GÜHRING

德國鈷領 RF 100 Diver 銑刀

PCD Diver for maximum machining rates and tool life in aluminium

new

Micro Diver from Ø 0.5 mm

新產品 PCD Diver 用於鋁合金加工，最佳加工效率與壽命
微小徑 Micro Diver 尺寸從 φ 0.5mm

RF 100 diver

The plunge milling cutter
for 5 milling operations
可進行 5 種銑削操作的插銑刀

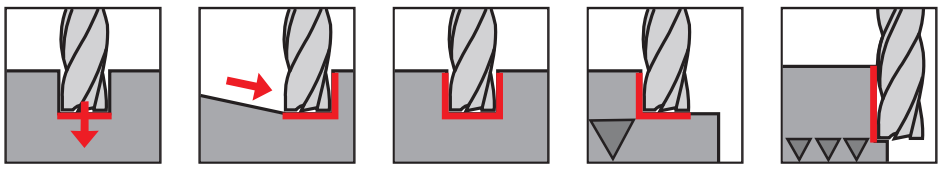
DIVE INTO IT

可進行 5 種銑削操作的插銑刀

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 efficient even under difficult machining conditions.

RF 100 Diver 銑刀系列是您鑽孔、斜向銑削、開槽、粗加工或精加工最好的選擇適用於所有材料在各種的銑削加工皆可以使用，因此，Diver銑刀的性能表現優越，即使在困難的加工條件下也能保持高效率而且毫不費力。



Drilling 鑽銑 | Ramping 斜向銑削 | Slotting 開槽銑削 | Roughing 粗銑 | Finishing 精銑

RF 100 diver

For any application the optimal Diver

Diver 對於任何銑削應用皆適合

Micro Diver 微小徑 Diver 銑刀

new

- for the micro-machining of Ø 0.5 – 3.175 mm
  用於尺寸範圍 φ 0.5 – 3.175 mm 的微加工
- highly versatile
  高度通用
- extremely high cutting values and infeed rates
  極高的切削速度和進給率
- available with corner chamfer and corner radius

有刃口倒角與圓鼻2種型可以選用

3-fluted RF 100 Diver 3刃型 RF 100 Diver

- for weaker machines and clamping conditions 適用於較弱的機床和夾持條件不佳的情況
- for lathes and driven tools 用於車床和動力工具
- especially for slotting with smaller milling cutter diameters 特別適用於較小尺寸的開槽銑削

4-fluted RF 100 Diver, short 4刃短刃型 RF 100 Diver

- for more stability with slotting 提高開槽穩定性
- up to 25 % higher feed rate 進給率提高高達 25%
- reduced deflection 剛性好、減少刃口被頂開偏移的讓刀現象

4-fluted RF 100 Diver 4刃標準型 RF 100 Diver

- high-performance milling with maximum cutting speeds 能以最大切削速度的高性能銑削
- for stable machine & clamping conditions 用於穩定的機器和夾持條件

PCD Diver

new

- all-rounder for maximum machining rates and neverending tool lives in aluminium
- cost savings due to low-burr profile and structural part processing
- helical hole machining with reduced torque and axial force

. 鋁合金加工幾乎達到無止境的加工壽命，加工效率達到最大的全能銑刀。
. 結構件輪廓加工毛邊少，節省成本。
. 螺旋下刀減少扭力與軸向力

RF 100 Diver

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

一種工具，多種應用：
你可以查看所有切割參數在視頻中。

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

1mm 不銹鋼材質微小徑銑削加工參數

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°

M

切削影片

Application video

- PCD Diver

12mm PCD Diver 鋁合金銑削加工參數

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 AlSi1MgMn
Ramping, helical and pocket milling
Ramping angle = 30°

N

切削影片

Application video

- Slotting

開槽

12mm 鉻鉬合金剛 乾式開槽銑削加工參數

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

P

- Roughing

粗加工

12mm 鉻鉬合金剛 乾式擺線粗加工銑削加工參數

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

P

- Finishing

精加工

12mm 鉻鉬合金剛 乾式高速精加工銑削加工參數

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

P

- Ramping

斜向加工

12mm 鉻鉬合金剛 乾式斜向銑削加工參數

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°

P

- Drilling

鑽銑

12mm 鉻鉬合金剛 乾式鑽銑削加工參數

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

	P	M	K	N	S	H	Tool illustration		Z	Hard-ness	Cutting edge form	Length	Helix angle °	Tool material	Sur-face	d1/mm	Article no.	Page
Ratio end mills RF 100 Micro Diver																		
	•	•	•	•	•	○		刃口倒角	3	48 HRC	45°	2,5xD	40°	VHM	X	0.500 - 3.175	6808	9
	•	•	•	•	•	○		刃口倒角	3	48 HRC	45°	5xD	40°	VHM	X	0.500 - 3.175	6809	9
新產品	•	•	•	•	•	○		刃口圓鼻	3	48 HRC	R±0,01	2,5xD	40°	VHM	X	0.500 - 3.000	6691	10
新產品	•	•	•	•	•	○		刃口圓鼻	3	48 HRC	R±0,01	5xD	40°	VHM	X	0.500 - 3.000	6692	11
Ratio end mills RF 100 Diver (3-fluted)																		
	•	•	•	•	•			3刃標準長	3		45°		41° 43° 45°	VHM	Y	3.000 - 20.000	6797	12
	•	•	•	•	•				3		45°		41° 43° 45°	VHM	Y	3.000 - 20.000	6798	12
	•	•	•	•	•			3刃標準長 中心出水	3		45°		41° 43° 45°	VHM	Y	6.000 - 16.000	6799	13
	•	•	•	•	•				3		45°		41° 43° 45°	VHM	Y	6.000 - 16.000	6800	13
Ratio end mills RF 100 Diver																		
	•	•	•	•	•	○		4刃短刃型	4	48 HRC	45°		36° 38° 37°	VHM	Y	3.000 - 20.000	6803	14
	•	•	•	•	•	○			4	48 HRC	45°		36° 38° 37°	VHM	Y	3.000 - 20.000	6804	14
	•	•	•	•	•	○		4刃標準長	4	48 HRC	45°		36° 38° 37°	VHM	Y	4.000 - 20.000	6737	15
	•	•	•	•	•	○			4	48 HRC	45°		36° 38° 37°	VHM	Y	4.000 - 20.000	6736	15
	•	•	•	•	•	○		4刃標準長 中心出水	4	48 HRC	45°		36° 38° 37°	VHM	Y	6.000 - 25.000	6801	16
	•	•	•	•	•	○			4	48 HRC	45°		36° 38° 37°	VHM	Y	6.000 - 25.000	6802	16
Ratio end mill sets RF 100 Diver																		
	•	•	•	•	•				4	48 HRC	45°		36° 38° 37°	VHM	Y		6755	17
	•	•	•	•	•				4	48 HRC	45°		36° 38° 37°	VHM	Y		6754	17
PCD Diver (3-fluted)																		
新產品				•					3		R±0,05			PKD	◯	12.000 - 32.000	4190	19

THE SMALLEST DIVER IN THE WORLD

- **plunge and mill with just one tool** 只需一支刀具即可進行鑽銑和一般銑削
- **universal, in every application, in every material** 應用廣泛，適用於各種材料。
- **extreme cutting values and very high cutting depths** 非常高的切削速度和非常高的切削深度

SYMMETRICAL DRILL FACE
optimised for drilling and ramping operations
high cutting edge stability

刀底鑽面對稱設計
使鑽銑和斜坡加工達到了最佳化
切削刃穩定性高

new

新款式刃口帶圓鼻
MICRO DIVER WITH CORNER RADIUS
can now be found as new 6691 and 6692 varieties in the range

R ±0,01

EXTENSION FROM Ø 0.5 mm
Ø 0.5 – 3.175 mm

LENGTHS
刃長 2.5xD and 5xD

INNOVATIVE FLUTE FORM
very high tool stability
low-vibration cut
創新的溝槽設計
高穩定性、低震動

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
HIPIMS 鍍層，不論乾式或是濕式加工皆能達到非常高的表面品質、最佳的排屑效果、耐磨損和抗氧化。

NEW TRANSITION VERSION
improves overall stability
新的幾何形狀設計 提高了整體穩定性

GÜHROJET COOLANT DUCTS
targeted cooling and lubrification
perfect hardness-toughness ratio
directly in the cutting area
effective chip removal
鉆領特有的冷卻出水設計
直接在切削區域冷卻和潤滑
達到最佳排屑效果

NEW ULTRAFINE CARBIDE
perfect for hardness-toughness ratio for the micro-machining
採用新的超細微粒鎢鋼棒材，
使硬度和韌性達到最佳的平衡，
特別適用於精細的加工應用。

MIKRO RF 100 diver

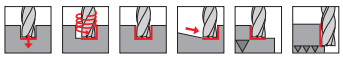
Ratio end mills RF 100 Micro Diver 高效率RF 100 Microdiver 銑刀

Article no. **6808**

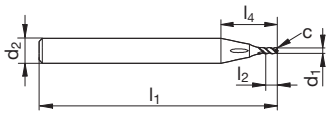
2.5D 標準長

VHM | NH | WN | 40° | 2,5xD | 3 | Cyl | 45° | 11° | 48 HRC

P	M	K	N	S	H
●	●	●	●	●	○



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



- ●高切削參數與高性能
- ●鉆領特有4～6道平行中心出水
- ●切刃過中心
- ●端刃面可以鑽銑

Article no. **6808**

d1 h8 mm	d2 h5 mm	l1 mm	l2 mm	l4 mm	c mm x 45°	Z	價格
0.50	4.00	38	1.2	9.3	0.010	3	3,000
0.75	4.00	38	1.8	9.3	0.015	3	3,000
0.79	4.00	38	1.9	9.3	0.016	3	2,800
0.80	4.00	38	2.0	9.3	0.016	3	2,800
1.00	4.00	38	2.5	9.3	0.020	3	2,800
1.19	4.00	38	2.9	9.4	0.024	3	2,800
1.20	4.00	38	3.0	9.4	0.024	3	2,800
1.50	4.00	45	3.7	9.8	0.030	3	2,800
1.59	4.00	44	3.9	9.9	0.032	3	2,800
1.80	4.00	45	4.5	10.3	0.036	3	2,900
1.98	6.00	50	4.9	14.7	0.040	3	2,900
2.00	6.00	50	5.0	14.7	0.040	3	2,900
2.20	6.00	50	5.5	14.9	0.044	3	2,900
2.38	6.00	50	5.9	15.2	0.048	3	2,900
2.50	6.00	50	6.2	15.3	0.050	3	2,900
2.78	6.00	50	6.9	15.9	0.056	3	2,900
2.80	6.00	50	7.0	15.9	0.056	3	2,900
3.00	6.00	50	7.5	16.2	0.060	3	2,900
3.17	6.00	50	7.9	16.6	0.064	3	2,900

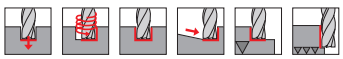
Ratio end mills RF 100 Micro Diver 高效率RF 100 Microdiver 銑刀

Article no. **6809**

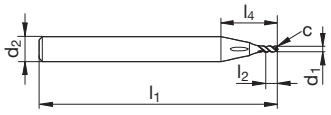
5D 長刃型

VHM | NH | WN | 40° | 5xD | 3 | Cyl | 45° | 11° | 48 HRC

P	M	K	N	S	H
●	●	●	●	●	○



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



- ●高切削參數與高性能
- ●鉆領特有4～6道平行中心出水
- ●切刃過中心
- ●端刃面可以鑽銑

Article no. **6809**

d1 h8 mm	d2 h5 mm	l1 mm	l2 mm	l4 mm	c mm x 45°	Z	價格
0.50	4.00	38	2.5	10.6	0.010	3	3,500
0.75	4.00	38	3.7	11.2	0.015	3	3,500
0.79	4.00	38	3.9	11.3	0.016	3	3,500
0.80	4.00	38	4.0	11.3	0.016	3	3,500
1.00	4.00	45	5.0	11.8	0.020	3	3,300
1.19	4.00	50	5.9	12.4	0.024	3	3,300
1.50	4.00	50	7.5	13.5	0.030	3	3,300
1.59	4.00	50	7.9	13.9	0.032	3	3,500
1.98	6.00	57	9.9	19.6	0.040	3	3,500
2.00	6.00	57	10.0	19.7	0.040	3	3,500
2.38	6.00	57	11.9	21.1	0.048	3	3,500
2.50	6.00	57	12.5	21.6	0.050	3	3,500
2.78	6.00	57	13.9	22.8	0.056	3	3,500
3.00	6.00	57	15.0	23.7	0.060	3	3,500
3.17	6.00	57	15.8	24.6	0.064	3	3,500

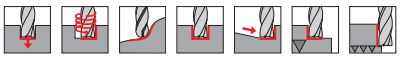
Ratio end mills RF 100 Micro Diver 高效率RF 100 Microdiver 圓鼻銑刀 Article no. **6691**

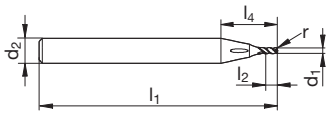
2.5D 標準長

NEW | VHM | NH | WN | 40° | 2,5xD | 3 | Cyl | R±0,01 | 11° | 48 HRC

P	M	K	N	S	H
●	●	●	●	●	○

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





- 高切削參數與高性能
- 鈷領特有4～6道平行中心出水
- 切刃過中心
- 端刃面可以鑽銑

圓鼻 Article no. **6691**

d1 h8 mm	d2 h5 mm	l1 mm	l2 mm	l4 mm	r mm	Z	價格
0.50	4.00	38	1.2	9.3	0.05	3	3,200
0.50	4.00	38	1.2	9.3	0.10	3	3,200
0.75	4.00	38	1.8	9.3	0.05	3	3,200
0.75	4.00	38	1.8	9.3	0.10	3	3,200
0.80	4.00	38	2.0	9.3	0.05	3	3,200
0.80	4.00	38	2.0	9.3	0.10	3	3,200
1.00	4.00	38	2.5	9.3	0.05	3	3,200
1.00	4.00	38	2.5	9.3	0.10	3	3,200
1.00	4.00	38	2.5	9.3	0.20	3	3,200
1.20	4.00	38	3.0	9.4	0.10	3	3,200
1.20	4.00	38	3.0	9.4	0.20	3	3,200
1.50	4.00	45	3.7	9.8	0.10	3	3,200
1.50	4.00	45	3.7	9.8	0.20	3	3,200
1.50	4.00	45	3.7	9.8	0.30	3	3,200
1.80	4.00	45	4.5	10.2	0.10	3	3,200
1.80	4.00	45	4.5	10.2	0.20	3	3,200
1.80	4.00	45	4.5	10.2	0.30	3	3,200
2.00	6.00	50	5.0	14.7	0.10	3	3,300
2.00	6.00	50	5.0	14.7	0.20	3	3,300
2.00	6.00	50	5.0	14.7	0.30	3	3,300
2.00	6.00	50	5.0	14.7	0.50	3	3,300
2.20	6.00	50	5.5	14.9	0.20	3	3,300
2.20	6.00	50	5.5	14.9	0.50	3	3,300
2.50	6.00	50	6.2	15.4	0.20	3	3,300
2.50	6.00	50	6.2	15.4	0.30	3	3,300
2.50	6.00	50	6.2	15.4	0.50	3	3,300
2.80	6.00	50	7.0	15.9	0.20	3	3,300
2.80	6.00	50	7.0	15.9	0.30	3	3,300
2.80	6.00	50	7.0	15.9	0.50	3	3,300
3.00	6.00	50	7.5	16.3	0.20	3	3,300
3.00	6.00	50	7.5	16.3	0.30	3	3,300
3.00	6.00	50	7.5	16.3	0.50	3	3,300

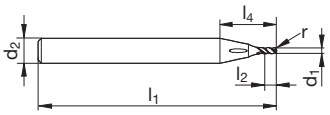
Ratio end mills RF 100 Micro Diver 高效率RF 100 Microdiver 圓鼻銑刀 Article no. **6692**

5D 長刃型

NEW | VHM | NH | WN | 40° | 5xD | 3 | Cyl | R±0,01 | 11° | 48 HRC

P	M	K	N	S	H
●	●	●	●	●	○

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



- ●高切削參數與高性能
- ●鈷領特有4~6道平行中心出水
- ●切刃過中心
- ●端刃面可以鑽銑

					圓鼻	Article no.	6692
d1 h8 mm	d2 h5 mm	l1 mm	l2 mm	l4 mm	r mm	Z	價格
0.50	4.00	38	2.5	10.6	0.05	3	3,700
0.50	4.00	38	2.5	10.6	0.10	3	3,700
0.75	4.00	38	3.7	11.2	0.05	3	3,700
0.75	4.00	38	3.7	11.2	0.10	3	3,700
0.80	4.00	38	4.0	11.3	0.05	3	3,700
0.80	4.00	38	4.0	11.3	0.10	3	3,700
1.00	4.00	45	5.0	11.8	0.05	3	3,700
1.00	4.00	45	5.0	11.8	0.10	3	3,700
1.00	4.00	45	5.0	11.8	0.20	3	3,700
1.20	4.00	50	6.0	12.4	0.10	3	3,700
1.20	4.00	50	6.0	12.4	0.20	3	3,700
1.50	4.00	50	7.5	13.5	0.10	3	3,700
1.50	4.00	50	7.5	13.5	0.20	3	3,700
1.50	4.00	50	7.5	13.5	0.30	3	3,700
1.80	4.00	50	9.0	14.7	0.10	3	3,700
1.80	4.00	50	9.0	14.7	0.20	3	3,700
1.80	4.00	50	9.0	14.7	0.30	3	3,700
2.00	6.00	57	10.0	19.7	0.10	3	3,900
2.00	6.00	57	10.0	19.7	0.20	3	3,900
2.00	6.00	57	10.0	19.7	0.30	3	3,900
2.00	6.00	57	10.0	19.7	0.50	3	3,900
2.20	6.00	57	11.0	20.4	0.20	3	3,900
2.20	6.00	57	11.0	20.4	0.50	3	3,900
2.50	6.00	57	12.5	21.6	0.20	3	3,900
2.50	6.00	57	12.5	21.6	0.30	3	3,900
2.50	6.00	57	12.5	21.6	0.50	3	3,900
2.80	6.00	57	14.0	22.9	0.20	3	3,900
2.80	6.00	57	14.0	22.9	0.30	3	3,900
2.80	6.00	57	14.0	22.9	0.50	3	3,900
3.00	6.00	57	15.0	23.8	0.20	3	3,900
3.00	6.00	57	15.0	23.8	0.30	3	3,900
3.00	6.00	57	15.0	23.8	0.50	3	3,900

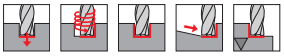
Ratio end mills RF 100 Diver (3-fluted) RF 100 Diver 3刃標準長

Article no. **6797**

VHM | NH | WN | 41° 43° 45° | 3 | HA | 45° | 7°

neck clearance • centre cutting • with special drill face

P	M	K	N	S	H
●	●	●	●	●	



Ratio end mills RF 100 Diver (3-fluted) RF 100 Diver 3刃標準長

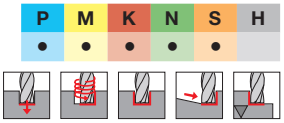
Article no. **6798**

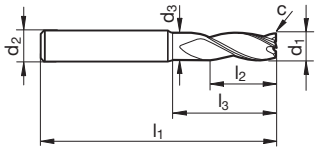
VHM | NH | WN | 41° 43° 45° | 3 | HB | 45° | 7°

neck clearance • centre cutting • with special drill face

M7C
unstable conditions

P	M	K	N	S	H
●	●	●	●	●	





- 縮頸設計
- 刀底端面過中心
- 刀底刃口可以鑽銑

特別適用於以下工況
. 機台馬力不足
. 工件夾持不穩固的情況
. 車床及動力刀座機台
. 小直徑銑刀的開槽加工

d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	Article no. 6797 價格	Article no. 6798 價格
3.00	6.00	2.80	57	8.0	15.0	0.05	3	1,200	1,200
3.50	6.00	3.30	57	10.0	15.0	0.05	3	1,200	1,200
3.70	6.00	3.50	57	11.0	15.0	0.06	3	1,200	1,200
4.00	6.00	3.80	57	11.0	18.0	0.06	3	1,200	1,200
4.50	6.00	4.30	57	11.0	18.0	0.07	3	1,200	1,200
4.70	6.00	4.50	57	13.0	18.0	0.07	3	1,200	1,200
5.00	6.00	4.80	57	13.0	18.0	0.08	3	1,200	1,200
5.50	6.00	5.30	57	13.0	19.4	0.08	3	1,200	1,200
5.70	6.00	5.50	57	13.0	19.6	0.09	3	1,200	1,200
6.00	6.00	5.70	57	13.0	20.0	0.09	3	1,200	1,200
6.50	8.00	6.20	63	16.0	24.4	0.10	3	1,300	1,400
7.00	8.00	6.70	63	16.0	24.9	0.11	3	1,400	1,500
7.50	8.00	7.20	63	19.0	25.3	0.11	3	1,600	1,600
8.00	8.00	7.70	63	19.0	26.0	0.12	3	1,600	1,700
8.50	10.00	8.20	72	19.0	29.4	0.13	3	1,800	1,900
9.00	10.00	8.70	72	19.0	29.9	0.14	3	2,000	2,100
9.50	10.00	9.20	72	22.0	30.3	0.14	3	2,300	2,300
10.00	10.00	9.50	72	22.0	30.0	0.15	3	2,500	2,600
12.00	12.00	11.50	83	26.0	36.0	0.18	3	3,100	3,200
16.00	16.00	15.50	92	32.0	42.0	0.19	3	5,400	5,600
20.00	20.00	19.50	104	38.0	52.0	0.24	3	8,300	8,500

開槽銑削 加工參數

ISO 材料	Hardness 抗拉強度	vc 切速	fz (mm/z) / Ø 每刃進給/ 刃徑 3	6	8	10	12	16	20
			切深 ap = 1,0 x D				切寬 ae = 1,0 x D		
P	≤ 850 N/mm²	270	0,017	0,025	0,034	0,050	0,060	0,080	0,100
	≥ 850 N/mm²	180	0,014	0,021	0,028	0,045	0,054	0,072	0,090
M	≤ 750 N/mm²	120	0,014	0,021	0,028	0,045	0,054	0,072	0,090
	≥ 750 N/mm²	80	0,013	0,019	0,026	0,040	0,048	0,064	0,080
S	Ti-based	60	0,013	0,019	0,026	0,040	0,048	0,064	0,080
K	≤ 240 HB	150	0,017	0,025	0,034	0,050	0,060	0,080	0,100
N	≥ 7% Si	340	0,018	0,027	0,036	0,055	0,066	0,088	0,110

側銑加工參數

vc 切速	fz (mm/z) / Ø 每刃進給/ 刃徑 3	6	8	10	12	16	20
	切深 ap = 1,5 x D				最大切寬 ae max = 0,33 x D		
350	0,021	0,032	0,042	0,063	0,075	0,100	0,125
260	0,018	0,027	0,036	0,059	0,070	0,094	0,117
160	0,018	0,027	0,036	0,059	0,070	0,094	0,117
120	0,019	0,029	0,038	0,060	0,072	0,096	0,120
110	0,017	0,025	0,033	0,052	0,062	0,083	0,104
190	0,021	0,032	0,042	0,063	0,075	0,100	0,125
440	0,023	0,034	0,045	0,069	0,083	0,110	0,138

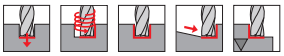
Ratio end mills RF 100 Diver (3-fluted) RF 100 Diver 3刃標準長 中心出水 Article no. **6799**

刀底與側刃刀口皆有出水

VHM | NH | WN | 41° 43° 45° | 3 | HA | 45° | 7°

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

P	M	K	N	S	H
●	●	●	●	●	



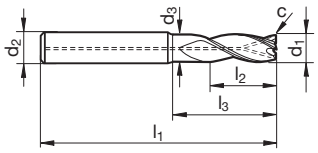
Ratio end mills RF 100 Diver (3-fluted) RF 100 Diver 3刃標準長 中心出水 Article no. **6800**

刀底與側刃刀口皆有出水

VHM | NH | WN | 41° 43° 45° | 3 | HB | 45° | 7°

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

P	M	K	N	S	H
●	●	●	●	●	



- 刀底與側刃刀口皆有出水
- 縮頸設計
- 刀底端面過中心
- 刀底刃口可以鑽銑

M7C
unstable conditions

特別適用於以下工況
. 機台馬力不足
. 工件夾持不穩固的情況
. 車床及動力刀座機台
. 較小直徑銑刀的開槽加工

d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	Article no. 6799 價格	Article no. 6800 價格
6.00	6.00	5.70	57	13.0	20.0	0.09	3	1,500	1,600
8.00	8.00	7.70	63	19.0	26.0	0.12	3	2,100	2,200
10.00	10.00	9.50	72	22.0	30.0	0.15	3	3,000	3,000
12.00	12.00	11.50	83	26.0	36.0	0.18	3	3,800	3,900
16.00	16.00	15.50	92	32.0	42.0	0.19	3	6,200	6,400

開槽銑削 加工參數

ISO 材料	Hardness 抗拉強度	vc 切速	fz (mm/z) / Ø 每刃進給/ 刃徑 4	6	8	10	12	16	20
			切深 ap = 1,0 x D				切寬 ae = 1,0 x D		
P	≤ 850 N/mm²	270	0,017	0,025	0,034	0,050	0,060	0,080	0,100
	≥ 850 N/mm²	180	0,014	0,021	0,028	0,045	0,054	0,072	0,090
M	≤ 750 N/mm²	120	0,014	0,021	0,028	0,045	0,054	0,072	0,090
	≥ 750 N/mm²	80	0,013	0,019	0,026	0,040	0,048	0,064	0,080
S	Ti-based	60	0,013	0,019	0,026	0,040	0,048	0,064	0,080
K	≤ 240 HB	150	0,017	0,025	0,034	0,050	0,060	0,080	0,100
N	≥ 7% Si	340	0,018	0,027	0,036	0,055	0,066	0,088	0,110

其他加工方式參數

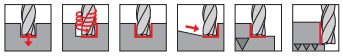
vc	fz (mm/z) / Ø 每刃進給/ 刃徑 4	6	8	10	12	16	20
	切深 ap = 1,0 x D					切寬 ae = 1,0 x D	
270	0,014	0,021	0,028	0,040	0,048	0,064	0,080
180	0,008	0,012	0,016	0,025	0,030	0,040	0,050
90	0,007	0,011	0,014	0,023	0,027	0,036	0,045
60	0,006	0,010	0,013	0,020	0,024	0,032	0,040
50	0,006	0,010	0,013	0,020	0,024	0,032	0,040
150	0,014	0,021	0,028	0,040	0,048	0,064	0,080
340	0,014	0,021	0,028	0,040	0,048	0,064	0,080

Ratio end mills RF 100 Diver RF 100 Diver 4刃 短刃型 Article no. **6803**

VHM | N | DIN 6527K | 36° 38° 37° | 4 | HA | 45° | 7° | 48 HRC

neck clearance • centre cutting

P	M	K	N	S	H
●	●	●	●	●	○

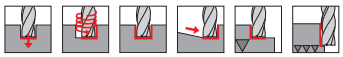


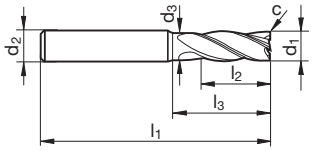
Ratio end mills RF 100 Diver RF 100 Diver 4刃 短刃型 Article no. **6804**

VHM | N | DIN 6527K | 36° 38° 37° | 4 | HB | 45° | 7° | 48 HRC

neck clearance • centre cutting

P	M	K	N	S	H
●	●	●	●	●	○





● 縮頸設計
● 刀底端面過中心

短刃型優點：
. 開槽可提高穩定性
. 最高進給速度提高25％
. 減少切刃被頂出，工件面垂直度佳

Article no.								6803	6804
d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	價格	
3.00	6.00	2.80	50	5.0	12.0	0.03	4	1,100	1,200
3.70	6.00	3.50	54	8.0	12.0	0.04	4	1,100	1,200
4.00	6.00	3.80	54	8.0	15.0	0.04	4	1,100	1,200
4.70	6.00	4.50	54	9.0	15.0	0.05	4	1,100	1,200
5.00	6.00	4.80	54	9.0	15.0	0.05	4	1,100	1,200
5.70	6.00	5.50	54	10.0	16.6	0.06	4	1,100	1,200
6.00	6.00	5.70	54	10.0	17.0	0.06	4	1,100	1,200
7.00	8.00	6.70	58	11.0	19.9	0.07	4	1,500	1,600
7.70	8.00	7.40	58	12.0	20.5	0.08	4	1,500	1,600
8.00	8.00	7.70	58	12.0	21.0	0.08	4	1,500	1,600
9.00	10.00	8.70	66	13.0	23.9	0.09	4	2,300	2,400
9.70	10.00	9.40	66	14.0	24.5	0.10	4	2,300	2,400
10.00	10.00	9.50	66	14.0	24.0	0.10	4	2,300	2,400
11.70	12.00	11.20	73	16.0	25.3	0.12	4	2,900	3,000
12.00	12.00	11.50	73	16.0	26.0	0.12	4	2,900	3,000
15.60	16.00	15.10	82	22.0	31.2	0.16	4	5,100	5,300
16.00	16.00	15.50	82	22.0	32.0	0.16	4	5,100	5,300
19.00	20.00	18.50	92	26.0	38.7	0.19	4	7,700	7,800
20.00	20.00	19.50	92	26.0	40.0	0.20	4	7,700	7,800

開槽銑削 加工參數

ISO 材料	Hardness 抗拉強度	vc 切速	fz (mm/z) / Ø 每刃進給/ 刃徑						
			3	6	8	10	12	16	20
			切深 ap = 1,0 x D				切寬 ae = 1,0 x D		
P	≤ 850 N/mm²	270	0,017	0,025	0,034	0,050	0,060	0,080	0,100
	≥ 850 N/mm²	180	0,014	0,021	0,028	0,045	0,054	0,072	0,090
M	≤ 750 N/mm²	120	0,014	0,021	0,028	0,045	0,054	0,072	0,090
	≥ 750 N/mm²	80	0,013	0,019	0,026	0,040	0,048	0,064	0,080
S	Ti-based	60	0,013	0,019	0,026	0,040	0,048	0,064	0,080
K	≤ 240 HB	150	0,017	0,025	0,034	0,050	0,060	0,080	0,100
N	≥ 7% Si	340	0,018	0,027	0,036	0,055	0,066	0,088	0,110

側銑加工參數

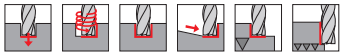
vc	fz (mm/z) / Ø 每刃進給/ 刃徑						
	3	6	8	10	12	16	20
	全刃長切深 ap = l2			HPC		最大切寬 ae max = 0,20 x D	
450	0,027	0,040	0,054	0,080	0,10	0,13	0,16
300	0,022	0,034	0,045	0,072	0,09	0,12	0,14
200	0,022	0,034	0,045	0,072	0,09	0,12	0,14
140	0,020	0,031	0,041	0,064	0,08	0,10	0,13
110	0,020	0,031	0,041	0,064	0,08	0,10	0,13
250	0,027	0,040	0,054	0,080	0,10	0,13	0,16
570	0,029	0,043	0,058	0,088	0,11	0,14	0,18

Ratio end mills RF 100 Diver RF 100 Diver 4刃標準長 Article no. **6737**

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

neck clearance • centre cutting

P	M	K	N	S	H
●	●	●	●	●	○

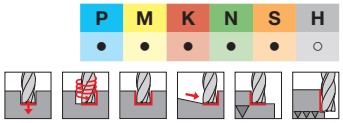


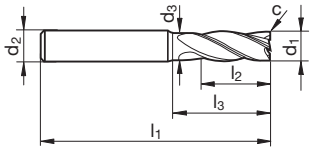
Ratio end mills RF 100 Diver RF 100 Diver 4刃標準長 Article no. **6736**

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

neck clearance • centre cutting

P	M	K	N	S	H
●	●	●	●	●	○





● 縮頸設計
● 刀底端面過中心

d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	Article no. 6737	Article no. 6736
								價格	
4.00	6.00	3.80	57	11.0	18.0	0.04	4	1,300	1,400
5.00	6.00	4.80	57	13.0	18.0	0.05	4	1,300	1,400
5.70	6.00	5.50	57	13.0	19.6	0.06	4	1,300	1,400
6.00	6.00	5.70	57	13.0	20.0	0.06	4	1,300	1,400
7.70	8.00	7.40	63	19.0	25.5	0.08	4	1,800	1,900
8.00	8.00	7.70	63	19.0	26.0	0.08	4	1,800	1,900
9.70	10.00	9.40	72	22.0	30.5	0.10	4	2,700	2,800
10.00	10.00	9.50	72	22.0	30.0	0.10	4	2,700	2,800
11.70	12.00	11.20	83	26.0	35.3	0.12	4	3,500	3,600
12.00	12.00	11.50	83	26.0	36.0	0.12	4	3,500	3,600
13.70	14.00	13.20	83	26.0	35.3	0.14	4	4,700	4,800
14.00	14.00	13.50	83	26.0	36.0	0.14	4	4,700	4,800
15.60	16.00	15.10	92	32.0	41.2	0.16	4	6,100	6,200
16.00	16.00	15.50	92	32.0	42.0	0.16	4	6,100	6,200
19.50	20.00	19.00	104	38.0	51.1	0.20	4	9,300	9,500
20.00	20.00	19.50	104	38.0	52.0	0.20	4	9,300	9,500

開槽銑削 加工參數

ISO 材料	Hardness 抗拉強度	vc 切速	fz (mm/z) / Ø 每刃進給/ 刃徑						
			3	6	8	10	12	16	20
			切深 ap = 1,0 x D				切寬 ae = 1,0 x D		
P	≤ 850 N/mm²	270	0,017	0,025	0,034	0,050	0,060	0,080	0,100
	≥ 850 N/mm²	180	0,014	0,021	0,028	0,045	0,054	0,072	0,090
M	≤ 750 N/mm²	120	0,014	0,021	0,028	0,045	0,054	0,072	0,090
	≥ 750 N/mm²	80	0,013	0,019	0,026	0,040	0,048	0,064	0,080
S	Ti-based	60	0,013	0,019	0,026	0,040	0,048	0,064	0,080
K	≤ 240 HB	150	0,017	0,025	0,034	0,050	0,060	0,080	0,100
N	≥ 7% Si	340	0,018	0,027	0,036	0,055	0,066	0,088	0,110

側銑加工參數

vc	fz (mm/z) / Ø 每刃進給/ 刃徑						
	3	6	8	10	12	16	20
	全刃長切深 ap = l2			HPC	最大切寬 ae max = 0,20 x D		
450	0,027	0,040	0,054	0,080	0,10	0,13	0,16
300	0,022	0,034	0,045	0,072	0,09	0,12	0,14
200	0,022	0,034	0,045	0,072	0,09	0,12	0,14
140	0,020	0,031	0,041	0,064	0,08	0,10	0,13
110	0,020	0,031	0,041	0,064	0,08	0,10	0,13
250	0,027	0,040	0,054	0,080	0,10	0,13	0,16
570	0,029	0,043	0,058	0,088	0,11	0,14	0,18

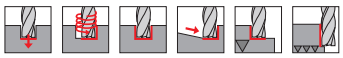
Ratio end mills RF 100 Diver RF 100 Diver 4刃標準長 中心出水 Article no. **6801**

刀底與側刃刀口皆有出水

VHM | N | DIN 6527L | 36° 38° 37° | 4 | HA | 45° | 7° | 48 HRC | GTC

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

P	M	K	N	S	H
●	●	●	●	●	○



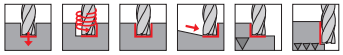
Ratio end mills RF 100 Diver RF 100 Diver 4刃標準長 中心出水 Article no. **6802**

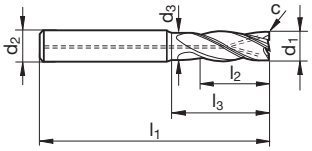
刀底與側刃刀口皆有出水

VHM | N | DIN 6527L | 36° 38° 37° | 4 | HB | 45° | 7° | 48 HRC | GTC

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

P	M	K	N	S	H
●	●	●	●	●	○





- 刀底與側刃刀口皆有出水
- 縮頸設計
- 刀底端面過中心

Article no.	6801	6802
d1 h10 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	價格	
6.00	6.00	5.70	57	13.0	20.0	0.06	4	1,700	1,800
8.00	8.00	7.70	63	19.0	26.0	0.08	4	2,400	2,400
10.00	10.00	9.50	72	22.0	30.0	0.10	4	3,300	3,400
12.00	12.00	11.50	83	26.0	36.0	0.12	4	4,300	4,400
16.00	16.00	15.50	92	32.0	42.0	0.16	4	6,700	6,900
20.00	20.00	19.50	104	38.0	52.0	0.20	4	10,300	10,400
25.00	25.00	24.00	121	45.0	63.0	0.25	4	14,700	14,900

開槽銑削 加工參數

ISO 材料	Hardness 抗拉強度	vc 切速	fz (mm/z) / Ø 每刃進給/ 刃徑						
			4	6	8	10	12	16	20
			切深 ap = 1,0 x D				切寬 ae = 1,0 x D		
P	≤ 850 N/mm²	270	0,017	0,025	0,034	0,050	0,060	0,080	0,100
	≥ 850 N/mm²	180	0,014	0,021	0,028	0,045	0,054	0,072	0,090
M	≤ 750 N/mm²	120	0,014	0,021	0,028	0,045	0,054	0,072	0,090
	≥ 750 N/mm²	80	0,013	0,019	0,026	0,040	0,048	0,064	0,080
S	Ti-based	60	0,013	0,019	0,026	0,040	0,048	0,064	0,080
K	≤ 240 HB	150	0,017	0,025	0,034	0,050	0,060	0,080	0,100
N	≥ 7% Si	340	0,018	0,027	0,036	0,055	0,066	0,088	0,110

其他加工方式參數

vc	fz (mm/z) / Ø 每刃進給/ 刃徑						
	4	6	8	10	12	16	20
	切深 ap = 1,0 x D					切寬 ae = 1,0 x D	
270	0,014	0,021	0,028	0,040	0,048	0,064	0,080
180	0,008	0,012	0,016	0,025	0,030	0,040	0,050
90	0,007	0,011	0,014	0,023	0,027	0,036	0,045
60	0,006	0,010	0,013	0,020	0,024	0,032	0,040
50	0,006	0,010	0,013	0,020	0,024	0,032	0,040
150	0,014	0,021	0,028	0,040	0,048	0,064	0,080
340	0,014	0,021	0,028	0,040	0,048	0,064	0,080

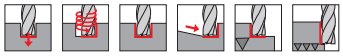
Ratio end mill sets RF 100 Diver

Article no. **6755**

VHM | Y | N | DIN 6527L | 36° 38° 37° | 4 | HA | 45° | 7° | 48 HRC

neck clearance • centre cutting • consisting of art. no. 6737
縮頸/ 底刃過中心 包含規格 # 6737 標準長

P	M	K	N	S	H
•	•	•	•	•	



Article no. **6755**

Ø-range mm	Pieces/set	Order no.	價格
5.7/7.7/9.7/11.7/15.6	5	6755 1.000	19,400
6/8/10/12/16	5	6755 2.000	19,400

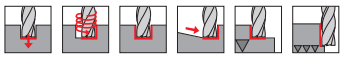
Ratio end mill sets RF 100 Diver

Article no. **6754**

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

neck clearance • centre cutting • consisting of art. no. 6736
縮頸/ 底刃過中心 包含規格 # 6736 標準長 側固柄

P	M	K	N	S	H
•	•	•	•	•	



Article no. **6754**

Ø-range mm	Pieces/set	Order no.	價格
5.7/7.7/9.7/11.7/15.6	5	6754 1.000	19,400
6/8/10/12/16	5	6754 2.000	19,400

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°**

. 超硬 PCD 人造鑽石材質，確保最長的刀具壽命
. 輪廓成形和結構部件銑削過程中產生的毛刺最少
. 由於高正向的幾何形狀設計，銑削過程運行非常平穩
. 斜向進刀角度最大到 60度

刀底端刃
斜向進刀角度最大到 60度
FRONT END
for ramp angle up to 60°

OPTIMIZED CHIP SPACE GEOMETRY
ensures optimum chip flow
排屑空間幾何形狀最佳化
確保最好的排屑性

INTERNAL COOLING
optimised for drilling and milling
內冷卻油孔
確保鑽銑及銑削加工最佳冷卻與排屑性

HIGHLY POSITIVE PCD CUTTING EDGES
and carbide cutting edges up to the centre
高品質 PCD人造鑽石刃口
及過中心的鎢鋼切削刃

new

DIMENSIONS
尺寸 Ø 12.0 – 32.0 mm

LENGTHS
長度 2xD – 3xD

TAPERED NECK
for optimised chip removal in deep pockets
斜錐度頸部、加強剛性
用於深的口袋槽形加工
可以得到排屑最佳化

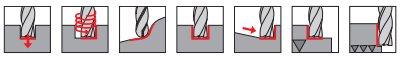
PKD diver

PCD Diver (3-fluted)

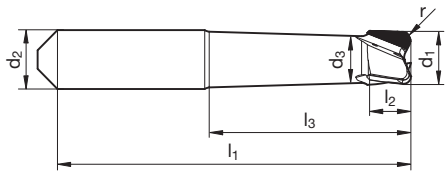
Article no. **4190**

NEW | PKD | 3 | HA | R ±0,05

P	M	K	N	S	H
			●		



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



- 特殊刀底設計
- 軸向與徑向皆有出水孔
- MQL可以適用
- 3刃 PCD切削刃
- 錐度頸部
- 底刃過中心

Article no. **4190**

d1 ±0,02 mm	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	r mm	Z	價格
12.00	12.00	10.50	75	8.0	28.00	2.00	3	27,000
16.00	16.00	12.53	103	12.0	53.00	2.00	3	40,000
20.00	20.00	15.76	120	14.0	68.00	3.00	3	48,000
25.00	25.00	19.87	145	18.0	87.00	3.00	3	51,000
32.00	32.00	27.58	170	20.0	108.00	4.00	3	74,000

RF 100 Diver — HPC：High Performance Cutting

Milling conditions: 穩定的機械加工條件 主軸具有高驅動馬力

HPC stable machining conditions high drive power

short tools 短刃型

long tools 長刃型

Correction factors:

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

加工深度ap大於1.5D時，切削速度Vc與每刃進給Fz必須降低25%

see page "GTC milling strategies"

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
P1.1.1 Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB **P1.1.2** Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB **P1.1.3** Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB **P1.1.4** Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB **P1.1.5** Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB **P1.1.6** Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB **P1.1.7** Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 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
P2.1.1 Low-alloy steel, annealed, Rm 610 N/mm², 180 HB **P2.1.2** Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB **P2.1.3** Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB **P2.1.4** Low-alloy steel, heat-treated, Rm 1190 N/mm², 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
P3.1.1 High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB **P3.1.2** High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 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
M1.1.1 Stainless steel, ferritic/martensitic, with machining additives **M1.1.2** Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 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
M1.1.3 Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 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
M2.1.1 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
M2.2.1 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
K1.1.1 Grey cast iron, pearlitic/ferritic, 180 HB **K1.1.2** Grey cast iron, pearlitic/martensitic, 260 HB **K1.2.1** Cast iron with spheroidal graphite, ferritic, 160 HB **K1.2.2** 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
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB **N1.1.2** 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

All the values stated are guide values. You can find detailed cutting values online in our Gühring Navigator at navigator.guehring.de.

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
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB **N2.1.2** 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
N2.1.3 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
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 % **N3.1.2** 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
N3.1.3 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
S1.1.1 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
S1.1.2 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
S1.1.3 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
S1.1.4 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
S1.1.5 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
S2.1.1 Titanium alloys, pure titanium, Rm 400 N/mm²	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
S2.1.2 Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²	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
H1.1.1 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
H2.1.1 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
H2.1.2 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

All the values stated are guide values. You can find detailed cutting values online in our Gühring Navigator at navigator.guehring.de.

RF 100 Micro Diver, 2.5xD

Milling conditions: HSC：High Speed Cutting

HSC stable machining conditions
low cutting depths, high cutting values

穩定的機械加工條件
低切深、高切削速度

long tools 2.5D 標準長

GTC see page "GTC milling strategies"

Machining group	Application	v_c (m/min) with nom. Ø				a_p max.	a_e max.	f_z (mm/z) with nom. Ø							
		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
P1.1.1 Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB **P1.1.2** Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB **P1.1.3** Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB **P1.1.4** Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB **P1.1.5** Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB **P1.1.6** Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB **P1.1.7** Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 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
P2.1.1 Low-alloy steel, annealed, Rm 610 N/mm², 180 HB **P2.1.2** Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB **P2.1.3** Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB **P2.1.4** Low-alloy steel, heat-treated, Rm 1190 N/mm², 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
P3.1.1 High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB **P3.1.2** High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 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
M1.1.1 Stainless steel, ferritic/martensitic, with machining additives **M1.1.2** Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 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
M1.1.3 Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 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
M2.1.1 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
M2.2.1 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
K1.1.1 Grey cast iron, pearlitic/ferritic, 180 HB **K1.1.2** Grey cast iron, pearlitic/martensitic, 260 HB **K1.2.1** Cast iron with spheroidal graphite, ferritic, 160 HB **K1.2.2** 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

All the values stated are guide values. You can find detailed cutting values online in our Gühring Navigator at navigator.guehring.de.

Machining group	Application	v_c (m/min) with nom. Ø				a_p max.	a_e max.	f_z (mm/z) with nom. Ø							
		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
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB **N1.1.2** Wrought aluminium alloys, hardened, 100 HB	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
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB **N2.1.2** Aluminium casting alloys, hardened, ≤ 12 % Si, 90 HB	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
N2.1.3 Aluminium casting alloys, non-hardened, > 12 % Si, 130 HB	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
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 % **N3.1.2** Copper and copper alloys: CuZn, CuSnZn	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
N3.1.3 Copper and copper alloys: CuSn, lead-free copper and copper electrolyte	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
S1.1.1 Heat-resistant alloys, Fe-based, annealed, 200 HB	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
S1.1.2 Heat-resistant alloys, Fe-based, hardened, 280 HB	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
S1.1.3 Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB	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
S1.1.4 Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB	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
S1.1.5 Heat-resistant alloys, Ni- or Co-based, cast, 320 HB	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
S2.1.1 Titanium alloys, pure titanium, Rm 400 N/mm²	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
S2.1.2 Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²	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

All the values stated are guide values. You can find detailed cutting values online in our Gühring Navigator at navigator.guehring.de.

RF 100 Micro Diver, 5xD

Milling conditions: HSC：High Speed Cutting

HSC stable machining conditions
low cutting depths, high cutting values

穩定的機械加工條件
低切深、高切削速度

extra-long tools 5D長刃型

GTC see page "GTC milling strategies"

Machining group	Application	v_c (m/min) with nom. Ø				a_p max.	a_e max.	f_z (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
P1.1.1 Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB **P1.1.2** Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB **P1.1.3** Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB **P1.1.4** Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB **P1.1.5** Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB **P1.1.6** Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB **P1.1.7** Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 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
P2.1.1 Low-alloy steel, annealed, Rm 610 N/mm², 180 HB **P2.1.2** Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB **P2.1.3** Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB **P2.1.4** Low-alloy steel, heat-treated, Rm 1190 N/mm², 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
P3.1.1 High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB **P3.1.2** High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 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
M1.1.1 Stainless steel, ferritic/martensitic, with machining additives **M1.1.2** Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 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
M1.1.3 Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 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
M2.1.1 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
M2.2.1 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
K1.1.1 Grey cast iron, pearlitic/ferritic, 180 HB **K1.1.2** Grey cast iron, pearlitic/martensitic, 260 HB **K1.2.1** Cast iron with spheroidal graphite, ferritic, 160 HB **K1.2.2** 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

All the values stated are guide values. You can find detailed cutting values online in our Gühring Navigator at navigator.guehring.de.

Machining group	Application	v_c (m/min) with nom. Ø				a_p max.	a_e max.	f_z (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
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB **N1.1.2** 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
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB **N2.1.2** Aluminium casting alloys, hardened, ≤ 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
N2.1.3 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
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 % **N3.1.2** 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
N3.1.3 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
S1.1.1 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
S1.1.2 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
S1.1.3 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
S1.1.4 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
S1.1.5 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
S2.1.1 Titanium alloys, pure titanium, Rm 400 N/mm²	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
S2.1.2 Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²	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

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PCD Diver

Milling conditions: HPC : High performance Cutting

HPC stable machining conditions high drive power 用於穩定的切削條件 高驅動馬力機台

short tools 短刃型

long tools 標準長型

Machining group	Application	v_c (m/min)	a_p max.	a_e max.	f_z (mm/z) with nom. Ø				
					12	16	20	25	32
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB **N1.1.2** 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
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB **N2.1.2** Aluminium casting alloys, hardened, ≤ 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
N2.1.3 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
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 % **N3.1.2** 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
N3.1.3 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 擺線切削加工 (最高的金屬移除率)

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.

GÜHRING TROCHOIDAL CUTTING

這些銑削策略的應用屬於當前全鎢鋼銑刀的最新技術和最有效的應用方法。
使用時，極高的金屬移除率可確保生產效率的顯著提升，即使在功率較小的機台或是工況不穩定的條件下，
也可以實現非常高的切削參數。即使加工難切削材，或是刀具的直徑長度比不理想，也是可以大大提高加工過程的穩定性。

1

HIGH PERFORMANCE CUTTING 高性能切削加工 (最高的金屬移除率)

HPC

max. machining volume ➙ stable conditions; short unclamping; high performance; good cooling
單位時間內最高的金屬移除率 → 工況條件穩定、快速換模上下料；高性能；冷卻條件優良

2

HIGH SPEED CUTTING 高速度加工 (用於模具類球刀、圓鼻銑刀成形銑削)

HSC

at high speed/high feed rate ➙ high dynamics; low performance; low infeed
高轉速/ 高進給 → 高動能；低切寬、低切深；主軸馬力低

PRINCIPLES & OBJECTIVES

Maximum tool utilisation — 最大限度地利用刀具
- utilisation of entire cutting edge length — 盡量利用全部切削刃長度
- full power delivery — 機台全功率輸出利用
- increased tool lives — 延長刀具壽命
- balanced wear — 刀具磨損磨耗均勻

Modification of cutting distribution — 切削參數調整分配
- low cutting widths a_e — 低切割寬度 ae
- high cutting depths a_p — 高切削深度 ap

High process reliability 高加工的穩定性
- low tool wrapping 刀具纏屑情況低
- improved thermal conditions at tool cutting edge 改善刀具刃口的散熱
- lower mechanical load 工件加工面不能產生應力、不能硬化

Maximum metal removal rates 最大金屬移除率
- saving time/machine costs 節省時間與機器成本

GENERAL RECOMMENDATION TOOL COOLING

Steel	P	Dry machining, compressed air, MQL:	• avoid thermal shock 避免熱產生對刀具的衝擊 • dissipate machining temperature via chip 切屑把熱帶走 • supporting chip removal 幫助排屑
Cast iron	K		
Hardened	H		
Stainless	M	Emulsion; oil:	• cooling of tool cutting edge 切削刃口冷卻 • preventing built-up edgex 避免刃口沾黏積屑 • supporting chip removal 幫助排屑
Special alloy	S		
Non-ferrous metals	N	Emulsion; MQL:	• preventing built-up edges 避免刃口沾黏積屑 • supporting chip removal 幫助排屑

EXCEPTIONS FOR MATERIAL RANGES 材料範圍以外的注意事項

P K

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.
如果冷卻條件不佳，則應該降低切削速度（vc）及降低切寬（ae），這樣才能降低溫度，降低熱對刀刃的衝擊
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.
如果排屑不良，則應使用冷卻液，排屑不良會大大導致刀刃磨損甚至斷刀。
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.
當排屑不良而產生熱能時應檢查是否可以使用冷卻液，透過使用專門的 “冷卻液噴嘴” ，可以將冷卻液供應到堵塞處
而不會碰到切削區域， 另外，建議在整個加工過程中使用冷卻液。

OTHER NOTES 其他注意事項

Finishing 精銑削
The application of coolant is principally an advantage as a better surface finish can be achieved.
使用冷卻液原則上是一個優勢，因為可以實現更好的表面光潔度

Very long tools 長刃型銑削
Coolant can result in a smoother process, as the lubricant has a vibration-reducing effect.
使用冷卻液可以使加工過程更順暢，因為潤滑劑具有減振作用

Alignment of coolant 冷卻液對準加工區域

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

至少有三個方向的切削液噴嘴，需對準切削區域噴射 不要將小切屑衝回切削區域

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

最佳的排屑性，非常好的切削刃口冷卻，避免刃口沾黏積屑非常有效
特別推薦用於較大尺寸的刀具和堅韌的難切削材銑削

Peripheral cooling / Gührojet Guhrojet 刀具周邊外圍冷卻
Best external option: Optimal tool cooling and chip removal
thanks to the direct route from coolant exit to cutting area
由於冷卻液直接噴到切削區域，達到最佳的刀具冷卻和排屑性

GÜHROJET

Solid carbide milling cutter RF 100 Diver

GÜHRING

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