

PCB 鑽頭、銑刀專用材質表

Special Grades for PCB Drills and Routers

產品規格	晶粒度	鈷含量		硬 度		抗折力		韌 性		矯 頑 力	建議應用
Grade	WC grain size	Cobalt content	Density	Hardness		TRS	Young's Modulus	K _{IC}	4πσ	HC	Applications
	[μm]	[wt %]	[g/cm ³]	HV ISO 3878	HRC ISO 3738	[N/mm ²] ISO 3327	[10 ⁹ N/mm ²] [GPa]	[MNm ^{-3/2}]	[μTm ^{3/2} /kg]	[kA/m]	
KFM 40	0.6	10.0	14.45	1,610	92.0	3,800	580	10.5	16.0	20.1	"grey cast iron, titanium alloys, heat resistant alloys, austenitic stainless steels, fibre glass reinforced plastics, for engraving tools and for dental tools. 用於加工灰鑄鐵、鈦合金、耐熱合金、不鏽鋼、玻璃纖維、強化塑鋼以及用在雕刻及牙醫工具上。"
KFM 44	0.5	12.0	14.15	1,680	92.5	3,800	560	10.0	18.7	26.3	"drilling/milling applications, e.g. for titanium alloys, heat resistant alloys, stainless steels, hardened steels, grey cast iron, fiberglassreinforced plastics, composite materials and for machine taps. 適用於鑽孔/切割。適用加工件:鈦合金、耐熱金屬、不鏽鋼、超硬合金、灰鑄鐵、玻璃纖維、強化塑鋼、複合材料以及使用在機械牙攻上。"
KFM 66	0.6	6.0	14.85	1,900	93.8	4,000	630	9.3	9.3	28.0	"drilling/milling applications, e.g. for titanium alloys, heat resistant alloys, stainless steels, hardened steels, grey cast iron, fiberglassreinforced plastics, composite materials and graphite, for reamers, diameter available from Ø 4,2 - Ø 25,2mm. 適用於鑽孔/切割。適用加工件:鈦合金、耐熱金屬、不鏽鋼、超硬合金、灰鑄鐵、玻璃纖維、強化塑鋼、複合材料以及石墨。"
KFM 47	0.4	7.0	14.75	1,980	94.0	4,500	620	9.0	11.0	36.0	"high wear resistance materials, unusual high hardness and toughness, halogen free plastics, carbonfiber reinforced plastics, diameter available from Ø 4,2 - Ø 25,2mm. 用於加工高耐磨性材料、極高硬度及韌性材料、無鹵塑料、碳纖維、強化塑鋼。"
KFM 39	0.4	9.0	14.40	1,950	93.9	4,500	600	9.3	14.5	36.0	"drilling and milling applications, e.g. for high wear resistance materials, for stainless steels, for composite materials and for example Kevlar and carbonfiber reinforced plastics, diameter available from Ø 4,2 - Ø 25,2mm. 適用於鑽孔/切割。適用加工件:高耐磨性材料、不鏽鋼、複合材料、克維拉纖維及碳纖維、強化塑鋼。"
KFM 38	0.3	8.0	14.60	2,000	94.1	4,300	610	9.2	12.0	36.5	"drilling and milling applications, e.g. for high wear resistance materials, for stainless steels, for composite materials and for example Kevlar and carbonfiber reinforced plastics, glass-ceramic, diameter available from Ø 4,2 - Ø 25,2mm. 適用於鑽孔/切割。適用加工件:高耐磨性材料、不鏽鋼、複合材料、克維拉纖維、碳纖維、強化塑鋼、陶瓷。"

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產品規格 Grade	晶粒度 WC grain size [μm]	鈷含量 Cobalt content [wt %]	密度 Density [g/cm ³]	硬 度		抗折力 TRS [N/mm ²] [10 ³ N/mm ²] [GPa]	韌 性 K _{IC} [MNm ^{-3/2}]	4πσ [μTm ^{3/2} /kg]	矯 頑 力 HC [kA/m]	建議應用 Applications	
				HV ISO 3878	HRC ISO 3738						
KFM 208	0.2	8.0		2,010	94.2	4,700	9.3	12.0	38.0	PCB Drills from Ø 0,05 mm to 0,25 mm. 適用於 Ø0,05mm~0,25mm PCB鑽頭。	
KFM 209	0.2	9.0		2,000	94.1	4,800	9.3	14.5	40.0	PCB Drills from Ø 0,05 mm to 0,25 mm. 適用於 Ø0,05mm~0,25mm PCB鑽頭。	
KFM 606	0.6	6.0	14.85	1,900	93.8	4,000	630	9.3	9.3	28.0	PCB Routers, PCB Drills from Ø 0,3 mm to Ø 3,25 mm. 適用於 Ø0,3 mm~3,25 mm PCB鑽頭和銑刀。
KFM 407	0.4	7.0	14.75	1,980	94.0	4,500	620	9.0	11.0	36.0	PCB Routers, PCB Drills Ø 0,50 mm to 3,25 mm. 適用於 Ø0,50mm~3,25 mm PCB鑽頭和銑刀。
KFM 309	0.3	9.0	14.40	1,950	93.9	4,500	600	9.3	14.5	36.0	PCB Routers, PCB Drills Ø 0,20 mm to 0,50 mm. 適用於 Ø0,20mm~0,50 mm PCB鑽頭和銑刀。
KFM 308	0.3	8.0	14.60	2,000	94.1	4,300	610	9.2	12.0	36.5	PCB Routers, PCB Drills from Ø 0,10 mm to 0,50 mm. 適用於 Ø0,10mm~0,50mm PCB鑽頭和銑刀。

PCB 鑽頭、銑刀專用材質表

Special Grades for PCB Drills and Routers

KFM 208		KFM 209		KFM 308		KFM 309	
Chemical Data		Chemical Data		Chemical Data		Chemical Data	
Co (%)	8	Co (%)	9	Co (%)	8	Co (%)	9
WC incl. Doping(%)	92	WC incl. Doping(%)	91	WC incl. Doping(%)	92	WC incl. Doping(%)	91
Physical Data		Physical Data		Physical Data		Physical Data	
Density (g/cm ³)	14.75	Density (g/cm ³)	14.4	Density (g/cm ³)	14.6	Density (g/cm ³)	14.4
Hardness		Hardness		Hardness		Hardness	
HV 30	2010	HV 30	2000	HV 30	2000	HV 30	1950
HRC	94.2	HRC	94.1	HRC	94	HRC	93.9
K _{IC} (MNm ^{-3/2})	9.3	K _{IC} (MNm ^{-3/2})	9.3	K _{IC} (MNm ^{-3/2})	9.2	K _{IC} (MNm ^{-3/2})	9.3
Transverse Rupture Strength (N/mm ²)	4700	Transverse Rupture Strength (N/mm ²)	4800	Transverse Rupture Strength (N/mm ²)	4300	Transverse Rupture Strength (N/mm ²)	4500
Metallographic Data		Metallographic Data		Metallographic Data		Metallographic Data	
Porosity		Porosity		Porosity		Porosity	
<10 μm A	<02	<10 μm A	<02	<10 μm A	<02	<10 μm A	<02
>10-25 μm B	00	>10-25 μm B	00	>10-25 μm B	00	>10-25 μm B	00
C	00	C	00	C	00	C	00
Microstructure		Microstructure		Microstructure		Microstructure	
Tungsten Carbide α	∅0.2μm	Tungsten Carbide α	∅0.2μm	Tungsten Carbide α	∅0.3μm	Tungsten Carbide α	∅0.3μm
Binding Phase β	unif. distr.	Binding Phase β	unif. distr.	Binding Phase β	unif. distr.	Binding Phase β	unif. distr.
Mixed Carbide γ	—	Mixed Carbide γ	—	Mixed Carbide γ	—	Mixed Carbide γ	—
Eta Phase η	—	Eta Phase η	—	Eta Phase η	—	Eta Phase η	—
Areas of Application		Areas of Application		Areas of Application		Areas of Application	
PCB Drills dia. 0.05mm to 0.25mm		PCB Drills dia. 0.05mm to 0.25mm		PCB Drills dia. 0.20mm to 0.40mm		PCB Routers, PCB Drills dia. 0.20mm to 0.50mm, drilling and milling applications, e.g. for high wear resistance materials, for stainless steels, for composite materials like Kevlar and carbonfiber reinforced plastics.	
適用於0.05mm~0.25mm 鑽頭		適用於0.05mm~0.25mm 鑽頭		適用於0.20mm~0.40mm 鑽頭		適用於PCB銑刀、PCB鑽頭 0.20mm~0.50mm。可用於加工高耐磨耗材質、不銹鋼、複合材料如Kevlar和碳纖維強化塑鋼。	

PCB 鑽頭、銑刀專用材質表

Special Grades for PCB Drills and Routers

KFM 407

Chemical Data	
Co (%)	7
WC incl. Doping(%)	92.2

Physical Data

Density (g/cm ³)	14.75
Hardness	
HV 30	1980
HRC	94
K _{IC} (MNm ^{-3/2})	9
Transverse Rupture Strength (N/mm ²)	4500

Metallographic Data

Porosity	
<10 μm A	<02
>10-25 μm B	00
C	00

Microstructure

Tungsten Carbide α	ø0.4μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Areas of Application

PCB Drills dia. ≥0.5mm, standard chip chamber, PCB Routers, drilling applications in composite materials.

適用於 PCB 銑刀、PCB 鑽頭 ≥0.50mm。可用於加工複合材料。

KFM 410

Chemical Data	
Co (%)	10
WC incl. Doping(%)	90

Physical Data

Density (g/cm ³)	14.45
Hardness	
HV 30	1870
HRC	93.6
K _{IC} (MNm ^{-3/2})	9.3
Transverse Rupture Strength (N/mm ²)	4500

Metallographic Data

Porosity	
<10 μm A	<02
>10-25 μm B	00
C	00

Microstructure

Tungsten Carbide α	ø0.4μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Areas of Application

PCB Drills dia. 0.30mm to 0.60mm, extra long chip chamber.

適用於 PCB 鑽頭 0.30mm ~ 0.60mm。

KFM 606

Chemical Data	
Co (%)	6
WC incl. Doping(%)	94

Physical Data

Density (g/cm ³)	14.85
Hardness	
HV 30	1900
HRC	93.8
K _{IC} (MNm ^{-3/2})	9.3
Transverse Rupture Strength (N/mm ²)	4000

Metallographic Data

Porosity	
<10 μm A	<02
>10-25 μm B	00
C	00

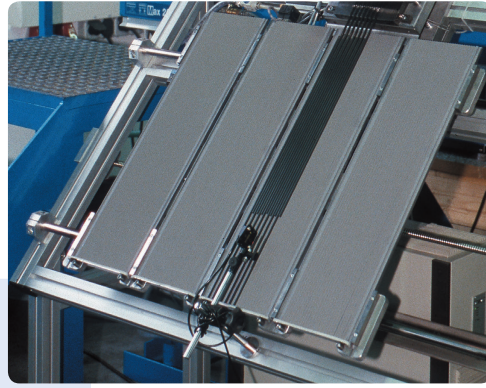
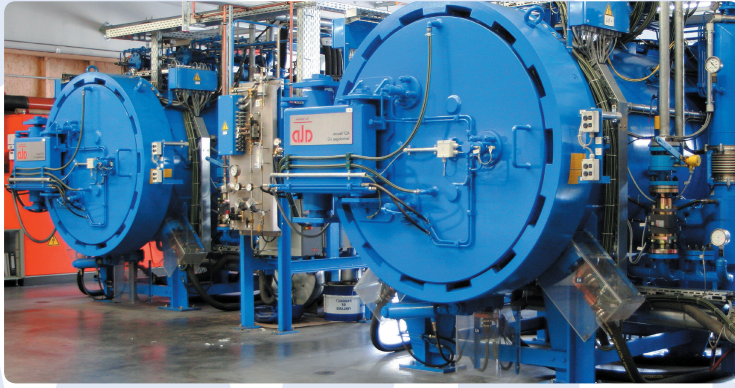
Microstructure

Tungsten Carbide α	ø0.6μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Areas of Application

drilling/milling applications, e.g. for titanium alloys, heat resistant alloys, stainless steels, hardened steels, grey cast iron, fiberglassreinforced plastics, composite materials and machine taps.

適用於鑽/銑，例如：鈦合金、抗熱合金、不銹鋼、超硬合金、灰鑄鐵、玻璃纖維強化塑鋼、機械牙攻。



KFM 38

Chemical Data	
Co (%)	8
WC incl. Doping(%)	92

Physical Data

Density (g/cm ³)	14.6
Hardness	
HV 30	2000
HRC	94.1
K _{IC} (MNm ^{-3/2})	9.2
Transverse Rupture Strength (N/mm ²)	4300

Metallographic Data

Porosity	
<10 μm A	≤02
>10-25 μm B	-
C	-

Microstructure

Tungsten Carbide α	∅0.3μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Areas of Application

drilling and milling applications, e.g. for high wear resistance materials, for stainless steels, for composite materials and for example Kevlar and carbonfiber reinforced plastics, glass-ceramic, diameter available from ∅ 4,2 - ∅ 25,2mm

適用於鑽孔/切削。適用加工件：高耐磨性材料、不鏽鋼、複合材料、克維拉纖維、碳纖維、強化塑鋼、陶瓷。

KFM 39

Chemical Data	
Co (%)	9
WC incl. Doping(%)	91

Physical Data

Density (g/cm ³)	14.4
Hardness	
HV 30	1950
HRC	93.9
K _{IC} (MNm ^{-3/2})	9.3
Transverse Rupture Strength (N/mm ²)	4500

Metallographic Data

Porosity	
<10 μm A	≤02
>10-25 μm B	-
C	-

Microstructure

Tungsten Carbide α	∅<0.4μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Areas of Application

drilling and milling applications, e.g. for high wear resistance materials, for stainless steels, for composite materials and for example Kevlar and carbonfiber reinforced plastics, diameter available from ∅4,2 - ∅25,2mm

適用於鑽孔/切削。適用加工件：高耐磨性材料、不鏽鋼、複合材料、克維拉纖維及碳纖維、強化塑鋼。

KFM 40

Chemical Data	
Co (%)	10
WC incl. Doping(%)	90

Physical Data

Density (g/cm ³)	14.45
Hardness	
HV 30	1610
HRC	92
K _{IC} (MNm ^{-3/2})	10.5
Transverse Rupture Strength (N/mm ²)	3800

Metallographic Data

Porosity	
<10 μm A	≤02
>10-25 μm B	-
C	-

Microstructure

Tungsten Carbide α	0.6μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Areas of Application

grey cast iron, titanium alloys, heat resistant alloys, austenitic stainless steels, fibre glass reinforced plastics, for engraving tools and for dental tools

用於加工灰鑄鐵、鈦合金、耐熱合金、不鏽鋼、玻璃纖維、強化塑鋼以及用在雕刻及牙醫工具上。

KFM 44

Chemical Data	
Co (%)	12
WC incl. Doping(%)	88

Physical Data

Density (g/cm ³)	14.15
Hardness	
HV 30	1680
HRC	92.5
K _{IC} (MNm ^{-3/2})	10
Transverse Rupture Strength (N/mm ²)	3800

Metallographic Data

Porosity	
<10 μm A	≤02
>10-25 μm B	-
C	-

Microstructure

Tungsten Carbide α	∅0.5μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Areas of Application

drilling/milling applications, e.g. for titanium alloys, heat resistant alloys, stainless steels, hardened steels, grey cast iron, fiberglassreinforced plastics, composite materials and for machine taps

適用於鑽孔/切削。適用加工件：鈦合金、耐熱金屬、不鏽鋼、超硬合金、灰鑄鐵、玻璃纖維、強化塑鋼、複合材料以及使用在機械牙攻上。

PCB 鑽頭、銑刀專用材質表

Special Grades for PCB Drills and Routers

KFM 66

Chemical Data

Co (%)	6
WC incl. Doping(%)	94

Physical Data

Density (g/cm ³)	14.85
Hardness	
HV 30	1900
HRC	93.8
K _{IC} (MNm ^{-3/2})	9.3
Transverse Rupture Strength (N/mm ²)	4000

Metallographic Data

Porosity

<10 μm A	≤02
>10-25 μm B	00
C	00

Microstructure

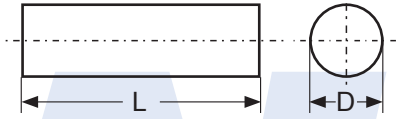
Tungsten Carbide α	ø0.6μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Areas of Application

drilling/milling applications, e.g. for titanium alloys, heat resistant alloys, stainless steels, hardened steels, grey cast iron, fiberglassreinforced plastics, composite materials and graphite, for reamers, diameter available from Ø 4,2 - Ø 25,2mm

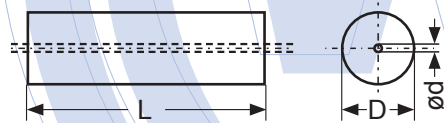
適用於鑽孔/切削。適用加工件：
鈦合金、耐熱金屬、不鏽鋼、超硬合金、灰鑄鐵、玻璃纖維、強化塑鋼、複合材料以及石墨。

實心圓棒 Solid Carbide Rods, raw



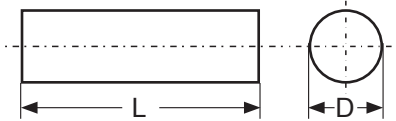
直徑 D (mm)	公差 Tol	長度 L +10 (mm)	公差 Tol	材質
1.15	+0.06	340	+5	KFM 308 KFM 606
1.30	+0.06	340	+5	KFM 308 KFM 606
1.50	+0.06	340	+5	KFM 308 KFM 606
3.25	+0.10	330	+5	KFM 407
		400	+5	
		38.3	+0.25	
		38.5	+0.25	
		40.0	±0.10	

單直孔圓棒 Rods with Central Hole



直徑 D (mm)	公差 Tol	孔徑 Hole Ø	公差 Tol	長度 L +10 (mm)
3.3	+0.3	0.05	±0.02	310/330
3.3	+0.3	0.10	±0.03	310/330
4.3	+0.3	0.25	±0.05	310/330
6.3	+0.3	0.35	±0.05	310/330

實心圓棒 Solid Carbide Rods, raw



Grade: KFM44 KFM39
KFM40 KFM38 KFM66

直徑 D (mm)	公差 Tol	長度 L +10 (mm)	公差 Tol
1.2	+0.2	310/330	+10
1.7	+0.2	310/330	+10
2.2	+0.2	310/330	+10
2.7	+0.2	310/330	+10
3.2	+0.2	310/330	+10
3.7	+0.2	310/330	+10
4.2	+0.2	310/330	+10
4.7	+0.2	310/330	+10
5.2	+0.2	310/330	+10
5.7	+0.2	310/330	+10
6.2	+0.2	310/330	+10
6.7	+0.2	310/330	+10
7.2	+0.2	310/330	+10
7.7	+0.2	310/330	+10
8.2	+0.2	310/330	+10
8.7	+0.2	310/330	+10
9.2	+0.2	310/330	+10
9.7	+0.2	310/330	+10
10.2	+0.2	310/330	+10
10.7	+0.2	310/330	+10
11.2	+0.2	310/330	+10
11.7	+0.2	310/330	+10
12.2	+0.2	310/330	+10
12.7	+0.2	310/330	+10

直徑 D (mm)	公差 Tol	長度 L +10 (mm)	公差 Tol
13.2	+0.2	310/330	+10
13.7	+0.2	310/330	+10
14.2	+0.2	310/330	+10
14.7	+0.2	310/330	+10
15.2	+0.2	310/330	+10
15.7	+0.2	310/330	+10
16.2	+0.2	310/330	+10
16.7	+0.2	310/330	+10
17.2	+0.2	310/330	+10
17.7	+0.2	310/330	+10
18.2	+0.2	310/330	+10
18.7	+0.2	310/330	+10
19.2	+0.2	310/330	+10
19.7	+0.2	310/330	+10
20.2	+0.2	310/330	+10
20.7	+0.2	310/330	+10
21.2	+0.2	310/330	+10
21.7	+0.2	310/330	+10
22.2	+0.2	310/330	+10
22.7	+0.2	310/330	+10
23.2	+0.2	310/330	+10
24.2	+0.2	310/330	+10
25.2	+0.2	310/330	+10
25.2	+0.2	310/330	+10

木工專用材質表

Special Grades for Blades

KFM 40

Chemical Data	
Co (%)	10
WC incl. Doping(%)	90

Physical Data

Density (g/cm ³)	14.45
Hardness	
HV 30	1610
HRC	92
K _{IC} (MNm ^{-3/2})	10.5
Transverse Rupture Strength (N/mm ²)	3800

Metallographic Data

Porosity	
<10 μm A	≤02
>10-25 μm B	-
C	-

Microstructure

Tungsten Carbide α	0.6μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

KFM G20

Chemical Data	
Co (%)	11.5
WC incl. Doping(%)	88.5

Physical Data

Density (g/cm ³)	14.35
Hardness	
HV 30	1300
HRC	n.m.
K _{IC} (MNm ^{-3/2})	n.m.
Transverse Rupture Strength (N/mm ²)	2600

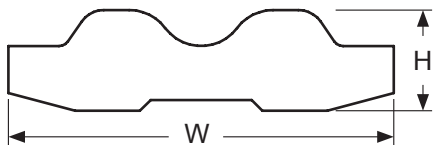
Metallographic Data

Porosity	
<10 μm A	≤02
>10-25 μm B	-
C	-

Microstructure

Tungsten Carbide α	3.0μm
Binding Phase β	unif. distr.
Mixed Carbide γ	—
Eta Phase η	—

Tersa

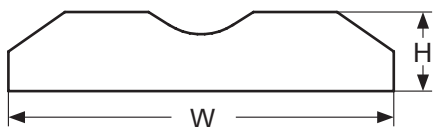


Grade: KFM40

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
10.7	2.8	235	
10.7	2.8	275	
10.7	2.8	315	
10.7	2.8	415	
10.7	2.8	475	

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
10.7	2.8	515	
10.7	2.8	615	
10.7	2.8	635	
10.7	2.8	655	

Terminus



Grade: KFM40

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
14.6	3.0	235	
14.6	3.0	245	
14.6	3.0	275	
14.6	3.0	315	

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
14.6	3.0	415	
14.6	3.0	515	
14.6	3.0	615	
14.6	3.0	655	

Centrolock



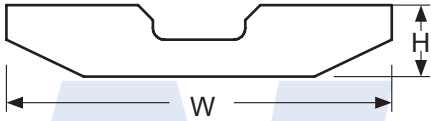
Grade: KFM40

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
16.6	3.5	235	
16.6	3.5	245	
16.6	3.5	275	
16.6	3.5	315	

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
16.6	3.5	415	
16.6	3.5	515	
16.6	3.5	615	
16.6	3.5	655	

Sinus

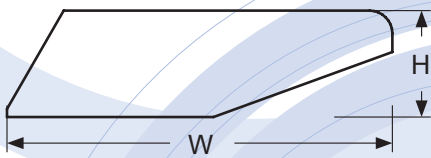
Grade: KFM40



寬度	高度	長度	產品編號
W(mm)	H(mm)	L(mm)	Article
16.7	3.0	655	

Saw Tooth

Grade: KFM40

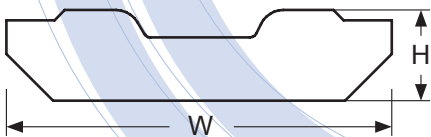


寬度	高度	長度	產品編號
W(mm)	H(mm)	L(mm)	Article
14.5	4.0	300	
14.5	4.0	310	
14.5	4.0	330	

寬度	高度	長度	產品編號
W(mm)	H(mm)	L(mm)	Article
14.5	4.0	355	
14.5	4.0	655	

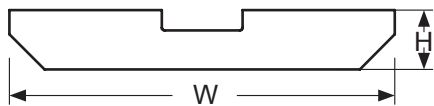
Enshin

Grade: KFM40



寬度	高度	長度	產品編號
W(mm)	H(mm)	L(mm)	Article
13.2	3.1	655	

Buldozer



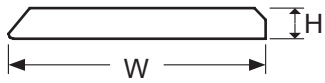
Grade: KFM40

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
14.3	2.2	70	
14.3	2.2	80	
14.3	2.2	100	
14.3	2.2	110	
14.3	2.2	120	
14.3	2.2	130	
14.3	2.2	140	
14.3	2.2	150	
14.3	2.2	160	
14.3	2.2	180	

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
14.3	2.2	190	
14.3	2.2	200	
14.3	2.2	230	
14.3	2.2	240	
14.3	2.2	250	
14.3	2.2	260	
14.3	2.2	335	
14.3	2.2	475	
14.3	2.2	620	
14.3	2.2	670	

WU

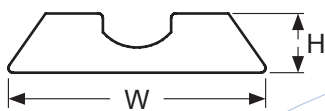
TCT-Strip



Grade: KFM G20

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
11.2	1.3	1.052	

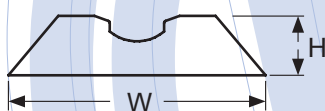
AEG



Grade: KFM G20

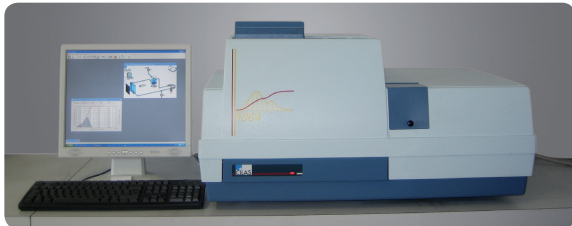
寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
5.65	1.3	346.5	

ELU



Grade: KFM G20

寬度 W(mm)	高度 H(mm)	長度 L(mm)	產品編號 Article
6.05	1.4	336.5	



Laser Particle Size Analyzer



Measuring Equipment for Magnetic Saturation



Hardness-Measuring Equipment



TRS-Measuring Equipment

