THE NEW VALUE FRONTIER

KYOCERA

이 문제들을
해결하고 싶습니까?

# 공업용 정밀 나이프

## KYOCERA INDUSTRIAL PRECISION KNIVES

ADVANCING PRODUCTIVITY

생산성 향상에 기여하는 교세라

한국교세라정공(주)

# KYOCERA Industrial

# 교세라의 공업용 정밀 나이프·내마모 부품

## Industrial Precision Knives / Wear Resistant Parts

**교세라는 파인 세라믹의 개척자로서 긴 시간 축적해온 재료기술·정밀가공 기술을 활용하여,**
**고품질·고정도의 공업용 정밀 나이프 ·내마모 부품 등을 공급하는 것으로 산업계의 품질 향상에 기여하고 있습니다.**

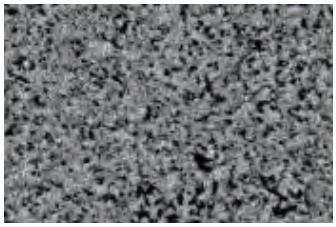
As a pioneer of fine ceramics, Kyocera contributes to improved quality throughout all types of industry by supplying high quality, high precision industrial precision knives and wear resistant parts. Our products are manufactured based on superior materials and precision machining technologies accumulated through many years of experience.

### ●초미립자 초경(FW) Super micro-grain carbide

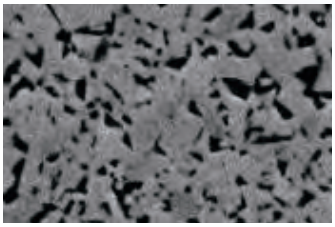
고강도·고인성의 재료이면서 내충격성이 뛰어난 재료입니다. 미세한 결합 구조를 가지고 있어 각종 공업용 정밀 나이프에 많이 사용되며 방전가공도 가능합니다.

An extremely high-strength, tough material, this material provides the best shock resistance. With a minute crystalline structure, used on many industrial precision knives and can be processed using electrical discharge machining.

■초미립자 초경
Super micro-grain carbide




■기존 재질
Conventional Material




### ●내마모 초경(VW) Wear resistant carbide

내마모 부품 재료에서 고강도·고인성입니다. 우수한 내마모성 및 윤활성이 우수합니다. 방전등에 의한 미세가공도 가능합니다.

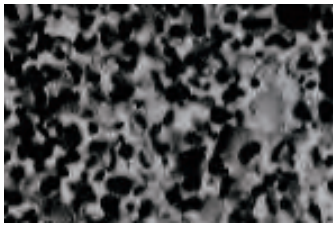
The wear resistant parts material provides high hardness and toughness, delivering superior wear resistance and slidability. Can be fine-processed using electrical discharge machining.

### ●써메트 Cermet

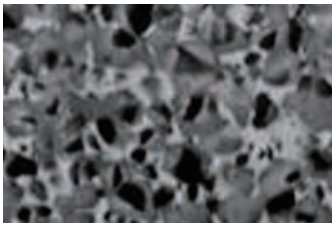
TiC나 TiN, NbC를 주성분으로 Co, Ni 등 금속과의 복합재료입니다. 내마모성이 우수하며 금속이 눌어붙기 어렵고 금속과의 용접이나 방전가공도 가능합니다.

Composite material of Tic, TiN and NbC with Co, Ni, etc. High wear resistant material with low affinity with metals. Can be processed by electrical discharge machining and brazed with metals.

■미립자 써메트
Micro-grain cermet




■기존재질
Conventional Material

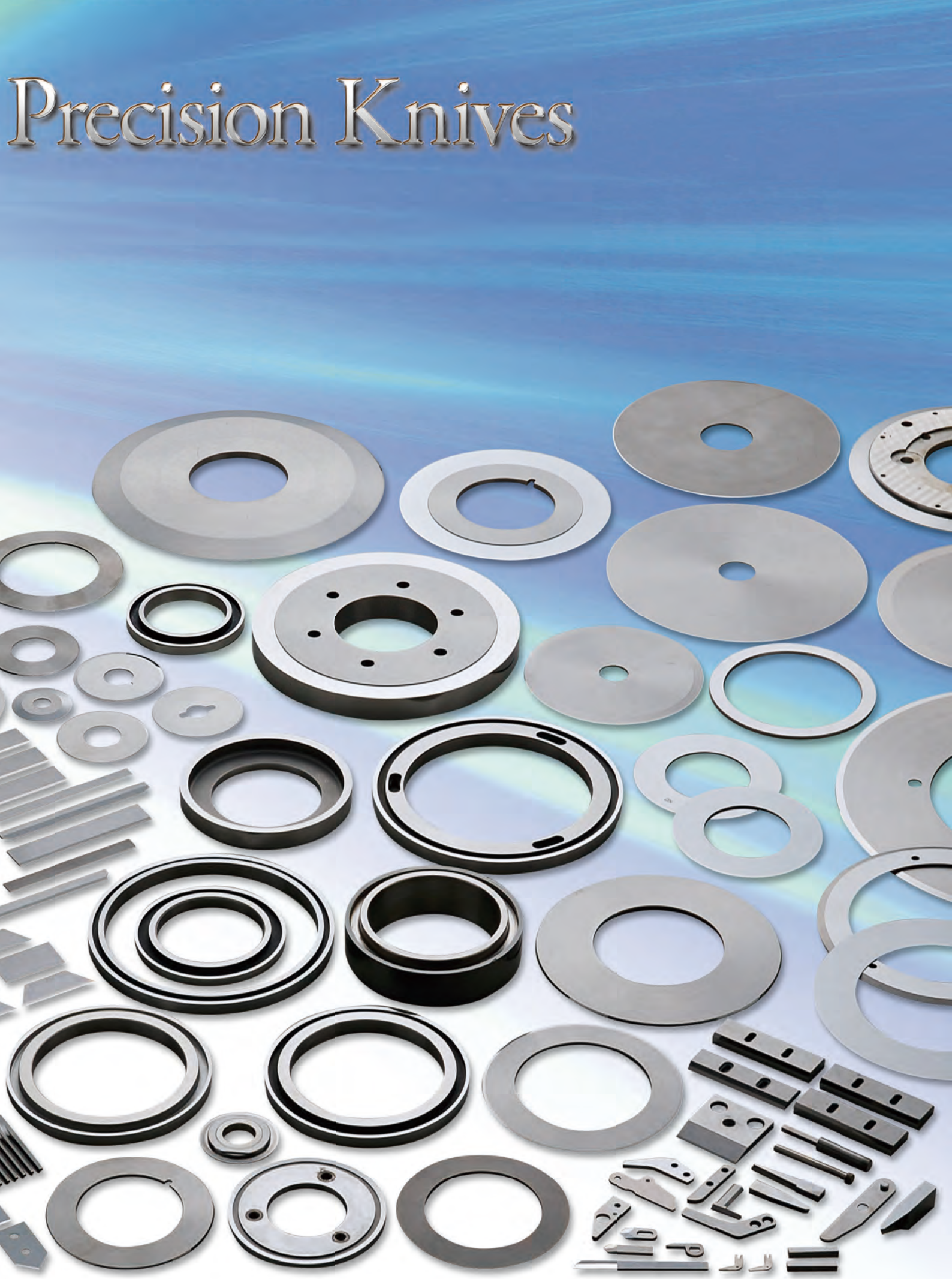



### ●지르코니아 Zirconia

내구성이 우수, 비자성, 전기 절연성 등의 특성을 갖춘 강인한 세라믹입니다. 가위 등의 공구를 중심으로 다양한 용도에서 사용되고 있습니다.

A tough ceramic that has superior corrosion resistance, with non-magnetic and electrical insulation properties.
Used in a wide variety of cutting instruments, such as scissors and knives.

# Precision Knives



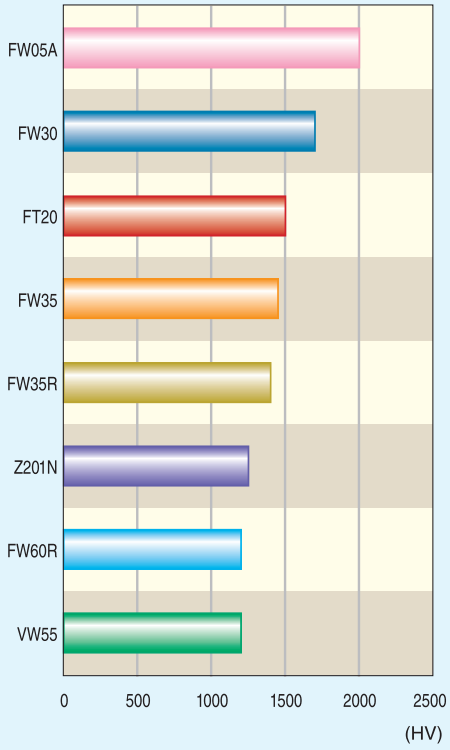
# 공업용 정밀 나이프·내마모 부품 재종특성표

Material Properties of Industrial Precision Knives and Wear Resistant Parts

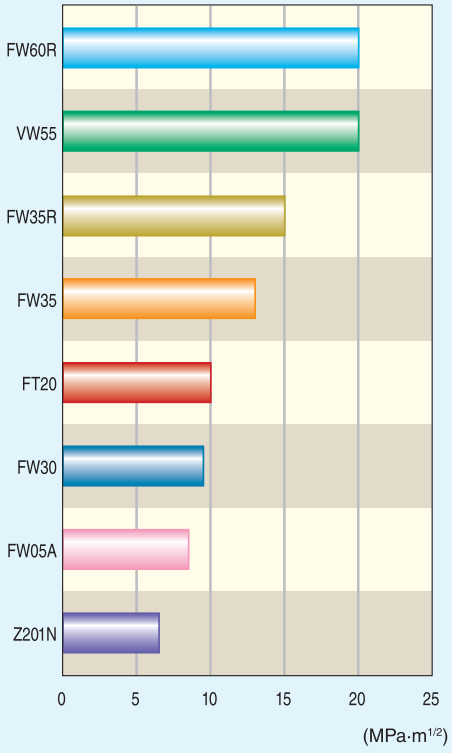
| 재 질 Material | | 초미립자 Super micro-grain carbide | | | | | | | 미립자 Micro-grain carbide | 내마모·내충격 Wear Resistance / Shock Resistance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 항 목 Properties | 단위 Unit | FW05A | FW08 | FW25 | FW30 | FW35 | FW35R | FW60R | KW10A | VW30 | VW55 | VW70 | VW80 |
| 비 중 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 |
| 경 도 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 |
| 파 괴 인 성 Fracture Toughness | $MPa \cdot m^{1/2}$ | 8.5 | 9.0 | 10.5 | 9.5 | 13.0 | 15.0 | 20.0 | 9.0 | 14.5 | 20.0 | >20 | >20 |
| 탄 성 강 도 Transverse Strength | MPa | 3600 | 3920 | 3900 | 4400 | 3300 | 3300 | 3500 | 2800 | 3300 | 3700 | 3100 | 2800 |

| 재 질 Material | | 비자성 Non-magnetic | 써메트 Cermet | | | 알루미늄 Alumina | 지르코니아 Zirconia | 질화규소 Silicon nitride |
|---|---|---|---|---|---|---|---|---|
| 항 목 Properties | 단위 Unit | NW20 | TN60 | TC60M | FT20 | A479SS | Z201N | SN235P |
| 비 중 Ratio | — | 14.4 | 6.6 | 8.1 | 6.4 | 3.9 | 6.1 | 3.2 |
| 경 도 Hardness | HV | 1500 | 1600 | 1500 | 1500 | 1650 | 1250 | 1500 |
| | HRA | 91.0 | 92.0 | 91.0 | 91.0 | — | — | — |
| 파 괴 인 성 Fracture Toughness | $MPa \cdot m^{1/2}$ | 10.0 | 9.0 | 10.5 | 10.0 | 3.5 | 6.5 | 6.5 |
| 탄 성 강 도 Transverse Strength | MPa | 3300 | 1760 | 1670 | 2500 | 320 | 980 | 880 |

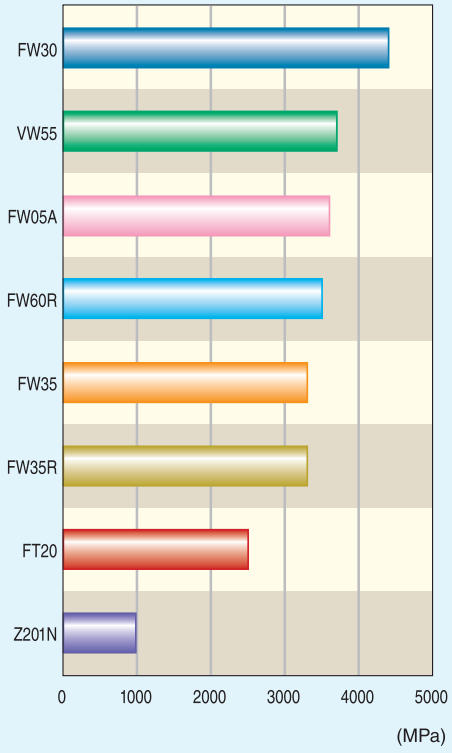
## 비커스 경도 비교 Vickers Hardness




## 파괴인성 비교 Fracture Toughness




## 탄성강도 비교 Transverse Strength

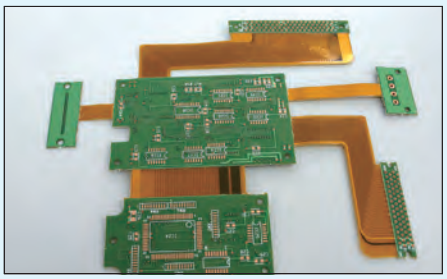


## 채용 제품 예 Examples of Application

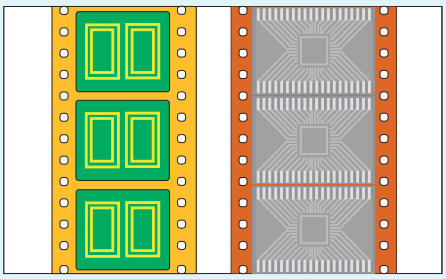
고기능 필름
High function film

액정 디스플레이(편광판)
LCD Display (Polarizing plate)

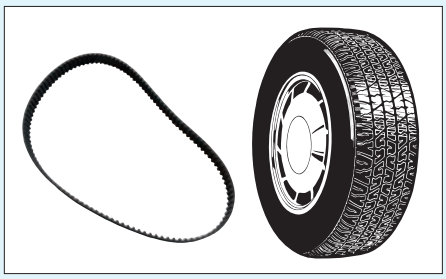
리튬이온 2차전지
Lithium ion rechargeable battery



FPC(플렉시블 프린트 기판)
FPC (Flexible printed circuit board)

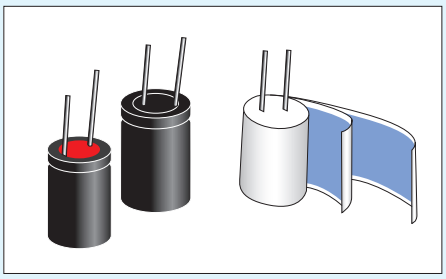


TAB테이프·COF테이프
TAB Tape, COF Tape



고무제품(타이밍벨트·타이어)
Rubber Products (Timing belt / Tires)

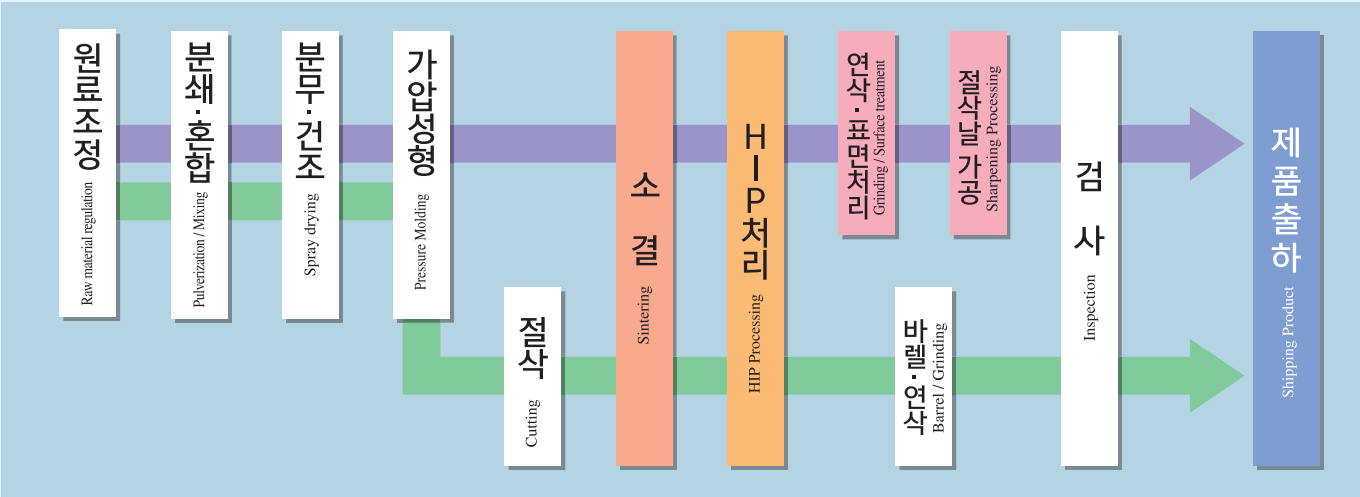
접착 테이프
Adhesive tape



알루미늄 전해 콘덴서
Aluminum electrolytic capacitor

종이·골판지
Paper / Cardboard box

## 제조공정 Manufacturing process



# 게벨·갱 날

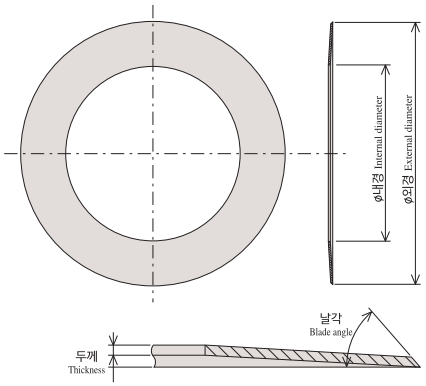
Gable / Gang Blades

초미립자 초경, 써메트, 지르코니아 등의 풍부한 나이프용 재료 레파토리와
다양한 가공기술을 조합하여 고객의 요청에 대응 가능한 고정도, 긴 수명의
절단 나이프를 제공합니다.

Our wide range of knife materials including micro-grain carbides, cermet, and zirconia provides customers with high precision and long life slitting knives through various processing technologies.

# ●표준 게벨 날 Standard gable blades

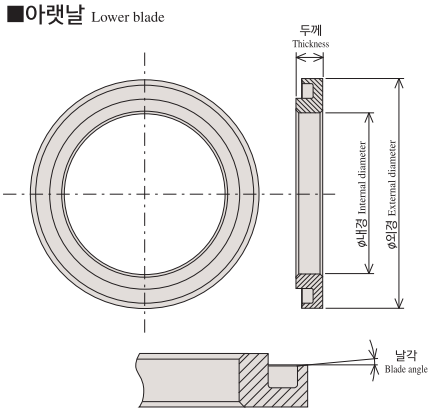
■윗날 Upper blade




(단위 Unit : mm)

| NO. | 윗날/품명<br>Upper blade / Description | 재 질<br>Material | ø외경<br>External diameter | ø내경<br>Internal diameter | 두께<br>Thickness | 날각<br>Blade angle |
|---|---|---|---|---|---|---|
| 1 | GUBD-09807T45DC15 | FW35 | 98 | 66 | 0.7 | 45° |
| 2 | GUBD-09807T60DC15 | | | | | 60° |
| 3 | GUBD-10807T45DC15 | | 108 | 75 | | 45° |
| 4 | GUBD-10807T60DC15 | | | | | 60° |
| 5 | GUBD-11808T45DC15 | | 118 | 80 | 0.8 | 45° |
| 6 | GUBD-11808T60DC15 | | | | | 60° |

■아랫날 Lower blade




(단위 Unit : mm)

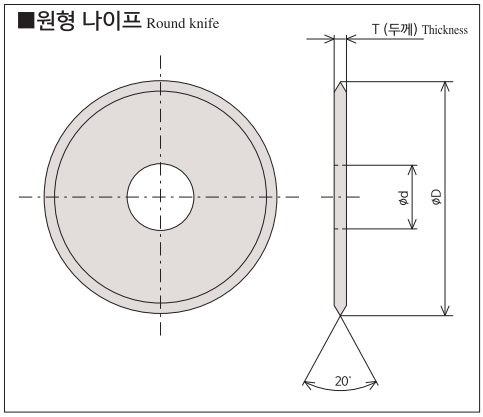
| NO. | 아랫날/품명<br>Lower blade / Description | 재 질<br>Material | ø외경<br>External diameter | ø내경<br>Internal diameter | 두께<br>Thickness | 날각<br>Blade angle |
|---|---|---|---|---|---|---|
| 7 | GDBD-08005T | FW35 | 80 | 55 | 5 | 5° |
| 8 | GDBD-08610T | | 86 | 60 | 10 | |
| 9 | GDBD-09210T | | 92 | 65 | | |

# 원형 나이프
Round knives

정밀한 절삭날 기술과 오리지널 표면 처리 기술에 의해
싱글 필름에서 각종 복합재의 절단까지 폭넓은 적용이 가능합니다.

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.

■원형 나이프 Round knife




(단위Unit : mm)

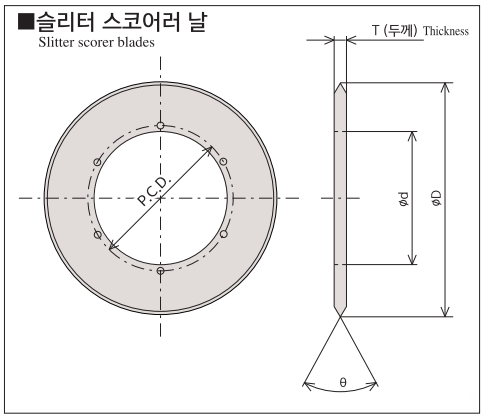
| 품 번 Description | 재 질 Material | 외경øD External diameter | 내경ød Internal diameter | 두께(T) Thickness | 날각(°) Blade angle |
|---|---|---|---|---|---|
| FRC28L | FW35 | 28 | 6.0 | 0.3 | 20° |
| FRC45L | | 45 | 8.1/8.3 | | |
| FRC50L | | 50 | 10.0 | | |
| FRC60L | | 60 | | | |
| FRC80L | | 80 | 19.0 | | |
| FRC100L | | 100 | | | |

# 슬리터 스코어러 날
Slitter scorer blades

고경도 초미립자 초경과 정밀한 절삭날 기술에 의한 종이·골판지 절단에 있어서 긴 수명을 실현

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

■슬리터 스코어러 날
Slitter scorer blades




(단위Unit : mm)

| 품 번 Description | 재 질 Material | 외경øD External diameter | 내경ød Internal diameter | 두께(T) Thickness | 날각θ(°) Blade angle | 비고 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° | |

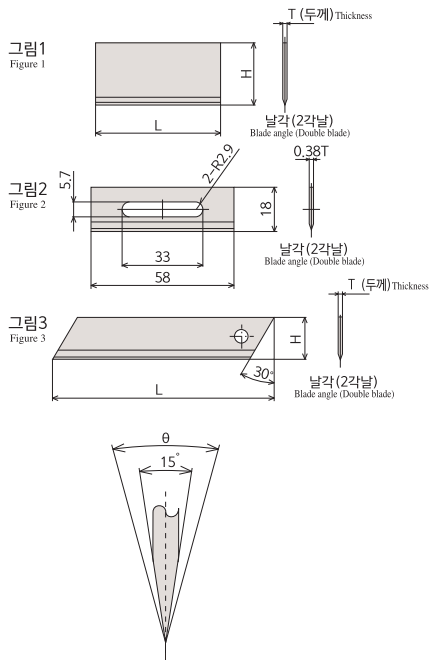
# 판형 나이프

Plate knives

최적의 재료 선정과 뛰어난 연마, 표면처리 기술로
절단면의 버나 절단 분진에 의한 이물질 발생을 억제하고 제품의 품질 향상이 가능합니다.
뛰어난 내마모성과 절단성으로 단수지 생산의 효율 향상이 가능합니다.

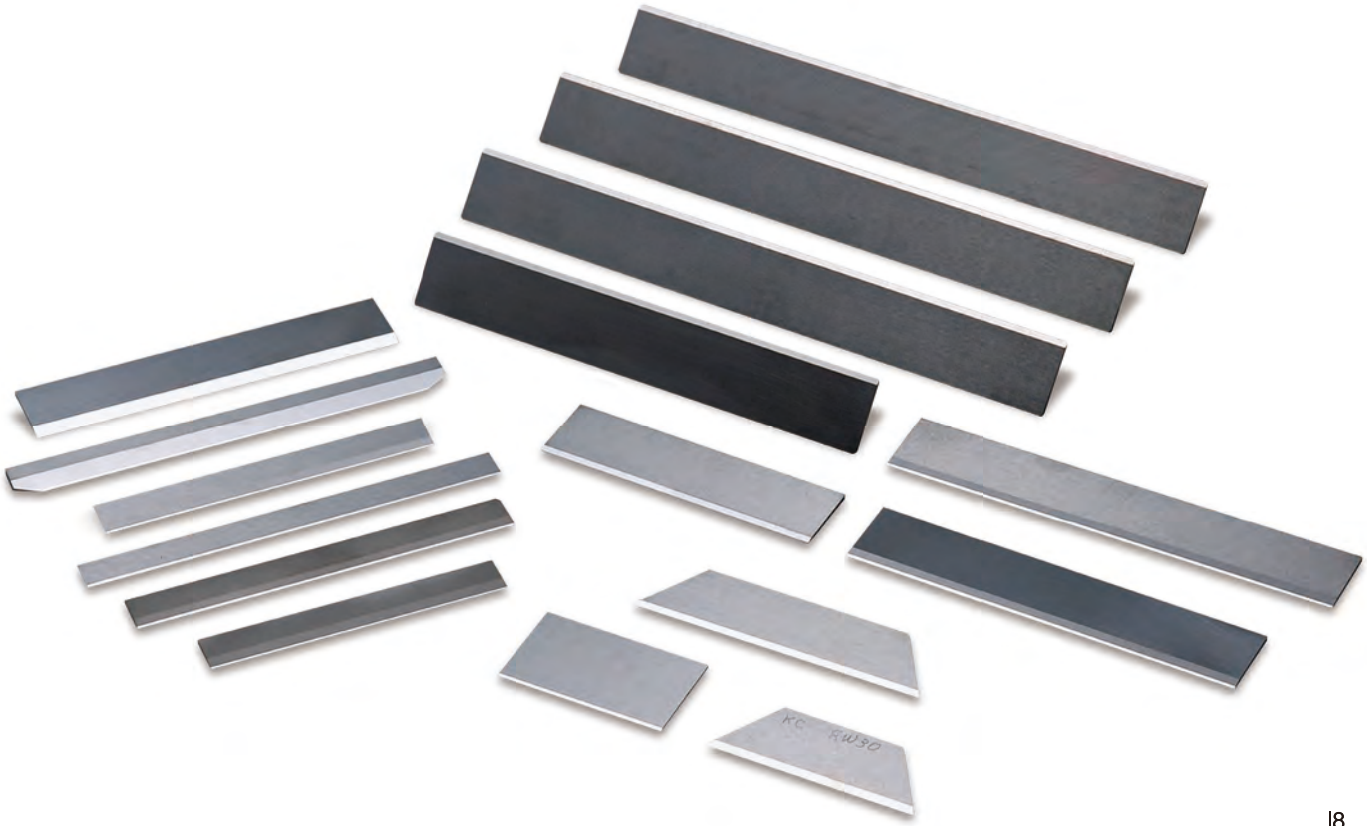
Optimum material choice and superior grinding and surface treatment technologies controls upper dulled edges and residual dust, increasing finished product quality.
Superior wear resistance and sharpness provide higher efficiency in producing short fiber.

■판형 나이프 Plate knife




(단위Unit : mm)

| 품 번 Description | 재 질 Material | 길이(L) Length | 폭(H) Width | 두께(T) Thickness | 날각(15×θ)° Blade angle | 형상 Shape |
|---|---|---|---|---|---|---|
| FBC4009G | FW30 | 40 | 9 | 0.2 | 2각날(15×25) Double blade | 그림1 Figure 1 |
| FBC4019G | FW25 | | 19 | 0.25 | | |
| FBC3515G | FW30 | 35 | 15 | 0.5 | | |
| FBC7010G | | 70 | 10 | 0.9 | 2각날(15×30) Double blade | |
| FBC9519G | | 95 | 19 | | | |
| FBC5818G | | 58 | 18 | 0.38 | 2각날(15×25) Double blade | 그림2 Figure 2 |
| FBC6009G | | 60 | 9 | | | 그림3 Figure 3 |
| FBC6018G | | | 18 | 0.5 | | |
| FBC11018G | | 110 | | | | |



# 특수형상 나이프
Special shape knives

## 특수형상 나이프 Special shape knives

다양한 용도에 맞는 특수형상의 나이프 제작이 가능합니다.

Special shape knives are available for a wide range of applications.

# 치 구
Jigs

## 치구, 금형 관련 제품 Jigs and mold related products

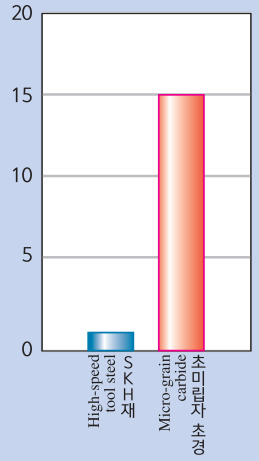
최적의 재료 선정과 고정도 가공 기술에 의해 다양한 용도에 대응하는 고품질·고정도의 내마모 제품을 제공합니다.
특히 금속과의 친화성이 적은 써메트의 사용에 의해 금형가공등에서는 제품표면의 손상을 절감하는 것이 가능합니다.

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.

# 수명 평가 비교 Life Evaluation Comparison

(단위 : 배율) Unit : Times

## 접착 테이프
Adhesive tape




·날 형상 : 게벨 날
Edge shape : gable blade

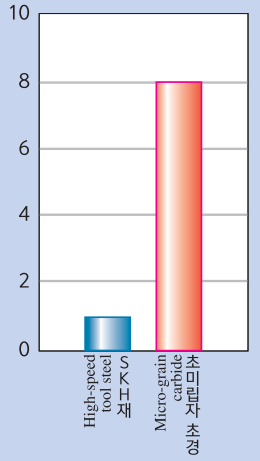
·절단방법 : 쉐어컷
Cutting method : Shear-cut

·재 질 : SKH→초미립자
Material : High-speed tool steel → Micro-grain

·효 과 : 15배
Results : 15 times

·기 타 : 표면 점착물 감소
Others : Reduced blade sticking

## 복합 필름 + 금속박
Composite film + Metal foil




·날 형상 : 갱 날
Edge shape : Gang blade

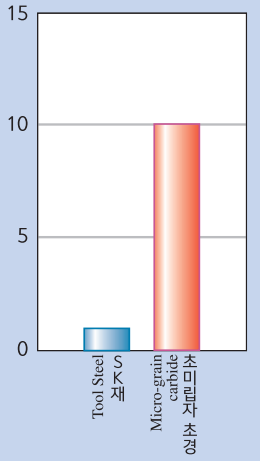
·절단방법 : 쉐어컷
Cutting method : Shear-cut

·재 질 : SKH→초미립자
Material : High-speed tool steel → Micro-grain

·효 과 : 8배
Results : 8 times

·기 타 : 절단면 우수
Others : Good cutting surface

## PET필름
PET Film




·날 형상 : 판형 날
Edge shape : Plate knife

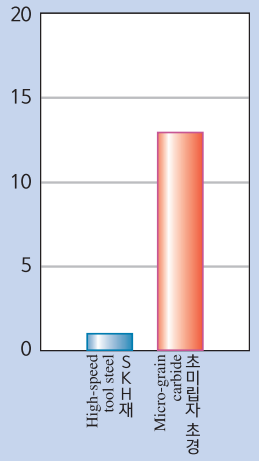
·절단방법 : 공중절단(비접촉)
Cutting method : Cut in the air (Non-contact)

·재 질 : SK→초미립자
Material : Tool Steel → Micro-grain

·효 과 : 10배
Results : 10 times

·기 타 : 절단면 우수
Others : Good cutting surface

## 알루미늄박
Aluminum foil




·날 형상 : 갱 날
Edge shape : Gang blade

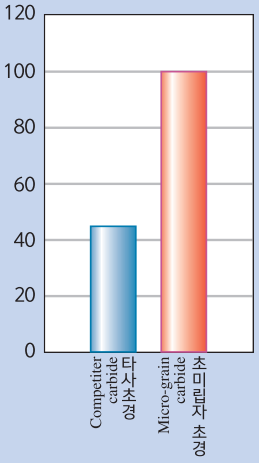
·절단방법 : 쉐어컷
Cutting method : Shear-cut

·재 질 : SKH→초미립자
Material : High-speed tool steel → Micro-grain

·효 과 : 13배
Results : 13 times

·기 타 : 품질 안정
Others : Stable quality

## 골판지
Cardboard box




·날 형상 : 원형 날
Edge shape : Round knife

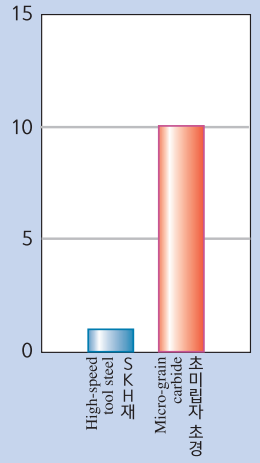
·절단방법 : 슬리터 스코어러
Cutting method : Slitter scorer

·재 질 : 타사초경→초미립자 초경
Material : Competitter → Micro-grain carbide

·효 과 : 2.3배
Results : 2.3 times

·기 타 : 생산성 향상
Others : Productivity improvement

## 동 박
Copper foil




·날 형상 : 갱 날
Edge shape : Gang blade

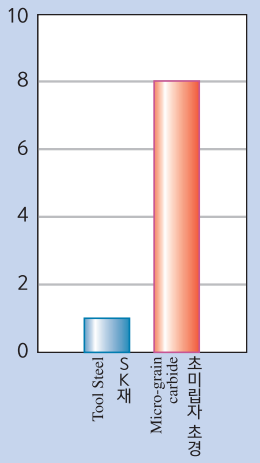
·절단방법 : 쉐어컷
Cutting method : Shear-cut

·재 질 : SKH→초미립자
Material : High-speed tool steel → Micro-grain

·효 과 : 10배
Results : 10 times

·기 타 : 품질 안정
Others : Stable quality

## 고무 시트
Rubber sheet




·날 형상 : 원형 나시지
Edge shape : Round knife with satin finished surface

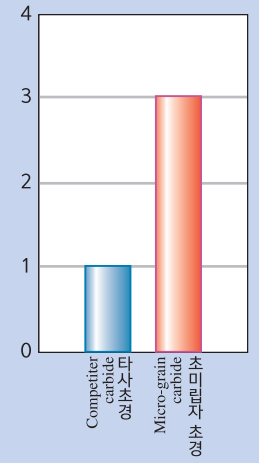
·절단방법 : 회전절단
Cutting method : Rotating cut

·재 질 : SK→초미립자
Material : Tool Steel → Micro-grain

·효 과 : 8배
Results : 8 times

·기 타 : 표면 점착물 감소
Others : Decreased adhesion to blade

## 섬 유
Fibers




·날 형상 : 판형 날
Edge shape : Plate knife

·절단방법 : 찹컷
Cutting method : Chopped cut

·재 질 : 타사초경→초미립자 초경
Material : Competitter → Micro-grain carbide

·효 과 : 3배
Results : 3 times

·기 타 : 생산성 향상
Others : Productivity improvement

(고객평가) User's evaluation

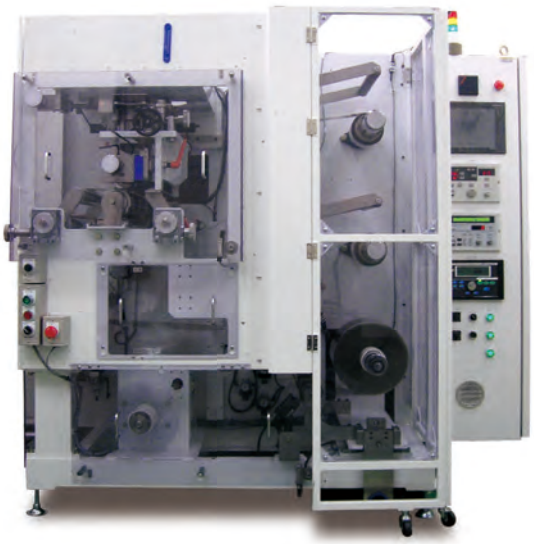
# 중부 테크니컬 센터
Chubu Technical Center

## 슬리터 평가 장비에 의한 절단면 품질 개선
Improved cut surface using a slitter evaluation machine

절삭면의 분진, 버, 플레어, 소음, 변형 등의 문제 해결을 위해서
슬릿을 평가하고 최적의 나이프 사양과 절단 조건을 제안합니다.

We evaluate cut surface and provide suitable proposal for the best specification and cutting conditions to solve problems such as residual dust, burr, flare, everted edge, whisker, and deformation.

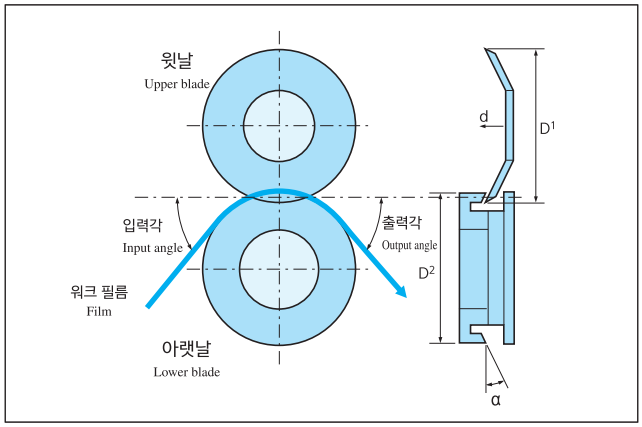
### 슬리터 평가 장비
Slitter Evaluation Machine



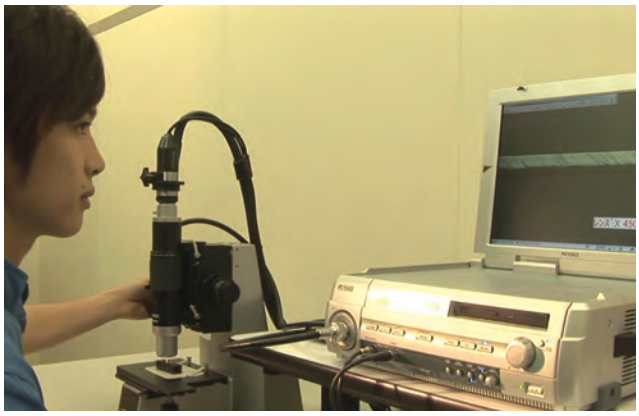
### 슬리팅 조건 설정
Slitting layout Position

· 게벨 날, 갱 날 등
Gable / Gang blades, etc.

· 날각, 표면처리, 오버랩, 옵셋, 입/출력각, 장력, 라인속도 등
Blade angle, Surface treatment, Overwrap, Offset, Input / Output angle, Tension, Line speed, etc.



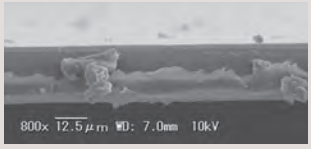
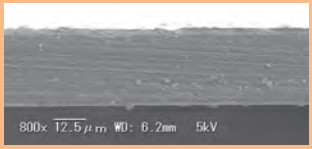
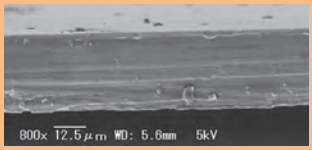

### 디지털 스코프에 의한 절삭면 평가
Cut surface evaluation by Digital Scope



### 평가 장비 탑재 가능 워크 조건
Evaluation Machine Loadable Material (Workpiece) Size

| 재 료 폭<br>Material width | 재 료 경<br>Material diameter | 재료 코어경<br>Material core diameter |
|---|---|---|
| 50~300mm | 300mm | ø3in, 6in |

# 절삭면 비교 사진 Comparison Photograph of Cut Surfaces

| | 금속날 Metallic blade | 교세라 초미립자 초경날 Kyocera micro-grain carbide blade |
|---|---|---|
| 폴리에틸렌 테레프탈레이트 (PET) Polyethylene-telephthalate — 윗날 Upper blade |  |  |
| 폴리에틸렌 테레프탈레이트 (PET) Polyethylene-telephthalate — 아랫날 Lower blade | |  |



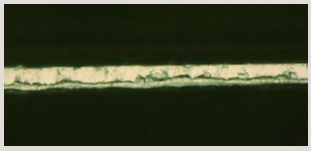
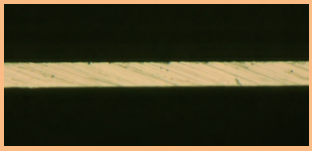
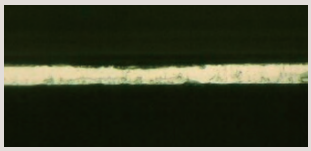
SEM

뜯김·분진 절감 !

Reduce whiskers and dust

금속날을 사용할 경우, 절삭이 되지 않고 뜯김이 발생하지만 초미립자 초경의 경우는 양호한 절삭면 가능!

Metal blades can not cut and create whiskers and dust. Micro-grain carbide blades provide an excellent cut surface.

| | | |
|---|---|---|
| 알루미늄박 Aluminum foil — 윗날 Upper blade |  |  |
| 알루미늄박 Aluminum foil — 아랫날 Lower blade |  | |

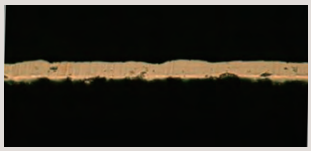
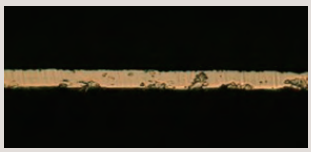
절단면 변형 억제 !

Prevent dust and deformation

디지털 스코프 Digital scope

금속날을 사용할 경우, 윗날의 변형이 발생하지만 초미립자 초경의 경우는 양호한 절삭면 가능!

Metal blades create dust and deformation by the upper blade. Micro-grain carbide blades provide an excellent cut surface.

| | | |
|---|---|---|
| 동박 Copper foil — 윗날 Upper blade |  | |
| 동박 Copper foil — 아랫날 Lower blade |  | |

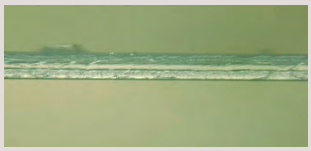
절단면 변형 억제 !

Prevent dust and deformation

디지털 스코프 Digital scope

금속날을 사용할 경우, 윗날의 변형이 발생하지만 초미립자 초경의 경우는 양호한 절삭면 가능!

Metal blades create dust and deformation by the upper blade. Micro-grain carbide blades provide an excellent cut surface.

| | | |
|---|---|---|
| 접착필름 Adhesive film — 윗날 Upper blade |  | |
| 접착필름 Adhesive film — 아랫날 Lower blade | | |

변형·버 억제 !

Prevent deformation and burr

디지털 스코프 Digital scope

금속날을 사용할 경우, 점착층에 변형과 버가 발생하지만 초미립자 초경의 경우는 양호한 절삭면 가능!

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

(당사비교) Internal evaluation

# 금속 나이프와 초경 나이프의 비교
Comparison of Metal Knife and Micro-grain Knife

**경도가 다르다 ! 《긴 수명》** Different hardness <Long life>

FW35 HV1450 > 금속 metal (SKD,SKH) HV770~800

**FW35 경도2배(금속대비)**
Double FW35 hardness (compared to metal)

| 재 질 Material | FW35 | SKD | SKH |
|---|---|---|---|
| | 초미립자 초경 Micro-grain carbide | 합금 공구강 Alloy Tool Steel | 고속 공구강(하이스) High-Speed Tool Steel (High-speed steel) |
| 용 도 Application | 공업용 정밀 나이프용 For Industrial Precision Knives | 절삭, 충격용, 금형용, 와이어 다이스, 프레스 등 For cutting tools, impact parts, wire drawing die, press die, etc. | 절삭공구용강 홀가공 공구, 톱니공구 등 For cutting tools, drill, end mill, gear cutting tools and others |
| 첨가원소 Added chemical element | WC + 10Co | C, W, Cr, Mo 등 etc. | C, W, Cr, Mo, Co 등 etc. |
| 비커스 경도 Vickers hardness | 1450(HV) | 770(HV) | 800(HV) |

# 초경 나이프 입자 차이에 의한 인선 비교
Blade comparison by grain diameters

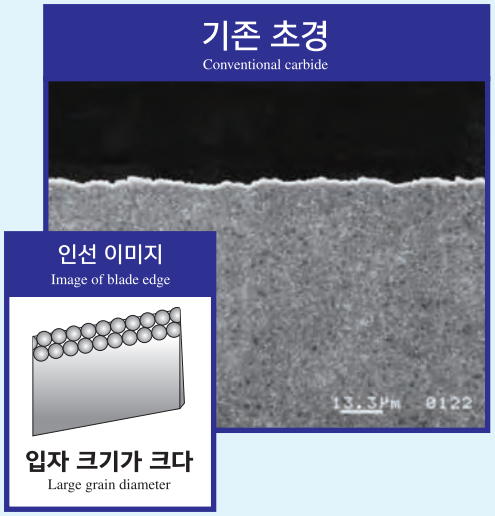
**입자 크기의 차이가 샤프한 인선 실현!!** Smaller diameters create sharp edges

초경재료는 작은 입자의 집합체로 구성되어 있으며,

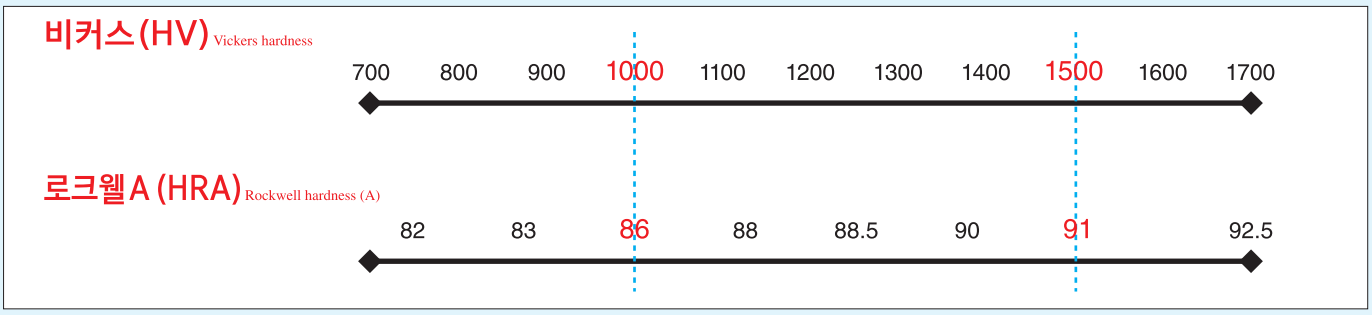
이 입자의 크기가 인선(날끝)의 예리함에 영향을 주어 인선의 선명도를 결정 짓습니다.

인선은 입자 크기가 작을수록 선명하고 안정된 인선을 만들 수 있습니다.

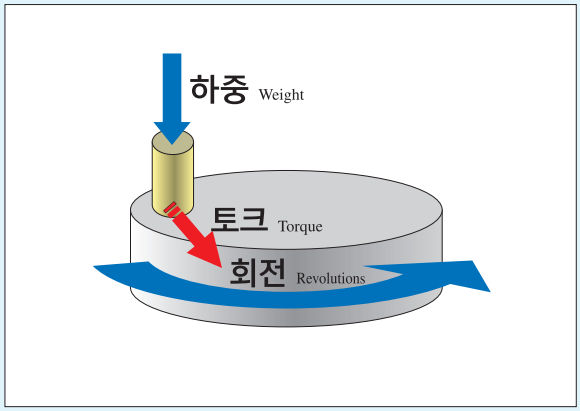
Micro-grain carbide is composed of an aggregate of micro grains. The grain size has a large effect to the sharpness of the blade edge.
The smaller the grain diameter, the sharper and more stable blade edge line can be created.

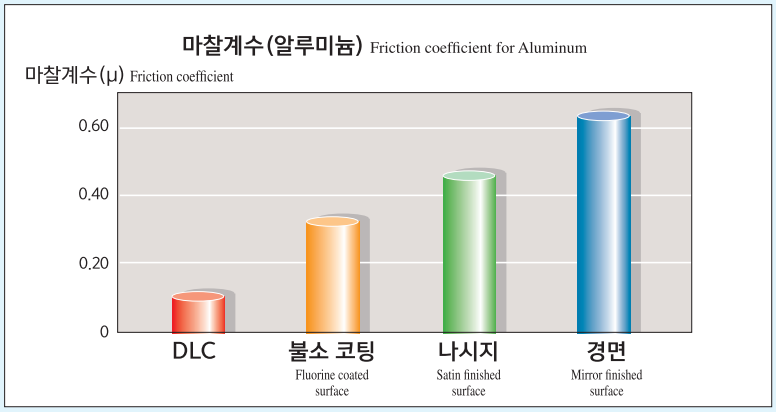


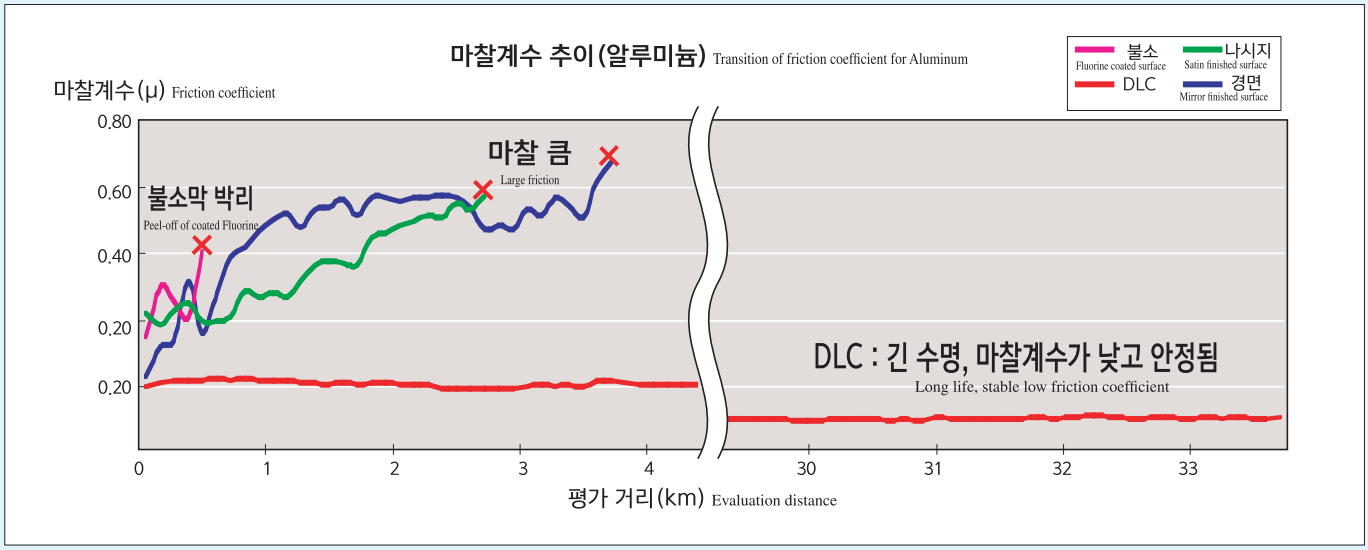
# HV-HRA비교표
Hardness comparison



## 핀 ON 디스크 마찰 실험 Pin on disc friction test




(당사비교) Internal evaluation

## 각종 표면 처리 Surface Treatment Variation

| | |
|---|---|
| DLC코팅※ DLC (Diamond-like Carbon) Coated Treatment | 내마모성 향상, 내부착성 향상, 내약품성 향상 Wear resistance, adhesion resistance and chemical resistance improved |
| 나시지 처리 Satin finished surface treatment | 절삭 가루 감소, 내부착성 향상 Reduced cut off dust, improved adhesion resistance |
| PVD코팅 PVD (Physical Vapor Deposition) Coated Treatment | 내약품성 향상, 매끄러움 향상 Chemical resistance and smoothness improved |

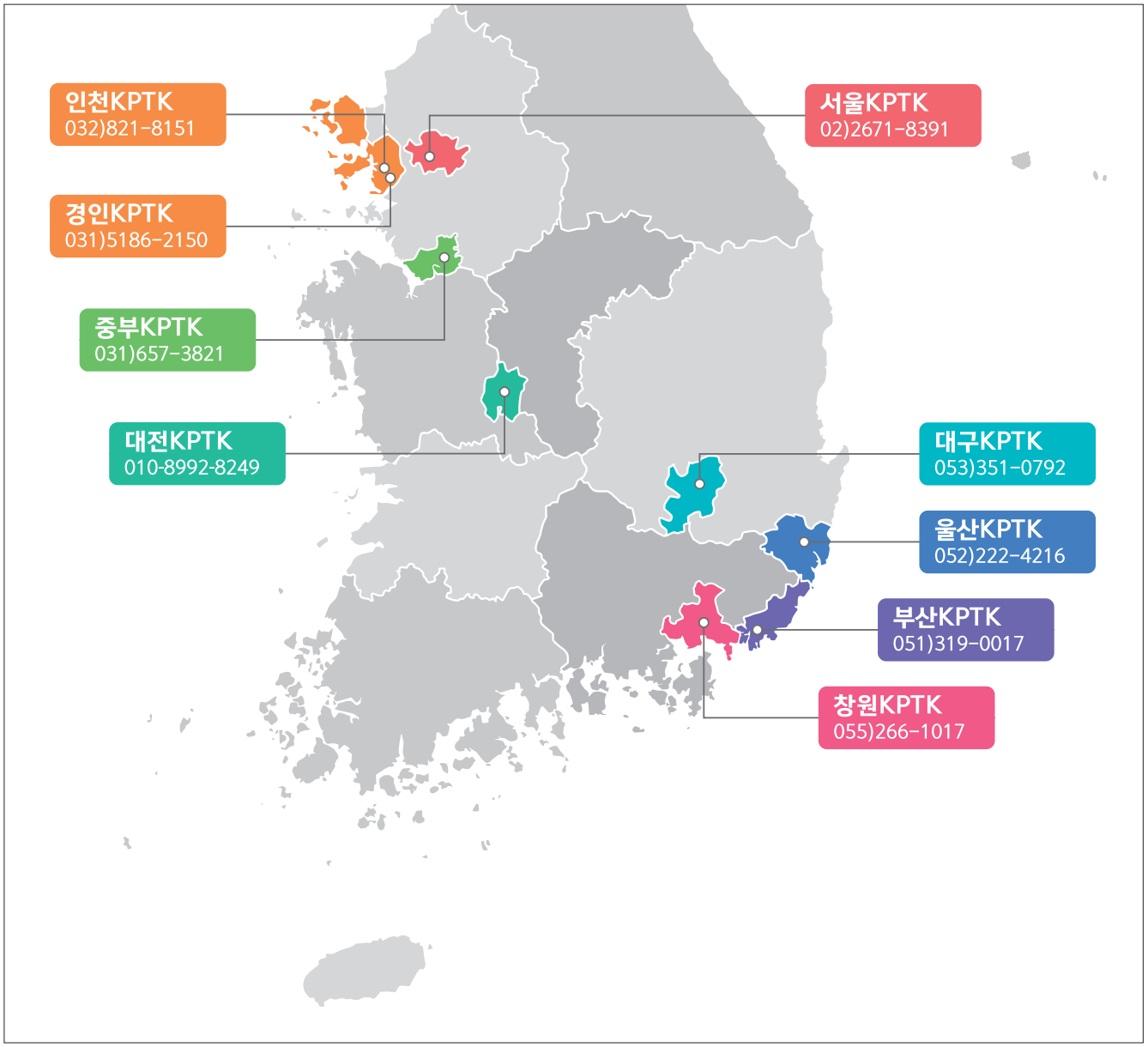
※DLC코팅은 유사 다이아몬드 코팅입니다. DLC Coating: Diamond-like Carbon Coating

### ■표면 처리 Surface treatment

| | 수 명 Life | 내점착 Adhesion resistance | 매끄러움 Smoothness | 내촉성 Corrosion resistance |
|---|---|---|---|---|
| DLC코트 DLC (Diamond-like Carbon) Coated Treatment | ◎ | ○ | ◎ | ◎ |
| 나시지 처리 Satin finished surface treatment | ○ | ◎ | ◎ | △ |
| PVD코팅 PVD (Physical Vapor Deposition) Coated Treatment | ◎ | △ | ○ | ◎ |

◎ : 1st choice, ○ : 2nd choice, △ : 3rd choice

## 지역 판매센터





절삭공구에 관련한 문의사항은

**한국교세라정공 영업기술팀** **032-899-1366**

FAX : 032-821-8369

●상담시간 8:30~12:00·13:00~16:30 ●토요일·일요일·공휴일 등은 쉽니다.

**한국교세라정공(주)**
영업본부

인천광역시 남동구 남동대로215번길 11(고잔동)
구) 인천광역시 남동구 고잔동 638-1, 남동공단 69BL 2LT
TEL:032-821-8365 FAX:032-821-8369
우:21633 http://www.kptk.co.kr



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