			48 HRC	45°		36° 38° 37°	VHM	⊙	6.000 - 25.000	6802	16
<b>Ratio end mill sets RF 100 Diver</b>																
•	•	•	•	•				48 HRC	45°		36° 38° 37°	VHM	⊙		6755	17
•	•	•	•	•				48 HRC	45°		36° 38° 37°	VHM	⊙		6754	17
<b>PCD Diver (3-fluted)</b>																
•									R=0,05			PKD	○	12.000 - 32.000	4190	19



**Tool shopping made easy**

## **Gühring online shop**

With just a few clicks, you can order tools exactly when it suits you. Check tool availability online 24/7. Creating watch lists and shopping cart templates saves you work for recurring orders. You can also assign individual user roles to your employees. Furthermore, use our subscription function in the shop to automatically reorder tools. And with the retrieval function, you can manage your contracts yourself in the shop.

- **check price and stock in real time**
- **own material numbers make ordering easier**
- **individual approval processes for your company**
- **conveniently download CAD data when purchasing**



# THE SMALLEST DIVER IN THE WORLD

- plunge and mill with just one tool
- universal, in every application, in every material
- extreme cutting values and very high cutting depths

## SYMMETRICAL DRILL FACE

optimised for drilling and ramping operations  
high cutting edge stability

**new**

## MICRO DIVER WITH CORNER RADIUS

can now be found as new 6691  
and 6692 varieties in the range



## EXTENSION FROM Ø 0.5 mm

Ø 0.5 – 3.175 mm

## LENGTHS

2.5xD and 5xD



## INNOVATIVE FLUTE FORM

very high tool stability  
low-vibration cut

## THE HIPIMS COATING PERROX

achieves a very high surface quality for  
optimum chip removal as well as perfect  
protection against wear and oxidation  
during dry and wet machining

## NEW TRANSITION VERSION

improves overall stability

## GÜHROJET COOLANT DUCTS

targeted cooling and lubrication  
perfect hardness-toughness ratio  
directly in the cutting area  
effective chip removal

## NEW ULTRAFINE CARBIDE

perfect for hardness-toughness  
ratio for the micro-machining

MIKRO  
RF100 **d**iver





Ratio end mills RF 100 Micro Diver

Article no. 6808



for extreme cutting values and cutting performance • with internal cooling: GühroJet peripheral cooling with 6 or 4 exits • centre cutting • with special drill face



Article no. **6808**

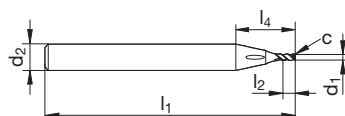
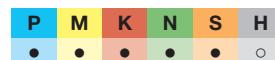
d1 h8 mm	d2 h5 mm	l1 mm	l2 mm	l4 mm	c mm x 45°	Z	Order no.
0.50	4.00	38	1.2	9.3	0.010	3	6808 0.500
0.75	4.00	38	1.8	9.3	0.015	3	6808 0.750
0.79	4.00	38	1.9	9.3	0.016	3	6808 0.790
0.80	4.00	38	2.0	9.3	0.016	3	6808 0.800
1.00	4.00	38	2.5	9.3	0.020	3	6808 1.000
1.19	4.00	38	2.9	9.4	0.024	3	6808 1.190
1.20	4.00	38	3.0	9.4	0.024	3	6808 1.200
1.50	4.00	45	3.7	9.8	0.030	3	6808 1.500
1.59	4.00	44	3.9	9.9	0.032	3	6808 1.590
1.80	4.00	45	4.5	10.3	0.036	3	6808 1.800
1.98	6.00	50	4.9	14.7	0.040	3	6808 1.980
2.00	6.00	50	5.0	14.7	0.040	3	6808 2.000
2.20	6.00	50	5.5	14.9	0.044	3	6808 2.200
2.38	6.00	50	5.9	15.2	0.048	3	6808 2.380
2.50	6.00	50	6.2	15.3	0.050	3	6808 2.500
2.78	6.00	50	6.9	15.9	0.056	3	6808 2.780
2.80	6.00	50	7.0	15.9	0.056	3	6808 2.800
3.00	6.00	50	7.5	16.2	0.060	3	6808 3.000
3.17	6.00	50	7.9	16.6	0.064	3	6808 3.175

Ratio end mills RF 100 Micro Diver

Article no. 6809



for extreme cutting values and cutting performance • with internal cooling: GühroJet peripheral cooling with 6 or 4 exits • centre cutting • with special drill face

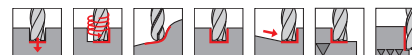


Article no. **6809**

d1 h8 mm	d2 h5 mm	l1 mm	l2 mm	l4 mm	c mm x 45°	Z	Order no.
0.50	4.00	38	2.5	10.6	0.010	3	6809 0.500
0.75	4.00	38	3.7	11.2	0.015	3	6809 0.750
0.79	4.00	38	3.9	11.3	0.016	3	6809 0.790
0.80	4.00	38	4.0	11.3	0.016	3	6809 0.800
1.00	4.00	45	5.0	11.8	0.020	3	6809 1.000
1.19	4.00	50	5.9	12.4	0.024	3	6809 1.190
1.50	4.00	50	7.5	13.5	0.030	3	6809 1.500
1.59	4.00	50	7.9	13.9	0.032	3	6809 1.590
1.98	6.00	57	9.9	19.6	0.040	3	6809 1.980
2.00	6.00	57	10.0	19.7	0.040	3	6809 2.000
2.38	6.00	57	11.9	21.1	0.048	3	6809 2.380
2.50	6.00	57	12.5	21.6	0.050	3	6809 2.500
2.78	6.00	57	13.9	22.8	0.056	3	6809 2.780
3.00	6.00	57	15.0	23.7	0.060	3	6809 3.000
3.17	6.00	57	15.8	24.6	0.064	3	6809 3.175



for extreme cutting values and cutting performance • with internal cooling: GühroJet peripheral cooling with 6 or 4 exits • centre cutting • with special drill face



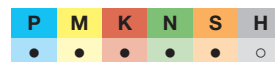
Article no. **6691**

d1 h8 mm	d2 h5 mm	l1 mm	l2 mm	l4 mm	r mm	Z	Order no.
0.50	4.00	38	1.2	9.3	0.05	3	6691 0.500
0.50	4.00	38	1.2	9.3	0.10	3	6691 0.501
0.75	4.00	38	1.8	9.3	0.05	3	6691 0.750
0.75	4.00	38	1.8	9.3	0.10	3	6691 0.751
0.80	4.00	38	2.0	9.3	0.05	3	6691 0.800
0.80	4.00	38	2.0	9.3	0.10	3	6691 0.801
1.00	4.00	38	2.5	9.3	0.05	3	6691 1.000
1.00	4.00	38	2.5	9.3	0.10	3	6691 1.001
1.00	4.00	38	2.5	9.3	0.20	3	6691 1.002
1.20	4.00	38	3.0	9.4	0.10	3	6691 1.201
1.20	4.00	38	3.0	9.4	0.20	3	6691 1.202
1.50	4.00	45	3.7	9.8	0.10	3	6691 1.501
1.50	4.00	45	3.7	9.8	0.20	3	6691 1.502
1.50	4.00	45	3.7	9.8	0.30	3	6691 1.503
1.80	4.00	45	4.5	10.2	0.10	3	6691 1.801
1.80	4.00	45	4.5	10.2	0.20	3	6691 1.802
1.80	4.00	45	4.5	10.2	0.30	3	6691 1.803
2.00	6.00	50	5.0	14.7	0.10	3	6691 2.001
2.00	6.00	50	5.0	14.7	0.20	3	6691 2.002
2.00	6.00	50	5.0	14.7	0.30	3	6691 2.003
2.00	6.00	50	5.0	14.7	0.50	3	6691 2.005
2.20	6.00	50	5.5	14.9	0.20	3	6691 2.202
2.20	6.00	50	5.5	14.9	0.50	3	6691 2.205
2.50	6.00	50	6.2	15.4	0.20	3	6691 2.502
2.50	6.00	50	6.2	15.4	0.30	3	6691 2.503
2.50	6.00	50	6.2	15.4	0.50	3	6691 2.505
2.80	6.00	50	7.0	15.9	0.20	3	6691 2.802
2.80	6.00	50	7.0	15.9	0.30	3	6691 2.803
2.80	6.00	50	7.0	15.9	0.50	3	6691 2.805
3.00	6.00	50	7.5	16.3	0.20	3	6691 3.002
3.00	6.00	50	7.5	16.3	0.30	3	6691 3.003
3.00	6.00	50	7.5	16.3	0.50	3	6691 3.005

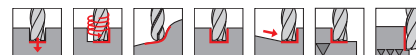


Ratio end mills RF 100 Micro Diver

Article no. 6692



for extreme cutting values and cutting performance • with internal cooling: GühroJet peripheral cooling with 6 or 4 exits • centre cutting • with special drill face



Article no. **6692**

d1 h8 mm	d2 h5 mm	l1 mm	l2 mm	l4 mm	r mm	Z	Order no.
0.50	4.00	38	2.5	10.6	0.05	3	6692 0.500
0.50	4.00	38	2.5	10.6	0.10	3	6692 0.501
0.75	4.00	38	3.7	11.2	0.05	3	6692 0.750
0.75	4.00	38	3.7	11.2	0.10	3	6692 0.751
0.80	4.00	38	4.0	11.3	0.05	3	6692 0.800
0.80	4.00	38	4.0	11.3	0.10	3	6692 0.801
1.00	4.00	45	5.0	11.8	0.05	3	6692 1.000
1.00	4.00	45	5.0	11.8	0.10	3	6692 1.001
1.00	4.00	45	5.0	11.8	0.20	3	6692 1.002
1.20	4.00	50	6.0	12.4	0.10	3	6692 1.201
1.20	4.00	50	6.0	12.4	0.20	3	6692 1.202
1.50	4.00	50	7.5	13.5	0.10	3	6692 1.501
1.50	4.00	50	7.5	13.5	0.20	3	6692 1.502
1.50	4.00	50	7.5	13.5	0.30	3	6692 1.503
1.80	4.00	50	9.0	14.7	0.10	3	6692 1.801
1.80	4.00	50	9.0	14.7	0.20	3	6692 1.802
1.80	4.00	50	9.0	14.7	0.30	3	6692 1.803
2.00	6.00	57	10.0	19.7	0.10	3	6692 2.001
2.00	6.00	57	10.0	19.7	0.20	3	6692 2.002
2.00	6.00	57	10.0	19.7	0.30	3	6692 2.003
2.00	6.00	57	10.0	19.7	0.50	3	6692 2.005
2.20	6.00	57	11.0	20.4	0.20	3	6692 2.202
2.20	6.00	57	11.0	20.4	0.50	3	6692 2.205
2.50	6.00	57	12.5	21.6	0.20	3	6692 2.502
2.50	6.00	57	12.5	21.6	0.30	3	6692 2.503
2.50	6.00	57	12.5	21.6	0.50	3	6692 2.505
2.80	6.00	57	14.0	22.9	0.20	3	6692 2.802
2.80	6.00	57	14.0	22.9	0.30	3	6692 2.803
2.80	6.00	57	14.0	22.9	0.50	3	6692 2.805
3.00	6.00	57	15.0	23.8	0.20	3	6692 3.002
3.00	6.00	57	15.0	23.8	0.30	3	6692 3.003
3.00	6.00	57	15.0	23.8	0.50	3	6692 3.005

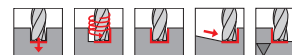


## Ratio end mills RF 100 Diver (3-fluted)

Article no. **6797**



neck clearance • centre cutting • with special drill face

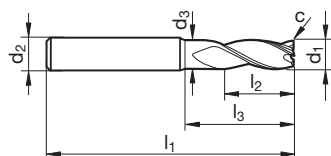
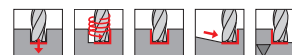


## Ratio end mills RF 100 Diver (3-fluted)

Article no. **6798**



neck clearance • centre cutting • with special drill face



Article no.

**6797**

**6798**

d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	Order no.	
3.00	6.00	2.80	57	8.0	15.0	0.05	3	6797 3.000	6798 3.000
3.50	6.00	3.30	57	10.0	15.0	0.05	3	6797 3.500	6798 3.500
3.70	6.00	3.50	57	11.0	15.0	0.06	3	6797 3.700	6798 3.700
4.00	6.00	3.80	57	11.0	18.0	0.06	3	6797 4.000	6798 4.000
4.50	6.00	4.30	57	11.0	18.0	0.07	3	6797 4.500	6798 4.500
4.70	6.00	4.50	57	13.0	18.0	0.07	3	6797 4.700	6798 4.700
5.00	6.00	4.80	57	13.0	18.0	0.08	3	6797 5.000	6798 5.000
5.50	6.00	5.30	57	13.0	19.4	0.08	3	6797 5.500	6798 5.500
5.70	6.00	5.50	57	13.0	19.6	0.09	3	6797 5.700	6798 5.700
6.00	6.00	5.70	57	13.0	20.0	0.09	3	6797 6.000	6798 6.000
6.50	8.00	6.20	63	16.0	24.4	0.10	3	6797 6.500	6798 6.500
7.00	8.00	6.70	63	16.0	24.9	0.11	3	6797 7.000	6798 7.000
7.50	8.00	7.20	63	19.0	25.3	0.11	3	6797 7.500	6798 7.500
8.00	8.00	7.70	63	19.0	26.0	0.12	3	6797 8.000	6798 8.000
8.50	10.00	8.20	72	19.0	29.4	0.13	3	6797 8.500	6798 8.500
9.00	10.00	8.70	72	19.0	29.9	0.14	3	6797 9.000	6798 9.000
9.50	10.00	9.20	72	22.0	30.3	0.14	3	6797 9.500	6798 9.500
10.00	10.00	9.50	72	22.0	30.0	0.15	3	6797 10.000	6798 10.000
12.00	12.00	11.50	83	26.0	36.0	0.18	3	6797 12.000	6798 12.000
16.00	16.00	15.50	92	32.0	42.0	0.19	3	6797 16.000	6798 16.000
20.00	20.00	19.50	104	38.0	52.0	0.24	3	6797 20.000	6798 20.000



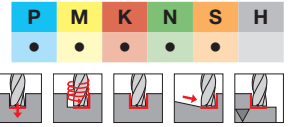


Ratio end mills RF 100 Diver (3-fluted)

Article no. 6799



with internal cooling: radial and axial exits • neck clearance • centre cutting • with special drill face

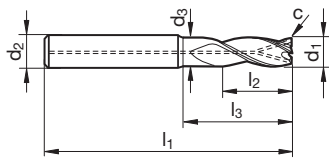
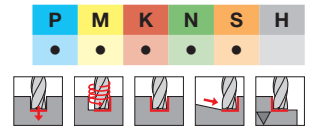


Ratio end mills RF 100 Diver (3-fluted)

Article no. 6800



with internal cooling: radial and axial exits • neck clearance • centre cutting • with special drill face



Article no.

6799

6800

d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	Order no.	
6.00	6.00	5.70	57	13.0	20.0	0.09	3	6799 6.000	6800 6.000
8.00	8.00	7.70	63	19.0	26.0	0.12	3	6799 8.000	6800 8.000
10.00	10.00	9.50	72	22.0	30.0	0.15	3	6799 10.000	6800 10.000
12.00	12.00	11.50	83	26.0	36.0	0.18	3	6799 12.000	6800 12.000
16.00	16.00	15.50	92	32.0	42.0	0.19	3	6799 16.000	6800 16.000

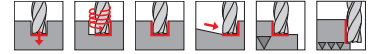


Ratio end mills RF 100 Diver

Article no. 6803



neck clearance • centre cutting

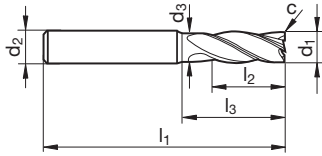
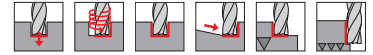


Ratio end mills RF 100 Diver

Article no. 6804



neck clearance • centre cutting



Article no.

6803

6804

d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	Order no.
3.00	6.00	2.80	50	5.0	12.0	0.03	4	6803 3.000 6804 3.000
3.70	6.00	3.50	54	8.0	12.0	0.04	4	6803 3.700 6804 3.700
4.00	6.00	3.80	54	8.0	15.0	0.04	4	6803 4.000 6804 4.000
4.70	6.00	4.50	54	9.0	15.0	0.05	4	6803 4.700 6804 4.700
5.00	6.00	4.80	54	9.0	15.0	0.05	4	6803 5.000 6804 5.000
5.70	6.00	5.50	54	10.0	16.6	0.06	4	6803 5.700 6804 5.700
6.00	6.00	5.70	54	10.0	17.0	0.06	4	6803 6.000 6804 6.000
7.00	8.00	6.70	58	11.0	19.9	0.07	4	6803 7.000 6804 7.000
7.70	8.00	7.40	58	12.0	20.5	0.08	4	6803 7.700 6804 7.700
8.00	8.00	7.70	58	12.0	21.0	0.08	4	6803 8.000 6804 8.000
9.00	10.00	8.70	66	13.0	23.9	0.09	4	6803 9.000 6804 9.000
9.70	10.00	9.40	66	14.0	24.5	0.10	4	6803 9.700 6804 9.700
10.00	10.00	9.50	66	14.0	24.0	0.10	4	6803 10.000 6804 10.000
11.70	12.00	11.20	73	16.0	25.3	0.12	4	6803 11.700 6804 11.700
12.00	12.00	11.50	73	16.0	26.0	0.12	4	6803 12.000 6804 12.000
15.60	16.00	15.10	82	22.0	31.2	0.16	4	6803 15.600 6804 15.600
16.00	16.00	15.50	82	22.0	32.0	0.16	4	6803 16.000 6804 16.000
19.00	20.00	18.50	92	26.0	38.7	0.19	4	6803 19.000 6804 19.000
20.00	20.00	19.50	92	26.0	40.0	0.20	4	6803 20.000 6804 20.000



Ratio end mills RF 100 Diver

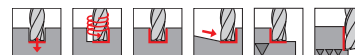
Article no. 6737



VHM Y NH DIN 6527L 36° 38° 37° 4 HA 45° 7° 48 HRC GTC

neck clearance • centre cutting

P M K N S H



Ratio end mills RF 100 Diver

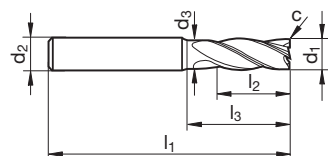
Article no. 6736



VHM Y NH DIN 6527L 36° 38° 37° 4 HB 45° 7° 48 HRC GTC

neck clearance • centre cutting

P M K N S H



Article no. 6737 6736

d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	Order no.
4.00	6.00	3.80	57	11.0	18.0	0.04	4	6737 4.000 6736 4.000
5.00	6.00	4.80	57	13.0	18.0	0.05	4	6737 5.000 6736 5.000
5.70	6.00	5.50	57	13.0	19.6	0.06	4	6737 5.700 6736 5.700
6.00	6.00	5.70	57	13.0	20.0	0.06	4	6737 6.000 6736 6.000
7.70	8.00	7.40	63	19.0	25.5	0.08	4	6737 7.700 6736 7.700
8.00	8.00	7.70	63	19.0	26.0	0.08	4	6737 8.000 6736 8.000
9.70	10.00	9.40	72	22.0	30.5	0.10	4	6737 9.700 6736 9.700
10.00	10.00	9.50	72	22.0	30.0	0.10	4	6737 10.000 6736 10.000
11.70	12.00	11.20	83	26.0	35.3	0.12	4	6737 11.700 6736 11.700
12.00	12.00	11.50	83	26.0	36.0	0.12	4	6737 12.000 6736 12.000
13.70	14.00	13.20	83	26.0	35.3	0.14	4	6737 13.700 6736 13.700
14.00	14.00	13.50	83	26.0	36.0	0.14	4	6737 14.000 6736 14.000
15.60	16.00	15.10	92	32.0	41.2	0.16	4	6737 15.600 6736 15.600
16.00	16.00	15.50	92	32.0	42.0	0.16	4	6737 16.000 6736 16.000
19.50	20.00	19.00	104	38.0	51.1	0.20	4	6737 19.500 6736 19.500
20.00	20.00	19.50	104	38.0	52.0	0.20	4	6737 20.000 6736 20.000

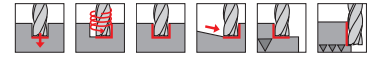


Ratio end mills RF 100 Diver

Article no. 6801



with internal cooling: radial and axial exits • neck clearance • centre cutting

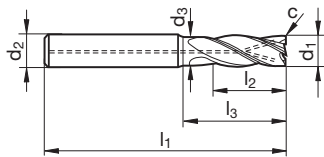
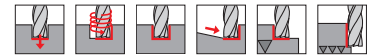


Ratio end mills RF 100 Diver

Article no. 6802



with internal cooling: radial and axial exits • neck clearance • centre cutting



Article no. 6801 6802

d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	Order no.
6.00	6.00	5.70	57	13.0	20.0	0.06	4	6801 6.000 6802 6.000
8.00	8.00	7.70	63	19.0	26.0	0.08	4	6801 8.000 6802 8.000
10.00	10.00	9.50	72	22.0	30.0	0.10	4	6801 10.000 6802 10.000
12.00	12.00	11.50	83	26.0	36.0	0.12	4	6801 12.000 6802 12.000
16.00	16.00	15.50	92	32.0	42.0	0.16	4	6801 16.000 6802 16.000
20.00	20.00	19.50	104	38.0	52.0	0.20	4	6801 20.000 6802 20.000
25.00	25.00	24.00	121	45.0	63.0	0.25	4	6801 25.000 6802 25.000



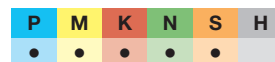


Ratio end mill sets RF 100 Diver

Article no. 6755



neck clearance • centre cutting • consisting of art. no. 6737



Article no. **6755**

Ø-range mm	Pieces/set	Order no.
5.7/7.7/9.7/11.7/15.6	5	6755 1.000
6/8/10/12/16	5	6755 2.000

Ratio end mill sets RF 100 Diver

Article no. 6754



neck clearance • centre cutting • consisting of art. no. 6736



Article no. **6754**

Ø-range mm	Pieces/set	Order no.
5.7/7.7/9.7/11.7/15.6	5	6754 1.000
6/8/10/12/16	5	6754 2.000

# THE NEW DIVER FOR ALU

- ultra-hard PCD cutting material ensures maximum tool lives
- minimal burr development during milling on profiles and structural components
- very smooth operation thanks to highly positive geometry
- ramping up to 60°

**HIGHLY POSITIVE  
PCD CUTTING EDGES**  
and carbide cutting edges  
up to the centre



**DIMENSIONS**  
Ø 12.0 – 32.0 mm

**LENGTHS**  
2xD – 3xD

**FRONT END**  
for ramp angle up to 60°

**OPTIMIZED CHIP  
SPACE GEOMETRY**  
ensures optimum chip flow

**INTERNAL COOLING**  
optimised for drilling and milling

**new**

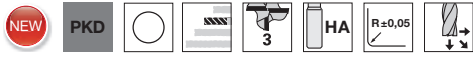
**TAPERED NECK**  
for optimised chip removal  
in deep pockets

**PKD** *d*iver

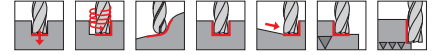
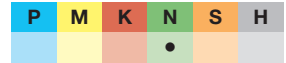
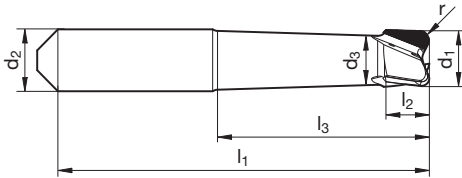


## PCD Diver (3-fluted)

Article no. 4190



with special front end • with internal cooling: radial and axial exits • suitable for MQL • three highly positive PCD cutting edges • tapered neck • centre cutting



Article no.

4190

d1 ±0,02 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	r mm	Z	Order no.
12.00	12.00	10.50	75	8.0	28.00	2.00	3	4190 12.020
16.00	16.00	12.53	103	12.0	53.00	2.00	3	4190 16.020
20.00	20.00	15.76	120	14.0	68.00	3.00	3	4190 20.030
25.00	25.00	19.87	145	18.0	87.00	3.00	3	4190 25.030
32.00	32.00	27.58	170	20.0	108.00	4.00	3	4190 32.040



## RF 100 Diver

### Milling conditions:

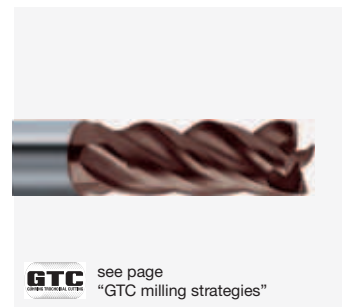
**HPC** stable machining conditions  
high drive power

short tools

long tools

### Correction factors:

$a_p$  roughing > 1.5 x D       $v_c$  -25 %       $f_z$  -25 %



Machining group	Application	$v_c$ (m/min)	$a_p$ max.	$a_e$ max.	$f_z$ (mm/z) with nom. Ø							
					4	5	6	8	10	12	16	20
<b>P1.1.1</b> Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm <sup>2</sup> , 125 HB <b>P1.1.2</b> Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm <sup>2</sup> , 125 HB <b>P1.1.3</b> Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm <sup>2</sup> , 190 HB <b>P1.1.4</b> Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm <sup>2</sup> , 190 HB <b>P1.1.5</b> Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm <sup>2</sup> , 250 HB <b>P1.1.6</b> Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm <sup>2</sup> , 270 HB <b>P1.1.7</b> Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm <sup>2</sup> , 300 HB	Plunging	270	1xD	1xD	0.015	0.025	0.030	0.040	0.045	0.060	0.075	0.075
	Slotting	270	1xD	1xD	0.020	0.025	0.035	0.050	0.060	0.080	0.100	0.100
	Roughing	350	1.5xD	0.4xD	0.025	0.040	0.050	0.065	0.075	0.100	0.125	0.125
	Finishing	540	2xD	0.02xD	0.020	0.035	0.045	0.055	0.065	0.090	0.110	0.110
<b>P2.1.1</b> Low-alloy steel, annealed, Rm 610 N/mm <sup>2</sup> , 180 HB <b>P2.1.2</b> Low-alloy steel, heat-treated, Rm 930 N/mm <sup>2</sup> , 275 HB <b>P2.1.3</b> Low-alloy steel, heat-treated, Rm 1020 N/mm <sup>2</sup> , 300 HB <b>P2.1.4</b> Low-alloy steel, heat-treated, Rm 1190 N/mm <sup>2</sup> , 350 HB	Plunging	230	1xD	1xD	0.015	0.025	0.030	0.040	0.045	0.060	0.075	0.075
	Slotting	230	1xD	1xD	0.020	0.025	0.035	0.050	0.060	0.080	0.100	0.100
	Roughing	300	1.5xD	0.4xD	0.025	0.040	0.050	0.065	0.075	0.100	0.125	0.125
	Finishing	460	2xD	0.02xD	0.020	0.035	0.045	0.055	0.065	0.090	0.110	0.110
<b>P3.1.1</b> High-alloy steel and tool steel, annealed, Rm 680 N/mm <sup>2</sup> , 200 HB <b>P3.1.2</b> High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm <sup>2</sup> , 325 HB	Plunging	180	1xD	1xD	0.015	0.020	0.025	0.035	0.040	0.055	0.070	0.070
	Slotting	180	1xD	1xD	0.015	0.025	0.030	0.045	0.055	0.070	0.090	0.090
	Roughing	235	1.5xD	0.4xD	0.025	0.035	0.045	0.055	0.070	0.090	0.115	0.115
	Finishing	360	2xD	0.02xD	0.020	0.030	0.040	0.050	0.060	0.080	0.100	0.100
<b>M1.1.1</b> Stainless steel, ferritic/martensitic, with machining additives <b>M1.1.2</b> Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm <sup>2</sup> , 200 HB	Plunging	115	1xD	1xD	0.015	0.020	0.025	0.035	0.040	0.055	0.070	0.070
	Slotting	115	1xD	1xD	0.015	0.025	0.030	0.045	0.055	0.070	0.090	0.090
	Roughing	170	1.5xD	0.33xD	0.025	0.035	0.045	0.060	0.070	0.095	0.115	0.115
	Finishing	230	2xD	0.02xD	0.020	0.030	0.040	0.050	0.060	0.080	0.100	0.100
<b>M1.1.3</b> Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm <sup>2</sup> , 240 HB	Plunging	85	1xD	1xD	0.010	0.020	0.025	0.030	0.035	0.050	0.060	0.060
	Slotting	85	1xD	1xD	0.015	0.020	0.030	0.040	0.050	0.065	0.080	0.080
	Roughing	125	1.5xD	0.33xD	0.020	0.030	0.040	0.055	0.065	0.085	0.105	0.105
	Finishing	165	2xD	0.02xD	0.020	0.025	0.035	0.045	0.055	0.070	0.090	0.090
<b>M2.1.1</b> Stainless steel, austenitic, quenched, 180 HB	Plunging	80	1xD	1xD	0.010	0.020	0.025	0.030	0.035	0.050	0.060	0.060
	Slotting	80	1xD	1xD	0.015	0.020	0.030	0.040	0.050	0.065	0.080	0.080
	Roughing	120	1.5xD	0.33xD	0.020	0.030	0.040	0.050	0.060	0.085	0.105	0.105
	Finishing	160	2xD	0.02xD	0.020	0.025	0.035	0.045	0.055	0.070	0.090	0.090
<b>M2.2.1</b> Duplex steel, high-strength stainless steels	Plunging	60	1xD	1xD	0.010	0.015	0.020	0.025	0.030	0.040	0.050	0.050
	Slotting	60	1xD	1xD	0.010	0.020	0.025	0.035	0.040	0.055	0.070	0.070
	Roughing	90	1.5xD	0.33xD	0.020	0.025	0.035	0.045	0.055	0.075	0.090	0.090
	Finishing	120	2xD	0.02xD	0.015	0.025	0.030	0.040	0.045	0.060	0.075	0.075
<b>K1.1.1</b> Grey cast iron, pearlitic/ferritic, 180 HB <b>K1.1.2</b> Grey cast iron, pearlitic/martensitic, 260 HB <b>K1.2.1</b> Cast iron with spheroidal graphite, ferritic, 160 HB <b>K1.2.2</b> Cast iron with spheroidal graphite, pearlitic, 250 HB	Slotting	175	1xD	1xD	0.020	0.030	0.040	0.055	0.070	0.090	0.115	0.115
	Roughing	200	1xD	0.75xD	0.025	0.040	0.050	0.065	0.080	0.105	0.130	0.130
	Finishing	350	1xD	0.02xD	0.025	0.040	0.050	0.065	0.075	0.100	0.125	0.125
	Plunging	175	1xD	1xD	0.015	0.025	0.035	0.045	0.050	0.070	0.085	0.085
<b>N1.1.1</b> Wrought aluminium alloys, non-hardened, 60 HB <b>N1.1.2</b> Wrought aluminium alloys, hardened, 100 HB	Plunging	500	1xD	1xD	0.020	0.030	0.040	0.050	0.060	0.080	0.100	0.100
	Slotting	500	1xD	1xD	0.025	0.035	0.045	0.065	0.080	0.105	0.130	0.130
	Roughing	650	1.5xD	0.4xD	0.035	0.050	0.065	0.080	0.100	0.130	0.165	0.165
	Finishing	1000	2xD	0.02xD	0.030	0.045	0.055	0.070	0.085	0.115	0.145	0.145





Machining group	Application	v <sub>c</sub> (m/min)	a <sub>p</sub> max.	a <sub>e</sub> max.	f <sub>z</sub> (mm/z) with nom. Ø							
					4	5	6	8	10	12	16	20
<b>N2.1.1</b> Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB <b>N2.1.2</b> Aluminium casting alloys, hardened, ≤ 12 % Si, 90 HB	Plunging	340	1xD	1xD	0.015	0.025	0.035	0.040	0.050	0.065	0.085	0.085
	Slotting	340	1xD	1xD	0.020	0.030	0.040	0.055	0.065	0.090	0.110	0.110
	Roughing	440	1.5xD	0.4xD	0.030	0.040	0.055	0.070	0.085	0.110	0.140	0.140
	Finishing	680	2xD	0.02xD	0.025	0.035	0.050	0.060	0.075	0.095	0.120	0.120
<b>N2.1.3</b> Aluminium casting alloys, non-hardened, > 12 % Si, 130 HB	Plunging	270	1xD	1xD	0.015	0.025	0.035	0.040	0.050	0.065	0.085	0.085
	Slotting	270	1xD	1xD	0.020	0.030	0.040	0.055	0.065	0.090	0.110	0.110
	Roughing	350	1.5xD	0.4xD	0.030	0.040	0.055	0.070	0.085	0.110	0.140	0.140
	Finishing	535	2xD	0.02xD	0.025	0.035	0.050	0.060	0.075	0.095	0.120	0.120
<b>N3.1.1</b> Copper and copper alloys: Free-machining alloy, Pb > 1 % <b>N3.1.2</b> Copper and copper alloys: CuZn, CuSnZn	Plunging	260	1xD	1xD	0.015	0.025	0.035	0.040	0.050	0.065	0.085	0.085
	Slotting	260	1xD	1xD	0.020	0.030	0.040	0.055	0.065	0.090	0.110	0.110
	Roughing	335	1.5xD	0.4xD	0.030	0.040	0.055	0.070	0.085	0.110	0.140	0.140
	Finishing	515	2xD	0.02xD	0.025	0.035	0.050	0.060	0.075	0.095	0.120	0.120
<b>N3.1.3</b> Copper and copper alloys: CuSn, lead-free copper and copper electrolyte	Plunging	200	1xD	1xD	0.015	0.025	0.030	0.040	0.045	0.060	0.075	0.075
	Slotting	200	1xD	1xD	0.020	0.025	0.035	0.050	0.060	0.080	0.100	0.100
	Roughing	265	1.5xD	0.4	0.025	0.040	0.050	0.065	0.075	0.100	0.125	0.125
	Finishing	405	2xD	0.02xD	0.020	0.035	0.045	0.055	0.065	0.090	0.110	0.110
<b>S1.1.1</b> Heat-resistant alloys, Fe-based, annealed, 200 HB	Plunging	35	1xD	1xD	0.010	0.015	0.020	0.025	0.030	0.040	0.055	0.055
	Slotting	35	1xD	1xD	0.010	0.020	0.025	0.035	0.040	0.055	0.070	0.070
	Roughing	50	1.5xD	0.33xD	0.020	0.025	0.035	0.045	0.055	0.075	0.090	0.090
	Finishing	65	2xD	0.02xD	0.015	0.025	0.030	0.040	0.045	0.060	0.075	0.075
<b>S1.1.2</b> Heat-resistant alloys, Fe-based, hardened, 280 HB	Plunging	30	1xD	1xD	0.010	0.015	0.020	0.025	0.030	0.040	0.055	0.055
	Slotting	30	1xD	1xD	0.010	0.020	0.025	0.035	0.040	0.055	0.070	0.070
	Roughing	40	1.5xD	0.33xD	0.020	0.025	0.035	0.045	0.055	0.075	0.090	0.090
	Finishing	55	2xD	0.02xD	0.015	0.025	0.030	0.040	0.045	0.060	0.075	0.075
<b>S1.1.3</b> Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB	Plunging	20	1xD	1xD	0.010	0.015	0.015	0.020	0.025	0.035	0.045	0.045
	Slotting	20	1xD	1xD	0.010	0.015	0.020	0.030	0.035	0.045	0.055	0.055
	Roughing	30	1.5xD	0.33xD	0.015	0.020	0.030	0.035	0.045	0.060	0.075	0.075
	Finishing	40	2xD	0.02xD	0.015	0.020	0.025	0.030	0.040	0.050	0.065	0.065
<b>S1.1.4</b> Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB	Plunging	15	1xD	1xD	0.010	0.010	0.015	0.020	0.025	0.030	0.040	0.040
	Slotting	15	1xD	1xD	0.010	0.015	0.020	0.025	0.030	0.045	0.055	0.055
	Roughing	20	1.5xD	0.33xD	0.015	0.020	0.030	0.035	0.040	0.055	0.070	0.070
	Finishing	30	2xD	0.02xD	0.010	0.020	0.025	0.030	0.035	0.045	0.060	0.060
<b>S1.1.5</b> Heat-resistant alloys, Ni- or Co-based, cast, 320 HB	Plunging	15	1xD	1xD	0.010	0.015	0.015	0.020	0.025	0.035	0.045	0.045
	Slotting	15	1xD	1xD	0.010	0.015	0.020	0.030	0.035	0.045	0.055	0.055
	Roughing	25	1.5xD	0.33xD	0.015	0.020	0.030	0.035	0.045	0.060	0.075	0.075
	Finishing	35	2xD	0.02xD	0.015	0.020	0.025	0.030	0.040	0.050	0.065	0.065
<b>S2.1.1</b> Titanium alloys, pure titanium, Rm 400 N/mm <sup>2</sup>	Plunging	80	1xD	1xD	0.015	0.020	0.025	0.035	0.040	0.055	0.065	0.065
	Slotting	80	1xD	1xD	0.015	0.025	0.030	0.045	0.055	0.070	0.090	0.090
	Roughing	120	1.5xD	0.33xD	0.025	0.035	0.045	0.055	0.070	0.090	0.115	0.115
	Finishing	160	2xD	0.02xD	0.020	0.030	0.040	0.050	0.060	0.075	0.095	0.095
<b>S2.1.2</b> Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm <sup>2</sup>	Plunging	65	1xD	1xD	0.010	0.020	0.025	0.030	0.035	0.045	0.060	0.060
	Slotting	65	1xD	1xD	0.015	0.020	0.030	0.040	0.045	0.065	0.080	0.080
	Roughing	100	1.5xD	0.33xD	0.020	0.030	0.040	0.050	0.060	0.080	0.105	0.105
	Finishing	135	2xD	0.02xD	0.015	0.025	0.035	0.045	0.050	0.070	0.085	0.085
<b>H1.1.1</b> Hardened steel, hardened and tempered, < 55 HRC	Roughing	190	1xD	0.05xD	0.035	0.055	0.070	0.090	0.105	0.140	0.175	0.175
	Finishing	180	1xD	0.01xD	0.015	0.020	0.030	0.035	0.040	0.055	0.070	0.070
<b>H2.1.1</b> Chilled cast iron, 400 HB	Roughing	225	1xD	0.1xD	0.035	0.055	0.075	0.090	0.110	0.145	0.185	0.185
	Finishing	235	1xD	0.01xD	0.015	0.025	0.030	0.040	0.050	0.065	0.080	0.080
<b>H2.1.2</b> Chilled cast iron, hardened and tempered, < 55 HRC	Roughing	175	1xD	0.05xD	0.035	0.055	0.070	0.090	0.105	0.140	0.180	0.180
	Finishing	170	1xD	0.01xD	0.015	0.020	0.030	0.035	0.045	0.055	0.070	0.070



## RF 100 Micro Diver, 2.5xD

### Milling conditions:

**HSC** stable machining conditions  
low cutting depths, high cutting values

long tools



Machining group	Application	$v_c$ (m/min) with nom. $\emptyset$				$a_p$ max.	$a_e$ max.	$f_z$ (mm/z) with nom. $\emptyset$							
		0.79 - 1.2	1.5 - 1.98	2.0 - 2.5	2.78 - 3.175			0.8	1	1.2	1.5	1.8	2	2.5	3
		<b>P1.1.1</b> Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm <sup>2</sup> , 125 HB <b>P1.1.2</b> Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm <sup>2</sup> , 125 HB <b>P1.1.3</b> Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm <sup>2</sup> , 190 HB <b>P1.1.4</b> Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm <sup>2</sup> , 190 HB <b>P1.1.5</b> Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm <sup>2</sup> , 250 HB <b>P1.1.6</b> Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm <sup>2</sup> , 270 HB <b>P1.1.7</b> Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm <sup>2</sup> , 300 HB													
Plunging	120	130	145	160	1xD	1xD	0.0040	0.0050	0.0060	0.0080	0.0120	0.0140	0.0170	0.0200	
Slotting	130	145	160	170	1xD	1xD	0.0060	0.0080	0.0100	0.0120	0.0160	0.0180	0.0230	0.0270	
Roughing	200	210	220	230	2xD	0.25xD	0.0100	0.0120	0.0150	0.0180	0.0240	0.0270	0.0340	0.0400	
Finishing	240	250	260	275	2xD	0.03xD	0.0060	0.0080	0.0090	0.0120	0.0170	0.0190	0.0240	0.0290	
<b>P2.1.1</b> Low-alloy steel, annealed, Rm 610 N/mm <sup>2</sup> , 180 HB <b>P2.1.2</b> Low-alloy steel, heat-treated, Rm 930 N/mm <sup>2</sup> , 275 HB <b>P2.1.3</b> Low-alloy steel, heat-treated, Rm 1020 N/mm <sup>2</sup> , 300 HB <b>P2.1.4</b> Low-alloy steel, heat-treated, Rm 1190 N/mm <sup>2</sup> , 350 HB															
Plunging	110	120	135	145	1xD	1xD	0.0040	0.0050	0.0060	0.0070	0.0110	0.0120	0.0150	0.0180	
Slotting	120	135	145	155	1xD	1xD	0.0060	0.0070	0.0090	0.0110	0.0140	0.0160	0.0200	0.0240	
Roughing	185	195	200	210	2xD	0.25xD	0.0090	0.0110	0.0130	0.0160	0.0220	0.0240	0.0300	0.0360	
Finishing	220	230	240	250	2xD	0.03xD	0.0060	0.0070	0.0080	0.0100	0.0160	0.0170	0.0220	0.0260	
<b>P3.1.1</b> High-alloy steel and tool steel, annealed, Rm 680 N/mm <sup>2</sup> , 200 HB <b>P3.1.2</b> High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm <sup>2</sup> , 325 HB															
Plunging	100	110	120	130	0.75xD	1xD	0.0030	0.0040	0.0040	0.0050	0.0080	0.0090	0.0110	0.0140	
Slotting	110	120	130	145	0.75xD	1xD	0.0040	0.0050	0.0060	0.0080	0.0110	0.0120	0.0150	0.0180	
Roughing	180	185	195	205	2xD	0.2xD	0.0070	0.0090	0.0100	0.0130	0.0170	0.0190	0.0240	0.0290	
Finishing	200	210	220	230	2xD	0.03xD	0.0040	0.0050	0.0060	0.0080	0.0120	0.0130	0.0160	0.0190	
<b>M1.1.1</b> Stainless steel, ferritic/martensitic, with machining additives <b>M1.1.2</b> Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm <sup>2</sup> , 200 HB															
Plunging	110	120	135	145	1xD	1xD	0.0040	0.0050	0.0060	0.0070	0.0110	0.0120	0.0150	0.0180	
Slotting	120	135	145	155	1xD	1xD	0.0060	0.0070	0.0090	0.0110	0.0140	0.0160	0.0200	0.0240	
Roughing	185	195	200	210	2xD	0.25xD	0.0090	0.0110	0.0130	0.0160	0.0220	0.0240	0.0300	0.0360	
Finishing	220	230	240	250	2xD	0.03xD	0.0060	0.0070	0.0080	0.0100	0.0160	0.0170	0.0220	0.0260	
<b>M1.1.3</b> Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm <sup>2</sup> , 240 HB															
Plunging	80	90	100	105	1xD	1xD	0.0030	0.0040	0.0050	0.0070	0.0100	0.0110	0.0140	0.0160	
Slotting	90	100	105	115	1xD	1xD	0.0050	0.0070	0.0080	0.0100	0.0130	0.0140	0.0180	0.0220	
Roughing	135	140	150	155	2xD	0.25xD	0.0080	0.0100	0.0120	0.0150	0.0200	0.0220	0.0270	0.0330	
Finishing	160	170	175	185	2xD	0.03xD	0.0050	0.0060	0.0080	0.0090	0.0140	0.0160	0.0200	0.0230	
<b>M2.1.1</b> Stainless steel, austenitic, quenched, 180 HB															
Plunging	90	100	110	120	0.75xD	1xD	0.0030	0.0040	0.0050	0.0060	0.0090	0.0110	0.0130	0.0160	
Slotting	100	110	120	130	0.75xD	1xD	0.0050	0.0060	0.0080	0.0090	0.0130	0.0140	0.0180	0.0210	
Roughing	160	170	175	185	2xD	0.2xD	0.0080	0.0100	0.0120	0.0150	0.0200	0.0220	0.0280	0.0340	
Finishing	180	185	195	205	2xD	0.03xD	0.0050	0.0060	0.0070	0.0090	0.0140	0.0150	0.0190	0.0230	
<b>M2.2.1</b> Duplex steel, high-strength stainless steels															
Plunging	65	75	80	90	0.75xD	1xD	0.0030	0.0040	0.0040	0.0060	0.0080	0.0090	0.0110	0.0140	
Slotting	75	80	90	95	0.75xD	1xD	0.0040	0.0060	0.0070	0.0080	0.0110	0.0120	0.0150	0.0180	
Roughing	120	125	130	135	2xD	0.2xD	0.0070	0.0090	0.0110	0.0130	0.0180	0.0200	0.0240	0.0290	
Finishing	135	140	145	150	2xD	0.03xD	0.0040	0.0050	0.0060	0.0080	0.0120	0.0130	0.0170	0.0200	
<b>K1.1.1</b> Grey cast iron, pearlitic/ferritic, 180 HB <b>K1.1.2</b> Grey cast iron, pearlitic/martensitic, 260 HB <b>K1.2.1</b> Cast iron with spheroidal graphite, ferritic, 160 HB <b>K1.2.2</b> Cast iron with spheroidal graphite, pearlitic, 250 HB															
Plunging	110	120	135	145	1xD	1xD	0.0030	0.0040	0.0050	0.0060	0.0090	0.0110	0.0130	0.0160	
Slotting	120	135	145	155	1xD	1xD	0.0050	0.0060	0.0080	0.0090	0.0130	0.0140	0.0180	0.0210	
Roughing	185	195	200	210	2xD	0.25xD	0.0080	0.0090	0.0110	0.0140	0.0190	0.0210	0.0260	0.0320	
Finishing	220	230	240	250	2xD	0.03xD	0.0050	0.0060	0.0070	0.0090	0.0140	0.0150	0.0190	0.0230	



Machining group	Application	$v_c$ (m/min) with nom. $\emptyset$				$a_p$ max.	$a_e$ max.	$f_z$ (mm/z) with nom. $\emptyset$							
		0.79 - 1.2	1.5 - 1.98	2.0 - 2.5	2.78 - 3.175			0.8	1	1.2	1.5	1.8	2	2.5	3
		<b>N1.1.1</b> Wrought aluminium alloys, non-hardened, 60 HB <b>N1.1.2</b> Wrought aluminium alloys, hardened, 100 HB													
N1.1.1 N1.1.2	Plunging	170	185	205	225	1xD	1xD	0.0060	0.0070	0.0090	0.0110	0.0160	0.0180	0.0230	0.0270
	Slotting	185	205	225	245	1xD	1xD	0.0090	0.0110	0.0130	0.0160	0.0220	0.0240	0.0300	0.0360
	Roughing	285	300	315	325	2xD	0.25xD	0.0130	0.0160	0.0190	0.0240	0.0320	0.0360	0.0450	0.0540
	Finishing	335	355	370	385	2xD	0.03xD	0.0080	0.0100	0.0120	0.0160	0.0230	0.0260	0.0320	0.0390
<b>N2.1.1</b> Aluminium casting alloys, non-hardened, $\leq 12\%$ Si, 75 HB <b>N2.1.2</b> Aluminium casting alloys, hardened, $\leq 12\%$ Si, 90 HB															
N2.1.1 N2.1.2	Plunging	170	185	205	225	1xD	1xD	0.0060	0.0070	0.0090	0.0110	0.0160	0.0180	0.0230	0.0270
	Slotting	185	205	225	245	1xD	1xD	0.0090	0.0110	0.0130	0.0160	0.0220	0.0240	0.0300	0.0360
	Roughing	285	300	315	325	2xD	0.25xD	0.0130	0.0160	0.0190	0.0240	0.0320	0.0360	0.0450	0.0540
	Finishing	335	355	370	385	2xD	0.03xD	0.0080	0.0100	0.0120	0.0160	0.0230	0.0260	0.0320	0.0390
<b>N2.1.3</b> Aluminium casting alloys, non-hardened, $> 12\%$ Si, 130 HB															
N2.1.3	Plunging	135	150	165	175	1xD	1xD	0.0060	0.0070	0.0090	0.0110	0.0160	0.0180	0.0230	0.0270
	Slotting	150	165	175	190	1xD	1xD	0.0090	0.0110	0.0130	0.0160	0.0220	0.0240	0.0300	0.0360
	Roughing	225	235	245	260	2xD	0.25xD	0.0130	0.0160	0.0190	0.0240	0.0320	0.0360	0.0450	0.0540
	Finishing	265	280	295	305	2xD	0.03xD	0.0080	0.0100	0.0120	0.0160	0.0230	0.0260	0.0320	0.0390
<b>N3.1.1</b> Copper and copper alloys: Free-machining alloy, Pb $> 1\%$ <b>N3.1.2</b> Copper and copper alloys: CuZn, CuSnZn															
N3.1.1 N3.1.2	Plunging	160	175	195	210	1xD	1xD	0.0050	0.0060	0.0070	0.0090	0.0140	0.0150	0.0190	0.0230
	Slotting	175	195	210	230	1xD	1xD	0.0070	0.0090	0.0110	0.0140	0.0180	0.0200	0.0250	0.0300
	Roughing	270	280	295	310	2xD	0.25xD	0.0110	0.0140	0.0160	0.0200	0.0270	0.0300	0.0380	0.0450
	Finishing	315	335	350	365	2xD	0.03xD	0.0070	0.0090	0.0100	0.0130	0.0190	0.0220	0.0270	0.0320
<b>N3.1.3</b> Copper and copper alloys: CuSn, lead-free copper and copper electrolyte															
N3.1.3	Plunging	125	140	150	165	1xD	1xD	0.0040	0.0060	0.0070	0.0080	0.0120	0.0140	0.0170	0.0210
	Slotting	140	150	165	180	1xD	1xD	0.0070	0.0080	0.0100	0.0120	0.0170	0.0180	0.0230	0.0280
	Roughing	210	220	230	240	2xD	0.25xD	0.0100	0.0120	0.0150	0.0190	0.0250	0.0280	0.0350	0.0410
	Finishing	250	260	275	285	2xD	0.03xD	0.0060	0.0080	0.0100	0.0120	0.0180	0.0200	0.0250	0.0300
<b>S1.1.1</b> Heat-resistant alloys, Fe-based, annealed, 200 HB															
S1.1.1	Plunging	50	55	60	65	0.5xD	1xD	0.0030	0.0030	0.0040	0.0050	0.0070	0.0080	0.0100	0.0120
	Slotting	55	60	65	70	0.5xD	1xD	0.0040	0.0050	0.0060	0.0070	0.0100	0.0110	0.0140	0.0170
	Roughing	95	100	105	110	2xD	0.15xD	0.0080	0.0090	0.0110	0.0140	0.0190	0.0210	0.0260	0.0310
	Finishing	100	105	110	115	2xD	0.03xD	0.0040	0.0050	0.0060	0.0070	0.0110	0.0120	0.0150	0.0180
<b>S1.1.2</b> Heat-resistant alloys, Fe-based, hardened, 280 HB															
S1.1.2	Plunging	40	45	50	55	0.5xD	1xD	0.0030	0.0030	0.0040	0.0050	0.0070	0.0080	0.0100	0.0120
	Slotting	45	50	55	60	0.5xD	1xD	0.0040	0.0050	0.0060	0.0070	0.0100	0.0110	0.0140	0.0170
	Roughing	80	85	90	90	2xD	0.15xD	0.0080	0.0090	0.0110	0.0140	0.0190	0.0210	0.0260	0.0310
	Finishing	85	90	90	95	2xD	0.03xD	0.0040	0.0050	0.0060	0.0070	0.0110	0.0120	0.0150	0.0180
<b>S1.1.3</b> Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB															
S1.1.3	Plunging	30	30	35	40	0.5xD	1xD	0.0020	0.0030	0.0030	0.0040	0.0060	0.0070	0.0080	0.0100
	Slotting	30	35	40	40	0.5xD	1xD	0.0030	0.0040	0.0050	0.0060	0.0080	0.0090	0.0110	0.0130
	Roughing	55	55	60	60	2xD	0.15xD	0.0060	0.0080	0.0090	0.0110	0.0150	0.0170	0.0210	0.0250
	Finishing	55	60	65	65	2xD	0.03xD	0.0030	0.0040	0.0050	0.0060	0.0090	0.0100	0.0120	0.0140
<b>S1.1.4</b> Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB															
S1.1.4	Plunging	20	25	25	30	0.5xD	1xD	0.0020	0.0030	0.0030	0.0040	0.0060	0.0060	0.0080	0.0100
	Slotting	25	25	30	30	0.5xD	1xD	0.0030	0.0040	0.0050	0.0060	0.0080	0.0080	0.0110	0.0130
	Roughing	40	40	45	45	2xD	0.15xD	0.0060	0.0070	0.0090	0.0110	0.0140	0.0160	0.0200	0.0240
	Finishing	40	45	45	50	2xD	0.03xD	0.0030	0.0040	0.0040	0.0050	0.0080	0.0090	0.0110	0.0140
<b>S1.1.5</b> Heat-resistant alloys, Ni- or Co-based, cast, 320 HB															
S1.1.5	Plunging	25	30	30	35	0.5xD	1xD	0.0020	0.0030	0.0030	0.0040	0.0060	0.0070	0.0080	0.0100
	Slotting	30	30	35	35	0.5xD	1xD	0.0030	0.0040	0.0050	0.0060	0.0080	0.0090	0.0110	0.0130
	Roughing	50	50	50	55	2xD	0.15xD	0.0060	0.0080	0.0090	0.0110	0.0150	0.0170	0.0210	0.0250
	Finishing	50	55	55	60	2xD	0.03xD	0.0030	0.0040	0.0050	0.0060	0.0090	0.0100	0.0120	0.0140
<b>S2.1.1</b> Titanium alloys, pure titanium, Rm 400 N/mm <sup>2</sup>															
S2.1.1	Plunging	80	90	95	105	0.75xD	1xD	0.0040	0.0050	0.0060	0.0070	0.0110	0.0120	0.0150	0.0180
	Slotting	90	95	105	115	0.75xD	1xD	0.0060	0.0070	0.0090	0.0110	0.0140	0.0160	0.0200	0.0240
	Roughing	140	150	155	165	2xD	0.2xD	0.0090	0.0120	0.0140	0.0170	0.0230	0.0260	0.0320	0.0380
	Finishing	160	165	175	180	2xD	0.03xD	0.0060	0.0070	0.0080	0.0100	0.0160	0.0170	0.0220	0.0260
<b>S2.1.2</b> Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm <sup>2</sup>															
S2.1.2	Plunging	65	75	80	90	0.75xD	1xD	0.0030	0.0040	0.0050	0.0060	0.0100	0.0110	0.0130	0.0160
	Slotting	75	80	90	95	0.75xD	1xD	0.0050	0.0060	0.0080	0.0100	0.0130	0.0140	0.0180	0.0220
	Roughing	120	125	130	140	2xD	0.2xD	0.0080	0.0100	0.0120	0.0160	0.0210	0.0230	0.0290	0.0350
	Finishing	135	140	145	155	2xD	0.03xD	0.0050	0.0060	0.0070	0.0090	0.0140	0.0160	0.0190	0.0230



## RF 100 Micro Diver, 5xD

### Milling conditions:

**HSC** stable machining conditions  
low cutting depths, high cutting values

 extra-long tools



Machining group	Application	v <sub>c</sub> (m/min) with nom. Ø				a <sub>p</sub> max.	a <sub>e</sub> max.	f <sub>z</sub> (mm/z) with nom. Ø						
		0.79 - 1.2	1.5 - 1.98	2.0 - 2.5	2.78 - 3.175			1	1.2	1.5	2	2.5	2.8	3
<b>P1.1.1</b> Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm <sup>2</sup> , 125 HB <b>P1.1.2</b> Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm <sup>2</sup> , 125 HB <b>P1.1.3</b> Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm <sup>2</sup> , 190 HB <b>P1.1.4</b> Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm <sup>2</sup> , 190 HB <b>P1.1.5</b> Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm <sup>2</sup> , 250 HB <b>P1.1.6</b> Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm <sup>2</sup> , 270 HB <b>P1.1.7</b> Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm <sup>2</sup> , 300 HB	Plunging	50	55	60	65	0.5xD	1xD	0.0020	0.0030	0.0040	0.0060	0.0080	0.0090	0.0090
	Slotting	65	75	80	85	0.25xD	1xD	0.0040	0.0050	0.0060	0.0090	0.0110	0.0130	0.0140
	Roughing	145	150	155	165	2.5xD	0.08xD	0.0120	0.0140	0.0170	0.0260	0.0320	0.0360	0.0380
	Finishing	145	150	155	165	5xD	0.02xD	0.0050	0.0060	0.0080	0.0130	0.0160	0.0180	0.0190
<b>P2.1.1</b> Low-alloy steel, annealed, Rm 610 N/mm <sup>2</sup> , 180 HB <b>P2.1.2</b> Low-alloy steel, heat-treated, Rm 930 N/mm <sup>2</sup> , 275 HB <b>P2.1.3</b> Low-alloy steel, heat-treated, Rm 1020 N/mm <sup>2</sup> , 300 HB <b>P2.1.4</b> Low-alloy steel, heat-treated, Rm 1190 N/mm <sup>2</sup> , 350 HB	Plunging	45	50	55	60	0.5xD	1xD	0.0020	0.0030	0.0030	0.0050	0.0070	0.0080	0.0080
	Slotting	60	65	75	80	0.25xD	1xD	0.0040	0.0040	0.0050	0.0080	0.0100	0.0110	0.0120
	Roughing	130	135	145	150	2.5xD	0.08xD	0.0100	0.0120	0.0150	0.0230	0.0290	0.0320	0.0340
	Finishing	130	135	145	150	5xD	0.02xD	0.0050	0.0050	0.0070	0.0110	0.0140	0.0160	0.0170
<b>P3.1.1</b> High-alloy steel and tool steel, annealed, Rm 680 N/mm <sup>2</sup> , 200 HB <b>P3.1.2</b> High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm <sup>2</sup> , 325 HB	Plunging	40	45	50	55	0.5xD	1xD	0.0020	0.0020	0.0020	0.0040	0.0050	0.0060	0.0060
	Slotting	55	60	65	70	0.25xD	1xD	0.0030	0.0030	0.0040	0.0060	0.0080	0.0080	0.0090
	Roughing	120	125	130	135	2.5xD	0.08xD	0.0080	0.0090	0.0120	0.0170	0.0210	0.0240	0.0260
	Finishing	120	125	130	135	5xD	0.02xD	0.0030	0.0040	0.0050	0.0090	0.0110	0.0120	0.0130
<b>M1.1.1</b> Stainless steel, ferritic/martensitic, with machining additives <b>M1.1.2</b> Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm <sup>2</sup> , 200 HB	Plunging	45	50	55	60	0.5xD	1xD	0.0020	0.0030	0.0030	0.0050	0.0070	0.0080	0.0080
	Slotting	60	65	75	80	0.25xD	1xD	0.0040	0.0040	0.0050	0.0080	0.0100	0.0110	0.0120
	Roughing	130	135	145	150	2.5xD	0.08xD	0.0100	0.0120	0.0150	0.0230	0.0290	0.0320	0.0340
	Finishing	130	135	145	150	5xD	0.02xD	0.0050	0.0050	0.0070	0.0110	0.0140	0.0160	0.0170
<b>M1.1.3</b> Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm <sup>2</sup> , 240 HB	Plunging	30	35	40	45	0.5xD	1xD	0.0020	0.0020	0.0030	0.0050	0.0060	0.0070	0.0070
	Slotting	45	50	55	60	0.25xD	1xD	0.0030	0.0040	0.0050	0.0070	0.0090	0.0100	0.0110
	Roughing	95	100	105	110	2.5xD	0.08xD	0.0090	0.0110	0.0140	0.0210	0.0260	0.0290	0.0310
	Finishing	95	100	105	110	5xD	0.02xD	0.0040	0.0050	0.0060	0.0100	0.0130	0.0140	0.0160
<b>M2.1.1</b> Stainless steel, austenitic, quenched, 180 HB	Plunging	35	40	45	50	0.5xD	1xD	0.0020	0.0020	0.0030	0.0050	0.0060	0.0070	0.0070
	Slotting	50	55	60	65	0.25xD	1xD	0.0030	0.0040	0.0050	0.0070	0.0090	0.0100	0.0110
	Roughing	105	110	120	125	2.5xD	0.08xD	0.0090	0.0110	0.0130	0.0200	0.0250	0.0280	0.0300
	Finishing	105	110	120	125	5xD	0.02xD	0.0040	0.0050	0.0060	0.0100	0.0130	0.0140	0.0150
<b>M2.2.1</b> Duplex steel, high-strength stainless steels	Plunging	25	30	30	35	0.5xD	1xD	0.0020	0.0020	0.0020	0.0040	0.0050	0.0060	0.0060
	Slotting	35	40	45	50	0.25xD	1xD	0.0030	0.0030	0.0040	0.0060	0.0080	0.0090	0.0090
	Roughing	85	90	90	95	2.5xD	0.05xD	0.0080	0.0090	0.0120	0.0170	0.0220	0.0240	0.0260
	Finishing	80	85	85	90	5xD	0.02xD	0.0040	0.0040	0.0050	0.0090	0.0110	0.0120	0.0130
<b>K1.1.1</b> Grey cast iron, pearlitic/ferritic, 180 HB <b>K1.1.2</b> Grey cast iron, pearlitic/martensitic, 260 HB <b>K1.2.1</b> Cast iron with spheroidal graphite, ferritic, 160 HB <b>K1.2.2</b> Cast iron with spheroidal graphite, pearlitic, 250 HB	Plunging	45	50	55	60	0.5xD	1xD	0.0020	0.0020	0.0030	0.0050	0.0060	0.0070	0.0070
	Slotting	60	65	75	80	0.25xD	1xD	0.0030	0.0040	0.0050	0.0070	0.0090	0.0100	0.0110
	Roughing	130	135	145	150	2.5xD	0.08xD	0.0090	0.0110	0.0130	0.0200	0.0250	0.0280	0.0300
	Finishing	130	135	145	150	5xD	0.02xD	0.0040	0.0050	0.0060	0.0100	0.0130	0.0140	0.0150



Machining group	Application	$v_c$ (m/min) with nom. $\emptyset$				$a_p$ max.	$a_e$ max.	$f_z$ (mm/z) with nom. $\emptyset$						
		0.79 - 1.2	1.5 - 1.98	2.0 - 2.5	2.78 - 3.175			1	1.2	1.5	2	2.5	2.8	3
<b>N1.1.1</b> Wrought aluminium alloys, non-hardened, 60 HB <b>N1.1.2</b> Wrought aluminium alloys, hardened, 100 HB	Plunging	65	75	80	90	0.5xD	1xD	0.0030	0.0040	0.0050	0.0080	0.0100	0.0110	0.0120
	Slotting	95	105	110	120	0.25xD	1xD	0.0050	0.0060	0.0080	0.0120	0.0150	0.0170	0.0180
	Roughing	190	200	210	220	2.5xD	0.1xD	0.0140	0.0170	0.0210	0.0310	0.0390	0.0440	0.0470
	Finishing	200	210	220	230	5xD	0.02xD	0.0070	0.0080	0.0100	0.0170	0.0210	0.0240	0.0260
<b>N2.1.1</b> Aluminium casting alloys, non-hardened, $\leq 12\%$ Si, 75 HB <b>N2.1.2</b> Aluminium casting alloys, hardened, $\leq 12\%$ Si, 90 HB	Plunging	65	75	80	90	0.5xD	1xD	0.0030	0.0040	0.0050	0.0080	0.0100	0.0110	0.0120
	Slotting	95	105	110	120	0.25xD	1xD	0.0050	0.0060	0.0080	0.0120	0.0150	0.0170	0.0180
	Roughing	190	200	210	220	2.5xD	0.1xD	0.0140	0.0170	0.0210	0.0310	0.0390	0.0440	0.0470
	Finishing	200	210	220	230	5xD	0.02xD	0.0070	0.0080	0.0100	0.0170	0.0210	0.0240	0.0260
<b>N2.1.3</b> Aluminium casting alloys, non-hardened, $> 12\%$ Si, 130 HB	Plunging	55	60	65	70	0.5xD	1xD	0.0030	0.0040	0.0050	0.0080	0.0100	0.0110	0.0120
	Slotting	75	80	90	95	0.25xD	1xD	0.0050	0.0060	0.0080	0.0120	0.0150	0.0170	0.0180
	Roughing	150	160	165	175	2.5xD	0.1xD	0.0140	0.0170	0.0210	0.0310	0.0390	0.0440	0.0470
	Finishing	160	170	175	185	5xD	0.02xD	0.0070	0.0080	0.0100	0.0170	0.0210	0.0240	0.0260
<b>N3.1.1</b> Copper and copper alloys: Free-machining alloy, Pb $> 1\%$ <b>N3.1.2</b> Copper and copper alloys: CuZn, CuSnZn	Plunging	65	70	75	85	0.5xD	1xD	0.0030	0.0030	0.0040	0.0070	0.0080	0.0090	0.0100
	Slotting	90	95	105	115	0.25xD	1xD	0.0050	0.0050	0.0070	0.0100	0.0130	0.0140	0.0150
	Roughing	180	190	200	210	2.5xD	0.1xD	0.0120	0.0140	0.0180	0.0260	0.0330	0.0370	0.0390
	Finishing	190	200	210	220	5xD	0.02xD	0.0060	0.0070	0.0090	0.0140	0.0180	0.0200	0.0210
<b>N3.1.3</b> Copper and copper alloys: CuSn, lead-free copper and copper electrolyte	Plunging	50	55	60	65	0.5xD	1xD	0.0020	0.0030	0.0040	0.0060	0.0080	0.0090	0.0090
	Slotting	70	75	85	90	0.25xD	1xD	0.0040	0.0050	0.0060	0.0090	0.0120	0.0130	0.0140
	Roughing	140	150	155	165	2.5xD	0.1xD	0.0110	0.0130	0.0160	0.0240	0.0300	0.0340	0.0360
	Finishing	150	155	165	170	5xD	0.02xD	0.0050	0.0060	0.0080	0.0130	0.0160	0.0180	0.0200
<b>S1.1.1</b> Heat-resistant alloys, Fe-based, annealed, 200 HB	Plunging	20	20	25	25	0.5xD	1xD	0.0010	0.0020	0.0020	0.0040	0.0050	0.0050	0.0060
	Slotting	30	30	35	35	0.25xD	1xD	0.0020	0.0030	0.0040	0.0060	0.0070	0.0080	0.0080
	Roughing	60	60	65	70	2.5xD	0.08xD	0.0070	0.0080	0.0110	0.0160	0.0200	0.0220	0.0240
	Finishing	60	60	65	70	5xD	0.02xD	0.0030	0.0040	0.0050	0.0080	0.0100	0.0110	0.0120
<b>S1.1.2</b> Heat-resistant alloys, Fe-based, hardened, 280 HB	Plunging	15	20	20	20	0.5xD	1xD	0.0010	0.0020	0.0020	0.0040	0.0050	0.0050	0.0060
	Slotting	25	25	30	30	0.25xD	1xD	0.0020	0.0030	0.0040	0.0060	0.0070	0.0080	0.0080
	Roughing	55	55	60	60	2.5xD	0.05xD	0.0070	0.0080	0.0110	0.0160	0.0200	0.0220	0.0240
	Finishing	50	55	55	60	5xD	0.02xD	0.0030	0.0040	0.0050	0.0080	0.0100	0.0110	0.0120
<b>S1.1.3</b> Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB	Plunging	10	15	15	15	0.5xD	1xD	0.0010	0.0010	0.0020	0.0030	0.0040	0.0040	0.0050
	Slotting	15	15	20	20	0.25xD	1xD	0.0020	0.0020	0.0030	0.0040	0.0060	0.0060	0.0070
	Roughing	35	40	40	40	2.5xD	0.05xD	0.0060	0.0070	0.0090	0.0130	0.0160	0.0180	0.0190
	Finishing	35	35	40	40	5xD	0.02xD	0.0030	0.0030	0.0040	0.0060	0.0080	0.0090	0.0100
<b>S1.1.4</b> Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB	Plunging	10	10	10	10	0.5xD	1xD	0.0010	0.0010	0.0020	0.0030	0.0040	0.0040	0.0040
	Slotting	10	15	15	15	0.25xD	1xD	0.0020	0.0020	0.0030	0.0040	0.0050	0.0060	0.0060
	Roughing	25	30	30	30	2.5xD	0.05xD	0.0050	0.0070	0.0080	0.0120	0.0150	0.0170	0.0180
	Finishing	25	25	30	30	5xD	0.02xD	0.0020	0.0030	0.0040	0.0060	0.0080	0.0080	0.0090
<b>S1.1.5</b> Heat-resistant alloys, Ni- or Co-based, cast, 320 HB	Plunging	10	10	10	15	0.5xD	1xD	0.0010	0.0010	0.0020	0.0030	0.0040	0.0040	0.0050
	Slotting	15	15	15	20	0.25xD	1xD	0.0020	0.0020	0.0030	0.0040	0.0060	0.0060	0.0070
	Roughing	30	35	35	35	2.5xD	0.05xD	0.0060	0.0070	0.0090	0.0130	0.0160	0.0180	0.0190
	Finishing	30	30	35	35	5xD	0.02xD	0.0030	0.0030	0.0040	0.0060	0.0080	0.0090	0.0100
<b>S2.1.1</b> Titanium alloys, pure titanium, Rm 400 N/mm <sup>2</sup>	Plunging	30	35	40	40	0.5xD	1xD	0.0020	0.0030	0.0030	0.0050	0.0070	0.0080	0.0080
	Slotting	45	50	55	55	0.25xD	1xD	0.0040	0.0040	0.0050	0.0080	0.0100	0.0110	0.0120
	Roughing	95	100	105	110	2.5xD	0.08xD	0.0100	0.0120	0.0150	0.0230	0.0290	0.0320	0.0340
	Finishing	95	100	105	110	5xD	0.02xD	0.0050	0.0050	0.0070	0.0110	0.0140	0.0160	0.0170
<b>S2.1.2</b> Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm <sup>2</sup>	Plunging	25	30	35	35	0.5xD	1xD	0.0020	0.0020	0.0030	0.0050	0.0060	0.0070	0.0070
	Slotting	35	40	45	50	0.25xD	1xD	0.0030	0.0040	0.0050	0.0070	0.0090	0.0100	0.0110
	Roughing	80	85	90	90	2.5xD	0.08xD	0.0090	0.0110	0.0140	0.0200	0.0260	0.0290	0.0310
	Finishing	80	85	90	90	5xD	0.02xD	0.0040	0.0050	0.0060	0.0100	0.0130	0.0140	0.0150



## PCD Diver

### Milling conditions:

**HPC**

stable machining conditions  
high drive power



short tools



long tools



Machining group	Application	$v_c$ (m/min)	$a_p$ max.	$a_e$ max.	$f_z$ (mm/z) with nom. $\emptyset$				
					12	16	20	25	32
<b>N1.1.1</b> Wrought aluminium alloys, non-hardened, 60 HB <b>N1.1.2</b> Wrought aluminium alloys, hardened, 100 HB	Slotting	750	0.6xD	1xD	0.10	0.14	0.16	0.18	0.23
	Roughing	940	0.6xD	0.60xD	0.12	0.16	0.19	0.21	0.27
	Finishing	1500	0.6xD	0.02xD	0.11	0.15	0.17	0.19	0.25
<b>N2.1.1</b> Aluminium casting alloys, non-hardened, $\leq 12\%$ Si, 75 HB <b>N2.1.2</b> Aluminium casting alloys, hardened, $\leq 12\%$ Si, 90 HB	Slotting	650	0.6xD	1xD	0.10	0.14	0.16	0.18	0.23
	Roughing	815	0.6xD	0.60xD	0.12	0.16	0.19	0.21	0.27
	Finishing	1300	0.6xD	0.02xD	0.11	0.15	0.17	0.19	0.25
<b>N2.1.3</b> Aluminium casting alloys, non-hardened, $> 12\%$ Si, 130 HB	Slotting	515	0.6xD	1xD	0.10	0.14	0.16	0.18	0.23
	Roughing	640	0.6xD	0.60xD	0.12	0.16	0.19	0.21	0.27
	Finishing	1030	0.6xD	0.02xD	0.11	0.15	0.17	0.19	0.25
<b>N3.1.1</b> Copper and copper alloys: Free-machining alloy, Pb $> 1\%$ <b>N3.1.2</b> Copper and copper alloys: CuZn, CuSnZn	Slotting	525	0.6xD	1xD	0.09	0.12	0.13	0.15	0.19
	Roughing	655	0.6xD	0.60xD	0.10	0.14	0.16	0.18	0.23
	Finishing	1050	0.6xD	0.02xD	0.10	0.13	0.15	0.17	0.21
<b>N3.1.3</b> Copper and copper alloys: CuSn, lead-free copper and copper electrolyte	Slotting	410	0.6xD	1xD	0.08	0.11	0.12	0.14	0.18
	Roughing	515	0.6xD	0.60xD	0.10	0.13	0.15	0.17	0.21
	Finishing	825	0.6xD	0.02xD	0.09	0.12	0.13	0.15	0.19





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# EFFICIENT MILLING

## WITH THE RIGHT STRATEGIES

### GTC MILLING STRATEGIES

These milling strategies belong to the state-of-the-art and most effective application methods for current solid carbide milling tools. When applied, an enormously high metal removal rate ensures a considerable increase in productivity. Very high cutting parameters can be achieved even with less powerful machines or unstable machining conditions. With difficult-to-machine materials or unfavourable diameter-length-ratios of the tools a massive increase of process reliability can be achieved.



### 1 HIGH PERFORMANCE CUTTING

max. machining volume → stable conditions; short unclamping; high performance; good cooling



### 2 HIGH SPEED CUTTING

at high speed/high feed rate → high dynamics; low performance; low infeed



### PRINCIPLES & OBJECTIVES



- Maximum tool utilisation
- utilisation of entire cutting edge length
  - full power delivery
  - increased tool lives
  - balanced wear



- Modification of cutting distribution
- low cutting widths  $a_e$
  - high cutting depths  $a_p$



- High process reliability
- low tool wrapping
  - improved thermal conditions at tool cutting edge
  - lower mechanical load









- Maximum metal removal rates
- saving time/machine costs





## GENERAL RECOMMENDATION TOOL COOLING

<b>Steel</b>			<ul style="list-style-type: none"> <li>• avoid thermal shock</li> </ul>
<b>Cast iron</b>		Dry machining, compressed air, MQL:	<ul style="list-style-type: none"> <li>• dissipate machining temperature via chip</li> <li>• supporting chip removal</li> </ul>
<b>Hardened</b>			
<b>Stainless</b>		Emulsion; oil:	<ul style="list-style-type: none"> <li>• cooling of tool cutting edge</li> <li>• preventing built-up edgex</li> <li>• supporting chip removal</li> </ul>
<b>Special alloy</b>			
<b>Non-ferrous metals</b>		Emulsion; MQL:	<ul style="list-style-type: none"> <li>• preventing built-up edges</li> <li>• supporting chip removal</li> </ul>

## EXCEPTIONS FOR MATERIAL RANGES



When coolant is not available the cutting speed  $v_c$  and/or the radial feed  $a_e$  should be reduced. The resulting reduced temperature reduces the risk of thermal shock.

If there are chip removal problems the application of coolant should be taken into consideration, because poor removal of chips can lead to massive tool wear and even tool breakage.

In the case of component heating by chip nests, it should be checked whether the component chips can be removed by a specifically aligned „coolant jet“ without hitting the cutting area. Alternatively, the application of coolant for the entire machining operation is recommended.

## OTHER NOTES

### Finishing

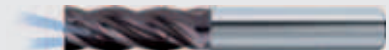
The application of coolant is principally an advantage as a better surface finish can be achieved.

### Very long tools

Coolant can result in a smoother process, as the lubricant has a vibration-reducing effect.

### Alignment of coolant

- as accurate as possible in the cutting area from at least three directions
- no flushing back of small chips to the cutting area

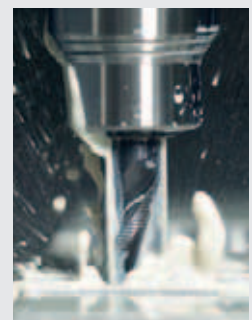


### Solid carbide milling cutter with internal cooling

- optimal chip removal, very good cutting edge cooling, very effective against built-up edges
- to be recommended especially for larger tool diameters and tough materials

### Peripheral cooling/ Gührojet

Best external option: Optimal tool cooling and chip removal thanks to the direct route from coolant exit to cutting area



**GÜHROJET**

# ISO code

<b>P</b>	Steel, high-alloyed steel
<b>M</b>	Stainless steel
<b>K</b>	Grey cast iron, spheroidal graphite iron and malleable cast iron
<b>N</b>	Aluminium and other non-ferrous metals
<b>S</b>	Special-, super- and titanium-alloys
<b>H</b>	Hardened steel and chilled cast iron
<b>O</b>	Fibre-reinforced plastics (FRP), graphite

Tool recommendations regarding the suitability for application groups or specifications of max. tensile strength and hardness can be found on the product and cutting value pages.

- optimal suitability
- limited suitability























# Surfaces

○ bright

ⓧ Perrox

Ⓨ Signum

# Pictograms

<b>Cutting material</b>	<b>VHM</b> Solid carbide	<b>PKD</b> Polycrystalline diamond					
<b>Shank form</b>	<b>HA</b> <b>HB</b> according to DIN 6535	<b>Cyl</b> cylindrical					
<b>Standard</b>	<b>DIN 6527K</b> <b>DIN 6527L</b> according to DIN	<b>WN</b> according to company standard					
<b>Type</b>	<b>N</b> <b>NH</b>						
<b>Applications</b>	 Slotting	 Roughing	 Ramping	 Helix	 Drilling	 Finishing	 Copying
<b>Length</b>	 short (DIN)	 long (DIN)	 2,5xD	 5xD			
<b>Number of cutting edges</b>	 3	 4	Number of main cutting edges				
<b>Helix angle</b>	 36° 38° 37°	 40°	 41° 43° 45°	Size of helix angle/no. of different helix angles			
<b>Rake angle</b>	 7°	 11°	Rake angle of circumference cutting edges				
<b>Cutting edge profile</b>	 45°	 R±0,01	 R±0,05	Corner chamfer Radius with tolerance			
<b>Infeed</b>		for lateral infeeds, for ramping and drilling					
<b>Hardness</b>	<b>48 HRC</b>	workable material hardness in HRC					



## Solid carbide milling cutter RF 100 Diver

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