GÜHRING

GÜHRING HIGH-PERFORMANCE TOOLS FOR
MACHINING FIBRE COMPOSITE MATERIALS

德國鈷領 高效能纖維與複合材料加工刀具

- without fraying of fibres and delamination
  不會造成纖維磨損和分層破壞
- for optimal component surface finish quality
  可以獲得最佳的零件表面光潔度與品質

Machining modern composite materials

加工現代複合材料、碳纖維、玻璃纖維、克維拉纖維的最佳選擇

GÜHRING – YOUR WORLDWIDE PARTNER

MACHINING MODERN COMPOSITE MATERIALS

Modern fibre reinforced plastics (FRP's) are making an entry into a broad range of industrial applications for reasons of efficiency, weight reduction, strength and dynamics. With their specific properties they extend the group of conventional metal lightweight construction materials such as aluminium- and titanium-alloys. FRP's or multi-material combinations, ie. a mixture of FRP and metallic materials, are therefore no longer exclusively retained for the aerospace industry, motorsport and other high-end applications. It is especially worth high-lighting the great growth in the general automotive and commercial vehicle technology.

現代纖維強化塑料(FRP)由於重量輕、強度佳的特性，應用時效率高與動力性好，正廣泛地應用於工業之中。憑藉其特殊的性能，用途擴展到常用的輕質結構金屬的種類材料，例如鋁和鈦合金。纖維材料或是多種材料的合成組合，例如FRP和金屬材料的混合物不再專門保留用於航空航天工業，賽車運動和其他高端的應用。已經廣泛應用於汽車和商用車之中。

FRP's are applied where high specific strength and low weight as well as high dynamic or energy efficient processes can be found. For the machining of CFRP, GFRP and stacks (FRP-metal-layer composite) without component damage, cutting edge quality and wear resistance of the tool material are of absolute importance. Guhring provides special solid carbide, coated carbide and PCD tooling solutions for these demanding materials. They are specially adapted to the respective material structure and ensure optimum chip evacuation as well as uniform hole diameters across all materials.

纖維材料適用於高強度，低重量的場合以及需要高動態或高效能的場合。加工CFRP，GFRP的堆疊（FRP-金屬層複合材料），不能造成工件的損壞與毛邊產生，刀具的刃口與耐磨性至關重要。德國鈷領提供特殊的鎢鋼刀具與塗層以及PCD鑽石刀具，為這些嚴苛的加工提供解決方案，特別適用於這些特殊的材料結構加工，確保最佳的排屑性以及均勻的孔徑。

CHALLENGES

- components without fraying of fibres
- delamination-free component surface finish
- no component damage through "peel-up" or "push-out"
- prevention of split fibres on component
- minimising burr development
- prevention of thermal damage

- 纖維不能有破損
- 表面不能有分層的現象
- 表面不能有“剝離”或“推出”
- 不能有纖維分裂
- 毛邊必須最少
- 防止因加工而造成的熱損傷

TOOLS

FOR THE MACHINING OF MODERN COMPOSITE MATERIALS

各式加工現代複合材料刀具

END MILLS

from Ø8.00 mm to Ø12.70 mm

四刃型PCD焊刃式銑刀（頁次24）

PCD

SOLID CARBIDE DRILLS

from Ø2.50 mm to Ø12.70 mm

鎢鋼鑽頭（頁次6,7）

Solid carbide

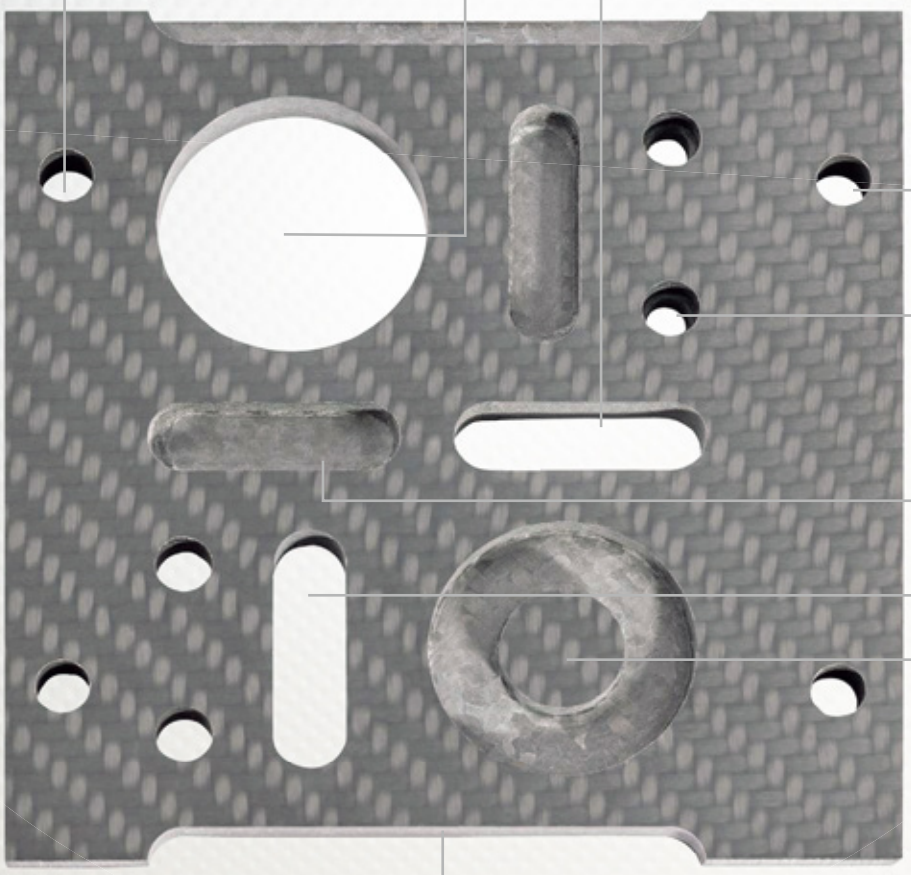
END MILLS Z=1

from Ø2.00 mm to Ø16.00 mm

鎢鋼單刃式銑刀/鑽頭（頁次8）

Solid carbide

可應用於加工壓克力



PCD DRILLS

from Ø2.70mm to Ø12.70mm

PCD鑽石焊刃式鑽頭（頁次18,19）

PCD

※ 羽球 / 網球拍，鑽孔有高壽命表現

TAPS

from M3mm to M16mm

鎢鋼絲攻（頁次14,15）

Solid carbide

THREAD MILLING CUTTERS

from M1.6mm to M20x1.5mm

鎢鋼銑牙刀（頁次16,17）

Solid carbide

KEVLAR END MILLS FR 100

from Ø4.00mm to Ø12.70mm

克維拉纖維材料加工用

銑刀 / 鑽石鍍膜銑刀（頁次12,13）

Solid carbide

"克維拉" 可以說是高科技的材料，它耐高溫，強度與硬度比鋼鐵高 5 倍，質量比玻璃纖維還輕。可用於用防彈背心、保護手套、安全帽、消防隊用的衣服、汽車剎車墊、汽車與腳踏車的輪胎、輪船、輕便飛行器、海底電纜、橋梁等。

KEVLAR END MILLS CR 100

from Ø4.00mm to Ø16.00mm

克維拉纖維材料加工用銑刀 / 鑽石鍍膜銑刀（頁次9,10,11）

Solid carbide

SLOT DRILLS Z=2

from Ø4.00mm to Ø20.00mm

PCD鑽石焊刃式銑刀/ 2刃式（頁次20,21）

PCD

SLOT DRILLS Z=3

from Ø14.00mm to Ø20.00mm

PCD鑽石焊刃式銑刀/ 3刃式（頁次22,23）

PCD

PCD COMPRESSION MILLING CUTTERS

from Ø12.70mm to Ø16.00mm

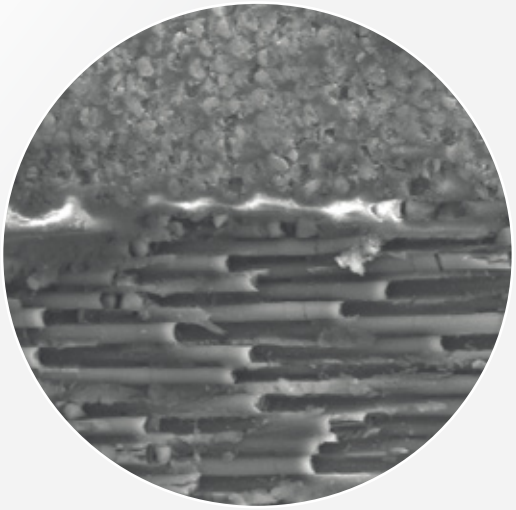
PCD鑽石焊刃式銑刀/ 三刃交錯齒型（頁次25）

PCD

RESULT OF A DRILLING OPERATION WITH SPECIALISED GUHRING TOOLING SOLUTIONS
使用德國鈷領特殊鑽頭加工碳纖維材質的結果

Machining with a Guhring tool retains the structure and direction of the fibres in the component, as the REM examination shows. The fibres are neither pressed into the matrix or ripped out of the composite.

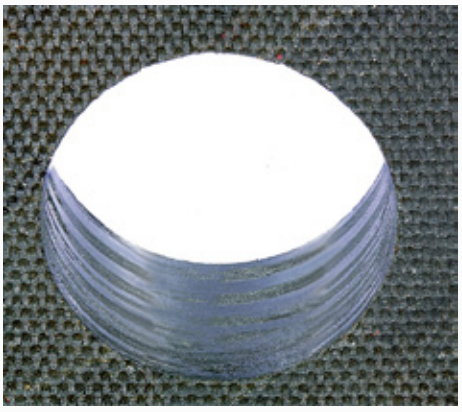
如REM檢查所示，使用德國鈷領刀具加工可保留工件中的纖維結構和方向性。
纖維既不會被壓入基體，也不會被撕裂。



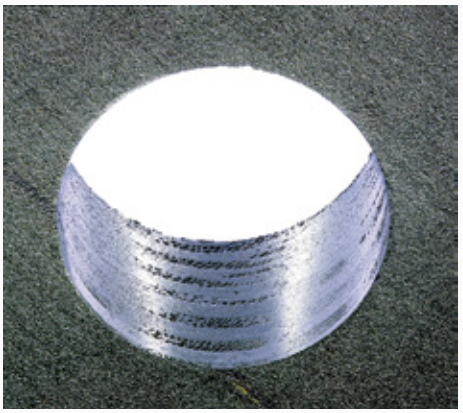
CFRP cut surface with 500-fold magnification
CFRP加工後表面500倍放大顯示

Optimal machining results in CFRP
碳纖維最佳的加工結果

no peel-up – no push-out
孔內壁沒有 "剝離" / 也沒有 "推出"



hole exit in CFRP
with woven cover layer
hole d = 6.35 mm
帶有編織覆蓋層CFRP中的孔出口
孔徑＝ 6.35mm

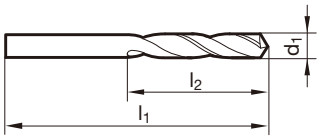


hole exit in
unidirectional CFRP
hole d = 6.35 mm
單向性的CFRP孔出口
孔徑＝ 6.35mm

Stub drills 鎢鋼短刃鑽頭

3xD | DIN 6539 | N | 118° | h7

Tool material	solid carbide
Surface finish	○
Cutting direction	®



編號： **730**

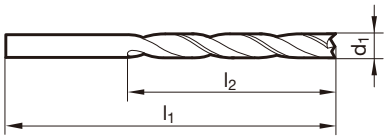
d1 mm	d1 inch	l1 mm	l2 mm	Availability
2.500		43.00	14.00	●
3.000		46.00	16.00	●
3.200		49.00	18.00	●
3.260		49.00	18.00	●
3.300		49.00	18.00	●
3.500		52.00	20.00	●
3.570	9/64	52.00	20.00	●
3.600		52.00	20.00	●
4.000		55.00	22.00	●
4.100		55.00	22.00	●
4.500		58.00	24.00	●
4.760	3/16	62.00	26.00	●
4.800		62.00	26.00	●
5.000		62.00	26.00	●
5.500		66.00	28.00	●
6.000		66.00	28.00	●
6.350	1/4	70.00	31.00	●
6.400		70.00	31.00	●
6.500		70.00	31.00	●
7.000		74.00	34.00	●
7.500		74.00	34.00	●
8.000		79.00	37.00	●
8.500		79.00	37.00	●
9.000		84.00	40.00	●
9.500		84.00	40.00	●
10.000		89.00	43.00	●
12.700	1/2	102.00	51.00	●

碳纖維/玻璃纖維	鑽孔	切削米數	每轉進給
CFRP GFRP aramid		40-130 m/min	0.03 - 0.15 f (mm/rev)

Kevlar drills 克維拉纖維材料用短刃鑽頭

WN | FK | h8

Tool material	solid carbide
Surface finish	○
Cutting direction	R

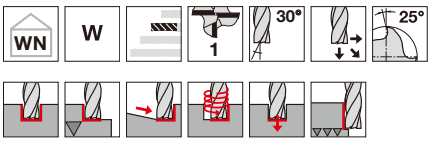


編號： **1149**

d1 mm	d1 inch	l1 mm	l2 mm	Availability
2.500		43.00	14.00	●
3.200		49.00	18.00	●
3.570	9/64	52.00	20.00	●
4.000		55.00	22.00	●
4.760	3/16	62.00	26.00	●
5.000		62.00	26.00	●
6.000		66.00	28.00	●
8.000		79.00	37.00	●
10.000		89.00	43.00	●

碳纖維/玻璃纖維	鑽孔	切削米數	每轉進給
CFRP GFRP aramid		40-130 m/min	0.03 - 0.15 f (mm/rev.)

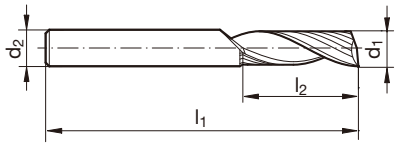
End mills Z=1 鎢鋼單刃式銑刀/鑽頭



Tool material	solid carbide
Surface finish	D
Cutting direction	R

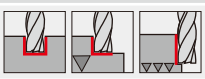
polished flutes, centre cutting
端面刃口有過中心

壓克力加工效果佳

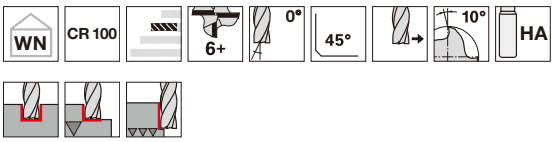


編號： **6793**

d1 h10	d2 h6	l1	l2	Z	Availability
mm	mm	mm	mm		
2.000	2.00	38	10.0	1	●
3.000	3.00	39	12.0	1	●
4.000	4.00	40	15.0	1	●
5.000	5.00	50	16.0	1	●
6.000	6.00	57	20.0	1	●
8.000	8.00	63	22.0	1	●
10.000	10.00	73	25.0	1	●
12.000	12.00	83	30.0	1	●
16.000	16.00	92	35.0	1	●

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFK GFK aramid		100-250 m/min	0,03 - 0,12 f_z (mm/z)
CFK GFK aramid		80-150 m/min	0,03 - 0,2 f (mm/rev.)

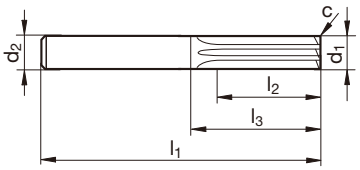
Kevlar CR 100 end mills 克維拉纖維材料用 CR100鎢鋼鑽石鍍膜銑刀



Tool material	**solid carbide**
Surface finish	D
Cutting direction	R

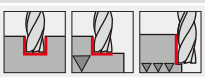
Solid carbide ultra-finest grain, diamond-coated,
without face cutting, for slotting and trimming

刀口端面無過中心，不能往下鑽銑

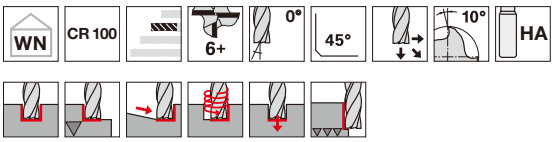


編號： **6717**

d1 e10	d2 h6	l1	l2	l3	c	Z	Availability
mm	mm	mm	mm	mm	mm x 45°		
4.000	6.00	57.00	10.00	19.40	0.10	6	●
6.000	6.00	65.00	15.00	29.00	0.15	8	●
8.000	8.00	75.00	20.00	39.00	0.15	10	●
10.000	10.00	80.00	25.00	40.00	0.15	12	●
12.000	12.00	93.00	32.00	48.00	0.15	14	●
16.000	16.00	108.00	34.00	60.00	0.15	14	●

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFRP GFRP aramid		250-500 m/min	0.03 - 0.12 f_z (mm/z)

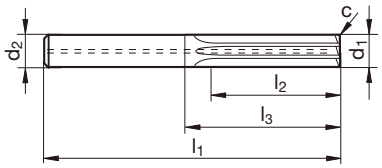
CR 100 Kevlar end mills 克維拉纖維材料用 CR100鎢鋼鑽石鍍膜銑刀



Tool material	**solid carbide**
Surface finish	D
Cutting direction	R

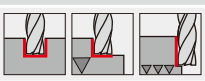
Solid carbide ultra-finest grain, diamond-coated,
with centre cutting, for slotting and trimming as well as oblique plunging

刀口端面有過中心，可以往下鑽銑

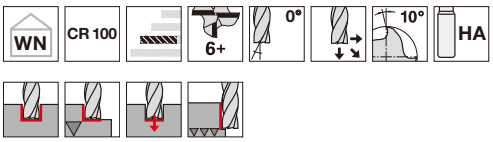


編號： **6719**

d1 e10	d2 h6	l1	l2	l3	c	Z	Availability
mm	mm	mm	mm	mm	mm x 45°		
4.000	6.00	57.00	10.00	19.40	0.32	6	●
6.000	6.00	65.00	15.00	29.00	0.48	8	●
8.000	8.00	75.00	20.00	39.00	0.64	10	●
10.000	10.00	80.00	25.00	40.00	0.80	12	●
12.000	12.00	93.00	32.00	48.00	0.96	14	●
16.000	16.00	108.00	34.00	60.00	1.28	14	●

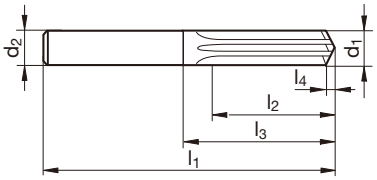
碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFRP GFRP aramid		250-500 m/min	0.03 - 0.12 f_z (mm/z)
CFRP GFRP aramid		100-250 m/min	0.05 - 0.2 f (mm/rev.)

CR 100 Kevlar end mills 克維拉纖維材料用 CR100鎢鋼鑽石鍍膜銑刀/鑽頭



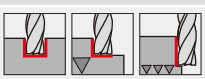
Tool material	**solid carbide**
Surface finish	D
Cutting direction	R

Solid carbide ultra-finest grain, diamond-coated,
with drill point, especially for plunging and subsequent milling

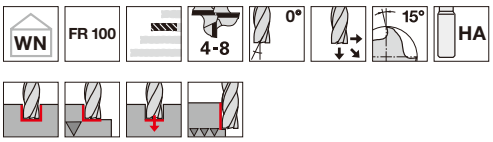


編號： **6720**

d1 (e10)	d2 (h6)	l1	l2	l3	l4	Z	Availability
mm	mm	mm	mm	mm	mm		
4.000	6.00	57.00	10.00	27.00	1.3	6	●
6.000	6.00	65.00	15.00	29.00	1.9	8	●
8.000	8.00	75.00	20.00	39.00	2.5	10	●
10.000	10.00	80.00	25.00	40.00	3.1	12	●
12.000	12.00	93.00	32.00	48.00	3.7	14	●
16.000	16.00	108.00	34.00	60.00	4.9	14	●

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFRP GFRP aramid		250-500 m/min	0.03 - 0.12 f_z (mm/z)
CFRP GFRP aramid		100-250 m/min	0.05 - 0.20 f (mm/rev.)

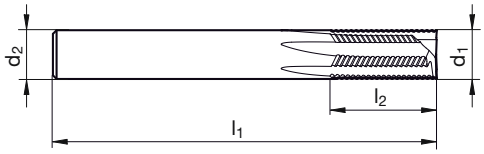
FR 100 Kevlar end mills 克維拉纖維材料用 FR100鎢鋼鑽石鍍膜銑刀



Tool material	solid carbide	
Surface finish	D	○
Cutting direction	R	R

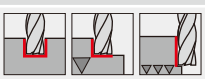
Solid carbide ultra-finest grain, diamond-coated,
with drill centre cutting, for slotting and trimming as well as oblique plunging

刀口端面有過中心，可以往下鑽銑

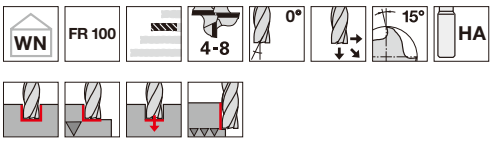


編號： **6769** **6805**

Code no.	d1 (e10)	d1 (e10)	d2 (h6)	l1	l1	l2	l2	Z	Availability	
	mm	inch	mm	mm	inch	mm	inch			
4.000	4.000		6.000	66.00		15.00		4	●	●
4.762	4.762	3/16	4.762	63.50	2.5	15.00	37/64	4	●	●
4.763	4.762	3/16	4.762	63.50	2.5	15.80	5/8	4	●	●
6.000	6.000		6.000	70.00		20.00		4	●	●
6.350	6.350	1/4	6.350	63.50	2.5	15.00	37/64	4	●	●
6.351	6.350	1/4	6.350	63.50	2.5	19.05	3/4	4	●	●
8.000	8.000		8.000	75.00		25.00		6	●	●
9.525	9.525	3/8	9.525	76.20	3.0	18.00	45/64	6	●	●
9.526	9.525	3/8	9.525	76.20	3.0	25.40	1	6	●	●
10.000	10.000		10.000	72.00		15.00		6	●	●
12.000	12.000		12.000	83.00		20.00		6	●	●
12.700	12.700	1/2	12.700	88.90	3.5	25.40	1	8	●	●
12.701	12.707	1/2	12.700	88.90	3.5	31.75	1.25	8	●	●

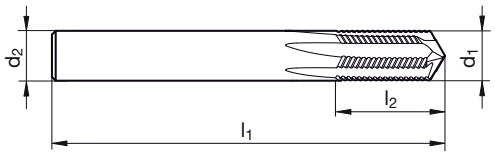
碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFRP GFRP aramid		150-450 m/min	0.03 - 0.12 f_z (mm/z)
CFRP GFRP aramid		125-150 m/min	0.05 - 0.20 f (mm/rev.)

FR 100 Kevlar end mills 克維拉纖維材料用 FR100鎢鋼鑽石鍍膜銑刀/鑽頭



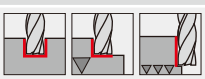
Tool material	solid carbide	
Surface finish	D	○
Cutting direction	R	R

Solid carbide ultra-finest grain, diamond-coated,
with drill point, specially for plunging and subsequent milling



編號：	6770	6806

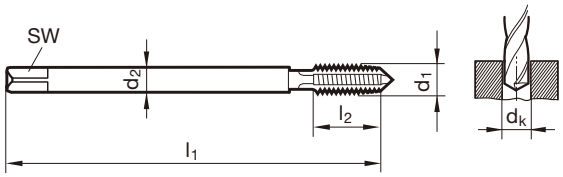
Code no.	d1 (e10)	d1 (e10)	d2 (h6)	l1	l1	l2	l2	Z	Availability	
	mm	inch	mm	mm	inch	mm	inch			
4.000	4.000		6.000	66.00		15.00		4	●	●
4.762	4.762	3/16	4.762	63.50	2.5	15.00	37/64	4	●	●
4.763	4.762	3/16	4.762	63.50	2.5	15.80	5/8	4	●	●
6.000	6.000		6.000	70.00		20.00		4	●	●
6.350	6.350	1/4	6.350	63.50	2.5	15.00	37/64	4	●	●
6.351	6.350	1/4	6.350	63.50	2.5	19.05	3/4	4	●	●
8.000	8.000		8.000	75.00		25.00		6	●	●
9.525	9.525	3/8	9.525	76.20	3.0	18.00	45/64	6	●	●
9.526	9.525	3/8	9.525	76.20	3.0	25.40	1	6	●	●
10.000	10.000		10.000	72.00		15.00		6	●	●
12.000	12.000		12.000	83.00		20.00		6	●	●
12.700	12.700	1/2	12.700	88.90	3.5	25.40	1	8	●	●
12.701	12.707	1/2	12.700	88.90	3.5	31.75	1.25	8	●	●

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFRP GFRP aramid		150-450 m/min	0.03 - 0.12 f_z (mm/z)
CFRP GFRP aramid		125-150 m/min	0.05 - 0.18 f (mm/rev.)

Machine taps for ISO metric threads 鎢鋼絲攻

~DIN 371 | R | H | D

Tool material	**solid carbide**
Surface finish	C
Tolerance on Ø	ISO2/6H



編號： **2944**

d1	P	d2	SW	dk	l1	l2	Availability
	mm	mm	mm	mm	mm	mm	
M3	0.500	3.50	2.700	2.60	56.00	12.00	●
M4	0.700	4.50	3.400	3.40	63.00	14.00	●
M5	0.800	6.00	4.900	4.30	70.00	17.00	●
M6	1.000	6.00	4.900	5.10	80.00	20.00	●
M8	1.250	8.00	6.200	6.90	90.00	20.00	●
M10	1.500	10.00	8.000	8.60	100.00	24.00	●
M12	1.750	12.00	9.000	10.40	110.00	28.00	●
M16	2.000	16.00	12.000	14.10	110.00	40.00	●

碳纖維/玻璃纖維	通 / 盲孔	切削米數
CFK GFK	blind hole through hole	10 - 20 m/min

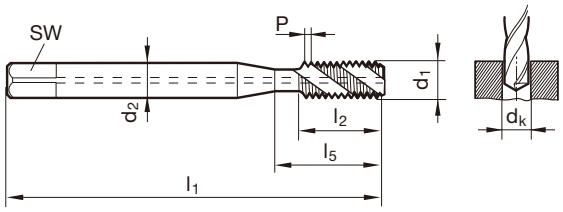
Taps for ISO metric threads with internal cooling 中心出水 鎢鋼絲攻

DIN 371 | R | N R15 | C

≥ M5 with internal cooling

≥ M5以上才有中心出水孔

Tool material	**solid carbide**
Surface finish	◯
Tolerance on Ø	6HX



編號： **971**

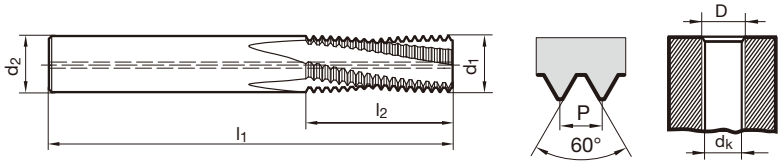
d1	P	d2	SW	dk	l1	l2	l5	Availability
	mm	mm	mm	mm	mm	mm	mm	
M3	0.500	3.500	2.700	2.50	56.000	8.000	18.000	●
M4	0.700	4.500	3.400	3.30	63.000	10.000	21.000	●
M5	0.800	6.000	4.900	4.20	70.000	10.000	25.000	●
M6	1.000	6.000	4.900	5.00	80.000	12.000	30.000	●
M8	1.250	8.000	6.200	6.80	90.000	16.000	35.000	●
M10	1.500	10.000	8.000	8.50	100.000	18.000	39.000	●

碳纖維/玻璃纖維	通 / 盲孔	切削米數
CFK GFK	blind hole through hole	10 - 20 m/min

Thread milling cutters without chamfer for ISO metric threads 中心出水 鎢鋼銑牙刀

WN | R | 2xD | TM SP

Tool material	solid carbide
Surface finish	C
Cutting direction	HA



編號： **3737**

D	P	d1	d2	dk	l1	l2	Z	Code no.	Availability
	mm	mm	mm	mm	mm	mm			
M6	1.000	4.800	6.000	5.00	54.000	13.500	3	6.000	●
M8	1.250	6.400	8.000	6.80	62.000	18.100	3	8.000	●
M8 x 1	1.000	6.400	8.000	7.00	62.000	17.500	3	8.005	●
M10	1.500	7.950	10.000	8.50	74.000	21.800	3	10.000	●
M10 x 1	1.000	7.950	10.000	9.00	74.000	21.500	3	10.005	●
M10 x 1.25	1.250	7.950	10.000	8.80	74.000	21.900	3	10.006	●
M12	1.750	9.950	10.000	10.20	74.000	25.400	4	12.000	●
M12 x 1.5	1.500	9.950	10.000	10.50	74.000	26.300	4	12.007	●
M14	2.000	11.200	12.000	12.00	90.000	31.000	4	14.000	●
M14 x 1.5	1.500	11.200	12.000	12.50	90.000	30.800	4	14.007	●
M16	2.000	12.800	14.000	14.00	90.000	35.000	4	16.000	●
M16 x 1.5	1.500	12.800	14.000	14.50	90.000	33.800	4	16.007	●
M20	2.500	14.950	16.000	17.50	102.000	41.300	4	20.000	●
M20 x 1.5	1.500	14.950	16.000	18.50	102.000	42.800	4	20.007	●

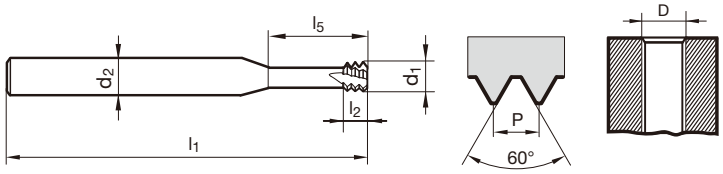
碳纖維/玻璃纖維	通 / 盲孔	切削米數	每轉進給
CFK GFK	blind hole through hole	50-80 m/min	0.01 - 0.10 f_z (mm/z)

The appropriate CNC programme with code and data sheet for the tool you can get for free with the free programming software CNC Gühro Thread Mill.

可以從德國鈷領網站下載銑牙刀CNC程式碼

Micro thread milling cutters 小尺寸鎢鋼銑牙刀

Tool material	solid carbide
Surface finish	C
Cutting direction	HA



編號： **4226**

D	P	d1	d2	l1	l2	l5	Z	Code no.	Availability
	mm	mm	mm	mm	mm	mm			
M1.6	0.350	1.200	3.000	39.000	1.100	4.800	3	1.600	●
M1.8	0.350	1.400	3.000	39.000	1.100	5.400	3	1.800	●
M2	0.400	1.550	3.000	39.000	1.200	6.000	4	2.000	●
M2.5	0.450	1.950	3.000	39.000	1.400	7.500	4	2.500	●
M3	0.500	2.400	6.000	58.000	1.500	9.500	4	3.000	●
M3.5	0.600	2.800	6.000	58.000	1.800	11.000	4	3.500	●
M4	0.700	3.200	6.000	58.000	2.100	12.500	4	4.000	●
M5	0.800	4.000	6.000	58.000	2.400	16.000	4	5.000	●
M6	1.000	4.800	6.000	58.000	3.000	20.000	4	6.000	●
M8	1.250	5.950	6.000	58.000	3.800	24.000	4	8.000	●
M10	1.500	7.800	8.000	73.000	4.500	33.000	4	10.000	●
M12	1.750	9.000	10.000	84.000	5.300	38.000	4	12.000	●
M16	2.000	11.800	12.000	84.000	6.000	35.000	5	16.000	●

碳纖維/玻璃纖維	通 / 盲孔	切削米數	每轉進給
CFK GFK	blind hole through hole	50-80 m/min	0.01 - 0.10 f_z (mm/z)

The appropriate CNC programme with code and data sheet for the tool you can get for free with the free programming software CNC Gühro Thread Mill.

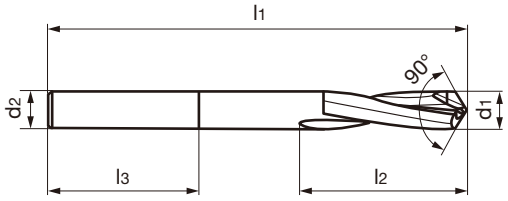
可以從德國鈷領網站下載銑牙刀CNC程式碼

90° PCD drills 90° PCD焊刃式鑽頭

N | 3xD | m7 | 90°

Tool material	PCD
Cutting direction	R

羽球 / 網球拍 鑽孔有高壽命表現



d1 mm	d1 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	編號：
2.700		4.00	60.00	18.00	28.00	303 209 684
3.000		4.00	60.00	18.00	28.00	303 209 685
3.250		4.00	60.00	18.00	28.00	303 420 038
3.572	9/64	4.00	60.00	18.00	28.00	303 209 686
4.000		5.00	60.00	20.00	28.00	303 209 802
4.170		5.00	75.00	25.00	28.00	303 420 039
4.762	3/16	5.00	75.00	25.00	28.00	303 209 803
4.830		5.00	75.00	25.00	28.00	303 420 040
5.000		6.00	75.00	25.00	36.00	303 209 804
6.000		8.00	75.00	30.00	36.00	303 209 805
6.350	1/4	8.00	75.00	35.00	36.00	303 209 806
7.937	5/16	10.00	75.00	30.00	40.00	303 209 807
8.000		10.00	75.00	30.00	40.00	303 209 808
9.525	3/8	10.00	100.00	50.00	40.00	303 209 809
10.000		12.00	125.00	50.00	45.00	303 209 810
12.000		14.00	125.00	60.00	45.00	303 209 811
12.700	1/2	14.00	150.00	65.00	45.00	303 209 812

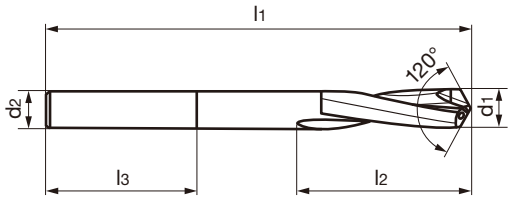
碳纖維/玻璃纖維	鑽孔	切削米數	每轉進給
CFRP GFRP aramid		75-200 m/min	0.05 - 0.2 f (mm/rev.)

120° PCD drills 120° PCD焊刃式鑽頭

N | 3xD | m7 | 120°

Tool material	PCD
Cutting direction	R

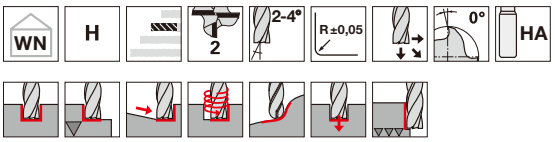
羽球 / 網球拍 鑽孔有高壽命表現



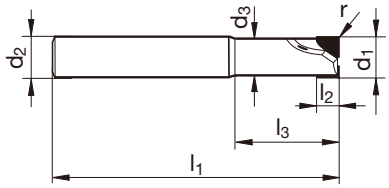
d1 mm	d1 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	編號：
2.700		4.00	60.00	18.00	28.00	303 209 813
3.000		4.00	60.00	18.00	28.00	303 209 814
3.250		4.00	60.00	18.00	28.00	303 420 041
3.572	9/64	4.00	60.00	18.00	28.00	303 209 815
4.000		5.00	60.00	20.00	28.00	303 209 816
4.170		5.00	75.00	25.00	28.00	303 420 047
4.762	3/16	5.00	75.00	25.00	28.00	303 209 817
4.830		5.00	75.00	25.00	28.00	303 420 048
5.000		6.00	75.00	25.00	36.00	303 209 818
6.000		8.00	75.00	30.00	36.00	303 209 819
6.350	1/4	8.00	75.00	35.00	36.00	303 209 820
7.937	5/16	10.00	75.00	30.00	40.00	303 209 821
8.000		10.00	75.00	30.00	40.00	303 209 822
9.525	3/8	10.00	100.00	50.00	40.00	303 209 823
10.000		12.00	125.00	50.00	45.00	303 209 824
12.000		14.00	125.00	60.00	45.00	303 209 825
12.700	1/2	14.00	150.00	65.00	45.00	303 209 826

碳纖維/玻璃纖維	鑽孔	切削米數	每轉進給
CFRP GFRP aramid		100-250 m/min	0.05 - 0.20 f (mm/rev.)

PCD slot drills Z=2 兩刃式PCD鑽石焊刃式銑刀 中心出水

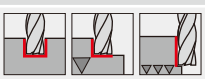


Tool material	PCD
Surface finish	◯
Cutting direction	(R)

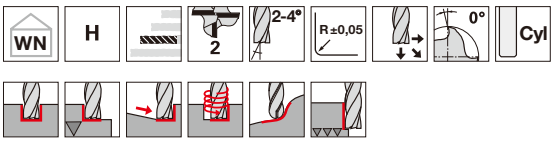


編號： **5492**

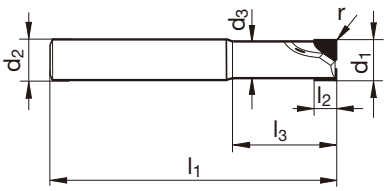
Code no.	d1	d1	d2 h6	d3	l1	l2	l3	r	Z	Availability
	mm		mm	mm	mm	mm	mm	mm		
4.000	4.000	± 0.02	6.00	3.70	51	6.0	14.0	0.1	2	●
5.000	5.000	± 0.02	6.00	4.70	51	8.0	14.5	0.1	2	●
6.000	6.000	± 0.02	6.00	5.70	57	8.0	20.0	0.1	2	●
8.000	8.000	± 0.02	8.00	7.40	63	8.0	26.0	0.1	2	●
8.001	8.000	± 0.02	8.00	7.40	63	12.0	26.0	0.1	2	●
10.000	10.000	± 0.02	10.00	9.40	72	8.0	30.0	0.1	2	●
10.001	10.000	± 0.02	10.00	9.40	72	16.0	30.0	0.1	2	●
12.000	12.000	± 0.02	12.00	11.20	83	8.0	36.0	0.1	2	●
12.001	12.000	± 0.02	12.00	11.20	83	16.0	36.0	0.1	2	●
14.000	14.000	± 0.02	14.00	13.00	83	8.0	36.0	0.1	2	●
14.001	14.000	± 0.02	14.00	13.00	83	16.0	36.0	0.1	2	●
16.000	16.000	± 0.02	16.00	15.00	100	12.0	50.0	0.1	2	●
16.001	16.000	± 0.02	16.00	15.00	100	20.0	50.0	0.1	2	●
18.000	18.000	± 0.02	18.00	17.00	100	12.0	50.0	0.1	2	●
18.001	18.000	± 0.02	18.00	17.00	100	20.0	50.0	0.1	2	●
20.000	20.000	± 0.02	20.00	19.00	100	12.0	48.0	0.1	2	●
20.001	20.000	± 0.02	20.00	19.00	100	20.0	48.0	0.1	2	●

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFRP GFRP aramid		150-450 m/min	0.03 - 0.12 f_z (mm/z)
CFRP GFRP aramid		125-150 m/min	0.05 - 0.18 f (mm/rev.)

PCD slot drills Z=2 兩刃式PCD鑽石焊刃式銑刀 中心出水

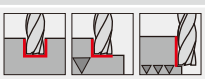


Tool material	PCD
Surface finish	◯
Cutting direction	(R)

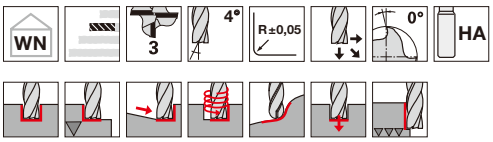


編號： **5493**

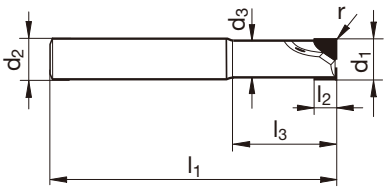
Code no.	d1	d1	d2 h6	d3	l1	l2	l3	r	Z	Availability
	mm		mm	mm	mm	mm	mm	mm		
4.000	4.000	± 0.02	6.00	3.70	70	6.0	14.0	0.1	2	●
5.000	5.000	± 0.02	6.00	4.70	70	8.0	14.5	0.1	2	●
6.000	6.000	± 0.02	6.00	5.70	75	8.0	20.0	0.1	2	●
8.000	8.000	± 0.02	8.00	7.40	100	8.0	26.0	0.1	2	●
8.001	8.000	± 0.02	8.00	7.40	100	12.0	26.0	0.1	2	●
10.000	10.000	± 0.02	10.00	9.40	100	8.0	30.0	0.1	2	●
10.001	10.000	± 0.02	10.00	9.40	100	16.0	30.0	0.1	2	●
12.000	12.000	± 0.02	12.00	11.20	100	8.0	36.0	0.1	2	●
12.001	12.000	± 0.02	12.00	11.20	100	16.0	36.0	0.1	2	●
14.000	14.000	± 0.02	14.00	13.00	100	8.0	36.0	0.1	2	●
14.001	14.000	± 0.02	14.00	13.00	100	16.0	36.0	0.1	2	●
16.000	16.000	± 0.02	16.00	15.00	150	12.0	50.0	0.1	2	●
16.001	16.000	± 0.02	16.00	15.00	150	20.0	50.0	0.1	2	●
18.000	18.000	± 0.02	18.00	17.00	125	12.0	50.0	0.1	2	●
18.001	18.000	± 0.02	18.00	17.00	125	20.0	50.0	0.1	2	●
18.002	18.000	± 0.02	18.00	17.00	150	12.0	50.0	0.1	2	●
18.003	18.000	± 0.02	18.00	17.00	150	20.0	50.0	0.1	2	●
20.000	20.000	± 0.02	20.00	19.00	150	12.0	48.0	0.1	2	●
20.001	20.000	± 0.02	20.00	19.00	150	20.0	48.0	0.1	2	●

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFK GFK aramid		150-450 m/min	0.03 - 0.12 f_z (mm/z)
CFK GFK aramid		125-150 m/min	0.05 - 0.18 f (mm/rev.)

PCD slot drills Z=3 三刃式PCD鑽石焊刃式銑刀 中心出水

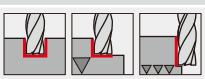


Tool material	PCD
Surface finish	◯
Cutting direction	Ⓡ

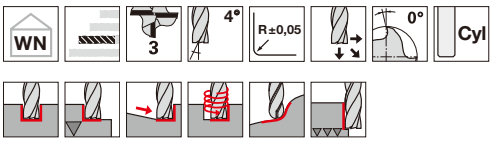


編號： **5495**

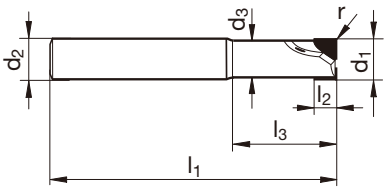
Code no.	d1	d1	d2 h6	d3	l1	l2	l3	r	Z	Availability
	mm		mm	mm	mm	mm	mm	mm		
14.000	14.000	± 0.02	14.00	13.00	83	8.0	38.0	0.1	3	●
14.001	14.000	± 0.02	14.00	13.00	83	16.0	38.0	0.1	3	●
16.000	16.000	± 0.02	16.00	15.00	100	12.0	52.0	0.1	3	●
16.001	16.000	± 0.02	16.00	15.00	100	20.0	52.0	0.1	3	●
18.000	18.000	± 0.02	18.00	17.00	100	12.0	52.0	0.1	3	●
18.001	18.000	± 0.02	18.00	17.00	100	20.0	52.0	0.1	3	●
20.000	20.000	± 0.02	20.00	19.00	100	12.0	50.0	0.1	3	●
20.001	20.000	± 0.02	20.00	19.00	100	20.0	50.0	0.1	3	●

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFK GFK aramid		150-450 m/min	0.03 - 0.12 f_z (mm/z)
CFK GFK aramid		125-150 m/min	0.05 - 0.18 f (mm/rev.)

PCD Slot drills Z=3 三刃式PCD鑽石焊刃式銑刀 中心出水

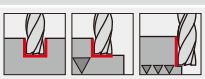


Tool material	PCD
Surface finish	◯
Cutting direction	®

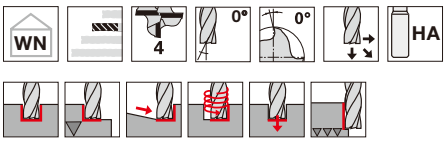


編號： **5496**

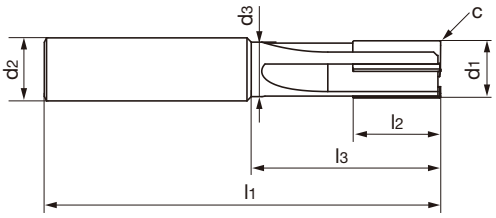
Code no.	d1	d1	d2 h6	d3	l1	l2	l3	r	Z	Availability
	mm		mm	mm	mm	mm	mm	mm		
14.000	14.000	± 0.02	14.00	13.00	100	8.0	38.0	0.1	3	●
14.001	14.000	± 0.02	14.00	13.00	100	16.0	38.0	0.1	3	●
16.000	16.000	± 0.02	16.00	15.00	150	12.0	52.0	0.1	3	●
16.001	16.000	± 0.02	16.00	15.00	150	20.0	52.0	0.1	3	●
18.000	18.000	± 0.02	18.00	17.00	150	12.0	52.0	0.1	3	●
18.001	18.000	± 0.02	18.00	17.00	150	20.0	52.0	0.1	3	●
20.000	20.000	± 0.02	20.00	19.00	150	12.0	50.0	0.1	3	●
20.001	20.000	± 0.02	20.00	19.00	150	20.0	50.0	0.1	3	●

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFK GFK aramid		150-450 m/min	0.03 - 0.12 f_z (mm/z)
CFK GFK aramid		125-150 m/min	0.05 - 0.18 f (mm/rev.)

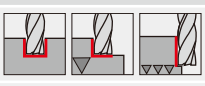
PCD End mills Z=4 四刃式PCD鑽石焊刃式銑刀



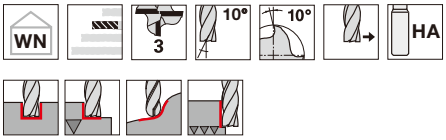
Tool material	PCD
Surface finish	◯
Cutting direction	Ⓡ



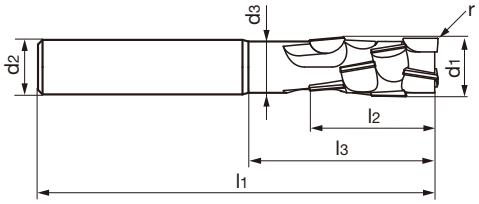
d1 mm	d1 inch	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	c mm x 45°	Z	編號：
8.000		8.00	7.40	75.00	19.50	38.50	0.20	4	303 206 512
9.525	3/8	10.00	8.92	80.00	19.50	39.26	0.20	4	303 206 513
10.000		10.00	9.40	80.00	19.50	39.50	0.20	4	303 206 514
12.000		12.00	11.40	88.00	19.50	42.50	0.20	4	303 206 515
12.700	1/2	14.00	12.10	88.00	19.50	41.85	0.20	4	303 211 229
12.700	1/2	14.00	11.10	88.00	19.50	41.35	0.20	2+1	303 211 230

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFK GFK aramid		150-500 m/min	0.03 - 0.12 f_z (mm/z)
CFK GFK aramid		125-200 m/min	0.05 - 0.20 f (mm/rev.)

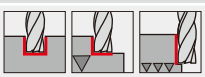
PCD Compression milling cutters Z=3 三刃交錯齒型PCD鑽石焊刃式銑刀



Tool material	PCD
Cutting direction	R



d1 mm	d1 inch	d2 h6 mm	d3 mm	l1 mm	l2 mm	l3 mm	r mm	編號：
12.700	1/2	12.00	11.30	88.00	28.00	41.49	0.10	303 211 231
14.000		14.00	12.60	88.00	28.00	40.19	0.10	303 211 257
16.000		16.00	14.60	91.00	28.00	40.19	0.10	303 211 258

碳纖維/玻璃纖維	加工應用	切削米數	每轉進給
CFRP GFRP aramid		150-500 m/min	0.03 - 0.12 f_z (mm/z)

GÜHRING

台灣鈷領股份有限公司

桃園總公司：(32846)桃園市觀音區忠愛路2段200號
中部辦事處：(40764)台中市西屯區台灣大道四段936號10F之3
南部辦事處：(82054)高雄市岡山區大仁南路140號
Website: http://www.guhring.com.tw

Tel：+886-3-498-7530 Fax：+886-3-4987-331
Tel：+886-4-2463-3788 Fax：+886-4-2463-0793
Tel：+886-7-622-4855 Fax：+886-7-622-4123
E-mail：info@guhring.com.tw