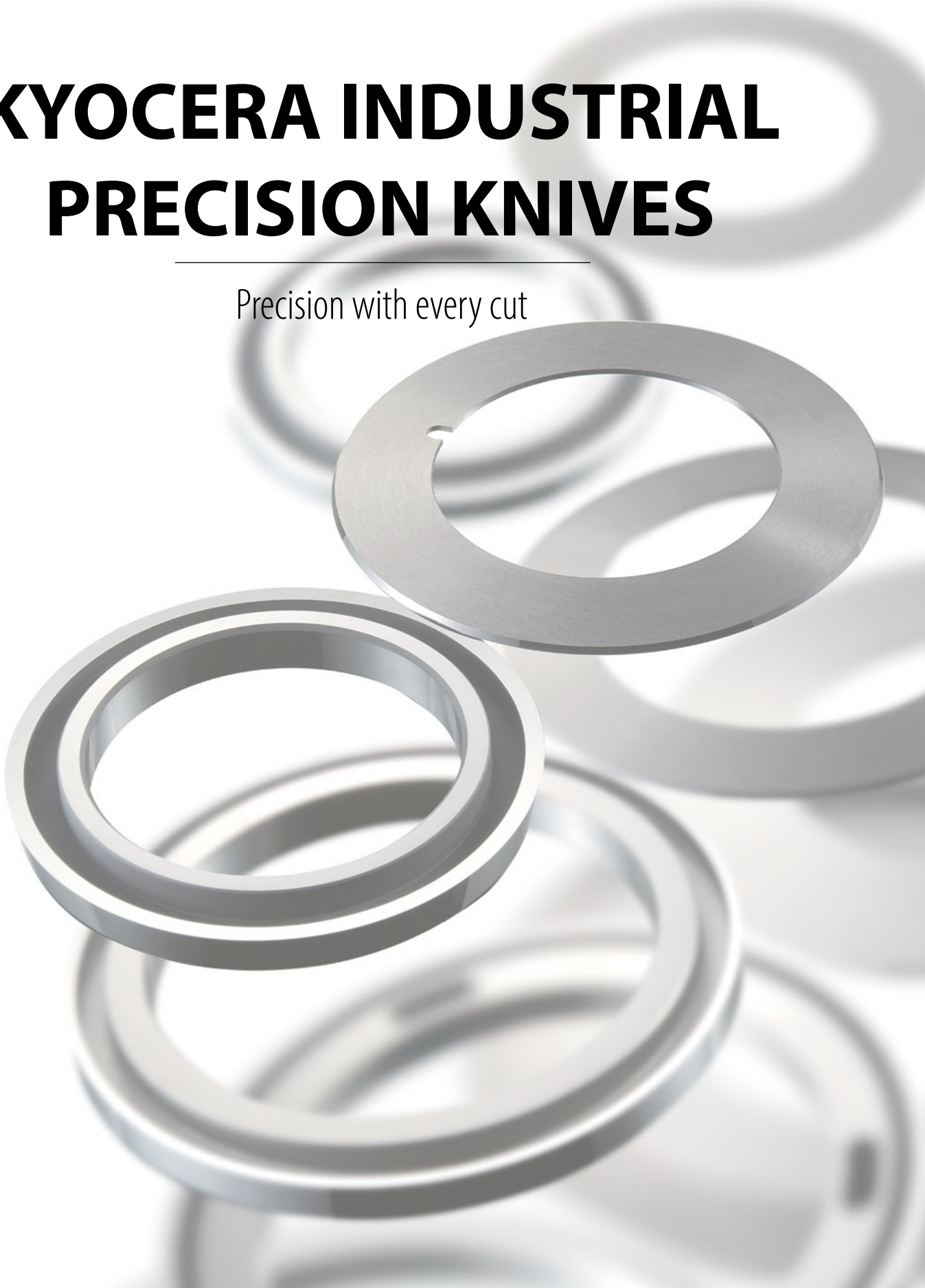
THE NEW VALUE FRONTIER

KYOCERA

KYOCERA INDUSTRIAL PRECISION KNIVES

Precision with every cut



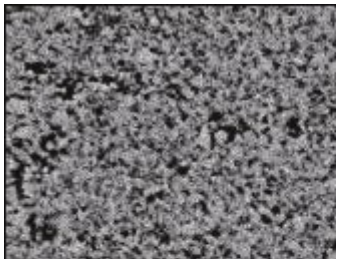
Industrial precision knives

Kyocera is a leading company as fine ceramic supplier and good experienced as a pioneer in this business quality and high precision products.

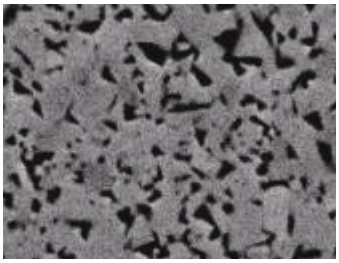
Super micro grain carbide (FW**) (VW**)

High intensity, high toughness and the highest crashworthy material. Due to super micro grain size, available for several applications. Possible to modify by electric discharge machining.

Super micro grain carbide



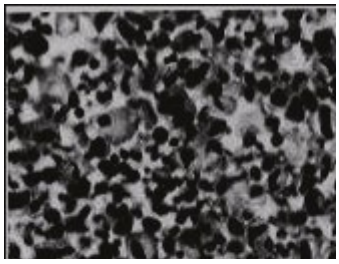
Conventional carbide



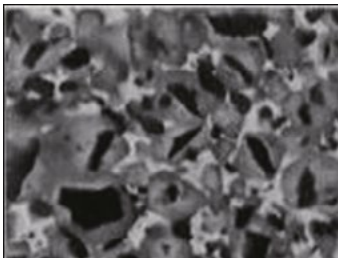
Cermet

Contains TiC and NbC, combined material with metal and Co, Ni, etc. Good wear resistance and less affinity with metal composition. Possible to braze with metal and use electric discharge machining.

Micro grain cermet



Conventional cermet



Zirconia

Good corrosion resistance, nonmagnetic, excellent electrical isolation and very tough ceramic. Used for several products such as scissors and knives.

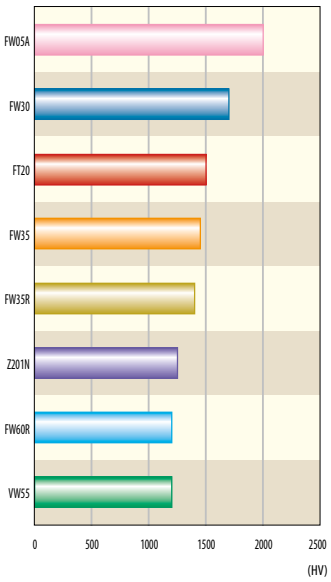
field. We contribute for quality improvement by providing high

Grade and mechanical property

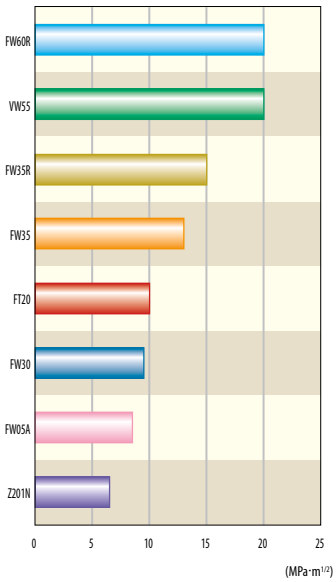
Material		Super micro grain carbide							Micro grain carbide	Wear resistance / Shock resistance			
Properties	Unit	FW05A	FW08	FW25	FW30	FW35	FW35R	FW60R	KW10A	VW30	VW55	VW70	VW80
Ratio	-	14.8	14.7	13.9	14.1	14.2	14.1	13.6	14.8	14.5	14.0	13.8	13.3
Hardness	HV	2000	1850	1600	1700	1450	1400	1200	1750	1450	1200	950	850
	HRA	94.0	93.5	92.0	92.5	90.5	90.0	88.5	93.0	90.5	88.5	85.5	83.0
Fracture toughness	MPa · $m^{1/2}$	8.5	9.0	10.5	9.5	13.0	15.0	20.0	9.0	14.5	20.0	>20.0	>20.0
Transverse strength	MPa	3600	3920	3900	4400	3300	3300	3500	2800	3300	3700	3100	2800

Material		Non-magnetic	Cermet			Alumina	Zirconia	Silicon nitride
Properties	Unit	NW20	TN60	TC60M	FT20	A479SS	Z201N	SN235P
Ratio	-	14.4	6.6	8.1	6.4	3.9	6.1	3.2
Hardness	HV	1500	1764	1666	2450	1650	980	1372
	HRA	91.0	92.0	91.0	91.0	-	-	-
Fracture toughness	MPa · $m^{1/2}$	10.0	9.0	10.5	10.0	3.5	6.5	6.5
Transverse strength	MPa	3300	1760	2500	320	320	980	880

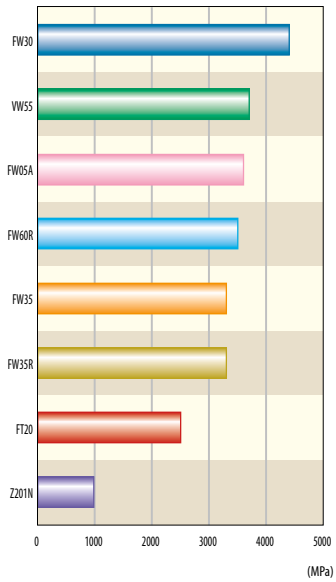
Comparison by vickers hardness



Comparison by fracture toughness



Comparison by transverse strength

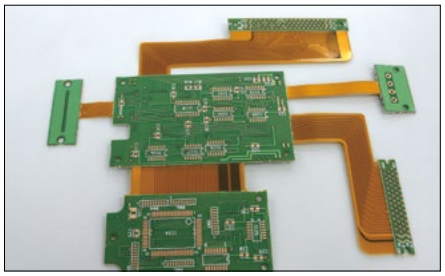


Examples of application

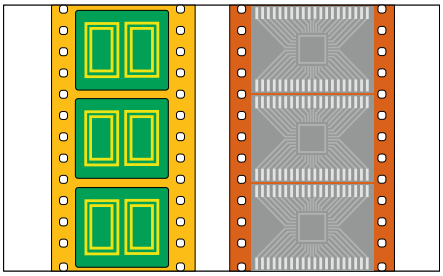
High function film

LCD display (Polarizing plate)

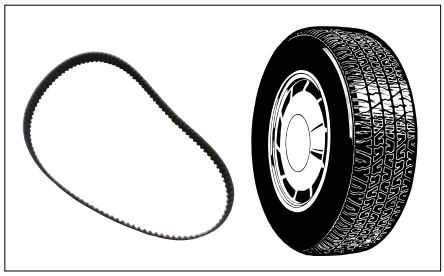
Lithium-ion rechargeable battery



FPC (Flexible printed circuit board)

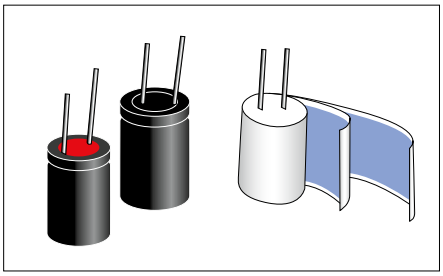


TAB tape, COF tape



Rubber products (Timing belt / Tires)

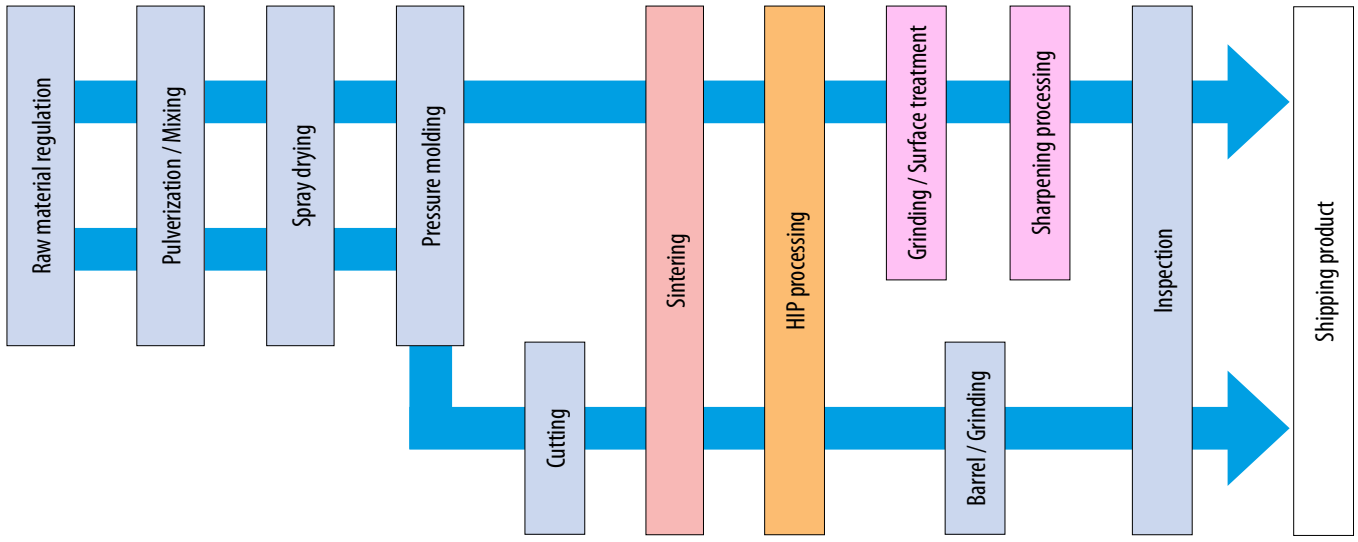
Adhesive tape



Aluminum electrolytic capacitor

Paper / Cardboard box

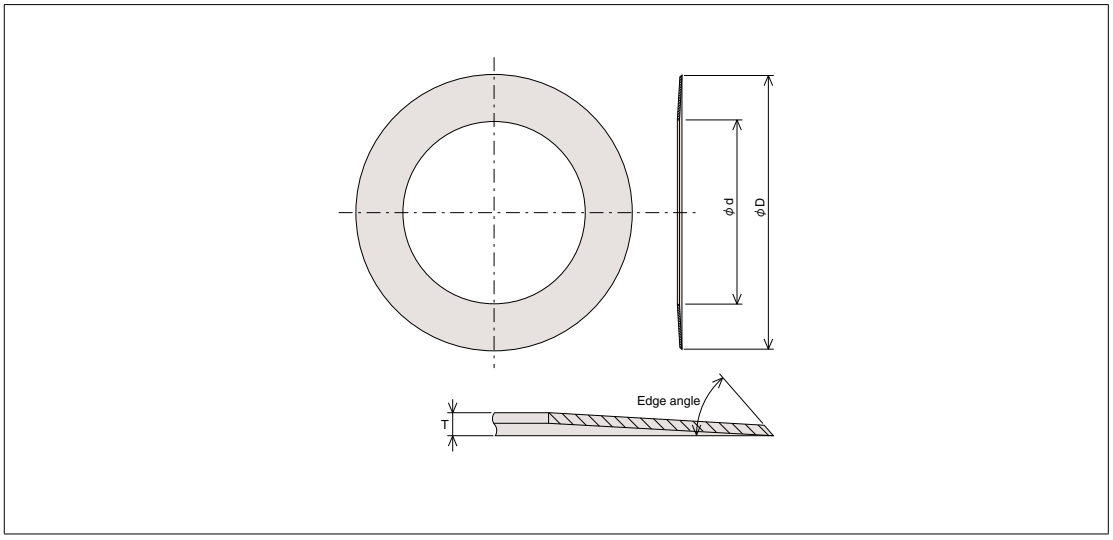
Manufacturing process



Gable and gang knives

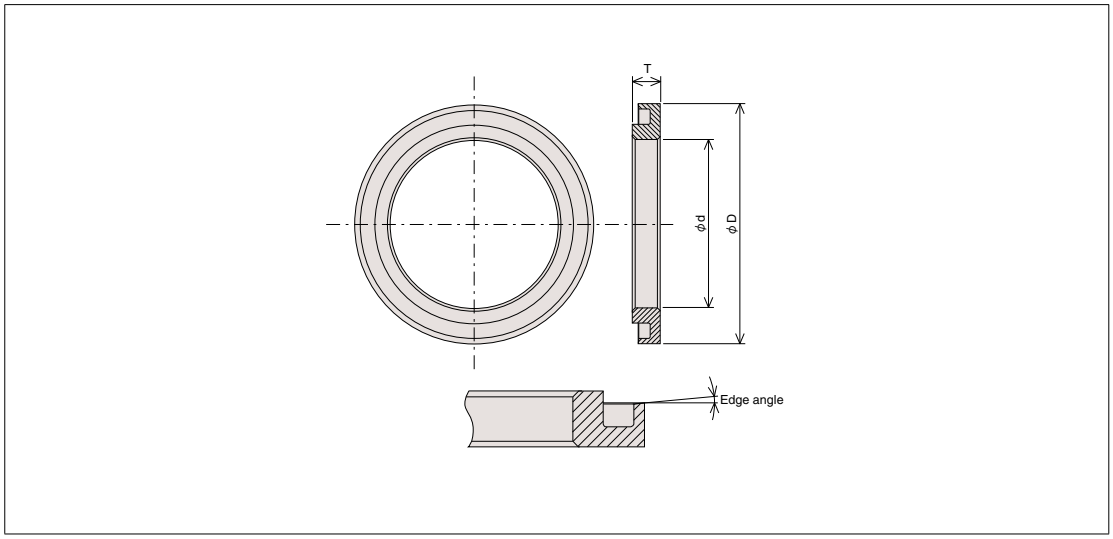
High precision and long life slitting knives made by optimized and experienced machining techniques, utilizing a variety of material such as super micro grain carbide, cermet, zirconia.

Standard gable knives



Upper knife (example dimensions)

No	Description	Grade	øD (mm)	ød (mm)	T (mm)	Edge angle
1	GUBD-90807T45DC15	FW35	98	66	0.7	45°
2	GUBD-90807T60DC15					60°
3	GUBD-10807T45DC15		108	75		45°
4	GUBD-10807T60DC15					60°
5	GUBD-11808T45DC15		118	80	0.8	45°
6	GUBD-11808T60DC15					60°

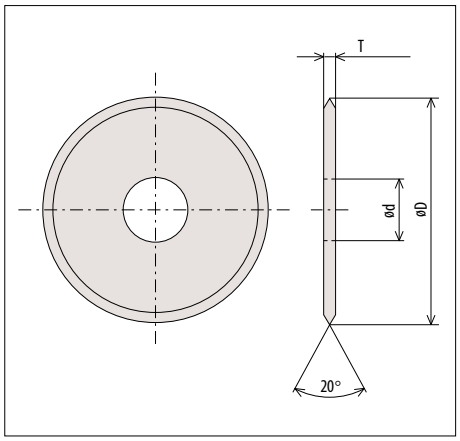


Bottom knife (example dimensions)

No	Description	Grade	øD (mm)	ød (mm)	T (mm)	Edge angle
7	GDBD-08005T	FW35	80	55	5	5°
8	GDBD-08610T		86	60	10	
9	GDBD-09210T		92	65		

Round knives

Our precise edge sharpening technology and original surface processing technology provides a wide range of slitting knives from single films to various types of composite materials.

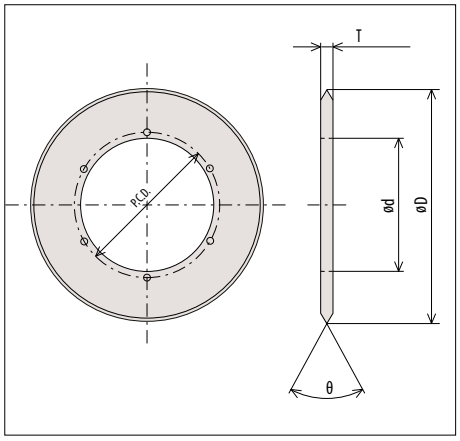


Example dimensions

Description	Material	øD (mm)	ød (mm)	T (mm)	Blade angle
FRC28L	FW35	28	6.0	0.3	20°
FRC45L		45	8.1/8.3		
FRC50L		50	10		
FRC60L		60			
FRC80L		80	19		
FRC100L		100			

Slitter scorer blades

High hardness micro-grain carbide and precise edge sharpening technology improves tool life at cardboard cutting.

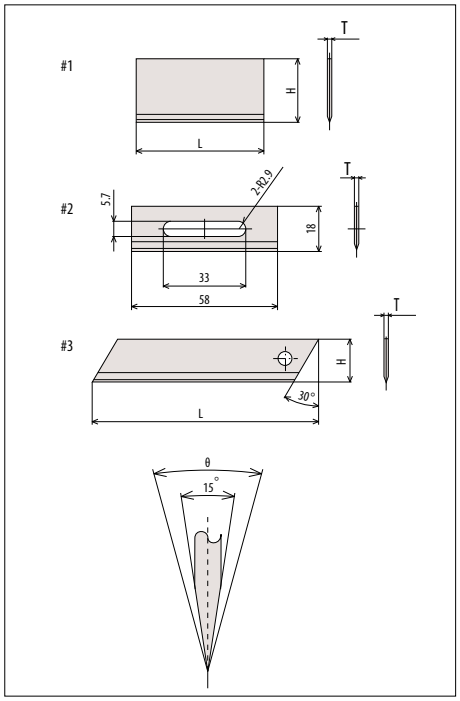


Example dimensions

Description	Material	øD (mm)	ød (mm)	T (mm)	Blade angle	Remarks
D260XD140X1.5T15DW	FW25	260	140	1.5	15°	P.C.D.160, 6-ø9
D260XD140X1.5T20DW					20°	
D280XD160X1T18DW		280	160	1.0	18°	P.C.D.175, 6-ø7.5
D280XD160X1T20DW					20°	

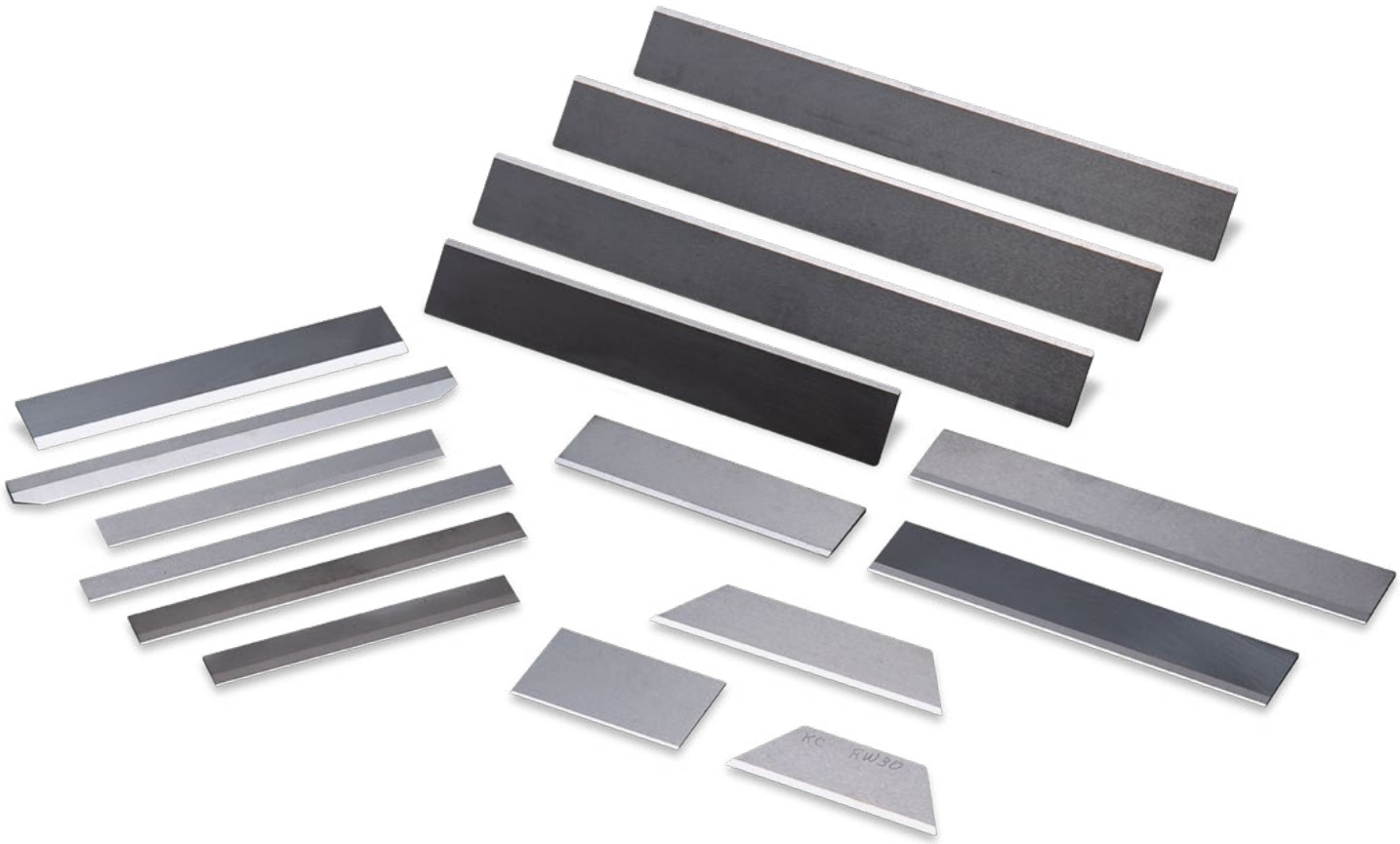
Plate knives

Optimum material choice and superior grinding and surface treatment technologies controls upper dulled edges and residual dust, increasing finished product quality. Superior wear resistance and sharpness provide higher efficiency in producing short fiber.



Example dimensions

Description	Material	L (mm)	H (mm)	T (mm)	Blade angle (15×Ø)	Drawing
FBC4009G	FW30	40	9	0.2	(15×25) Double blade	#1
FBC4019G	FW25		19	0.25		
FBC3515G	FW30	35	15	0.5		
FBC7010G		70	10	0.9	(15×30) Double blade	
FBC9519G		95	19			
FBC5818G		58	18	0.38	(15×25) Double blade	#2
FBC6009G		60	9			#3
FBC6018G			18	0.5		
FBC11018G		110				



Custom-made

Kyocera offers custom-made knives on request to meet special cutting conditions of customers.

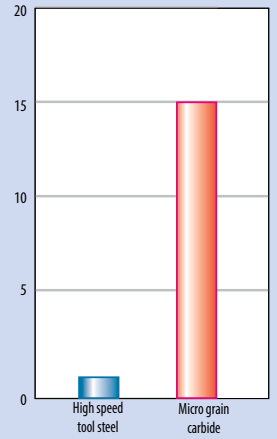
Jigs and mold related products

Optimum material choice and high-precision processing technology provide high quality, high precision wear resistant parts for a wide range of applications. Due to its low affinity with metal, cermet is especially suitable for reducing scratches on the surface of finished products during metal mold processing.

Comparison of tool life

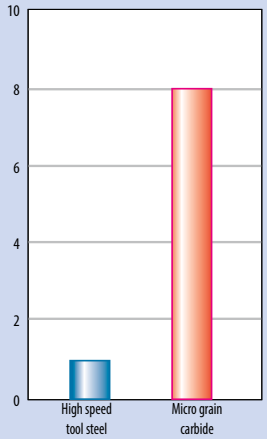
Unit: time(s)

Adhesion tape



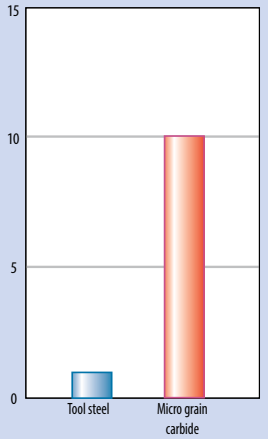
Knife shape: Gable knife
Application: Shear cutting
Effectiveness: 15 times
Remarks: Less adhesion

Composite film & Metal foil



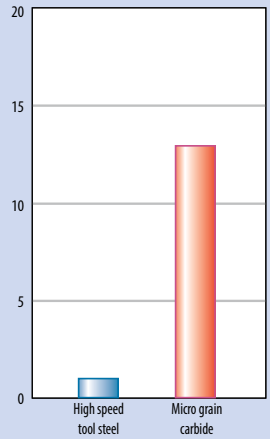
Knife shape: Gang knife
Application: Shear cutting
Effectiveness: 8 times
Remarks: Good surface

PET film



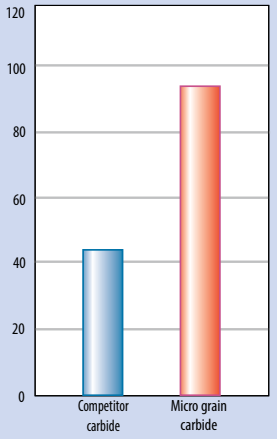
Knife shape: Straight blade
Appllication: Shear cutting
Effectiveness: 10 times
Remarks: Good surface

Aluminium foil



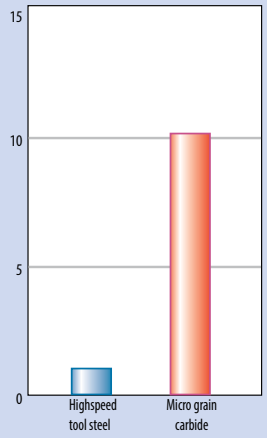
Knife shape: Gang knife
Appllication: Shear cutting
Effectiveness: 13 times
Remarks: Stable quality

Cardboard box



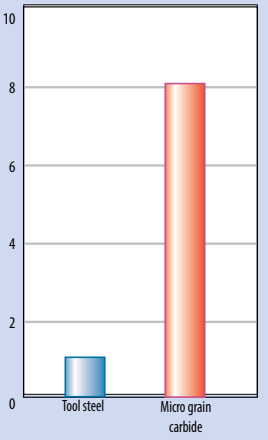
Knife shape: Round knife
Application: Slitter scorer
Effectiveness: 2.3 times
Remarks: Productivity improvement

Copper foil



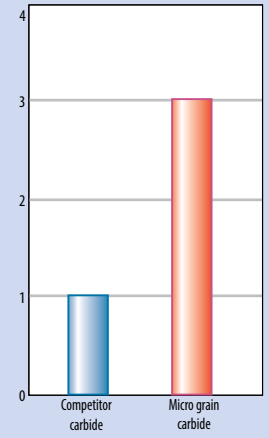
Knife shape: Gang knife
Application: Shear cutting
Effectiveness: 10 times
Remarks: Stable quality

Rubber sheet



Knife shape: Circular
Application: Rotating
Effectiveness: 8 times
Remarks: Less adhesion

Fibers



Knife shape: Plate knife
Application: Chopped cutting
Effectiveness: 3 times
Remarks: Productivity improvement

(Evaluation at end-users)

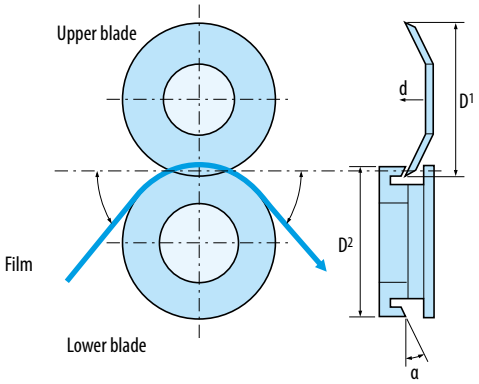
Chubu Technical Center

By evaluating the cut surface and providing suitable proposal for the best specification and cutting condition, it is possible to solve problems such as residual dust, burr, flare, everted edge, whisker and deformation.

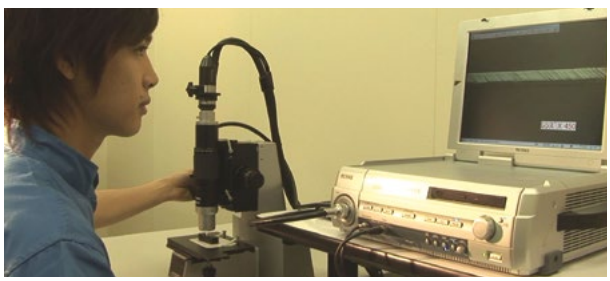
Slitter evaluation machine

Slitting layout position

- Gable / Gang blades, etc.
- Blade angle, surface treatment, overwrap, offset, input / output angle, tension, line speed.



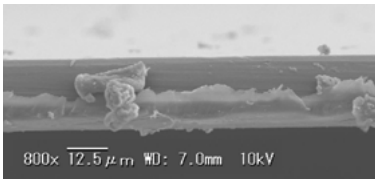
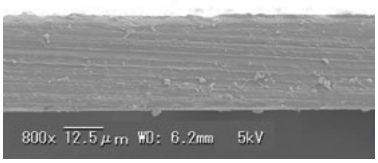
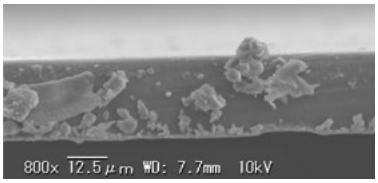
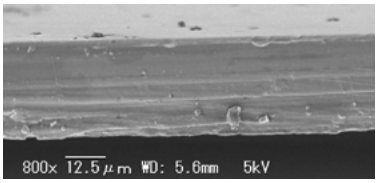
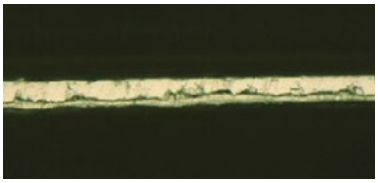
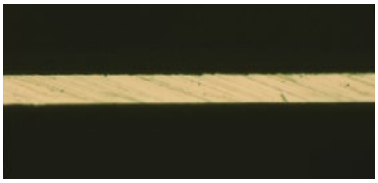
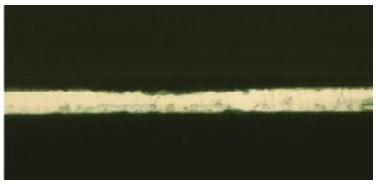
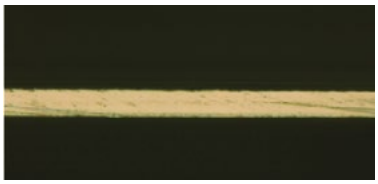
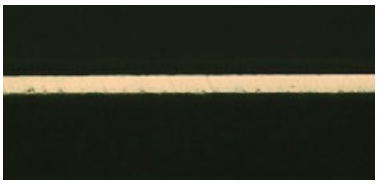
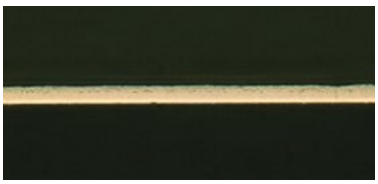
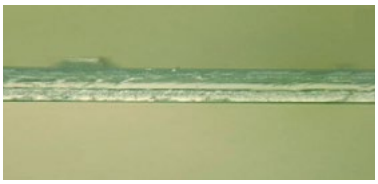
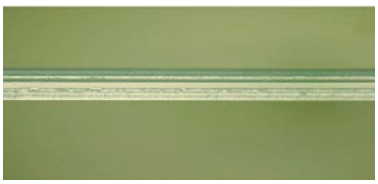
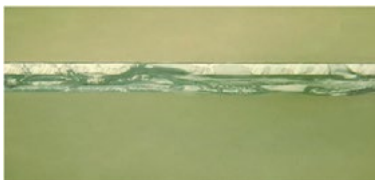
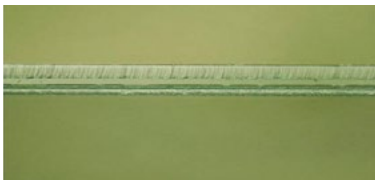
Cut surface evaluation by digital scope



Evaluation machine loadable material (workpiece) size

Material width:	Material diameter:	Material core diameter:
50 – 300 mm	300 mm	50 – 300 mm

Comparison of cutted surface

Material	Blade	Metallic blade	Kyocera micro grain carbide blade	Advantages of Kyocera blade
Polyethylene Terephthalate	Upper blade			Reduce whiskers and dust
	Lower blade			
Aluminum foil	Upper blade			Prevent dust and deformation
	Lower blade			
Copper foil	Upper blade			Prevent dust and deformation
	Lower blade			
Adhesive film	Upper blade			Prevent deformation and burr
	Lower blade			

Internal evaluation

Metal blades create deformation of adhesive layer and burr. Micro grain carbide blades provide an excellent cut surface.

Comparison of metal knife and micro grain knife

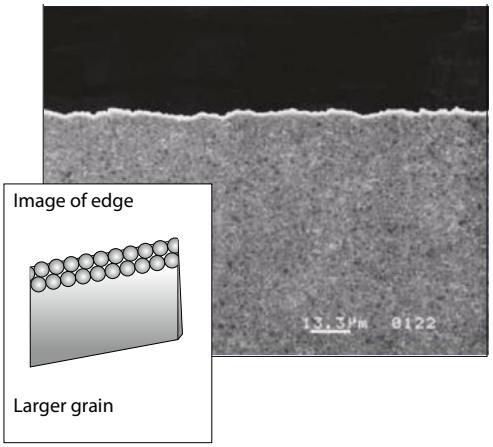
Material	FW35	SKD	SKH
	Micro grain carbide	Tool steel	High speed tool steel
Composition	WC+10Co	C, W, Cr, Mo	C, W, Mo, Co etc.
Vickers Hardness	1450 (HV)	770 (HV)	800 (HV)

FW35
Excellente hardness for long tool life
Double the hardness compared to metal

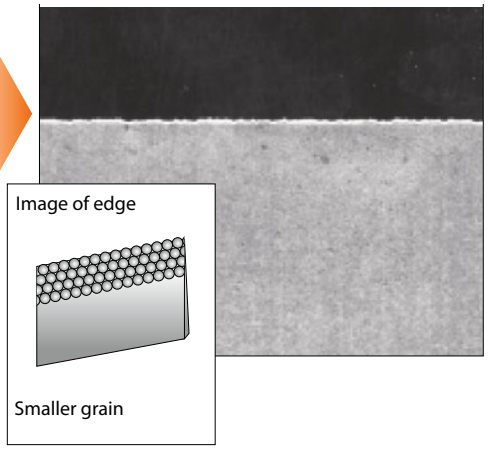
Edge sharpness comparison of different grain size

High intensity, high toughness and the highest crashworthy material. Due to super micro grain size, available for several applications. Possible to modify by electric discharge machining.

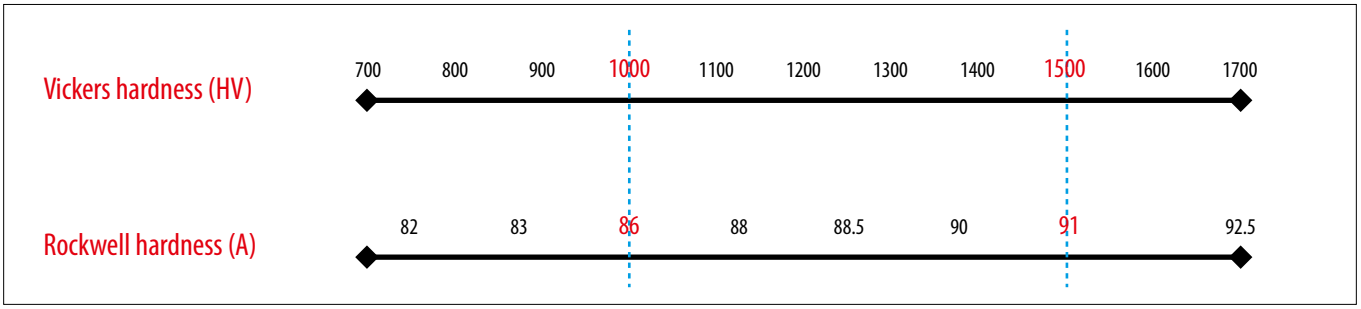
Conventional carbide



Micro grain carbide



Comparison of hardness

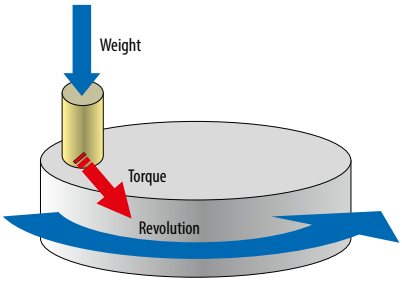


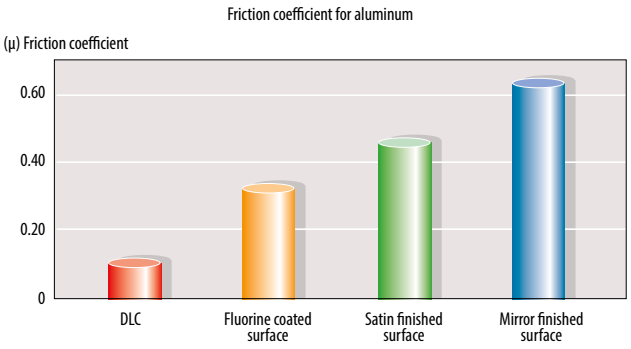
Surface treatment variation

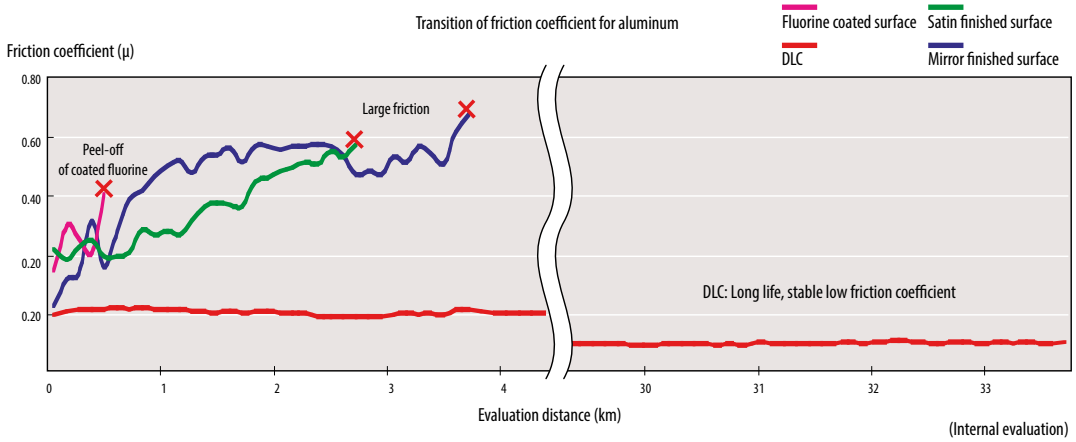
Treatment	Machining time	Adherence resistance	Smoothness	Corrosion resistance	Properties
DLC coated	★★★	★★★	★★★	★★★	Wear resistance, adhesion resistance and chemical resistance improved.
Satin finished surface	★★	★★★	★★★	★	Reduced cut off dust, improved adhesion resistance.
PVD coated	★★★	★	★★	★★★	Chemical resistance and smoothness improved.

*DLC = Diamond like carbon

Friction test







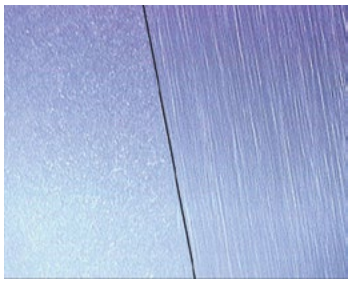
Satin finished surface treatment

Feature

Reduce frictional resistance of knives' side caused by grinding.

Benefits

- Prevent the spread of dust caused by friction after cutting
- Reduce adhesions of materials like synthetic fibers to cutting edges



Satin finished surface treatment surface

#1 000 grinded surface

DLC coating - surface treatment

DLC coating achieves long tool life with hardness close to that of diamond.

Features

- Low coefficient of friction and has lubricating effect
- Excels in chemical resistance and corrosion resistance
- Maintaines sharp edge after coating

Benefits

- No adhesion to non-ferrous film (aluminum film)
- Less likely to cause static electricity, therefore less likely paper powder to stick

0.1 μm coating

KYOCERA INDUSTRIAL

PRECISION KNIVES

KYOCERA

www.kyocera-unimerco.com

TZE00159