

New Products Introduction

**KYOCERA Asia Pacific
Cutting Tool div.**

FY18 New Products



Hi-performance
Indexable drill

MagicDrill DRV



Aluminum Cutter

MFAH



MFPN66



Hi-Performance
Milling

Solid Round Tools
Line-up expansion



Solid End mill for roughing
Difficult-to-machine material
4/5/6RFH



Cast Iron CVD Coating

CA3 Series



MFSN88

FY18 New Products

■ Milling tools Line-up expansion

Cermet for Milling

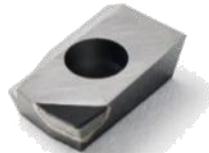
TN620M



BDGT type Insert for MEC

Diamond

KPD001/KPD230



CeramTec
THE CERAMIC EXPERTS

Finish Mill for Cast Iron
Aluminum Holder

PPCM



■ Turning tools Line-up expansion

PVD Turning

PR1535



Positive Wiper Insert

WP breaker



■ Threading tools Line-up expansion

TQ breaker

Line-up Expansion



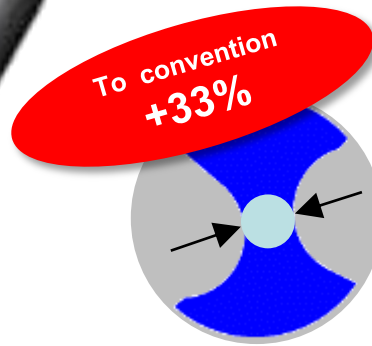
TF Series

New Grade Expansion



High Efficiency Indexable Drill **DRV**

■ Advantages

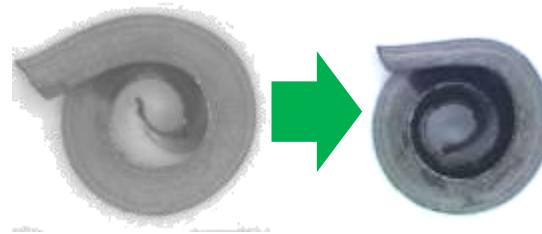


■ *High rigidity design*

- Thicker core than conventional
- High resistance for deflection & chattering

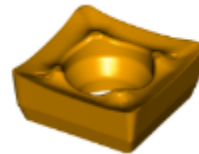
■ *Superior chip evacuation*

- Small chip from outer edge.
- weight saved chip from inner edge

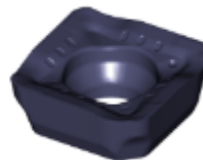


■ *High efficiency, covered 6D range*

- Increase the machining efficiency by CVD grade for outer edge
- Standard line-up for 6D type



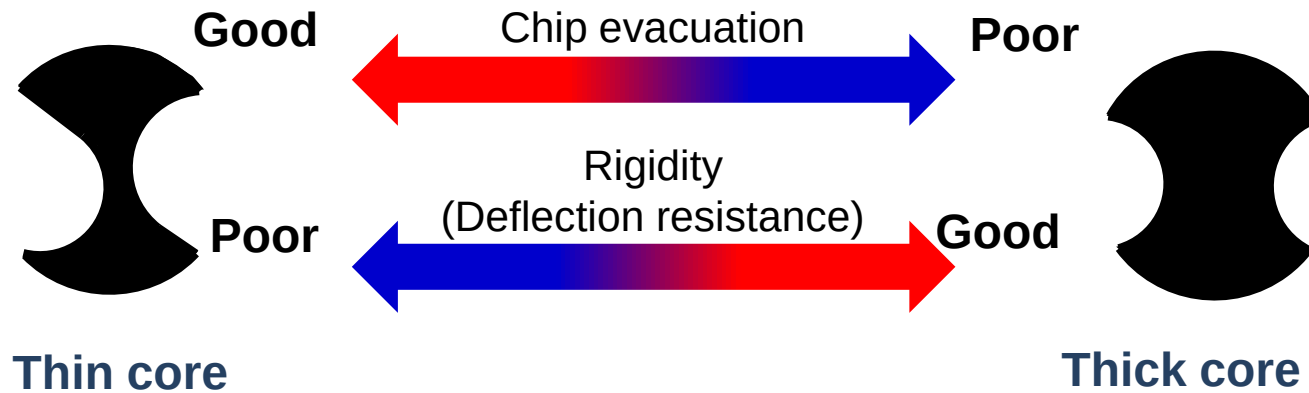
Outer edge
CVD,PVD



Inner edge
PVD

High Efficiency Indexable Drill **DRV**

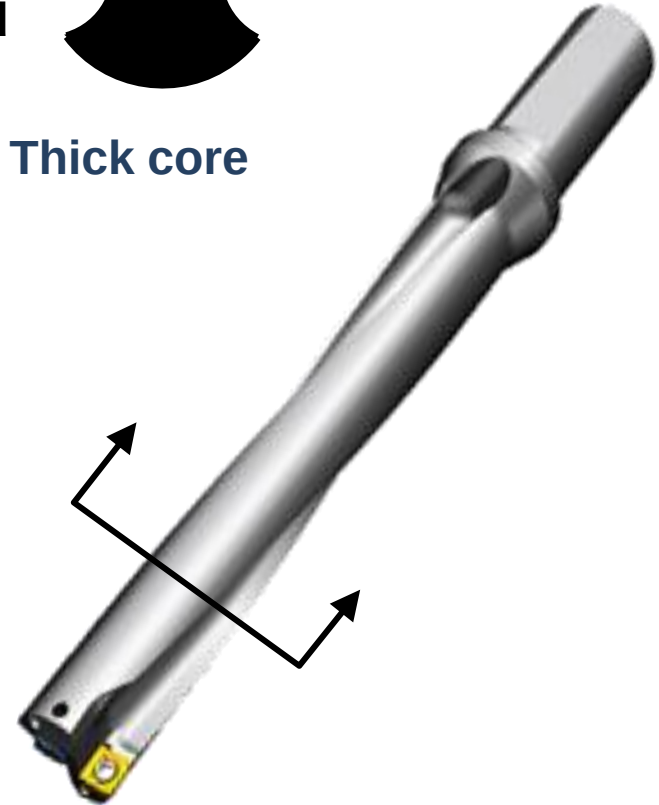
■ Role of Drilling Holder



Cross section & Function

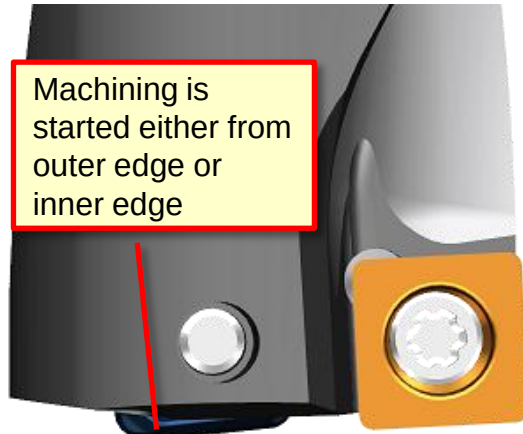
Good chip evacuation & High rigidity is contradictory.

DRV improves both contradictory factors by our unique technology.

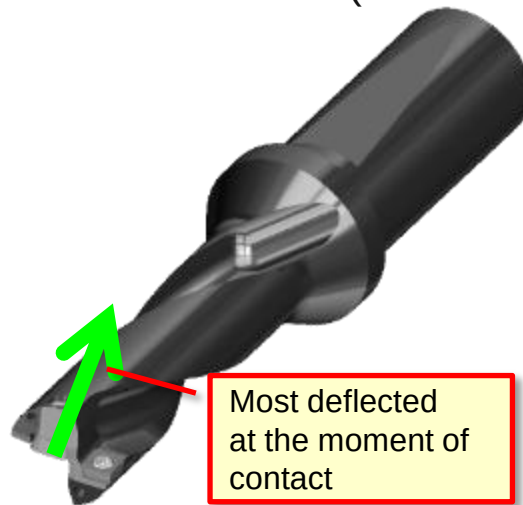


High Efficiency Indexable Drill **DRV**

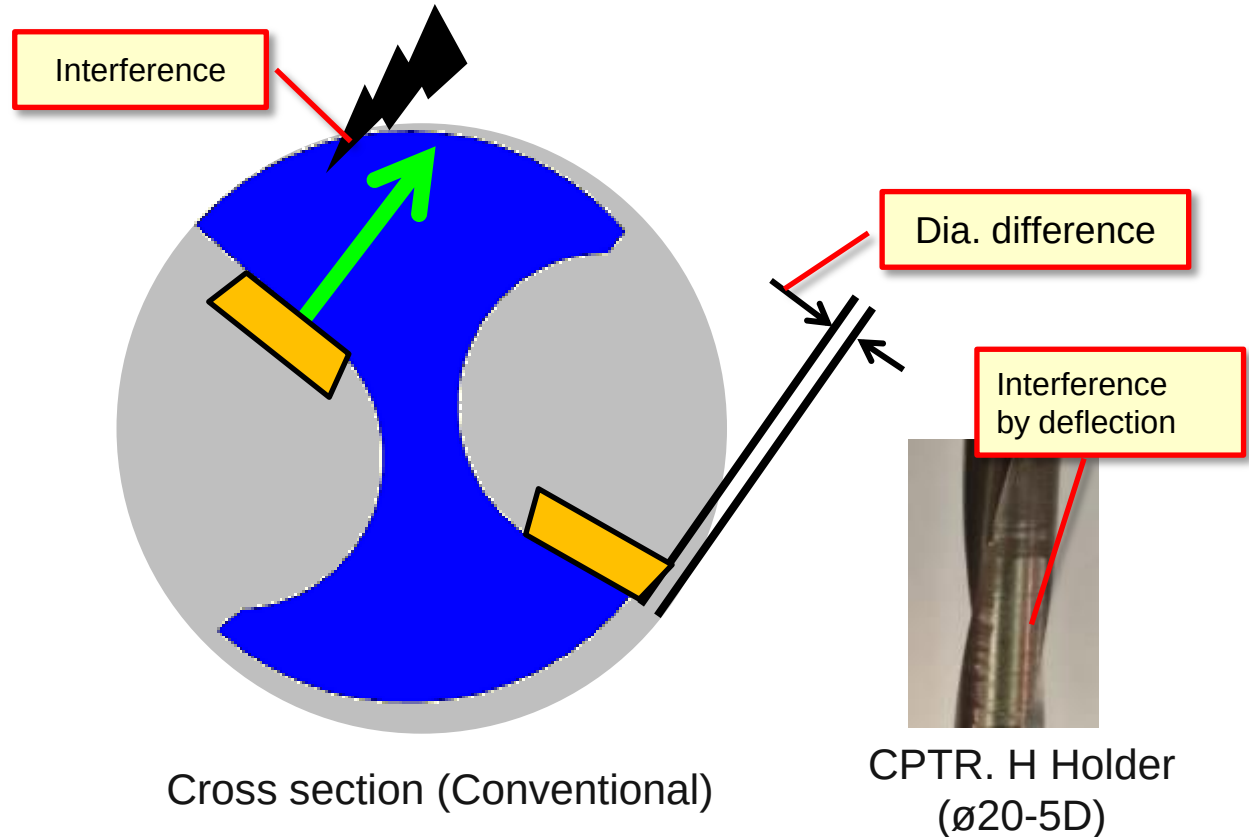
■ Holder Deflection



Holder side view (CPTR. H)



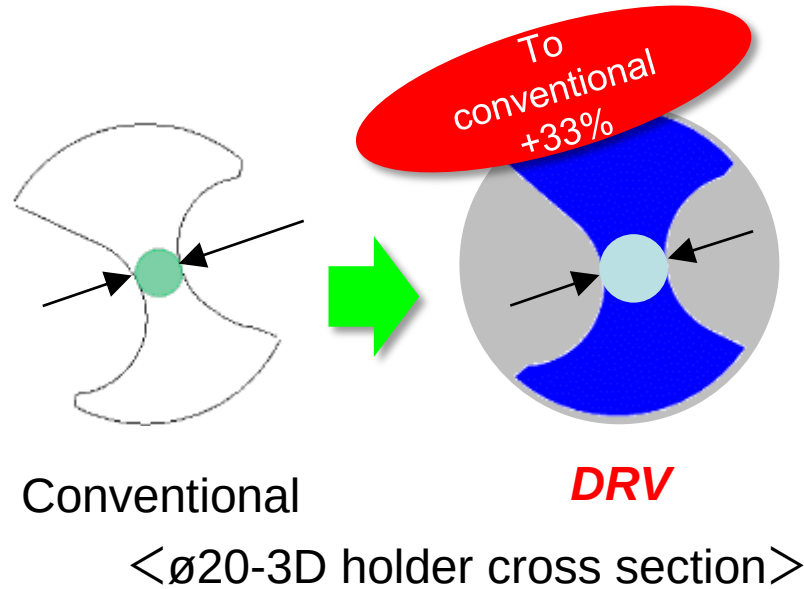
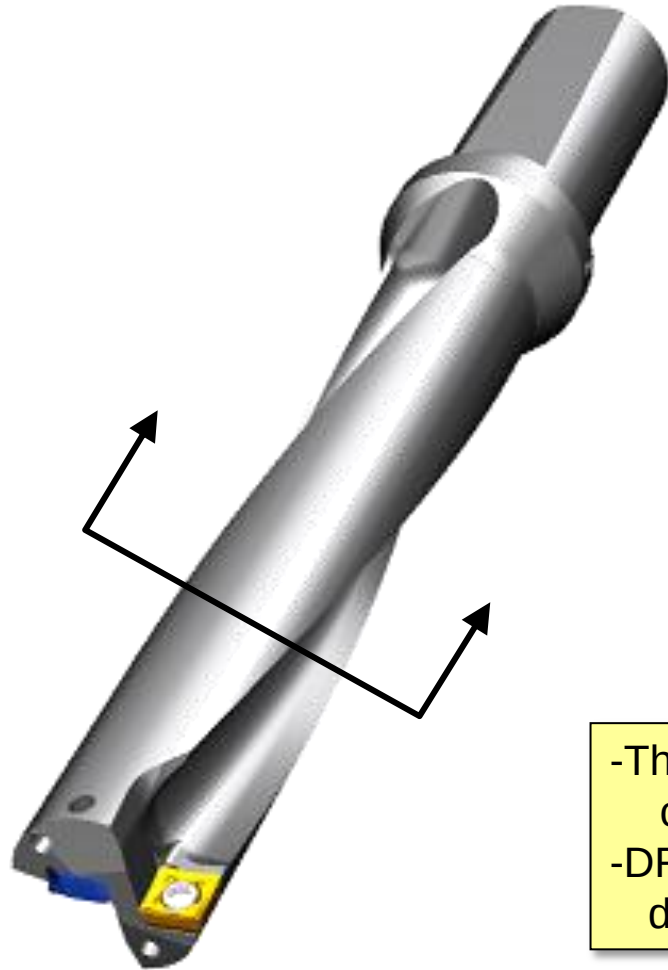
Holder slant view (CPTR. H)



Indexable drill machines with offsetting cutting force from outer edge & inner edge. However, as the machining is started either from outer or inner edge at the moment of contact, if the rigidity is not so high, machined dia. could be different from drill dia.

High Efficiency Indexable Drill **DRV**

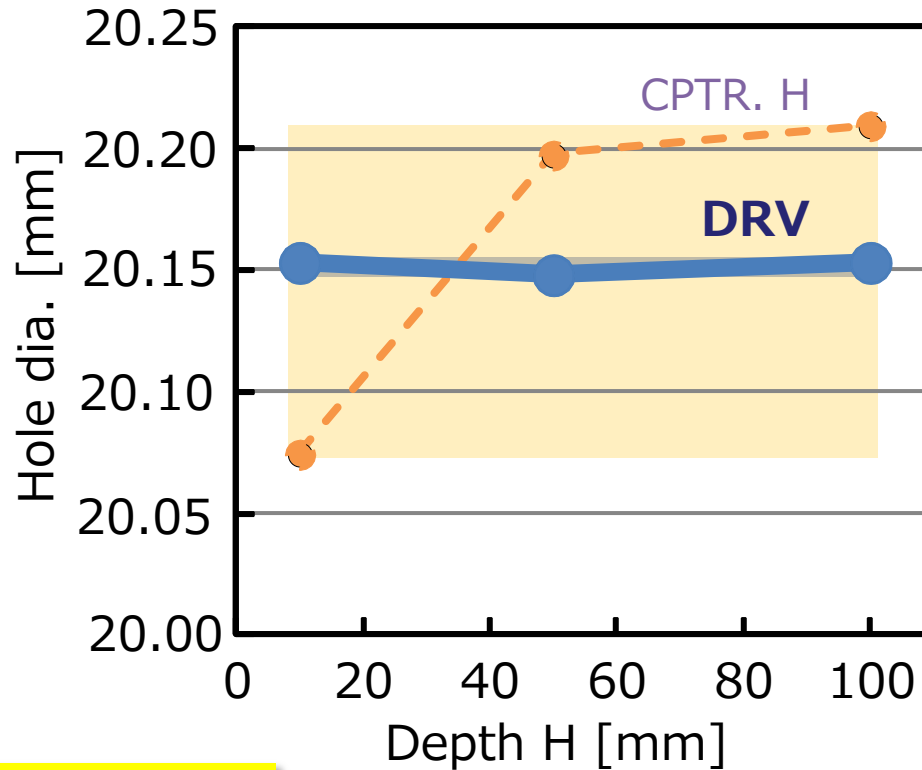
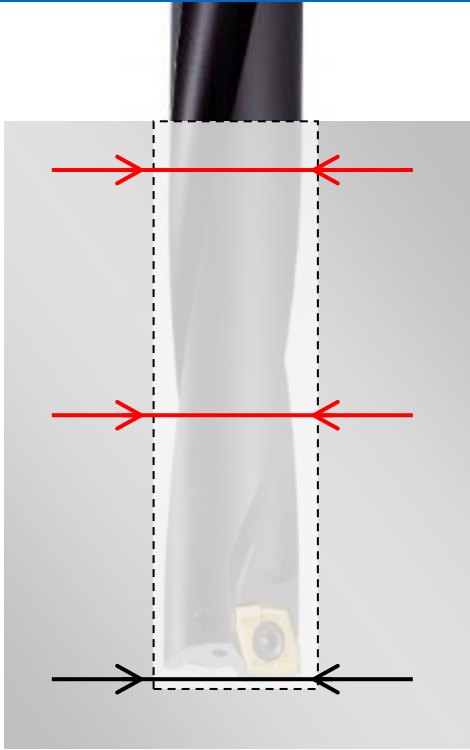
■ DRV Core



- The holder core thickness of DRV increase 20% to conventional so that deflection will be suppressed.
- DRV achieves stable machining with quite little dia. differences.

High Efficiency Indexable Drill **DRV**

■ Minimized Hole dia. Difference



Material: S50C

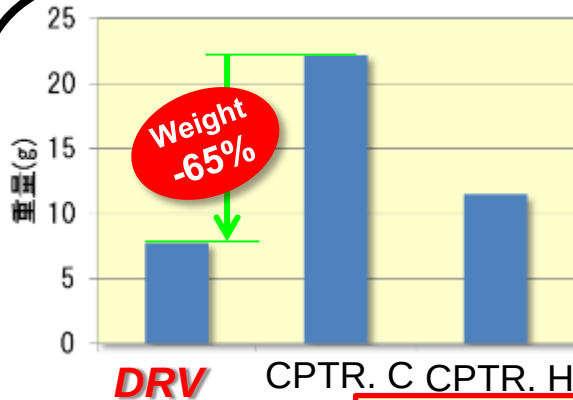
$V_c=200\text{m/min}$, $f=0.09\text{mm/rev}$, $H=100\text{mm}$, Wet

Tool: $\varnothing 20$ -**5D**

DRV achieved stable machined diameter, compared to competitor H by increasing the holder rigidity.

High Efficiency Indexable Drill **DRV**

■ Chip Evacuation



Dia. difference

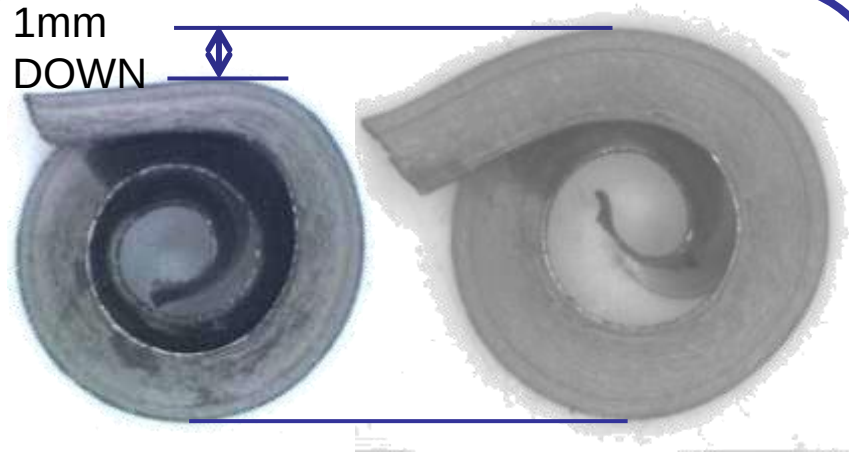


<Chips from inner edge>

Inner edge

SUS304, $V_c=150\text{m/min}$, $f=0.08\text{mm/rev}$
 $H=125\text{mm}$, Wet, $\phi 25\text{-}5\text{D}$

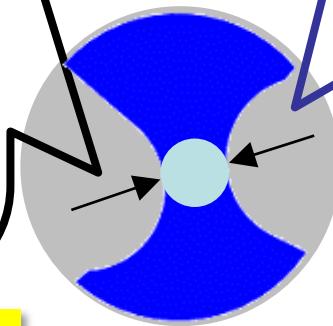
1mm
DOWN



Outer edge

S50C, $V_c=150\text{m/min}$, $f=0.06\text{mm/rev}$
 $H=60\text{mm}$, Wet, $\phi 20\text{-}3\text{D}$

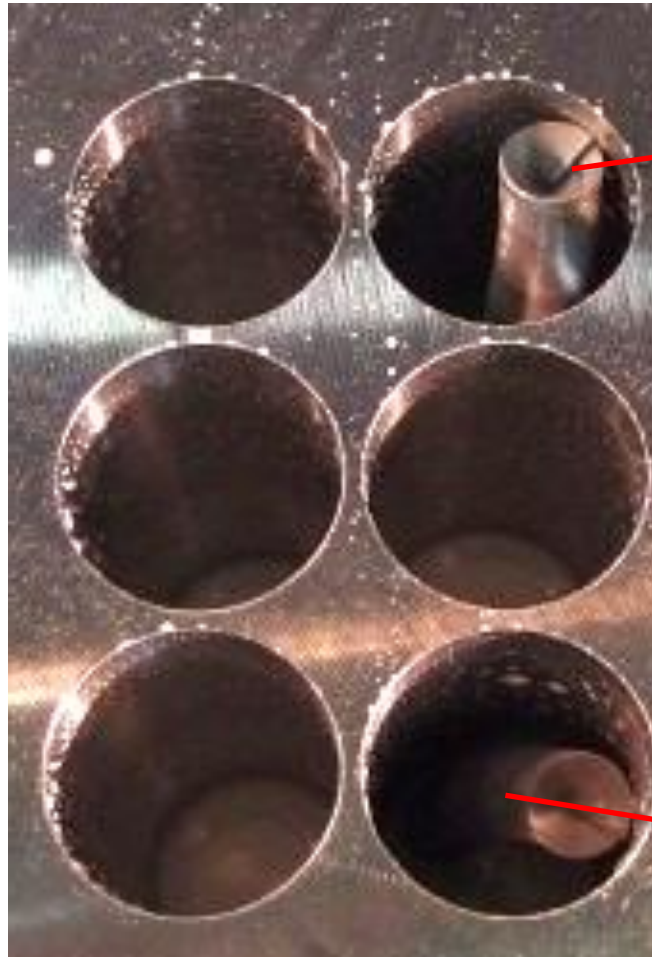
- Weight saving by DRV unique technology
- Chip evacuation is much better due to small chip from outer edge.



High Efficiency Indexable Drill **DRV**

■ Chip evacuation (Inner edge)

SUS304, $V_c=150\text{m/min}$, $f=0.08\text{mm/rev}$,
 $H=125\text{mm Wet}$, $\phi 25$ -**5D**



DRV

CPTR. C

Chip remains

Chip remains

Weight saving
due to longer pitch

DRV

CPTR.C

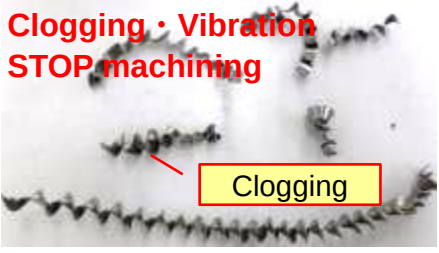
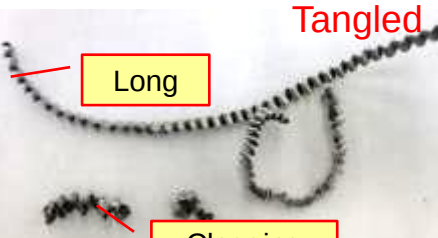
DRV achieves superior chip evacuation by weight saved chip from inner edge, and suppresses various trouble due to poor chip evacuation.

High Efficiency Indexable Drill **DRV**

■ Chip comparison

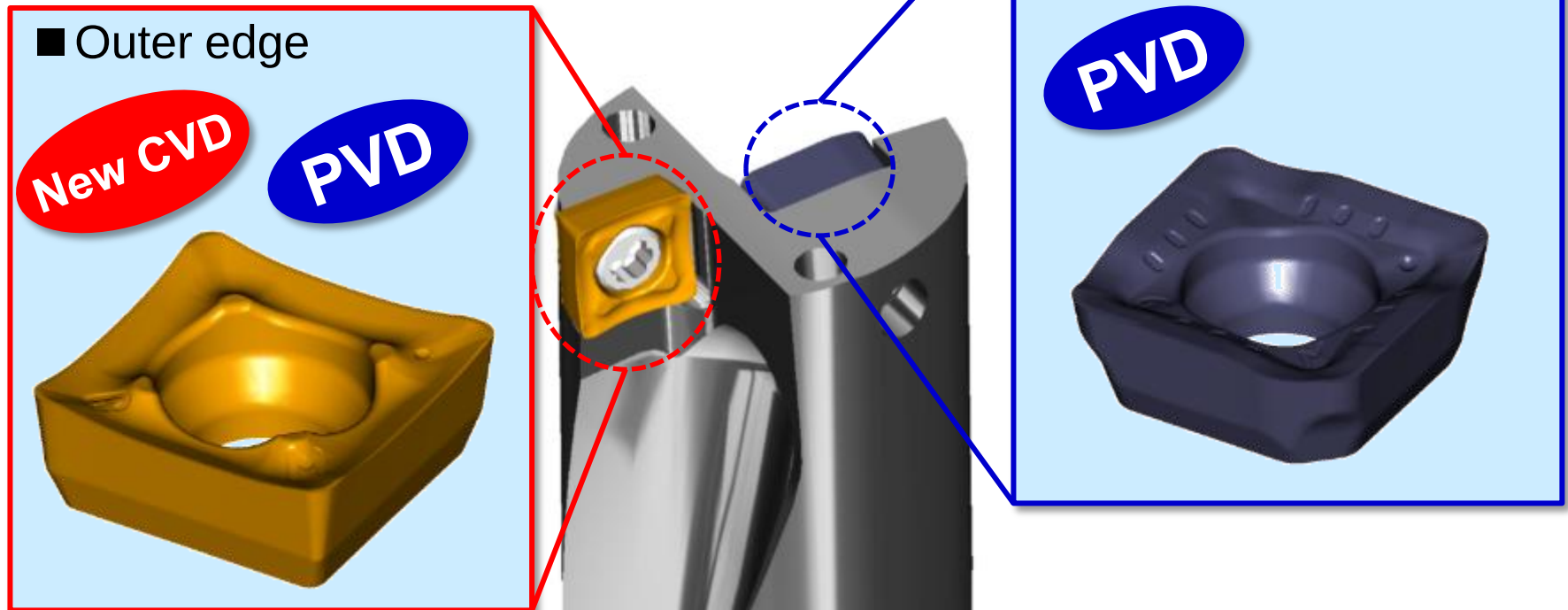
ø20-3D SUS304 Vc=100m/min

SUS304, Wet Vc=100m/min. M/C
f=0.06~0.14mm/rev , H=60mm , ø20-3D

f (mm/rev)	0.06	0.1	0.14
KYOCERA DRV S25-DRV200M-3-05 SCMT060210- SM -I(PR1535) SCMT060205- SM -E(PR1225) 			
Competitor H			Clogging · Vibration STOP machining  Clogging
Competitor C	Tangled  Long		
Competitor B	 Long Clogging	Tangled  Long Clogging	Stop the machining due to unusual vibration f=more than 0.12mm/rev

High Efficiency Indexable Drill **DRV**

■ DRV insert configuration



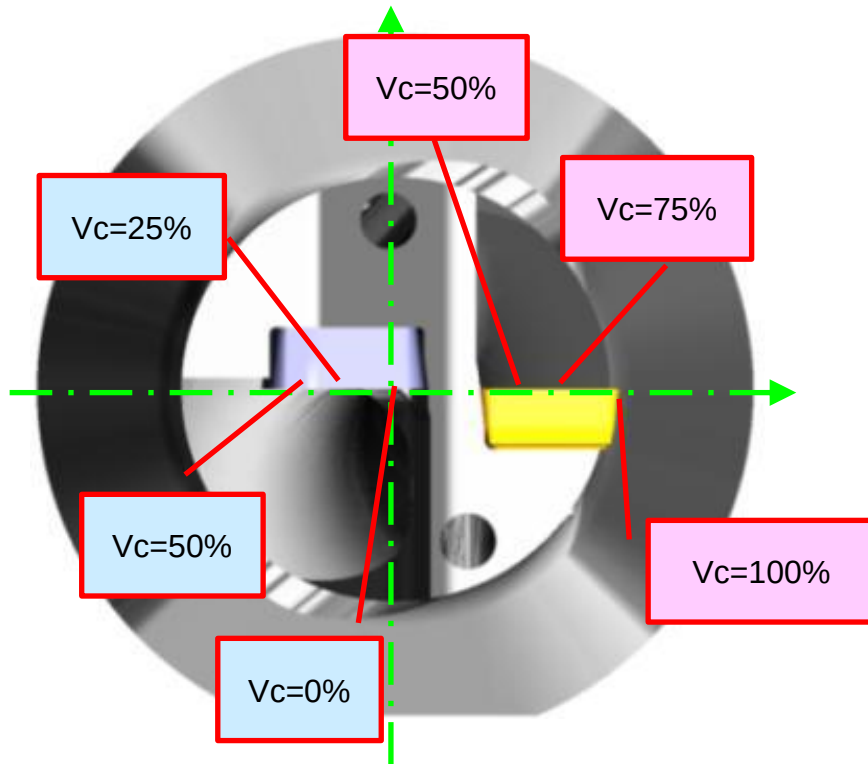
New CVD for drilling as outer insert.

High efficiency machining with high cutting speed

Outer & inner insert achieve superior chip control performance by optimization of both inserts.

High Efficiency Indexable Drill **DRV**

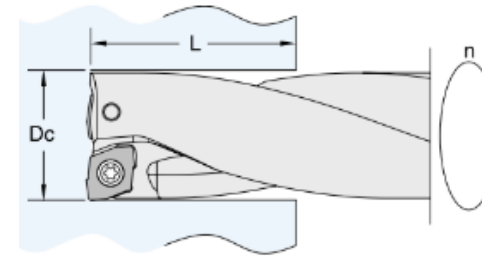
■ Edge location & cutting speed



<Bottom view of indexable drill>

Cutting speed changes by dia. point from 0 to 100%.

⇒ The efficiency can be increased by installing CVD insert as outer edge



● Cutting speed

$$V_c = \frac{\pi \times D_c \times n}{1000}$$

Vc: Cutting speed[m/min]

Dc: Diameter[mm]

n: Revolution[min^{-1}]

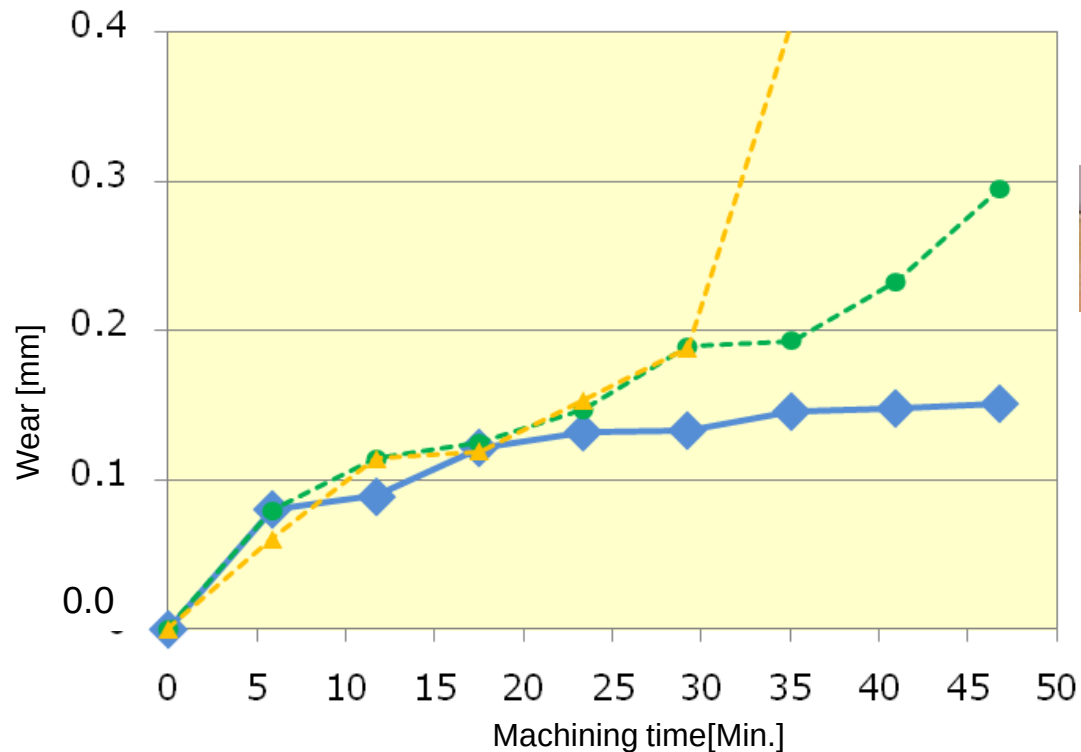
<Dia. point & cutting speed relation>

Edge	Dia.	Cutting speed Vc (m/min)				
		100	150	200	250	300
Inner	0%	0	0	0	0	0
	25%	25	38	50	63	75
Inner Outer	50%	50	75	100	125	150
Outer	75%	75	113	150	188	225
	100%	100	150	200	250	300

High Efficiency Indexable Drill **DRV**

■ Wear resistance evaluation

SCM440H, $V_c=200\text{m/min}$
 $f=0.12\text{mm/rev}$, $H=45\text{mm}$ Wet,
 $\varnothing 20\text{-}3\text{D}$



—◆— CA520D
- - ● - - CPTR. C (CVD)
- - ▲ - - CPTR. H (CVD)



CA520D
Machining time : 46 min
Wear : 0.15 mm



Competitor C
Machining time : 46 min
Wear : 0.29 mm



Competitor H
Machining time : 35 min
Wear : 0.41 mm

CA520D is developed as new CVD grade for drilling.

This grade achieves longer tool life by superior wear resistance performance,
and achieves high speed machining due to high heat resistance.

High Efficiency Indexable Drill **DRV**

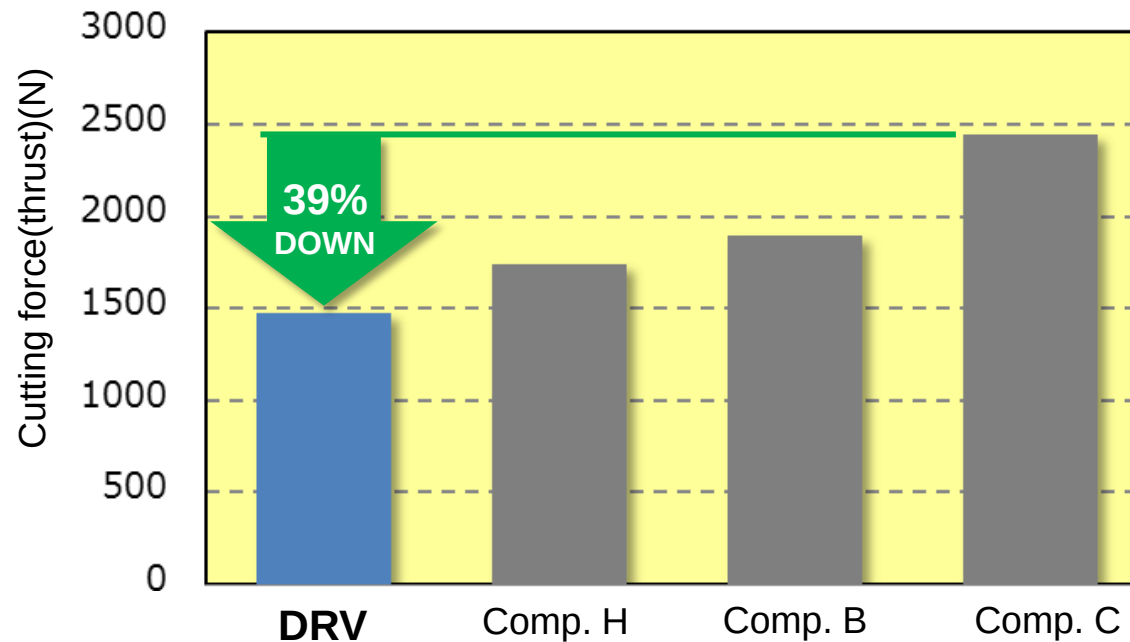
■ Cutting force comparison

– Cutting Conditions –

Work Piece :S50C, $\varnothing 20$ -3D

$V_c=200\text{m/min}$, $f=0.12\text{mm/rev}$

GM breaker

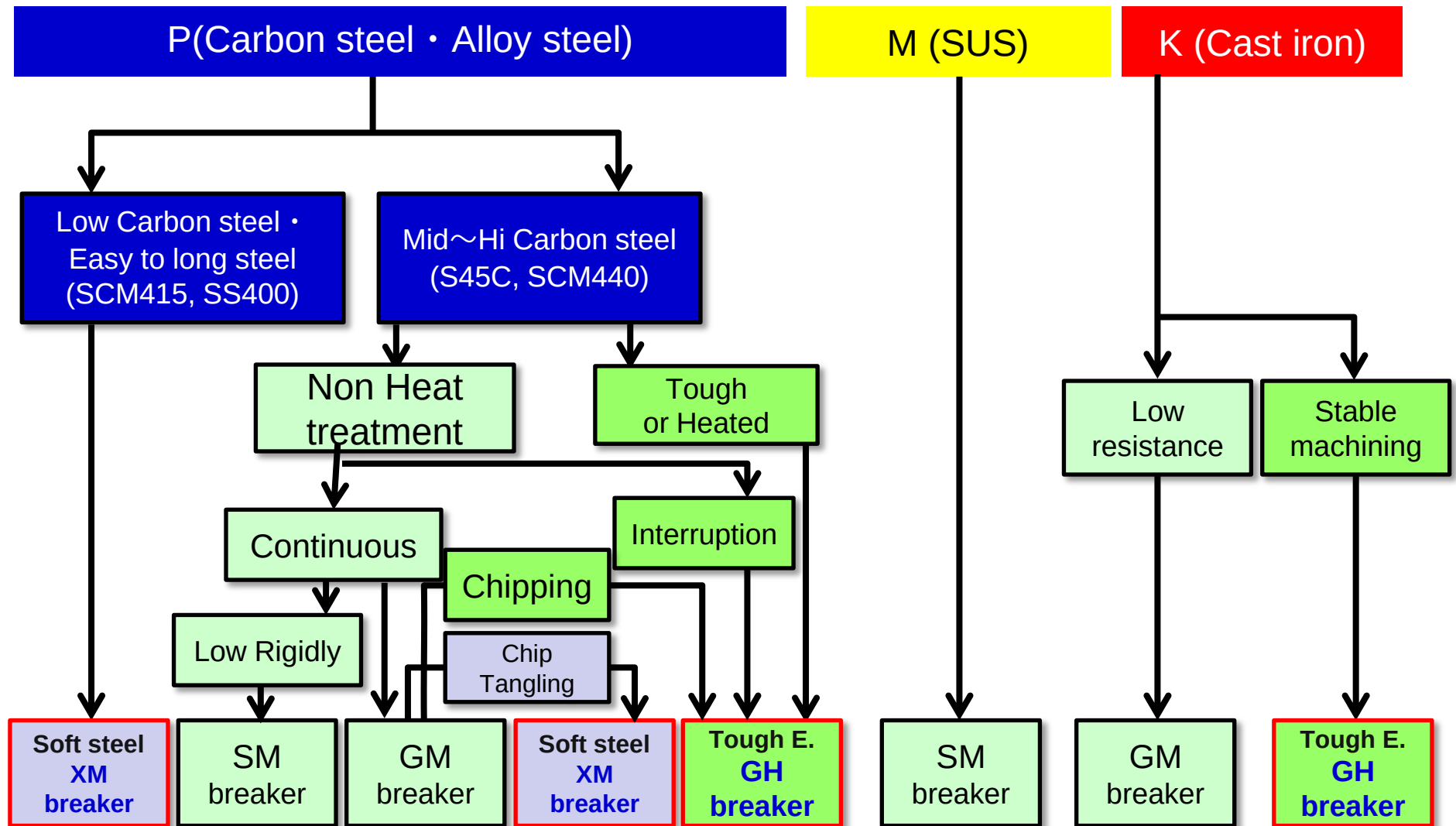


DRV is designed to machine in Low resistance.
Even in 6D Holder achieves stable machining.

High Efficiency Indexable Drill **DRV**

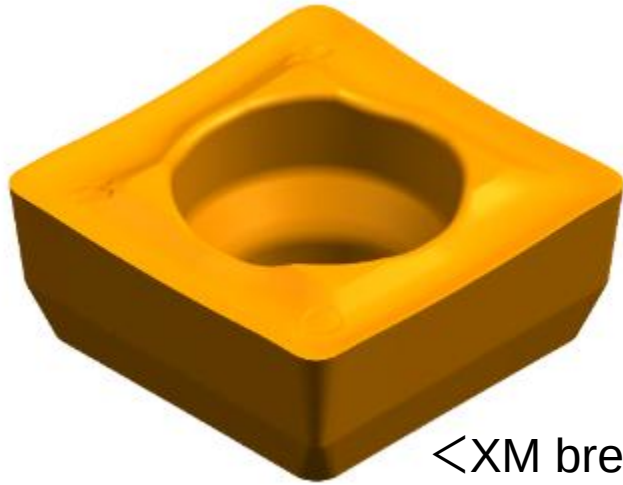
■ Breaker Selection

XM,GH : 05,06,07 size avl.

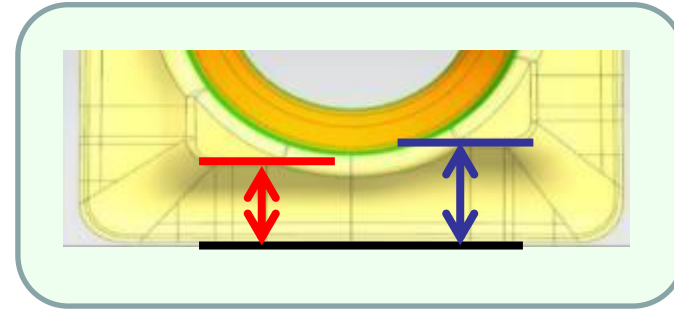


High Efficiency Indexable Drill **DRV**

■ XM breaker for Soft steel



<XM breaker>



<XM breaker's Rake angle>

Unique Designed breaker. Internal and External breaker length gradually change.



DRV XM breaker



Comp. H

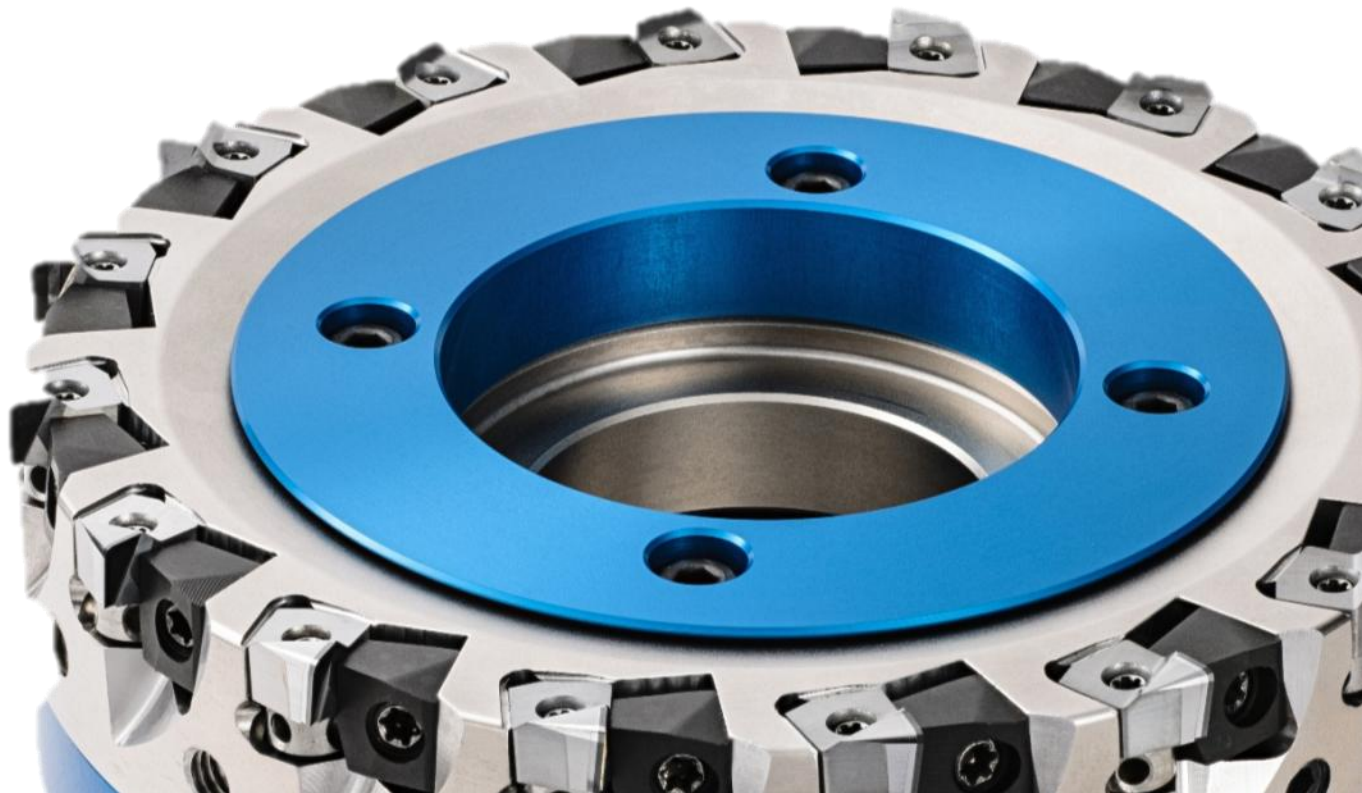
$V_c=200\text{m/min}$, $f=0.12\text{mm/rev}$, SS400, $\phi 16\text{-}3\text{D}$

XM breaker can have stable chip control for Soft and Easy to have long chip steel material.

Target: SS400, Soft steel, Customer with Chip control trouble.
(05, 06, 07 type Insert avl.)

Aluminum Use High Efficiency Finishing Cutter **MFAH**

1. Features & Design Structure
2. Performance of MFAH



Aluminum Use High Efficiency Finishing Cutter **MFAH**

■ Concept

Achievement of Burr-Less, Low Resistance, High Efficiency Machining, Wide Range of Product Depending on Cutting Applications.

■ Features

✓ Achieved Burr-Less Cutting

Large actual rake angle, Double edge insert

✓ Achieved High Speed Machining, High-Efficiency Machining

Applied an unique insert fly loss prevention mechanism

Achieved high efficiency cutting by multi-blade and low resistance design

✓ Easy Blade Run-out Adjustment Mechanism

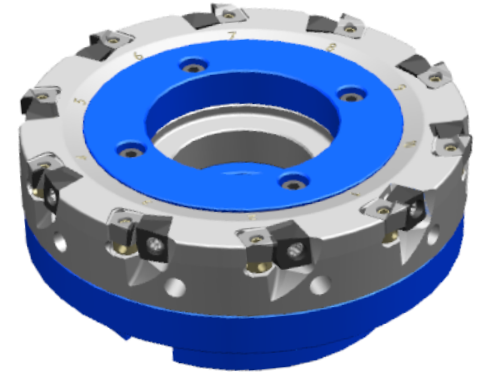
Applied an usable run-out adjustment mechanism for easy mounting and easy operation

✓ Wide Range of Products

Wide range of products including multi-blade type as compared with conventional products

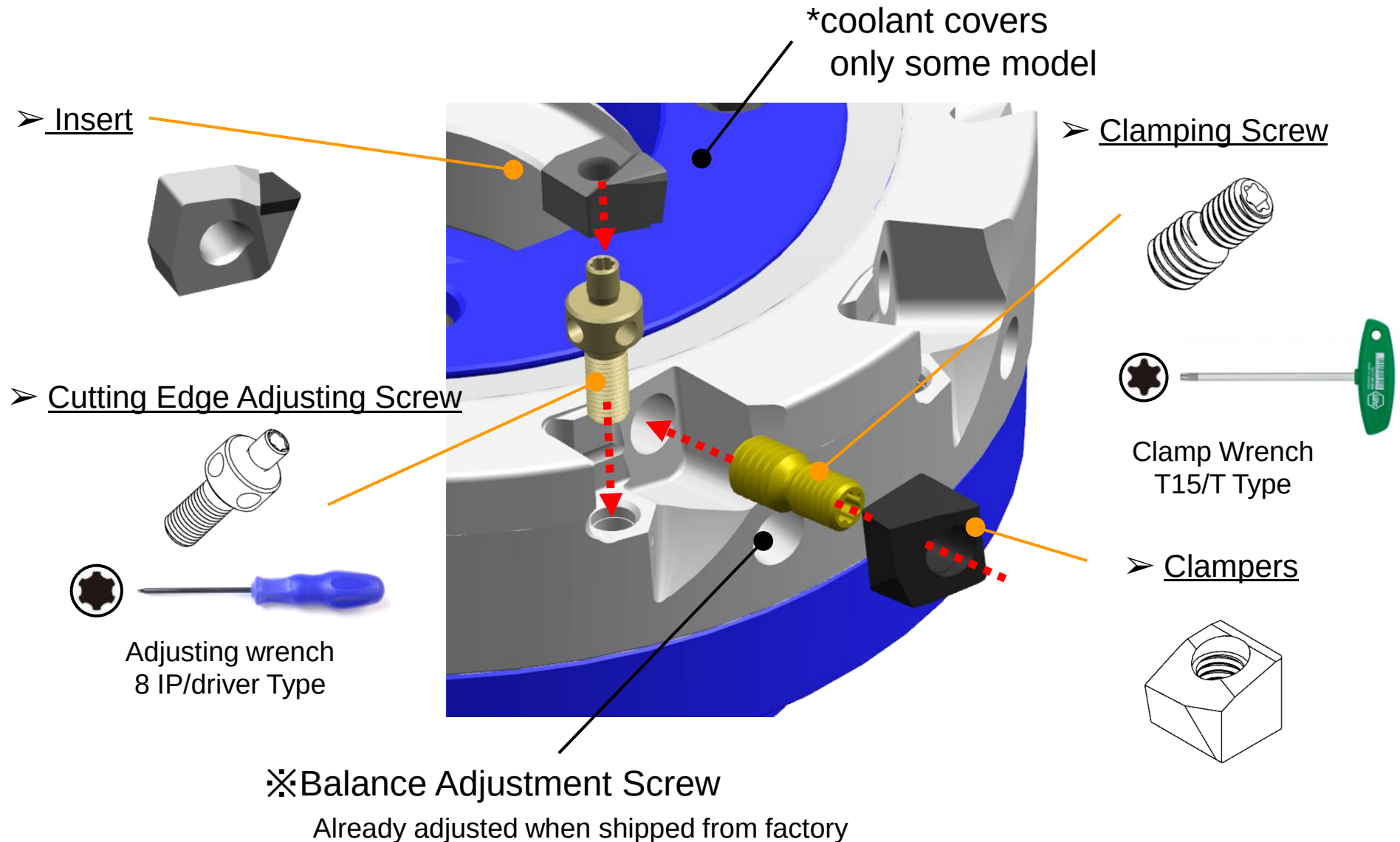
Lightweight & high rigidity cutter due to combination with aluminum alloy and steel alloy

Abundant selection of PDC inserts in accordance with various applications



Aluminum Use High Efficiency Finishing Cutter **MFAH**

■ Cutter Structural Layout, Range of Spare Parts

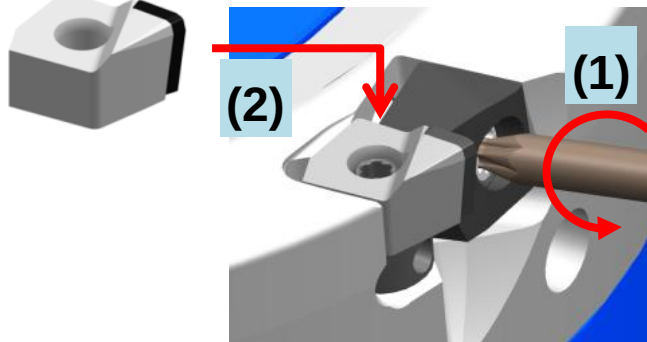


Aluminum Use High Efficiency Finishing Cutter **MFAH**

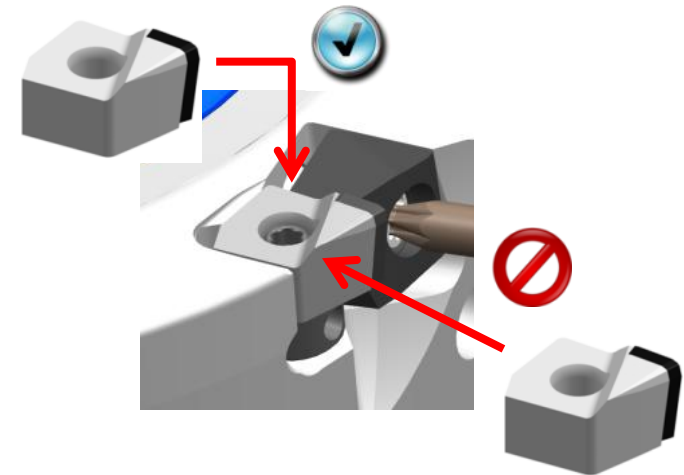
■ Easy Operation ~ Mounting of insert, Edge run-out adjustment ~

◆ Point 1 Simple Installation

- Easy positioning by guide pin



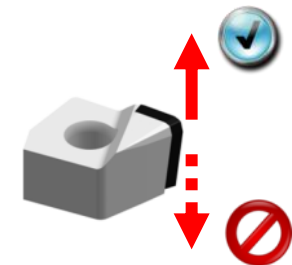
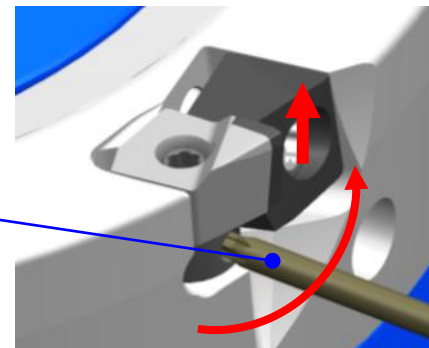
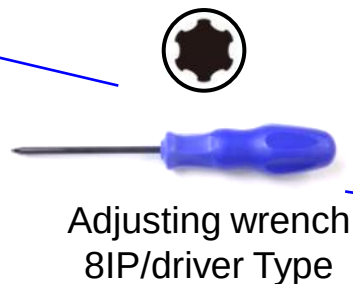
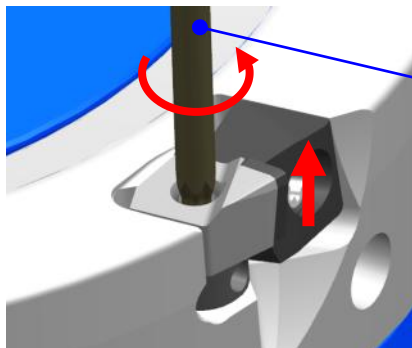
- (1) Loosen clampers
- (2) Insert guide pin



※ Remarks : Insert cannot be mounted from the peripheral side

◆ Point 2 Easily Blade Run-Out Adjustment

- Adjustable from the front side as well as the peripheral side



※ Caution :
Not adjustable towards
direction lowering
cutting edge

Operable from front side ※MFAH Unique Technology ※ Conventional Type : from the peripheral side

Aluminum Use High Efficiency Finishing Cutter **MFAH**

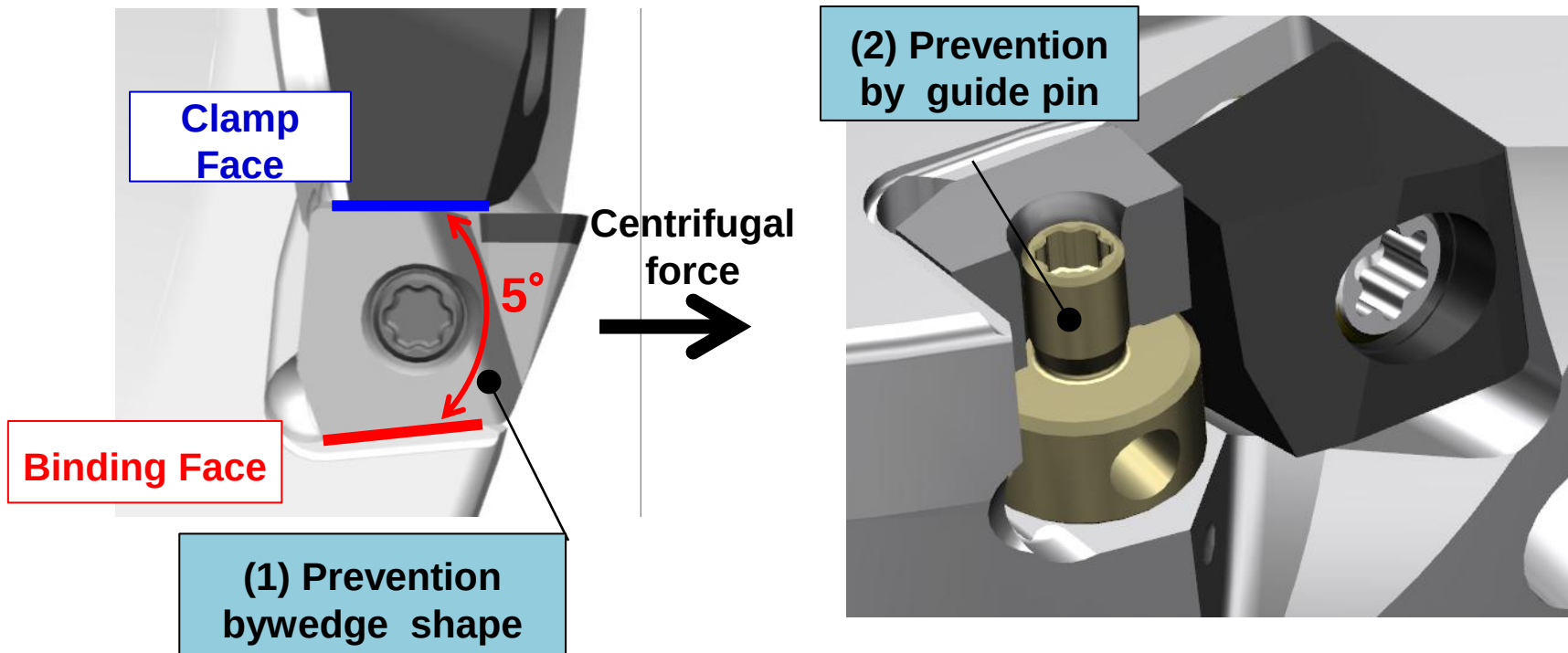
■ Anti-Fly Loss Mechanism

◆ Point 1 Fly loss prevention by wedge shape

- Insert movement by centrifugal force is suppressed by the shape binding towards the peripheral direction

◆ Point 2 Fly loss prevention by guide pin

- Structure that insert would not be pulled out to the peripheral direction by the guide pin.



Aluminum Use High Efficiency Finishing Cutter **MFAH**

■ MFAH Product Lineup ~Cutter~

MFAH 080 RS - 10T - M - SF

Cutter
Diameter

Hand

Body Type

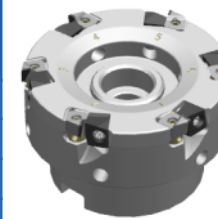
Number of
flute

Inlay
Type

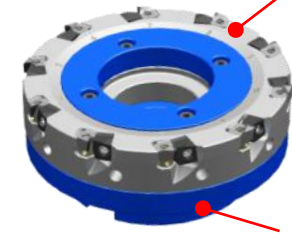
Adjustable Type

Body	Process Diameter	Number of flute		Inventory	Pills box		BT30 correspondence (3 kg or less)
Steel alloy Steel MFAH xx RSs	50	4	5	●	16	-	○
	63	5	6	●	22	-	○
	80	6	10	●	27	25.4	○
	100	8	12	●	32	31.75	○
	125	10	16	●	40	38.1	×
Aluminum alloy AL +Steel alloys steel MFAH xx RA	80	6	10	●	27	25.4	○
	100	8	12	●	27	25.4	○
		8	12	●	32	31.75	○
	125	10	16	●	27	25.4	○
		10	16	●	40	38.1	×
	160	12	20	●	40	50.8	×
	200	16	24	Catching	-	-	×
	250	20	32	Catching	-	-	×
	315	24	40	Catching	-	-	×

➤ Body Selection



Steel Body
MFAH xx RS-xx
Ø50-125

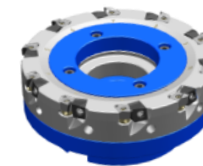


Lightweight Hybrid Body
MFAH xx RA-xx
Ø80-315

Steel
Alloy

Aluminum
Alloy

➤ Number of Cutting Flute



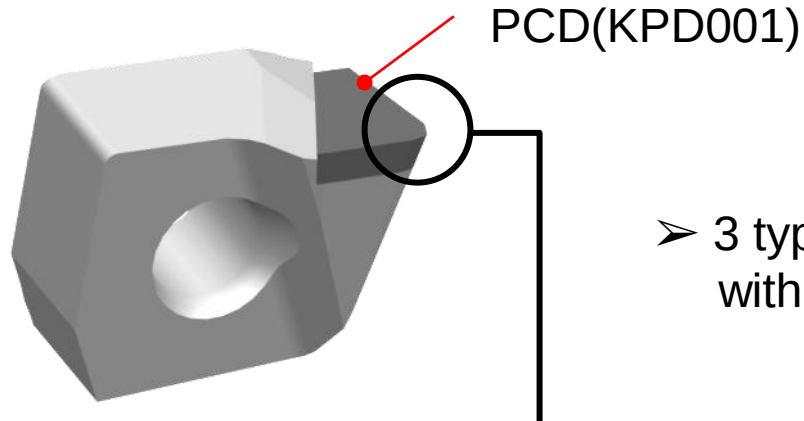
Standard Blade



Multi-Tool

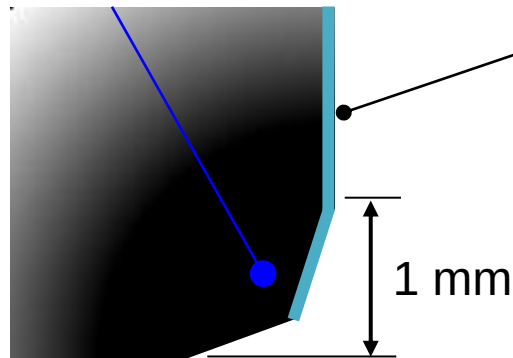
Aluminum Use High Efficiency Finishing Cutter **MFAH**

■ MFAH Product line-up ~Insert~



➤ 3 type of corner shape in accordance with the machining Application

Double Edge

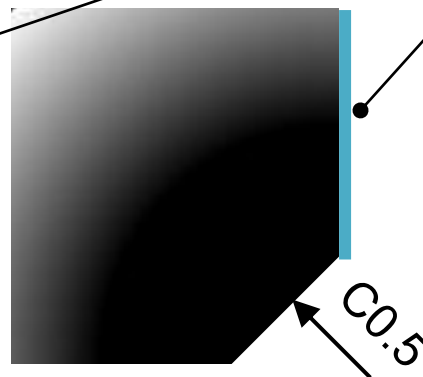


➤ ENET0905PAER-G

- Prevention of burr & edge chipping

※**First Recommendation**

Micro R Honing

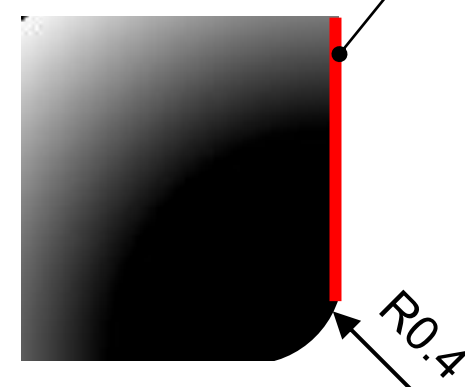


➤ ENET0905PAER-C

- Low Resistance Type

※For low rigidity work piece etc

Chamfer



➤ ENET0905PAER-R

- Cutting Edge Reinforced Type

※High intermittent work-piece etc.

Aluminum Use High Efficiency Finishing Cutter **MFAH**

■ MFAH Performance Unique Selling Point

Reference: Blade Type (MFAL)

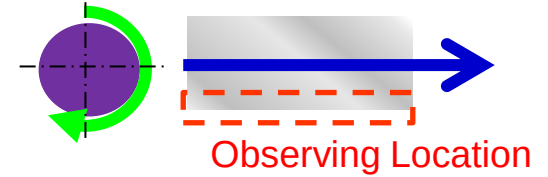


Competitors	Conventional Tool			New Tool	
	Competitor B-1	Competitor H	Competitor Z	Competitor B-2	Competitor C
Type	Insert Type	Insert Type	Blade Type	Insert Type	Insert Type
MFAH Advantage	- Not improving the efficiency (due to less number of cutting flute and high resistance) ➔ Better conditions due to more number of flutes and low resistivity - High Running Cost ➔ Cost reduction by insert type + Regrinding			- High load due to multi-flutes ➔ Achieved low resistivity and stable machining	
	- Large burr (More operations in order to remove burr) ➔ Improved quality by burr less design and reduction of operations - Take much time to adjust the edge height ➔ Improved usability due to unique mechanism				

Performance of **MFAH**

◆ **Point 1** Suppression of burr and edge chip

- Suppression burr and edge chip by big actual rake angle + doubles edge specification.



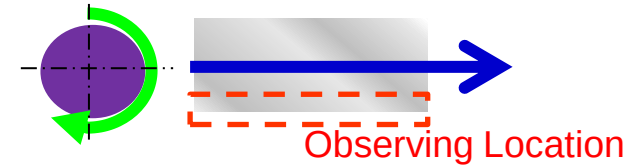
※ **Comparison with competitor's and conventional tools**

ADC12 φ63-6T	Finish Cutting Conditions (burr is easy to come out) $V_c = 2,000\text{mm/min}$, $a_p = 0.5\text{mm}$, $f_z = 0.05\text{mm/t}$	Rough Cutting Conditions (edge chip is easy to occur) $V_c = 2,000\text{mm/min}$, $a_p = 1.5\text{mm}$, $f_z = 0.15\text{mm/t}$
MFAH Type ENETxx-G Double Edge		
Competitor B C0.5		
Competitor H C0.25		
Competitor Z C0.2		

Performance of **MFAH**

◆ **Point 1 Suppression of Burr and Edge Chip**

- Suppress the burr and edge chip
by big actual rake angle+ doubles edge specification.



※ **Comparison with competitor's tools**

ADC12 φ80-10T	Finish Cutting Conditions(burr is easy to come out) $V_c = 2,500\text{mm/min}$, $a_p = 0.5\text{mm}$, $f_z = 0.05\text{mm/t}$	Rough Cutting Connditions (Edge Chip is easy to occur) $V_c = 2,500\text{mm/min}$, $a_p = 1.5\text{mm}$, $f_z = 0.15\text{mm/t}$
Type MFAH ENETxx-G Double edge		
Competitor B Double Edge		
Competitor C R0.8		

MFAH enables to minimize the burr and edge chip in comparison with competitors' latest tools.

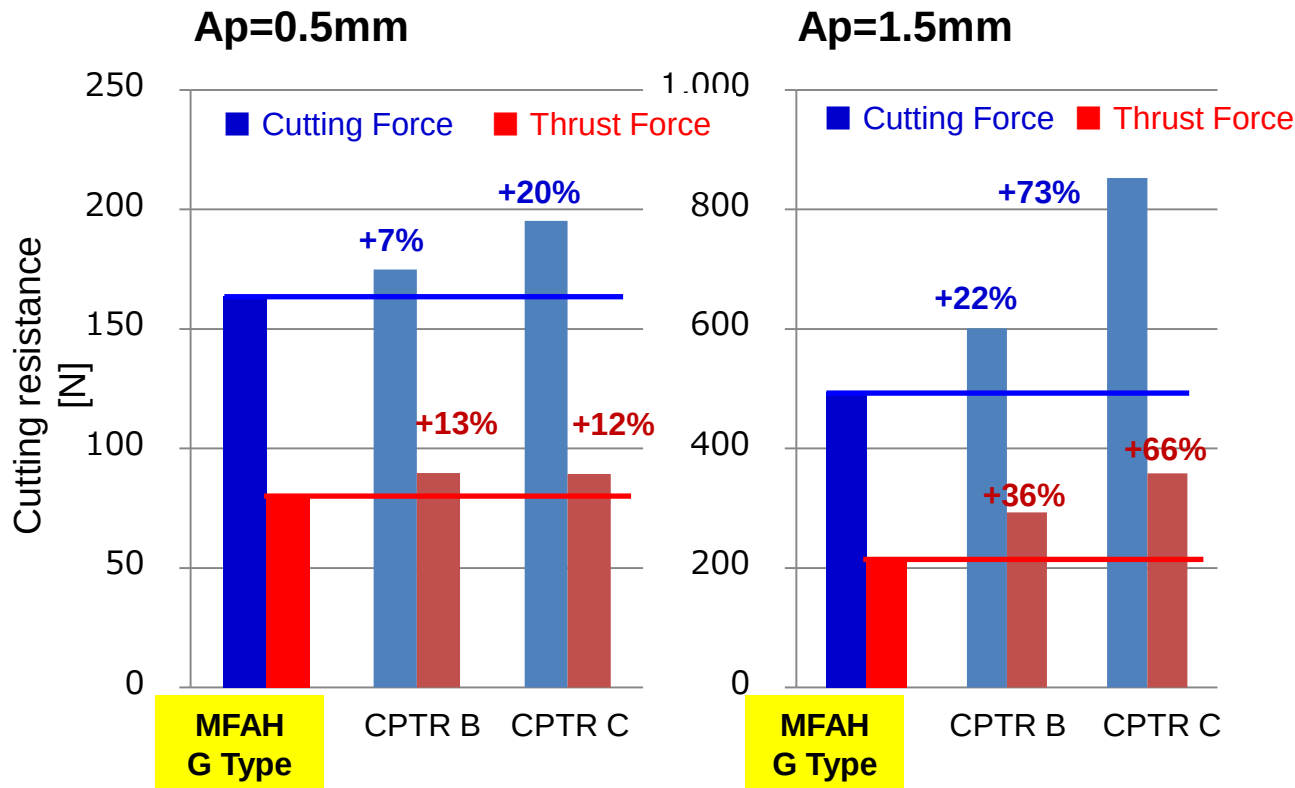
※ Superior to the competitor B, by having a large actual rake angle.

Performance of **MFAH**

◆ **Point 2 Low Resistance Design**

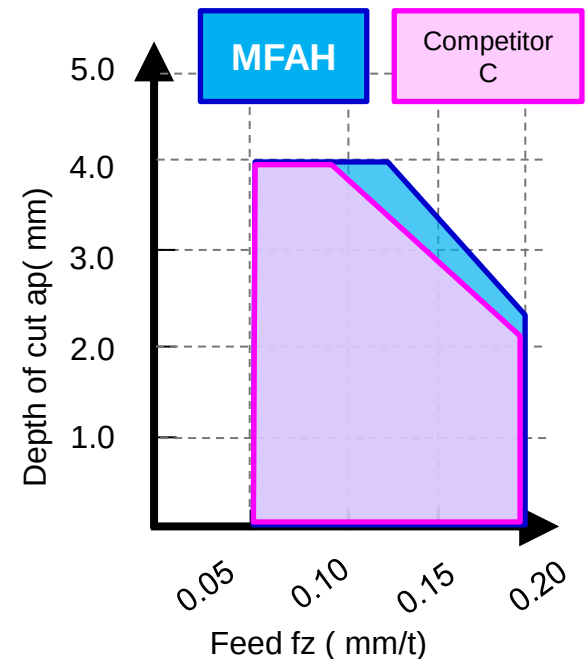
- Low resistance in accordance with the companies new tools
- Achieved high efficiency cutting by multi flute cutting edge**

Work :ADC12
Cutter :MFAH080RS-10T
Insert : ENET0905PAER-G(KPD001)
Vc :2,500 m/min
Ae :55 mm
Coolant :Wet



Resistance reduction for approx 10% in Finish Cutting Condition and more than 20% in Rough Cutting Condition

<Machining range comparison>



BT50 M/C

※output 30 kw or less cutting areas

Wider Machining Range

High Efficiency 88° cutter **MFSN88**
High Efficiency 66° cutter **MFPN66**



MFSN88



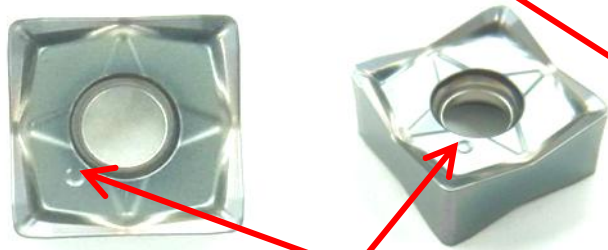
MFPN66

High Efficiency 88° Cutter **MFSN88**

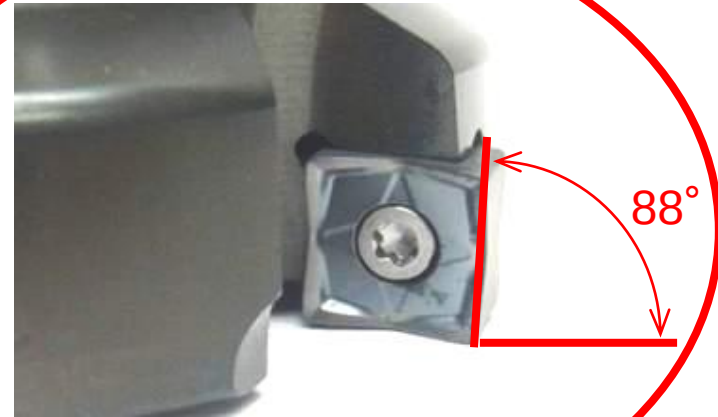
■ Product Design & Concept



- ✓ Approach Angle 88 °
- ✓ 3 Insert Chip-breaker
- ✓ High Economical Double-sided 8 Cutting Edges
- ✓ Cross Pitch & Extra Cross Pitch Design



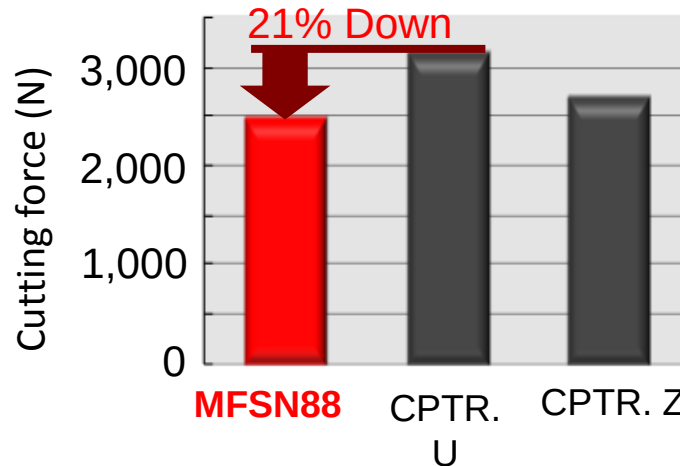
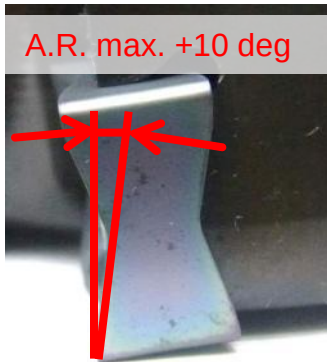
Edge identification mark



High Efficiency 88° Cutter **MFSN88**

Product Features

Feature 1: Low cutting force design



Cutting conditions

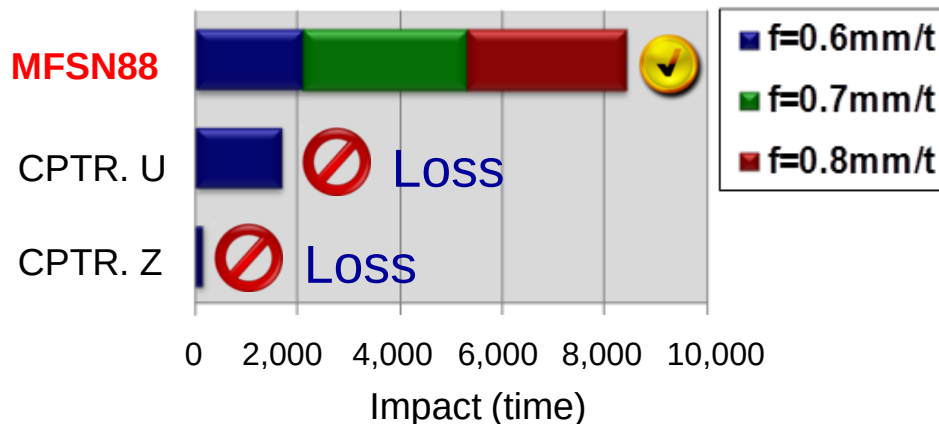
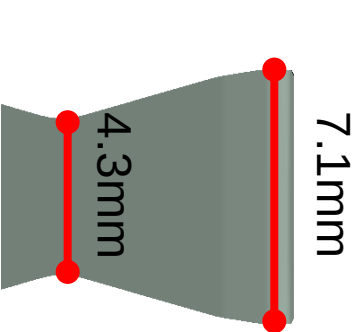
Workpiece material: SCM440

Cutter dia.: 100mm

$V_c=200\text{m/min}$, $f_z=0.2\text{mm/t}$,

$a_p \times a_e = 4 \times 50\text{mm}$

Feature 2: Superior fracture resistance



Cutting conditions

Workpiece material (38~40HRC)

Cutting dia.: 100 mm

$V_c=100\text{m/min}$, $f_z=0.6\sim0.8\text{mm/t}$, $a_p \times a_e$

$= 2 \times 40\text{mm}$

High Efficiency 88° Cutter **MFSN88**

Line up

Insert

Description	Grade
SNMU130508EN-GM	PR1510, PR1525, PR1535, TN620M
SNMU130508EN-SM	PR1510, PR1525, PR1535
SNMU130508EN-GH	PR1510, PR1525, PR1535

Holder

(Unit: mm)

Description				Dia.	N of flute
Metric type	Cross pitch	MFSN	88050R-4T-M-G	50	4
			88063R-5T-M-G	63	5
			88080R-6T-M-G	80	6
			88100R-7T-M-G	100	7
			88125R-9T-M-G	125	9
			88160R-11T-M-G	160	11
	Ex cross pitch	MFSN	88050R-5T-M-G	50	5
			88063R-7T-M-G	63	7
			88080R-9T-M-G	80	9
			88100R-11T-M-G	100	11
			88125R-13T-M-G	125	13
			88160R-15T-M-G	160	15

Description				Dia.	N of flute
Inch type	Cross pitch	MFSN	88080R-6T-G	80	6
			88100R-7T-G	100	7
			88125R-9T-G	125	9
			88160R-11T-G	160	11
	Ex.Cross pitch	MFSN	88080R-9T-G	80	9
			88100R-11T-G	100	11
			88125R-13T-G	125	13
			88160R-15T-G	160	15

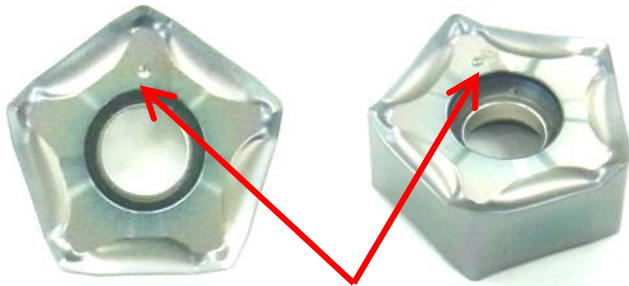
Description			Dia.	N of flute
EM	MFSN	88032R-S32-2T-G	32	2
		88040R-S32-3T-G	40	3

High Efficiency 66° cutter **MFPN66**

■ Product Design & Concept



- ✓ Approach angle 66 °
- ✓ Unique twist edge shape
- ✓ Double-sided 10 cutting edges
- ✓ Cross pitch, EX cross pitch design



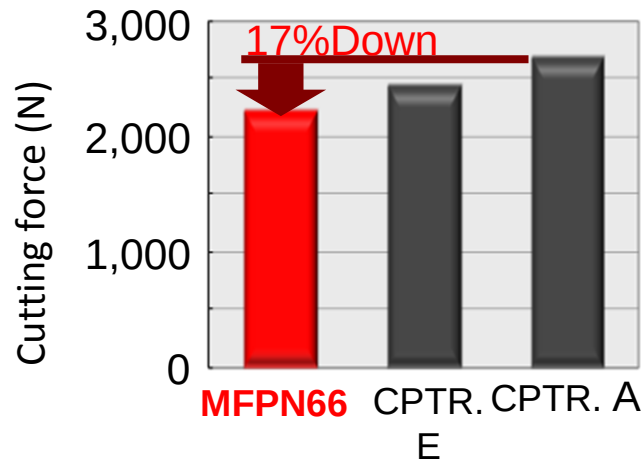
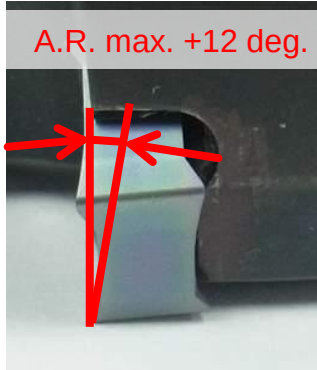
Edge identification mark



High Efficiency 66° cutter **MFPN66**

Product Features

Feature 1: Unique twisted edge design



Cutting conditions

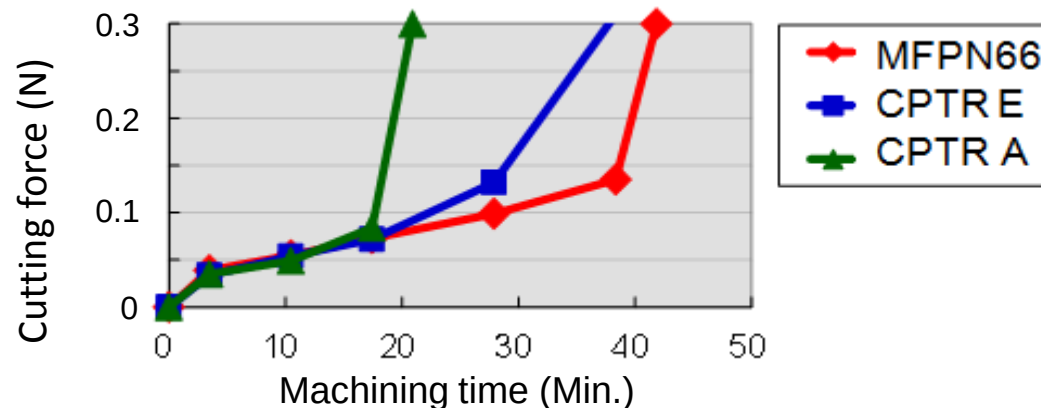
Workpiece material: SCM440

Cutter Dia.: 100mm

$V_c=200\text{m/min}$, $f_z=0.2\text{mm/t}$,

$a_p \times a_e=4 \times 50\text{mm}$

Feature 2: Longer tool life with MEGACOAT NANO



Cutting conditions

Workpiece material: SKD11

Cutter Dia.: 100 mm

$V_c=150\text{m/min}$, $f_z=0.15\text{mm/t}$,

$a_p \times a_e=2 \times 40\text{mm}$

High Efficiency 66° cutter **MFPN66**

Line up

Insert

Description	Grade
PNMU0905XNER-GM	PR1510, PR1525, PR1535 TN620M
PNMU0905XNER-SM	PR1510, PR1525, PR1535
PNMU0905XNER-GH	PR1510, PR1525, PR1535

Holder

(Unit: mm)

Description				Dia.	N of flute
Metric type	Cross pitch	MFPN	66050R-4T-M-G	50	4
			66063R-5T-M-G	63	5
			66080R-6T-M-G	80	6
			66100R-7T-M-G	100	7
			66125R-9T-M-G	125	9
			66160R-11T-M-G	160	11
	Ex. Cross pitch	MFPN	66050R-5T-M-G	50	5
			66063R-7T-M-G	63	7
			66080R-9T-M-G	80	9
			66100R-11T-M-G	100	11
			66125R-13T-M-G	125	13
			66160R-15T-M-G	160	15

Description				Dia.	N of flute
Inch type	Cross	MFPN	66080R-6T-G	80	6
			66100R-7T-G	100	7
			66125R-9T-G	125	9
			66160R-11T-G	160	11
	Ex. Cross	MFPN	66080R-9T-G	80	9
			66100R-11T-G	100	11
			66125R-13T-G	125	13
			66160R-15T-G	160	15

Model			Dia.	N of flute
E M	MFPN	66032R-S32-2T-G	32	2
		66040R-S32-3T-G	40	3

Differences from **MFWN90** & **MFPN45**

MFSN88 appeal point



MFSN88

The performance is equal to MFWN90 type with better cost efficient (8 cutting edges).

*MFSN88 cannot cover 90° shouldering & plunging machining.



MFWN90

MFPN appeal point



MFPN66

Cutting forces are equal to MFPN45 type, and radial force is 40% lower than MFPN45 type.

*Suitable in small work piece or low rigidity clamping, lower price than PNMU12 type insert .



MFPN45

Summary of Face Milling Cutter

- (1) MFPN45/MFWN90: for large d.o.c & MFPN66/MFSN88 : for small d.o.c
- (2) MFPN66/MFSN88 in case smaller dia. is required, Line-up min. $\varnothing 32$

Cermet for Milling **TN620M**

《 Features 》

① Designed for Milling application.

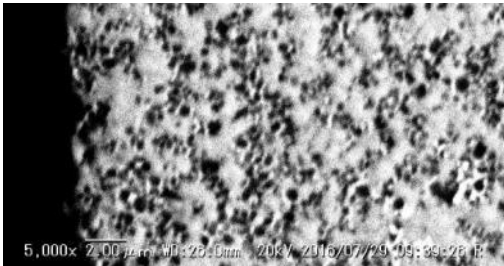
Excellent fracture resistance with surface-hardened layer using gradient composition technology

→ **Excellent surface finish** even in S50C, SS400, etc.

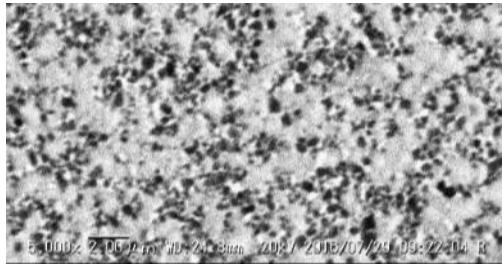
② Super Micro-Grain Thought Cermet

→ Provide Stable machining, **Long tool life with good surface finish.**

TN620M Structure



Surface structure



Inner structure

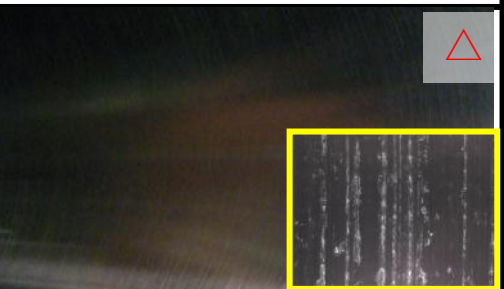


Grade Specification

Grade	Gravity	Hardness (Hv)	Fracture Toughness (MPa · m ^{1/2})	Transverse Strength (MPa)
TN620M	6.9	1,550	9.0	2,500
TN100M	6.7	1,520	10.5	1,860

Machining Performance **TN620M**

◆ Quality Finish Surface (Work piece brightness)

Machining distance	TN620M	PR1525	Comp. A (Negative insert, Cermet)
0.26 m	 A circular icon with a red outline is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears smooth and bright.	 A circular icon with a red outline is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears smooth and bright.	 A triangular icon with a red outline is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears smooth and bright.
2.34 m	 A circular icon with a red outline is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears smooth and bright.	 A triangular icon with a red outline is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears smooth and bright.	 A red 'X' icon is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears very rough and dark.
8.84 m	 A circular icon with a red outline is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears smooth and bright.	 A red 'X' icon is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears very rough and dark.	 A circular icon with a red outline is in the top right corner. A yellow rectangular inset shows a magnified view of the surface, which appears smooth and bright.

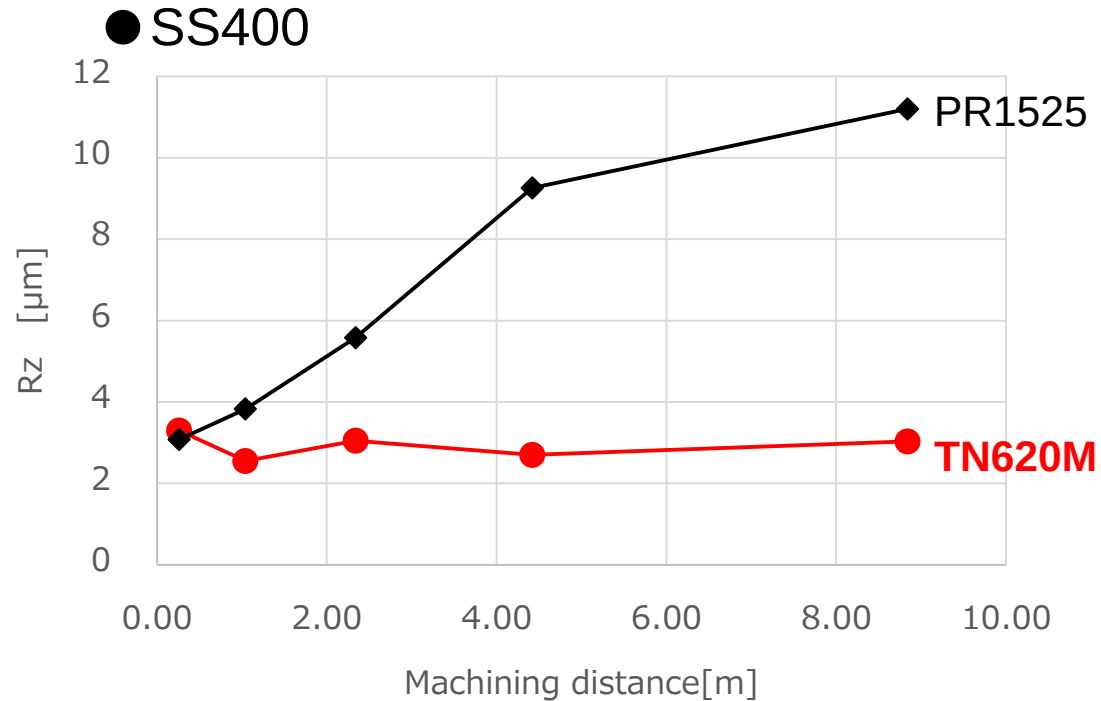
Cutting condition

Vc=250 m/min, ap=1.0 mm, fz=0.1 mm/t, n=637 min⁻¹, Z=7(TN620M), DRY, SS400,
Kyocera :MFPN45125R-7T-M, PNEU1205ANER-GL (TN620M,PR1525)

Excellent Surface finish with brightness

Machining Performance **TN620M**

◆ Finish Surface comparison (Surface Roughness)



Cutting condition

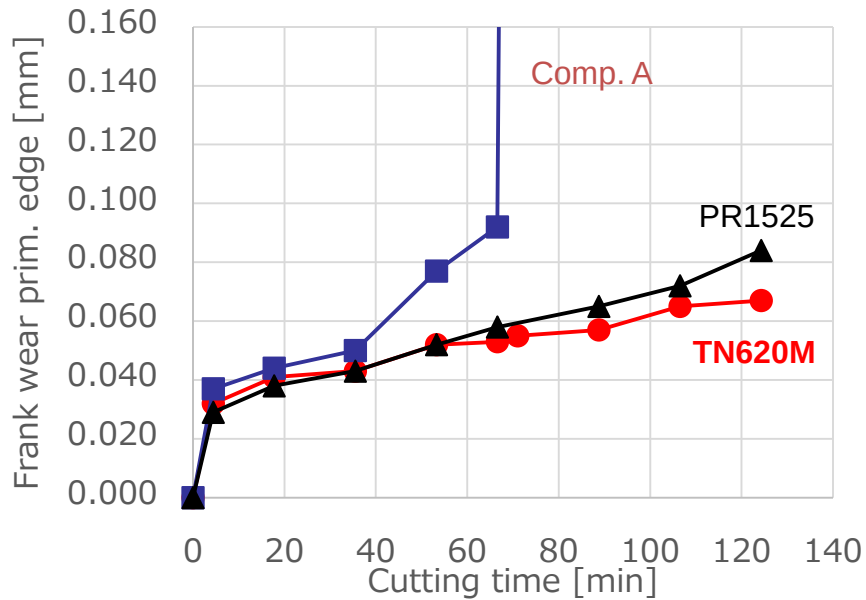
Vc=250 m/min, ap=1.0 mm, fz=0.1 mm/t, n=637 min⁻¹, Z=7(TN620M), DRY, SS400

Kyocera : MFPN45125R-7T-M, PNEU1205ANER-GL (TN620M,PR1525),

Stable Surface roughness

Machining Performance **TN620M**

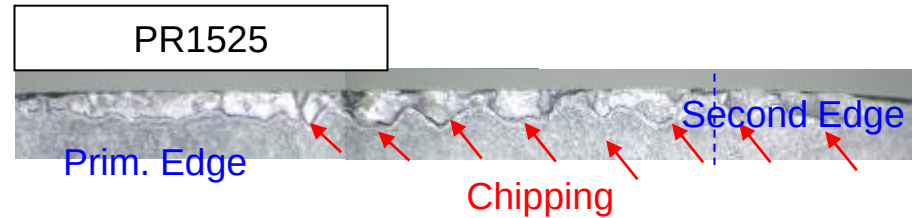
◆ Frank wear comparison



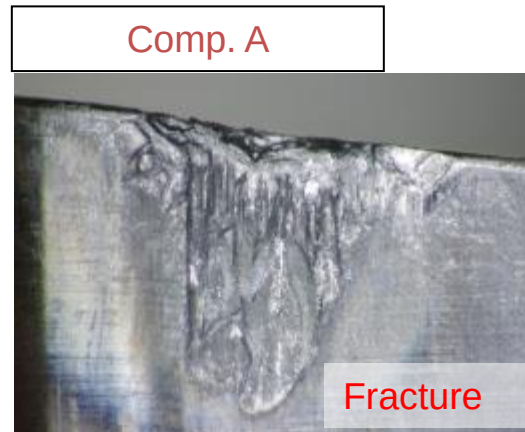
Cutting condition

$V_c=230$ m/min, $a_p=1.0$ mm, $a_e=110$ mm, $f_z=0.10$ mm/t, $n=586$ min⁻¹, $Z=1$,
DRY, SCM440,
Kyocera : MFPN45125R-7T-M, PNEU1205ANER-GL (TN620M, PR1525)

☆ After 124.3 min



☆ After 66.6 min



Provide Stable machining and **Long tool life.**

Line-up of **TN620M**

◆ Line-up

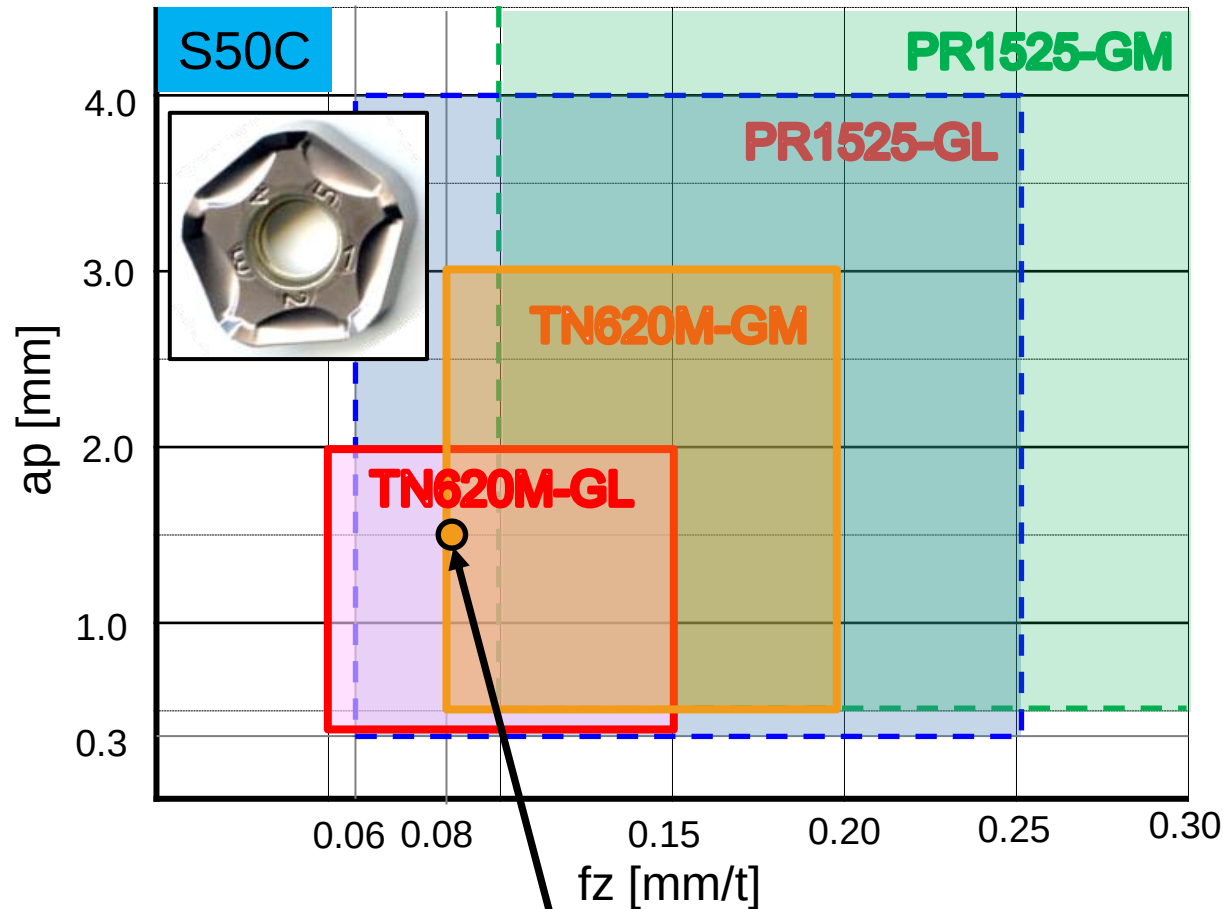
Milling type	Description	TN620M	TN100M
MFPN	PNEU1205ANEL-GL	●	
	PNEU1205ANER-GL	●	
	PNEU1205ANER-W	●	●
	PNMU1205ANEL-GM	●	
	PNMU1205ANER-GM	●	
MFWN	WNEU080608EN-GL	●	
	WNMU080604EN-GM	●	
	WNMU080608EN-GM	●	

Available in MFPN/MFWN series

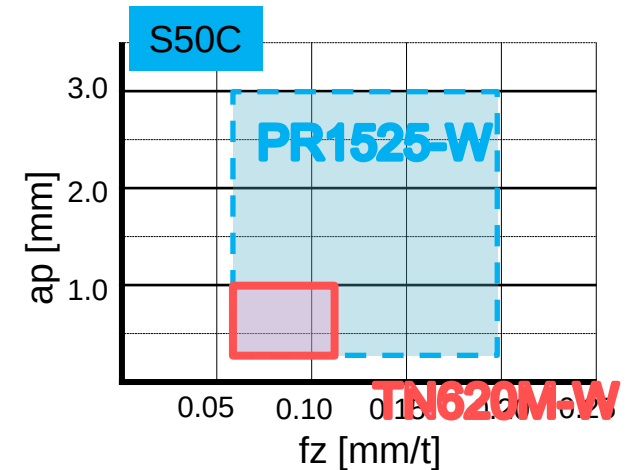


Application of **TN620M**

◆ TN620M area MAP (PNMU/PNEU)



Cutting condition
Vc=200 m/min, n=509 min⁻¹
ae=110 mm, Z=7, DRY, S50C, Center cutting
MFPN45125R-7T-M,
PNMU1205ANER-GM
PNEU1205ANER-GL



See next Slide for Surface comparison of GM breaker (PR1525, TN620M)

Application of **TN620M**

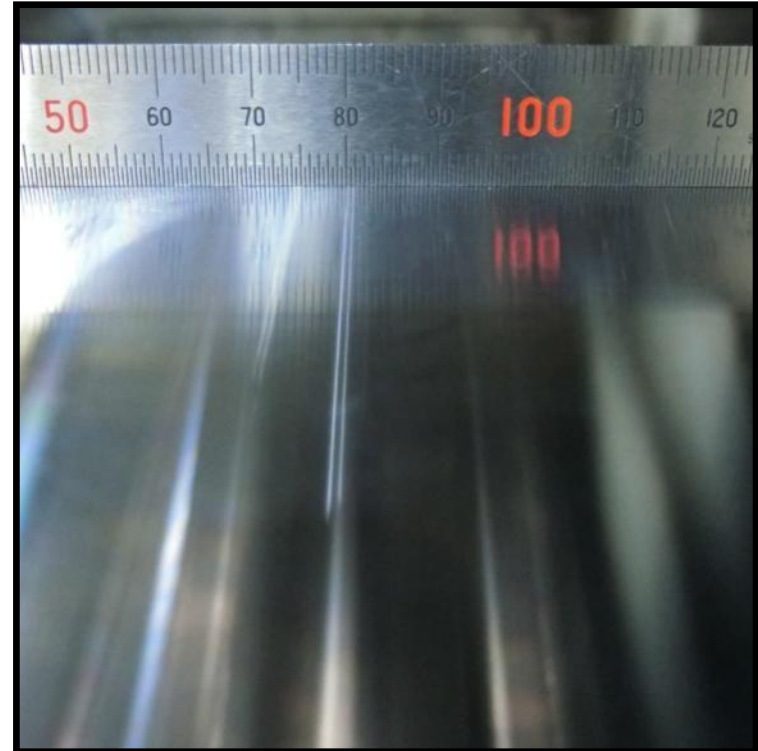
◆ Machining Surface comparison

TN620M



Brightness ○

PR1525



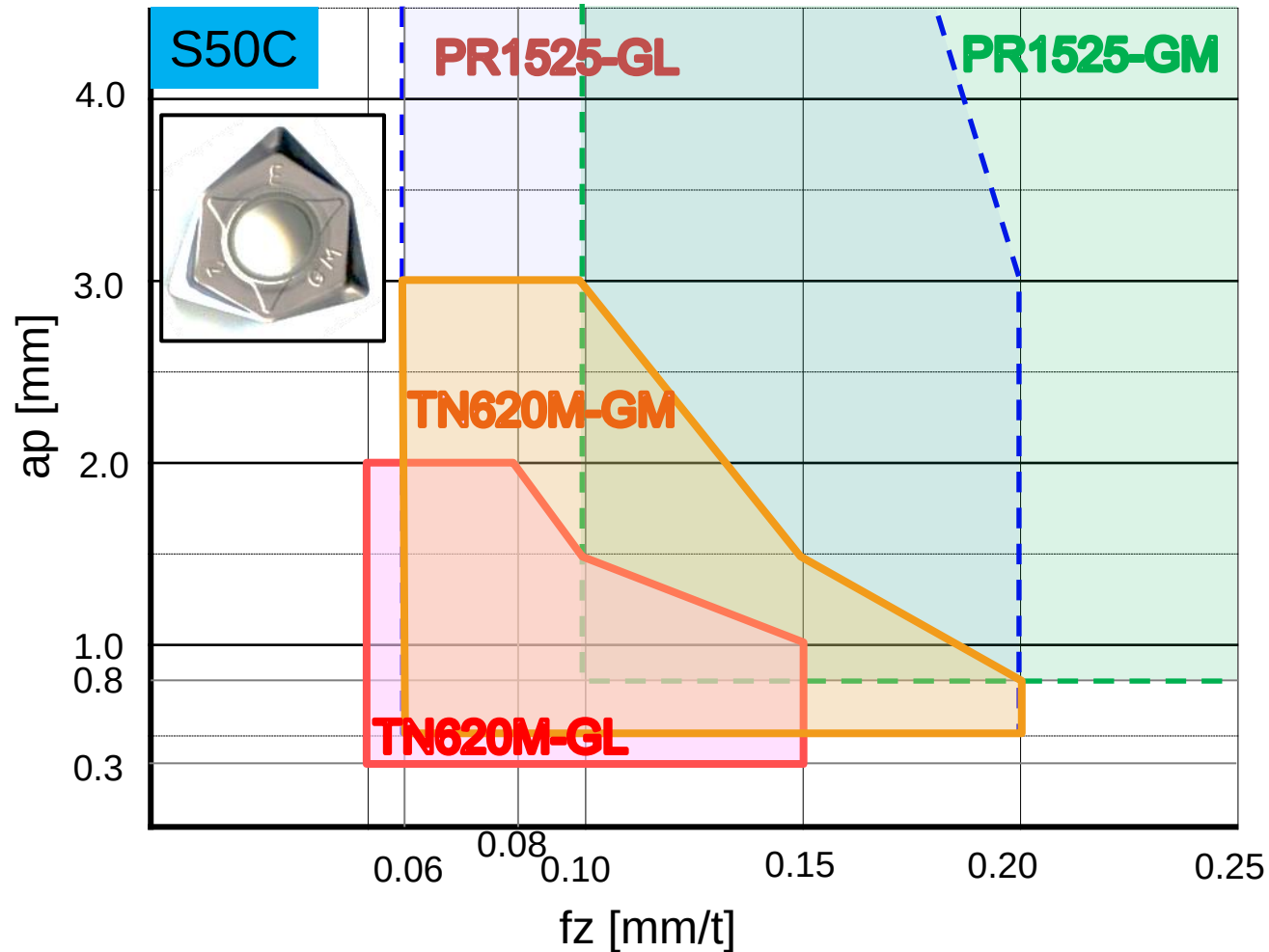
Brightness △

Cutting condition

Vc=200 m/min, n=509 min⁻¹, ap=1.5 mm, ae=110 mm, fz=0.08 mm/t,
Z=7, DRY, S50C, Center cutting, MFPN45125R-7T-M, PNMU1205ANER-GM

Application of **TN620M**

◆ TN620M Application MAP(WNMU/WNEU)



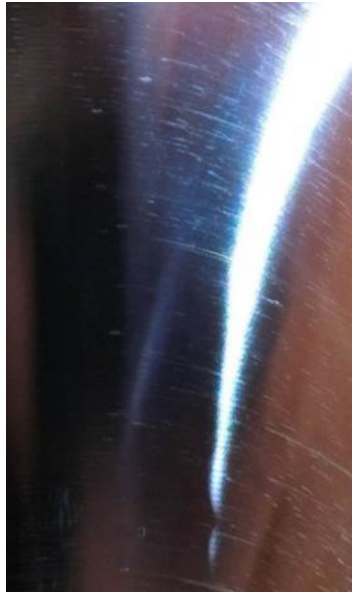
Cutting condition

Vc=200 m/min, n=509 min⁻¹
ae=110 mm, Z=6, DRY, S50C, Center cutting
MFWN90125R-6T-M, WNEU080608EN-GL,
WNMU080608EN-GM

Application of **TN620M**

◆ Machining Surface comparison

TN620M



Brightness ©

PR1525



Cloudy ×

Machined Work piece surface

Cutting condition

Vc=212 m/min, ap=1.0 mm, fz=0.11 mm/t, Z=6, DRY, S45C
MFPN45100R-6T-M, PNEU1205ANER-GL

- PR1525 has Cloudiness in Work piece
- TN620M has Brightness excellent finish surface

Roughing end-mill for high efficiency in difficult materials

4/5/6RFH



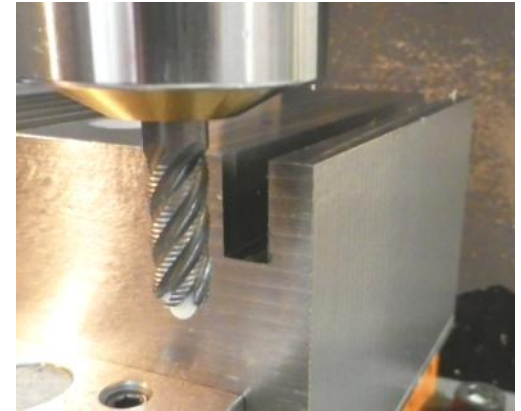
Roughing end-mill for high efficiency in difficult materials *RFH*

■ Overview

- For roughing in such as stainless steel and titanium-alloy. Improve efficiency in deep machining or grooving. Applicable grooving $2 \times D$ in titanium alloy.
- Superior fracture resistance due to special radius design of cutting edge. Using coolant achieves deep grooving with multi-edge specification.

■ Application

- Recommend of use
 - To improve roughing efficiency or reduce machining time.
 - To decrease cutting force due to machine low rigidity.
 - To cut deep roughing at one pass
 - To improve chip control performance
- Work piece material: Titanium alloy, Stainless steel etc.



Design and features of *RFH*

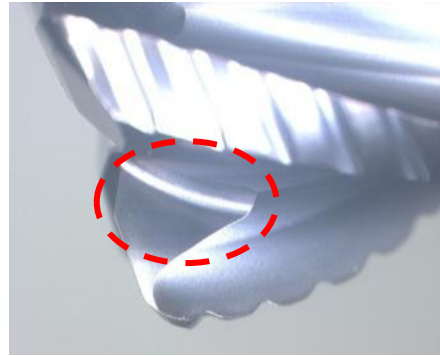
1. Design for high-efficient machining

● Coolant hole



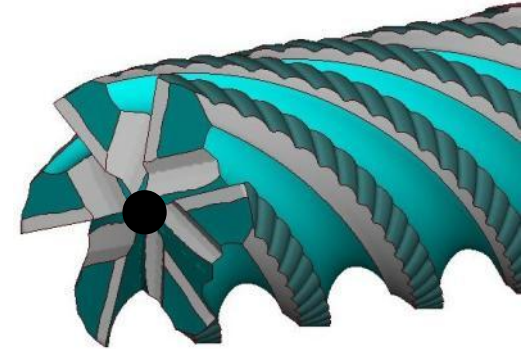
Central coolant hole delivers coolant effectively enhancing chip removal when pocketing or slotting

● Radius gashes



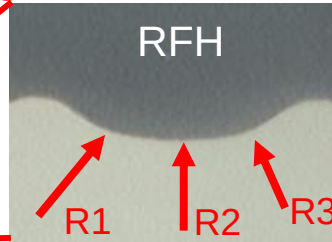
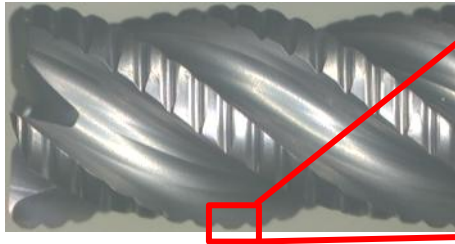
Easy to flow internal coolant and smooth evacuation.

● Line up large diameter with multi-edge



Large diameter type keeps efficiency in slotting.

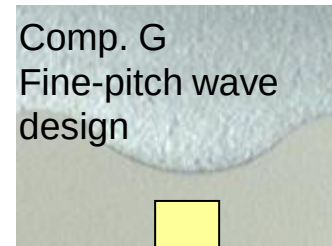
2. Composite radius edge restrains fracture



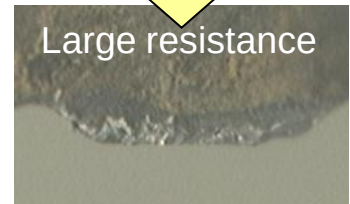
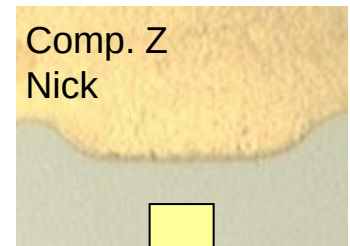
- External cutting edge have multiple R to reduce stress concentration.
- Easy to bite to work piece than nick type and achieve stable machining.

Design of comp.'s & Damage condition.

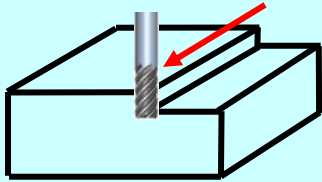
Comp. G
Fine-pitch wave
design



Comp. Z
Nick



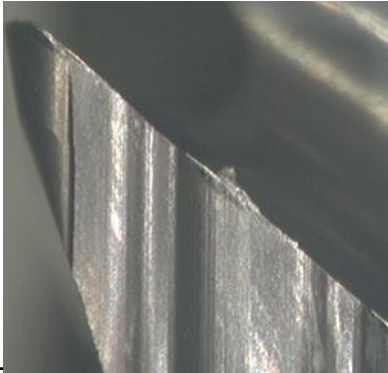
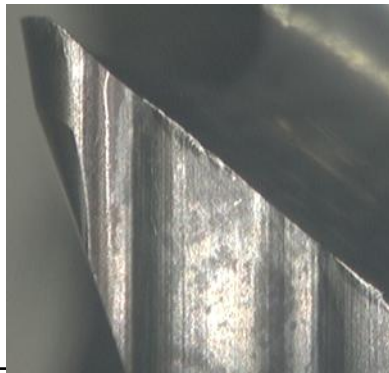
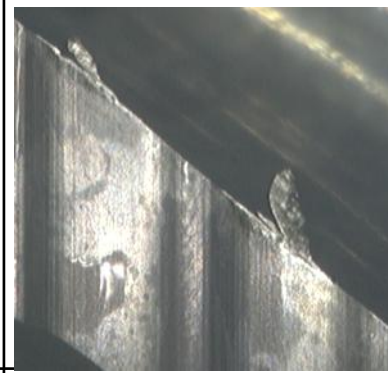
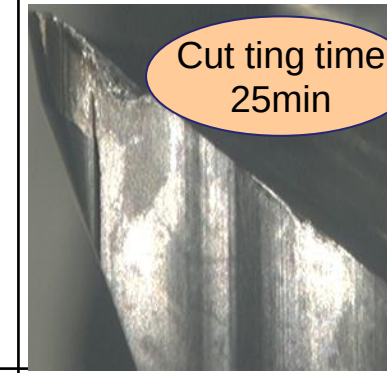
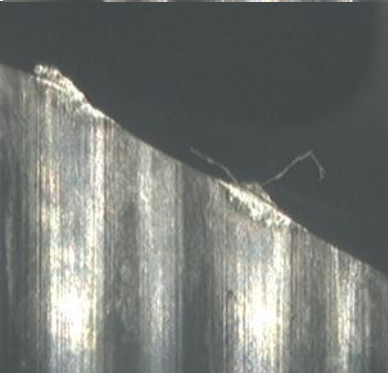
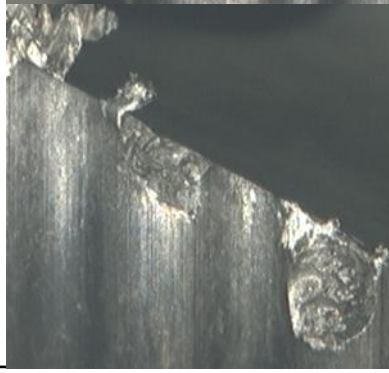
Case Study 1



Test tool: ①6RFH160 ②Competitor G

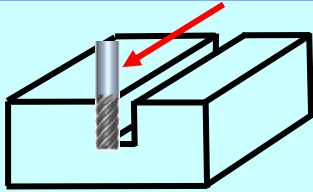
Machining dia. $\Phi 16$ / **SUS304** / shouldering / Wet

Cutting condition : $n=3,500\text{min}^{-1}$ $V_f=840\text{mm/min}$, $a_p \times a_e=5 \times 4.8\text{mm}$

Cutting length	4.2m	8.4m	12.6m	21.2m
KYOCERA 6RFH160				
Comp. G			-	-

Suppress wearing progress with composition radius design of external cutting edge.
Achieve more 2.5 times tool life than competitor's product.

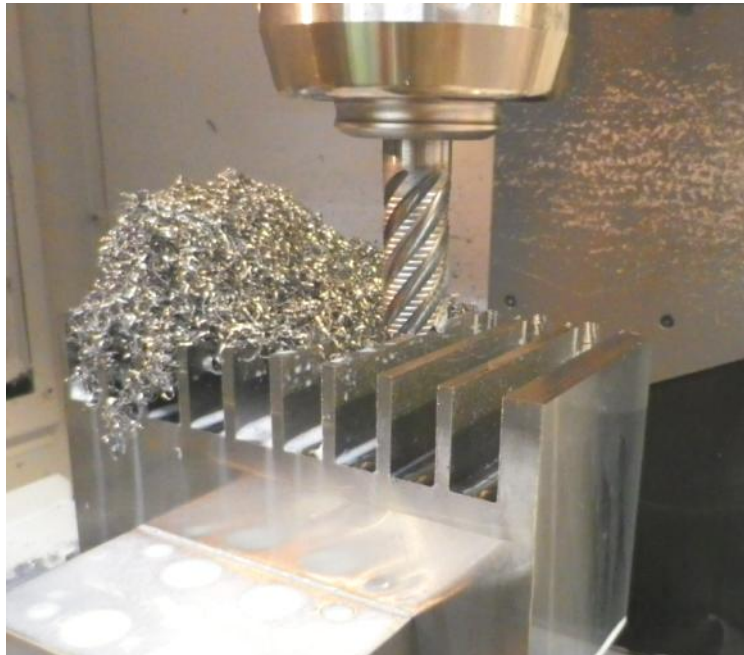
Case Study 2



Test tool: ① 6RFH160 ② Competitor G

Machining dia. $\Phi 16$ / **Ti-6Al-4V** / Slot Mill / Wet

Cutting condition: $n=1,200\text{min}^{-1}$ $V_f=176\text{mm/min}$, $a_p=32\text{ mm}$

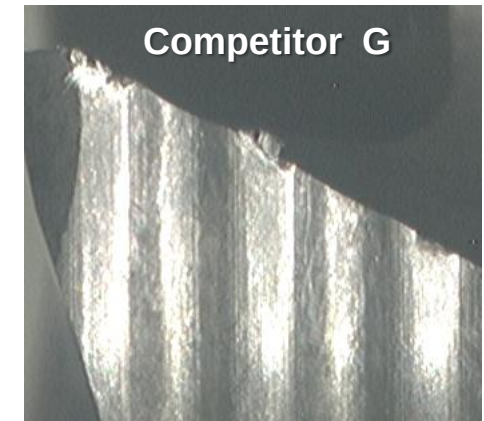


Only 1 pass in grooving $2 \times D$ depth

Cutting edge status after 900 mm machining



KYOCERA : 6RFH160

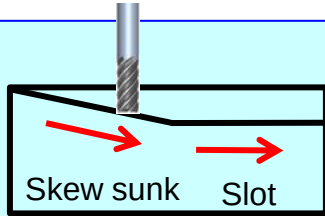


Competitor G

- Comp. G's tool occurred breakage from immediately beginning.
- KYOCERA's has almost no damage with less chattering ,and continue to cut.

In $a_p=2 \times D$ depth, coolant effects excellent chip evacuation performance.

Case Study 3

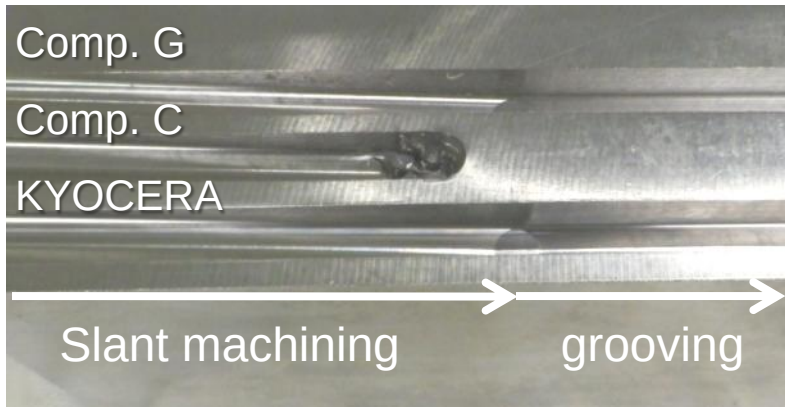


Test tool: ①5RFH100 ②Competitor C ③Competitor G

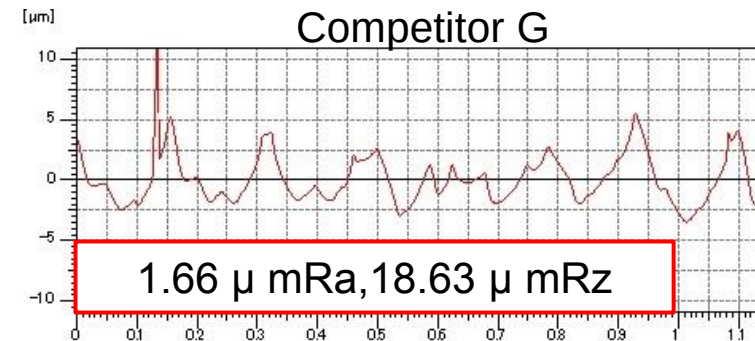
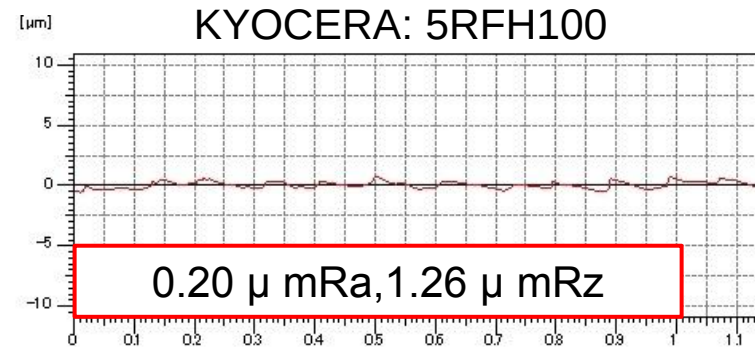
Machining dia. $\Phi 10$ / SUS304 / **Slant machining + Slotting** (cutting length: 200mm)

$n = 3,200\text{min}^{-1}$ $V_f = 310\text{mm/min}$, $a_p = 10\text{mm}$, raked angle 5°

- Work piece status after machining
- Machining surface accuracy (down-cut side in groove)

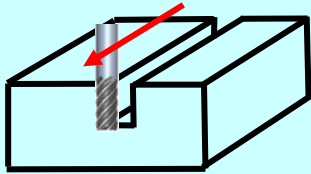


KYOCERA 5RFH100	5 cutting edge, with thru coolant, Fine machining surface. Less chattering vibration.
Comp. C	4 cutting edge, no thru coolant. Breakage by chip jammed
Comp. G	4 cutting edge, no thru coolant. Able to cut with chattering.



Fine machining surface by coolant hole and multi-edge.
Apply from roughing to semi-finishing.

Case Study 4



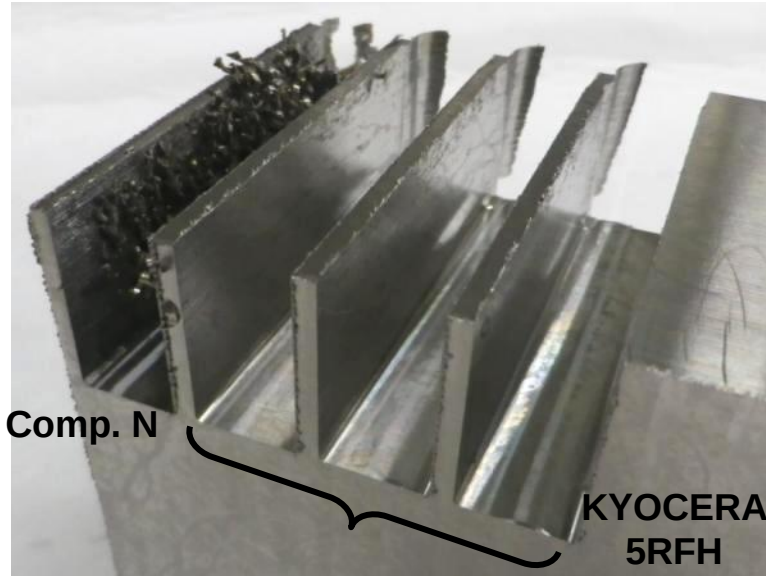
Test tool: ① KYOCERA 5RFH100(with coolant hole)

② Comp. N(no coolant hole)

Machining dia. $\Phi 10$ / **SUS304** / Slotting (cutting length: 50mm/pass) / Wet

Cutting condition: $n=2,550\text{min}^{-1}$ $V_f=336\text{mm/min}$, $a_p=20\text{ mm}$

Work piece status after machining



Kyocera (with OH)	Possible to continue machining Grooving 2 xD is also stable.
Comp. N (no OH)	Chip welding on the wall. Large cutting resistance. Rough machining surface.

Status of damage to tools

KYOCERA 5RFH100 : internal+ external coolant



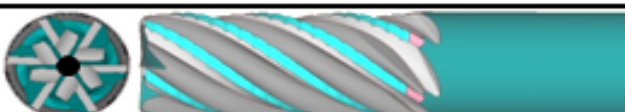
Comp. N: only external coolant



Line-up

(Total 12 model)

Medium cutting edge length type(from 2 to 2.5 × D cutting edge length)

Model	Cutting dia.	Cutting edge length	Shank dia.	Overall length	Number of cutting	Appearance
4RFH060-150	6	15	6	60	4	
4RFH080-200	8	20	8	70	4	
5RFH100-250	10	25	10	80	5	
5RFH120-260	12	26	12	100	5	
6RFH160-350	16	35	16	110	6	
6RFH200-450	20	45	20	125	6	

Long cutting edge length type(5 × D cutting edge length)

Model	Cutting edge dia.	Cutting edge length	Shank dia.	Overall length	Number of cutting edge	Appearance
4RFH060-300	6	30	6	80	4	
4RFH080-400	8	40	8	100	4	
5RFH100-500	10	50	10	110	5	
5RFH120-600	12	60	12	130	5	
6RFH160-800	16	80	16	160	6	
6RFH200-1000	20	100	20	180	6	

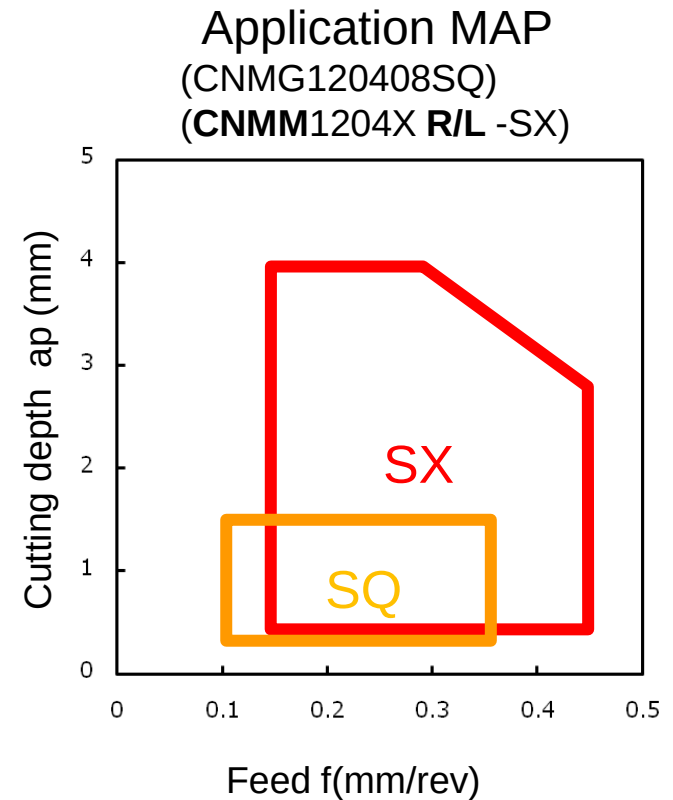
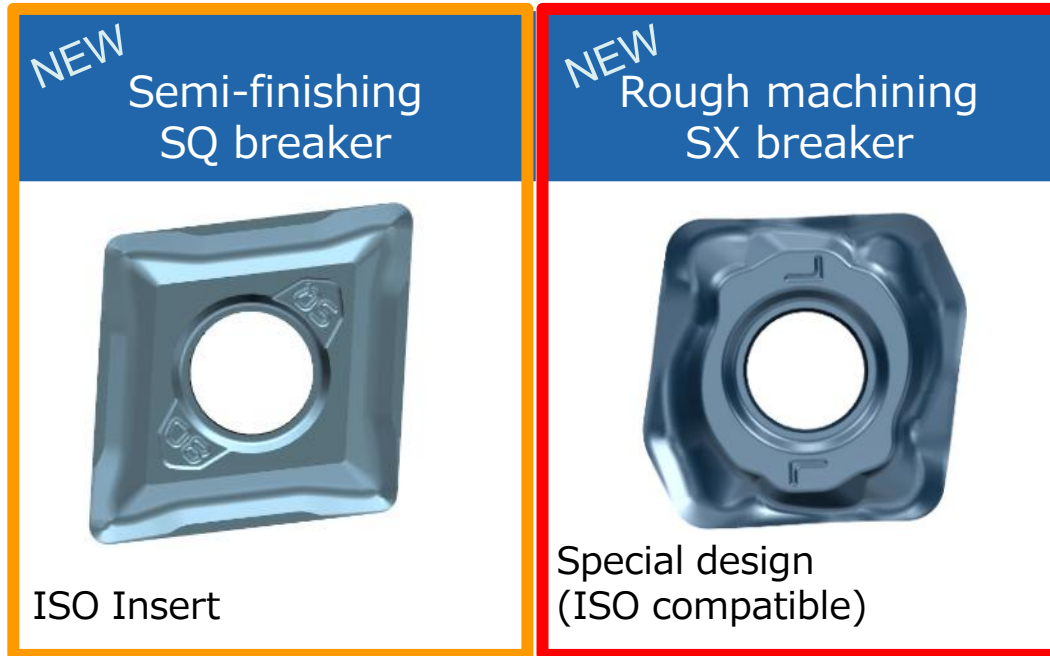
For Super Heat-Resistant Alloy

SQ/SX Chipbreaker



New Heat Resistant Alloy Chip Breaker **SQ/SX**

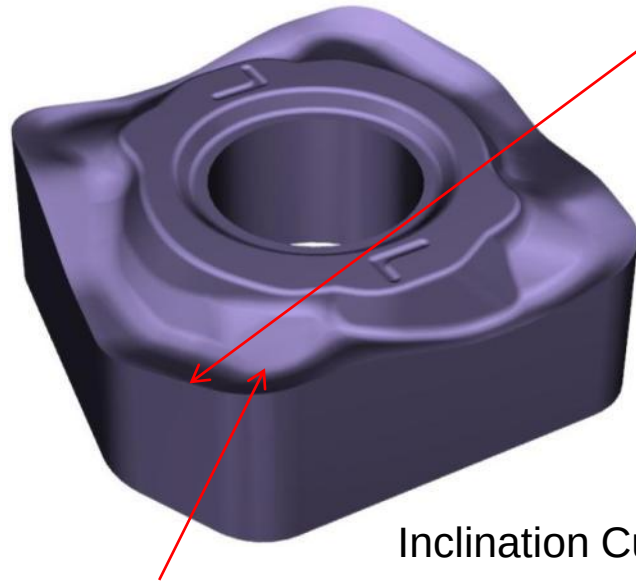
■ New Chipbreaker Line up



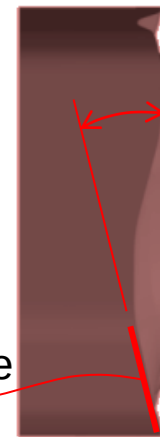
New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ SX Chipbreaker features

- ◆ Special nose shape (Handed type)
 - Lead angle 60° (installed on holder)
 - Inclination cutting edge 12°

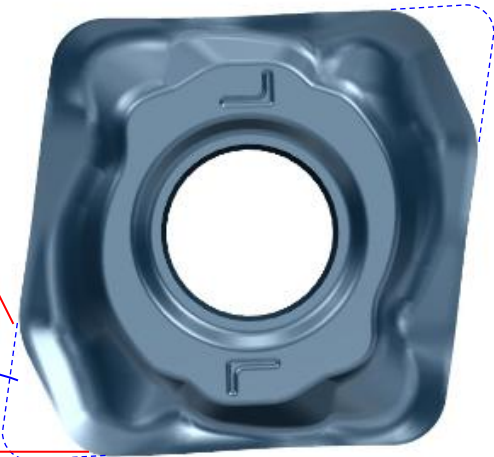


Inclination Cutting Edge



12°

60°



ISO-C type dimension

- ◆ Unique axial face design reduces cutting edge temperature.
Optimize design through simulation technology.

Effects of SX Chipbreaker

- Decrease the cutting edge temperature $\Rightarrow$ Tools life improvement.
- Negative lead angle $\Rightarrow$ Prevent burr and secure enough depth of cut.
- Radial force reduction $\Rightarrow$ prevent chattering, improve productivity.

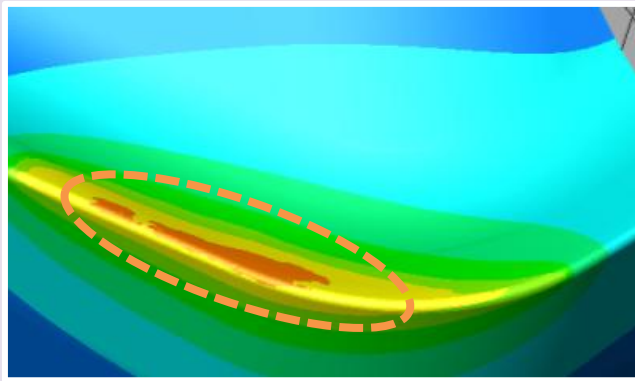
- ISO-C type holder installation is possible
- Single side, Handed type

Improve productivity for roughing super-heat-resistant alloy.

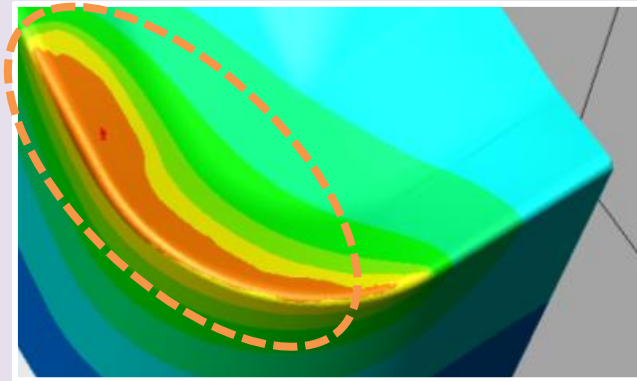
New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ SX Chipbreaker features

(1) Decrease the cutting edge temperature



SX Chipbreaker



Conventional Chipbreaker

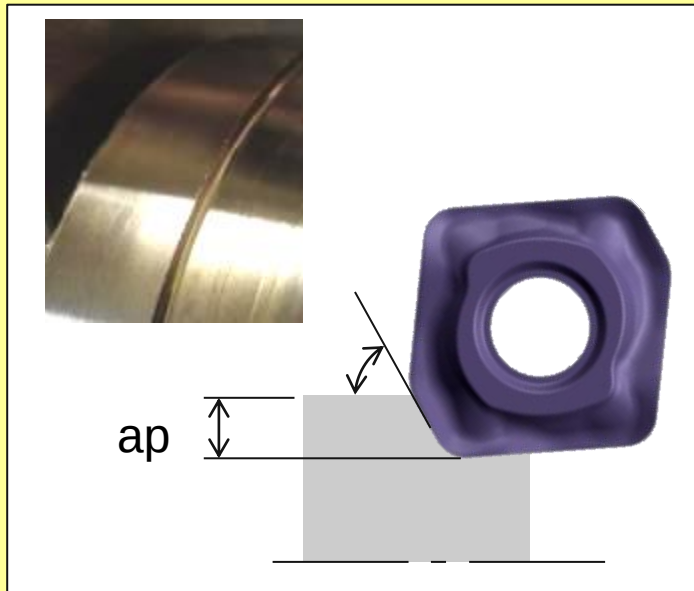
Ni based-heat resistance alloy, $V_c = 40\text{m/min}$, $a_{ps} = 2.0\text{mm}$, $f = 0.25\text{mm/rev}$
Cutting edge temperature comparison (simulation)

Unique cutting edge design and axial face reduce cutting edge temperature.
⇒ Improve tool life and machining efficiency.

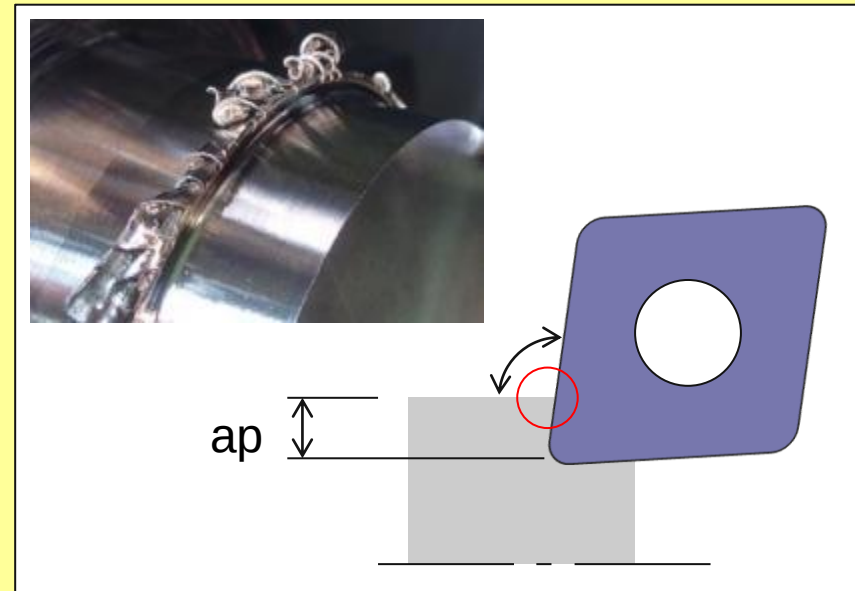
New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ SX Chipbreaker features

(2) Burr Prevention



SX chipbreaker



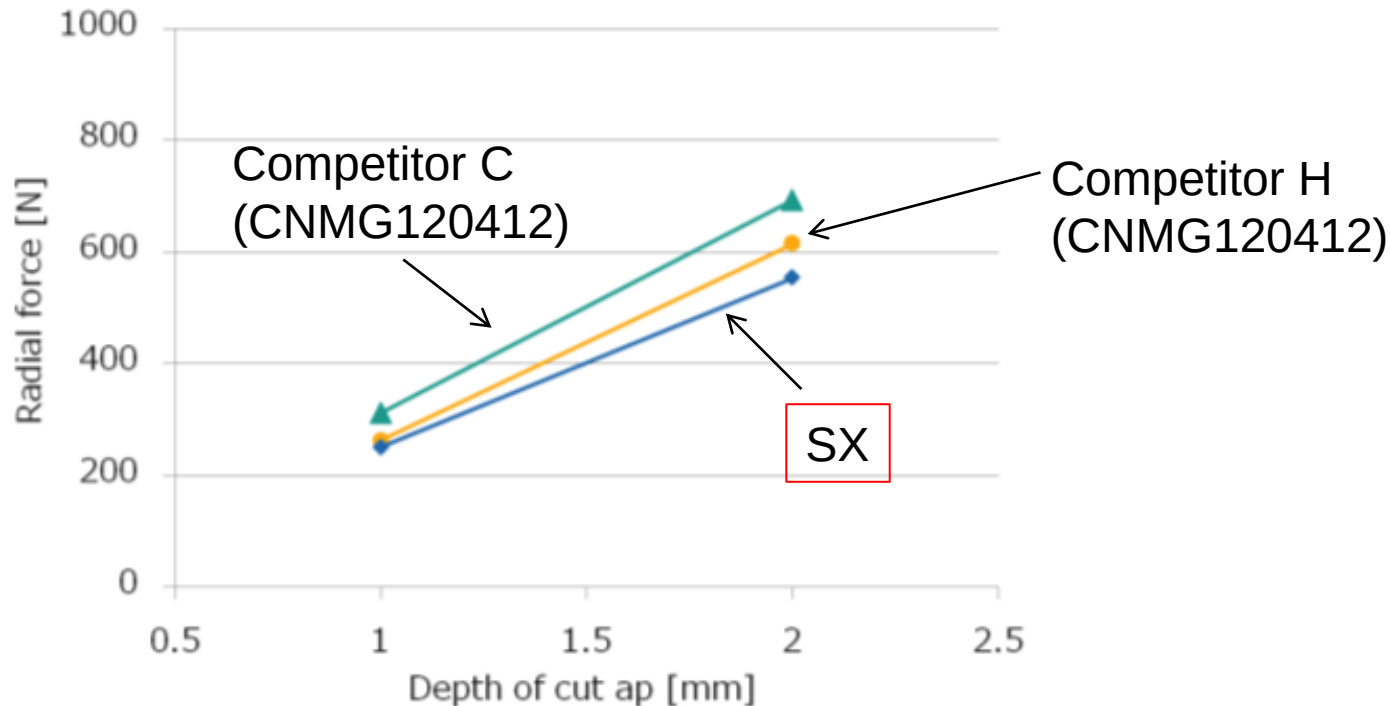
Conventional chipbreaker

Ni based-heat resistance alloy, $V_c = 40\text{m/min}$, $a_{ps} = 2.0\text{mm}$, $f = 0.25\text{mm/rev}$
Burr occurrence after 9.4min machining

Burr is prevented by new SX chipbreaker during deep machining.
⇒ Less notching by new SX, Improve productivity by large depth of cut.

■ SX Chipbreaker features

(3) Reduction of Cutting Force (Radial Force)

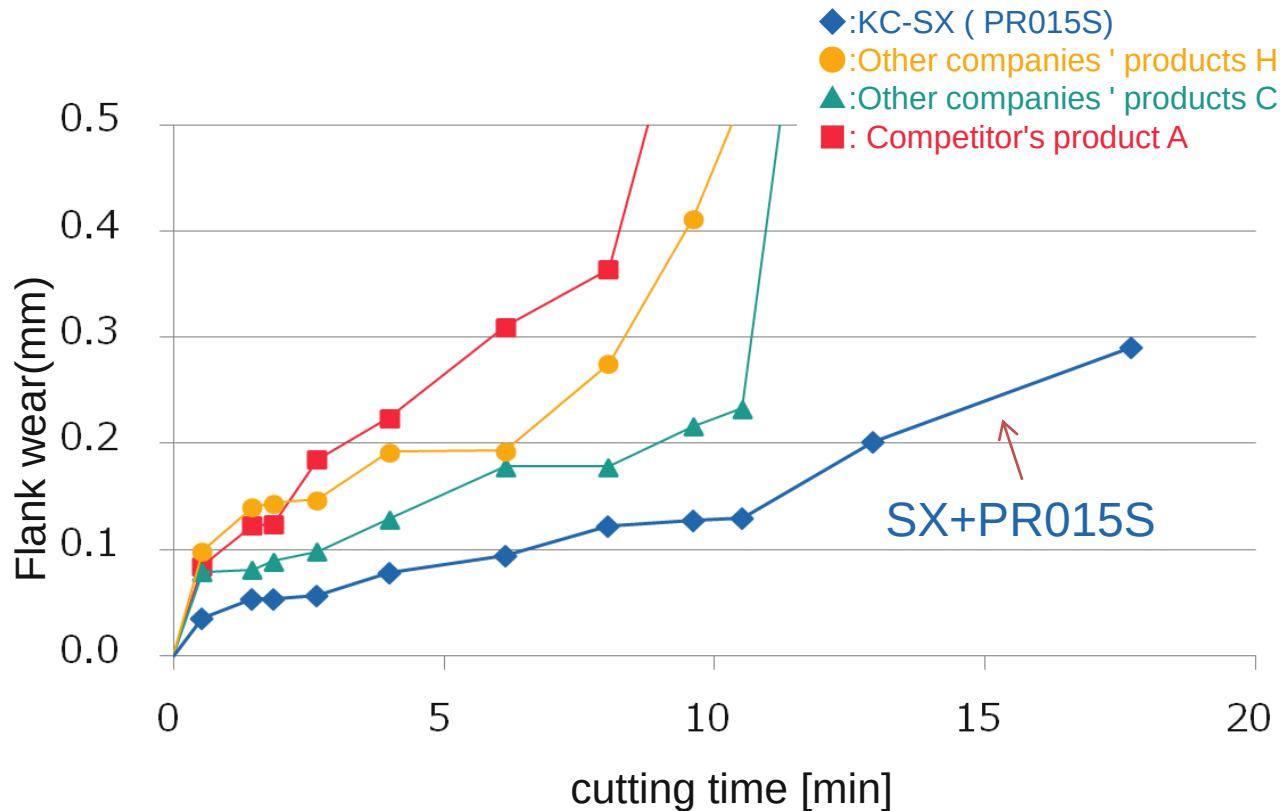


Ni based-heat resistance alloy, $V_c=40\text{m/min}$, $f=0.20\text{mm/rev}$
Cutting force comparison

Special edge design & inclination cutting edge realize low cutting force (radial force)
⇒ Prevent chattering, improve productivity.

New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ SX Chipbreaker evaluation data (Vc=40m/min)



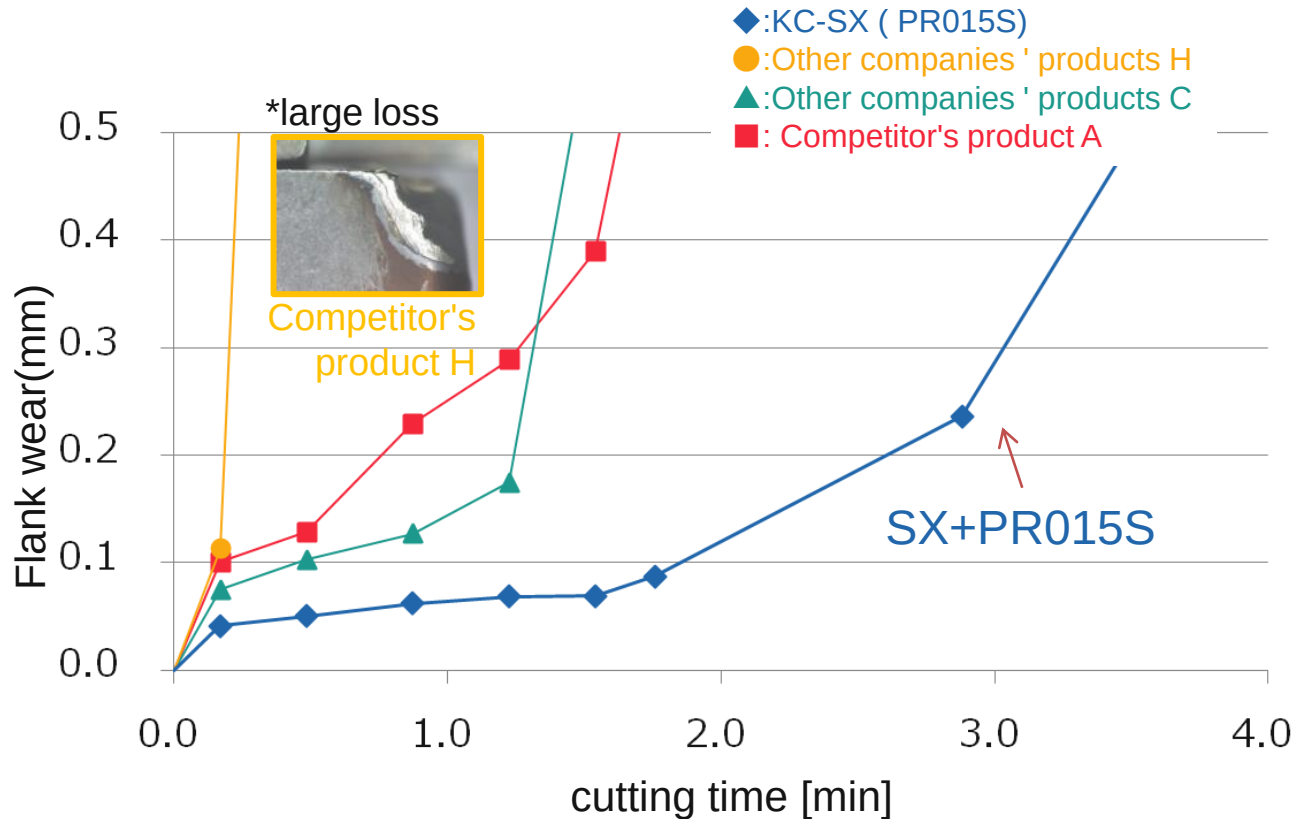
Work: Incone(r) I718(material equivalent) AM S 5663, Holder: DCLNL2525 M-12

Insert: CNMX1204XL-SX, CNMG120412, Conditions: **Vc = 40m/min**, aps = 2.0mm, f = 0.25mm/rev

SX chipbreaker reduces notching and improves tool life

New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ SX Chipbreaker evaluation data($v_c=80\text{m/min}$)



1.5minutes



KC-SX(PR015S)



Competitor's product C



Competitor's product A

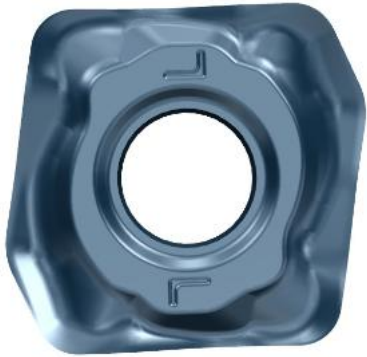
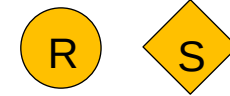
Work: Inconel(r) 718(material equivalent) AM S 5663, Holder: DCLNL2525 M-12(KC)
Insert: CNMM1204XL-SX, CNMG120412, Conditions: $V_c = 80\text{m/min}$, $a_{ps} = 2.0\text{mm}$, $f = 0.25\text{mm/rev}$

Keeping high performance even in high speed machining range.

New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ Comparison with SX chipbreaker and other insert shape

◆ Comparison with R type & S type



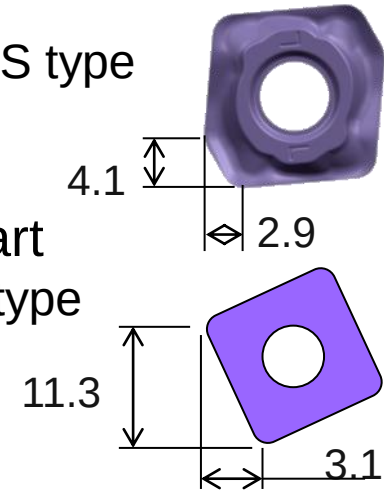
(1) Low radial force

Lower cutting force than R type and S type
Same cutting force with C type

(2) Small amount of un-machined part

Un-machined part is smaller than S type

*Comparison between
SX and S type in 12 sizes



◆ Comparison with C type and D type



(1) Long tool life

Prevents burr by lead angle 60°
Less notching and longer tool life

***Low cutting force and long tool life.**

***Improvement of productivity proposal is possible.**

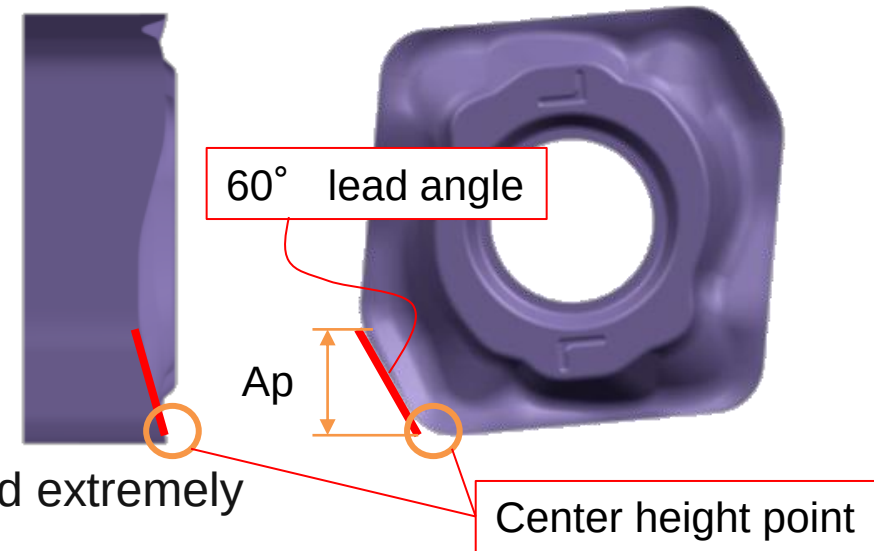
New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ Caution of using SX Chipbreaker

- ① Center of edge height
Cutting edge is slanting.
○ section of insert on the right figure
is center of edge height .
- ② Depth of cut recommendation

Good machining performance is demonstrated extremely during depth of cut is under 60° lead angle.

*Depth of cut recommendation is during depth of cut is under 60° lead angle.
However, larger depth of cut than 60° lead angle is possible.



Description	Depth of cut recommendation OD (mm)	Maximum depth of cut recommendation FACE (mm)
CNMM1204XR/L-SX	2.0(0.5-4.0)	2.0
CNMM1606XR/L-SX	2.5(0.5-4.5)	2.0
CNMM1906XR/L-SX	3.0(0.5-5.0)	2.5

New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ Caution of using SX Chipbreaker

③ Applicable tool holders

Installable on ISO-C type holder is possible, but interference happens because cutting edge goes backward.

Following measures are necessary to avoid interference.

(1) For Kyocera tool holders

- Replacement SX insert sheet with standard insert shim is necessary

- * Not necessary additional grind off tool holder

(2) For competitor tool holders

- Additional grind off toolholder and insert sheet is necessary.

Please grind off tool holder according to inserts retractions quantity.

- * Kyocera-SX insert sheet is not compatible with competitors' insert shim.



Insert retractions quantity (In case of R08) 12 sizes: 1.8mm 16 sizes: 2.2mm 19 sizes: 2.5mm

New Heat Resistant Alloy Chip Breaker **SQ/SX**

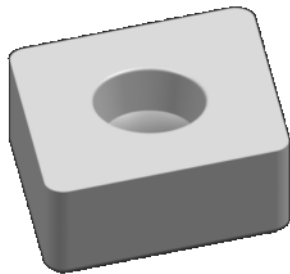
■ Caution of using SX Chipbreaker

③ Applicable tool holders

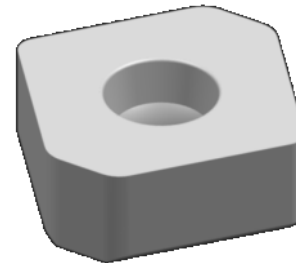
For kyocera holder

Replacement SX insert sheet with standard insert sheet is necessary.

Description	Applicable toolholder (kyocera corporation)	Standard sheet	SX sheet
CNMM1204XR/L-SX	DCLNR/L2525M-12	DC-44	DC-44-C
	PCLNR/L2525M-12	LC-42N	LC-42N-C
CNMM1606XR/L-SX	PCLNR/L2525M-16 PCLNR/L3232P-16	LC-53N	LC-53N-C
CNMM1906XR/L-SX	PCLNR/L3232P-19	LC-63	LC-63-C



Standard shim



SX shim

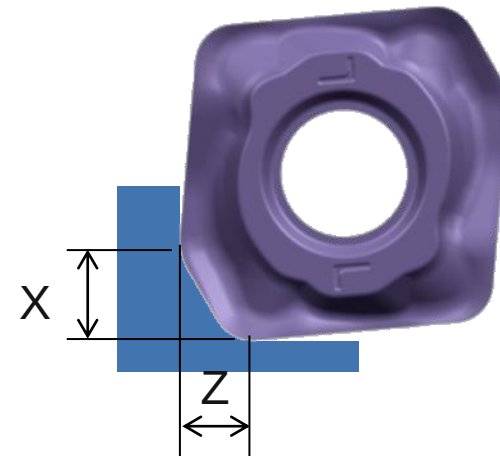
New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ Caution of using SX Chipbreaker

④ Regarding un-machined part

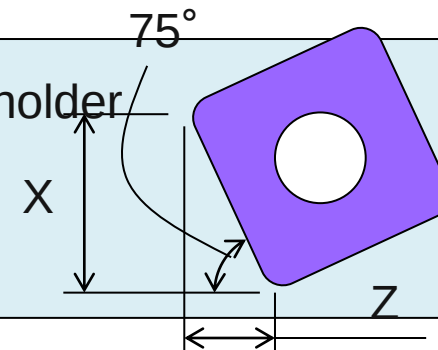
Un-machined part at the corner is following,

Description	Cut off amount(mm)	
	X	Z
CNMM1204XR/L-SX	4.1	2.9
CNMM1606XR/L-SX	4.8	3.3
CNMM1906XR/L-SX	5.4	3.6



Reference: S type(75°) when installing toolholder

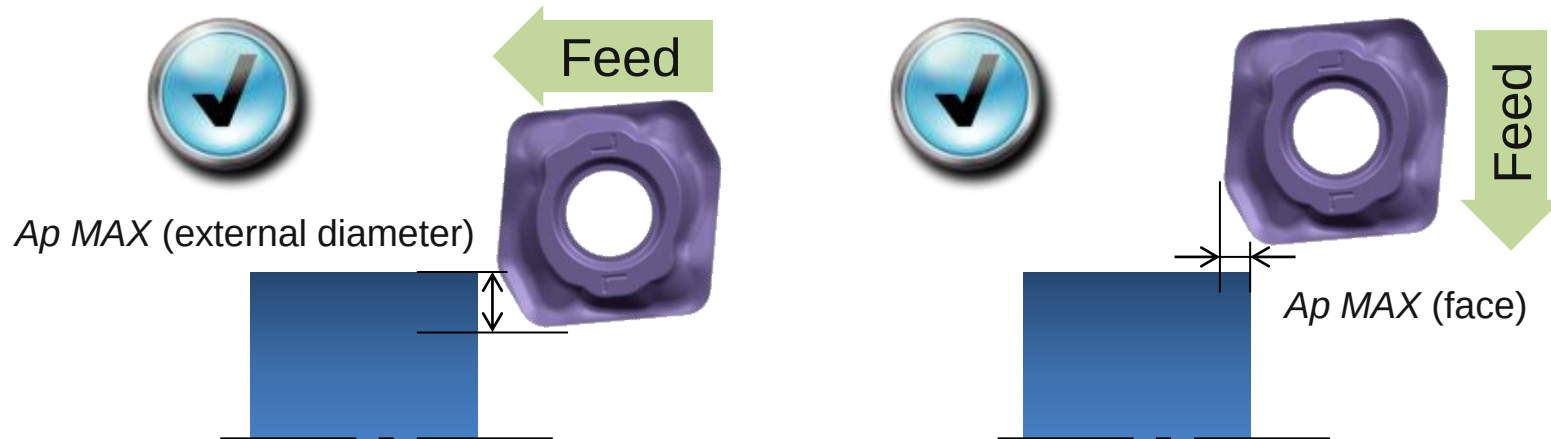
- SNMG120408 X=11.3, Z=3.1
- SNMG150608 X=14.4, Z=3.9
- SNMG190608 X=17.7, Z=4.7



■ Caution of using SX chipbreaker

(5) Facing

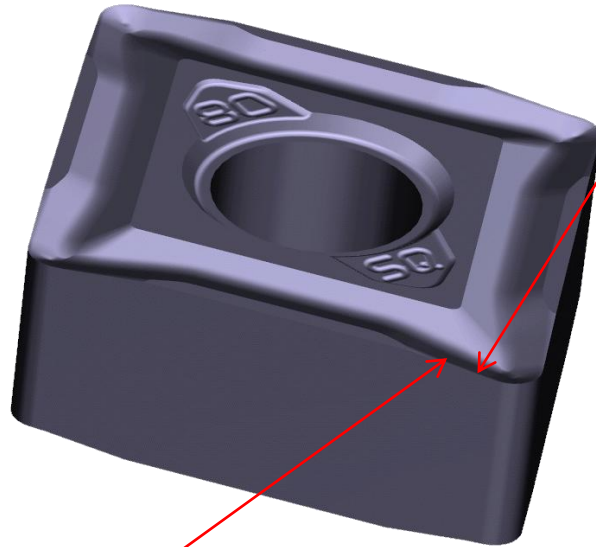
It is recommended for External machining, but facing is also possible.
Center height positioned below the center (Boss remains in the work center)



Description	Maximum depth of cut (mm) ※Face	Amount below the center(mm)
CNMM1204XR/L-SX	2.0	0.40
CNMM1606XR/L-SX	2.0	0.45
CNMM1906XR/L-SX	2.5	0.65

New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ SQ chipbreaker features



◆ Inclination cutting edge

Forward tilt in a negative direction (Patent pending)
Effective for reducing burr and notching.

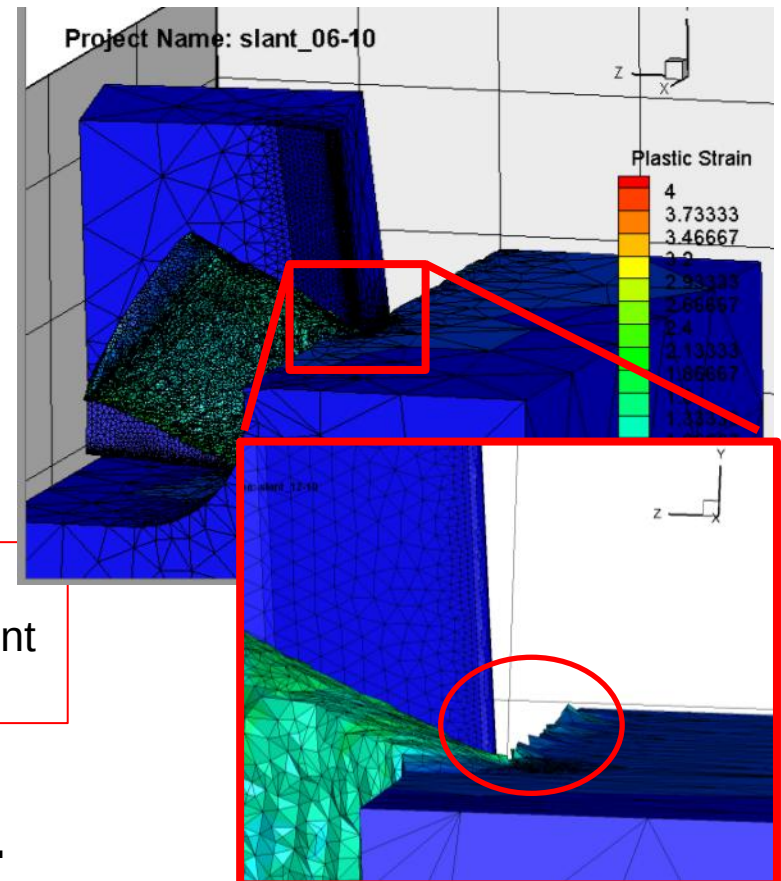
◆ Special axial face design decreases cutting edge temperature

Optimize design through simulation technology

Effects of SQ chipbreaker

- Decreasing cutting edge temperature $\Rightarrow$ Tool life improvement
- Prevents burr $\Rightarrow$ Tool life improvement, higher productivity

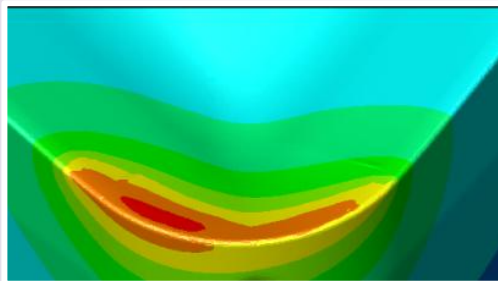
**For semi-finishing of super-heat-resistant alloy,
it is effective to improve tool life and productivity.**



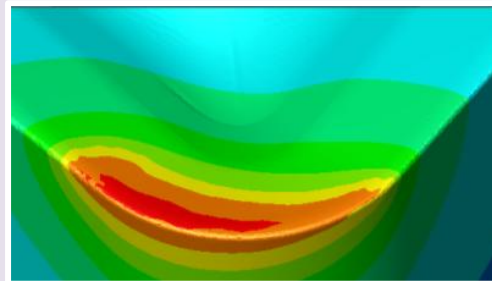
New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ SQ chipbreaker features

- (1) Decrease cutting edge temperature $\Rightarrow$ improve tool life.
- (2) Prevents burr $\Rightarrow$ Tool life improvement, higher productivity



SQ chipbreaker



Conventional products

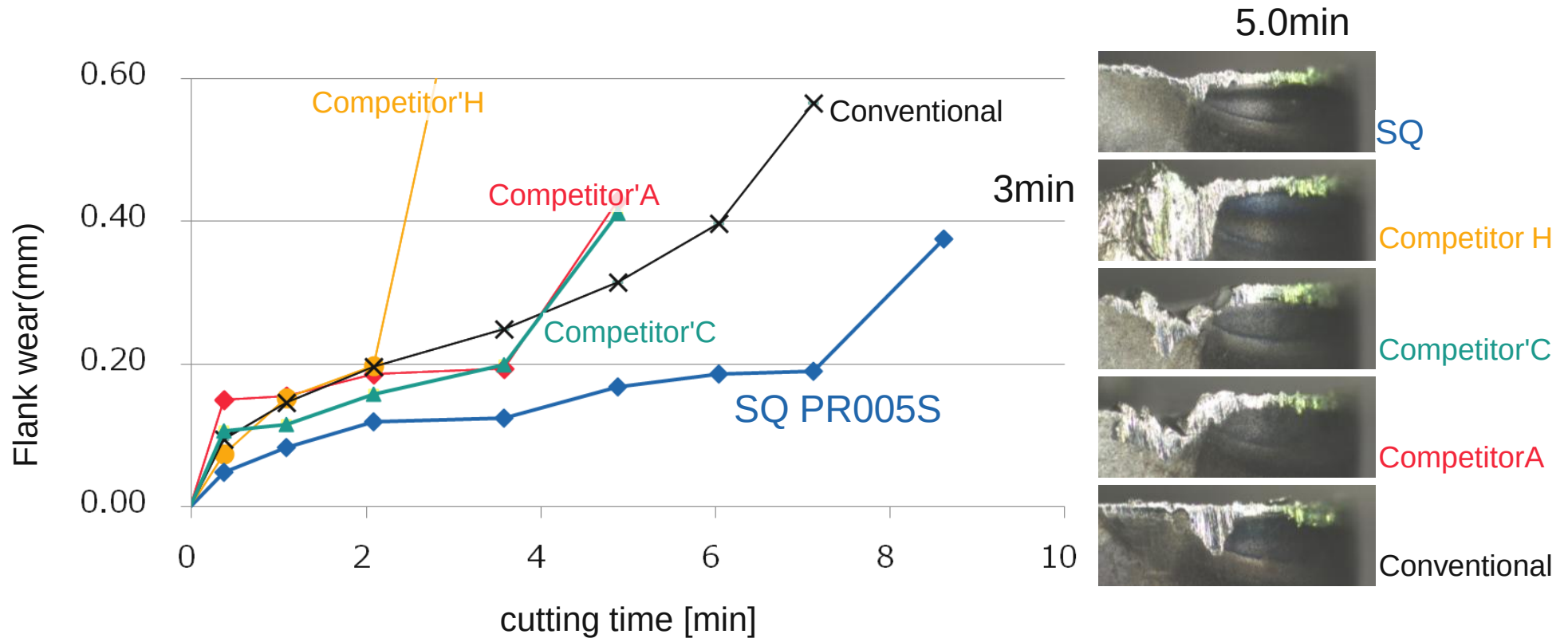
Ni based-heat resistance alloy, $V_c = 40\text{m/min}$, $a_{ps} = 1.0\text{mm}$, $f = 0.15\text{mm/rev}$

Cutting edge temperature comparison (simulation)

Unique cutting edge design reduces cutting edge temperature.
 $\Rightarrow$ Improve tool life and machining efficiency for semi-finishing.

New Heat Resistant Alloy Chip Breaker **SQ/SX**

■ SQ chipbreaker evaluation



Work: Inconel(r) 718(material equivalent) AM S 5663, Holder: DCLNL2525 M-12
Insert: CNMG120408type, Conditions: $V_c = 40\text{m/min}$, $a_{ps} = 1.0\text{mm}$, $f = 0.20\text{mm/rev}$

SQ chipbreaker reduces notching.

New Heat Resistant Alloy Chip Breaker **SQ/SX**

■Line Up

Description	Grade	
	PR005S	PR015S
CNMG120404SQ	●	●
CNMG120408SQ	●	●
CNMG120412SQ	●	●
CNMG160612SQ	●	●
CNMG160616SQ	●	●
CNMG190612SQ	●	●
CNMG190616SQ	●	●
DNMG150404SQ	●	●
DNMG150408SQ	●	●
DNMG150412SQ	●	●
DNMG150604SQ	●	●
DNMG150608SQ	●	●
DNMG150612SQ	●	●

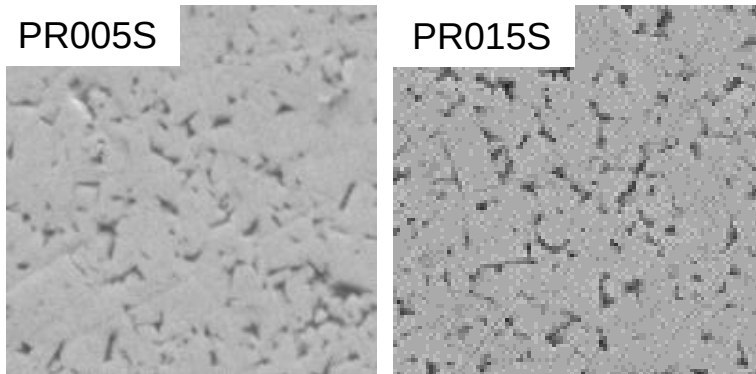
Description	Grade	
	PR005S	PR015S
CNMM1204XR-SX	●	●
CNMM1204XL-SX	●	●
CNMM1606XR-SX	●	●
CNMM1606XL-SX	●	●
CNMM1906XR-SX	●	●
CNMM1906XL-SX	●	●

PR005S/ PR015S

■ New Grade for Heat-resistant Alloys PR005S/PR015S

→ Improve toughness and prevent notch-wear and realize stable machining

◆ New Developed Substrate



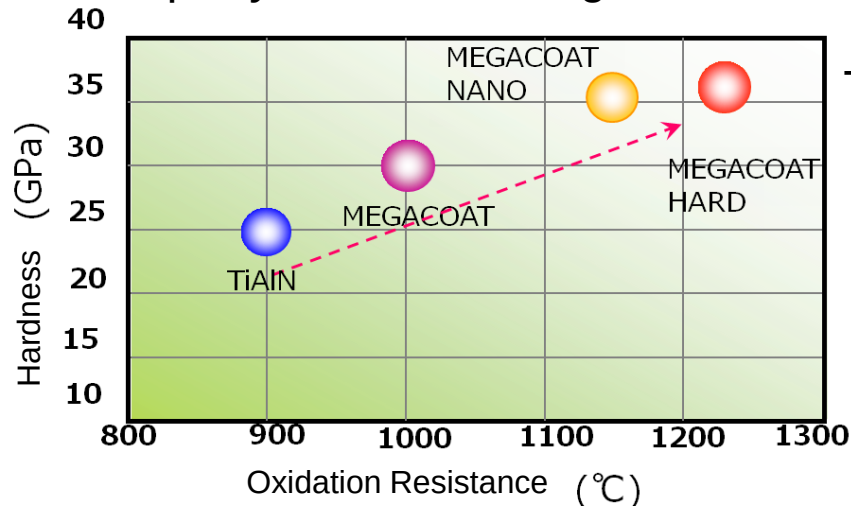
-PR005S

→ High hardness grade for high speed machining

-PR015S

→ Excellent wear resistance and stability

◆ Property of PVD coating



- Adopted "MEGACOAT HARD"

→ High hardness and excellent heat resistance

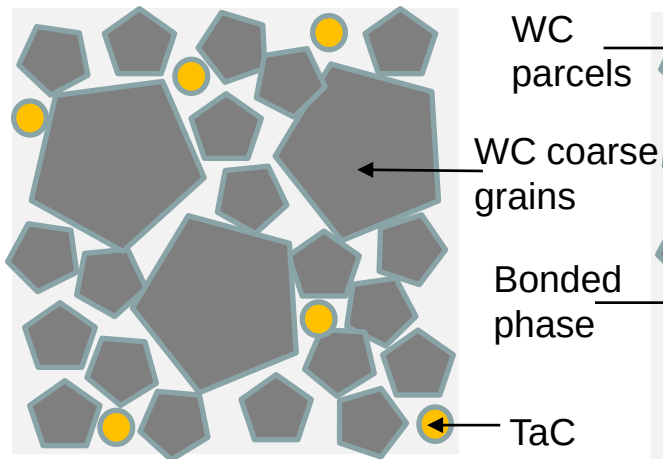
→ Reduce boundary damage by Improving thermal stability

PR005S/ PR015S

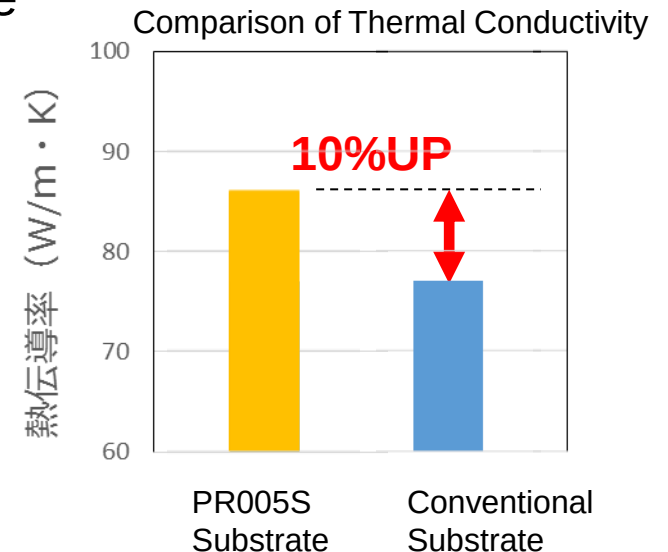
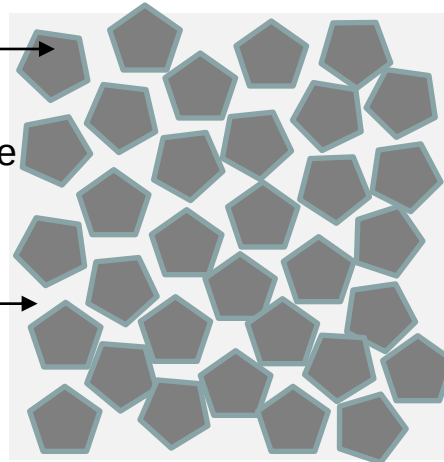
■ PR005S/PR015S

→ New developed substrate carbide reduce sudden fracture and notch-wear

Substrate of PR005S

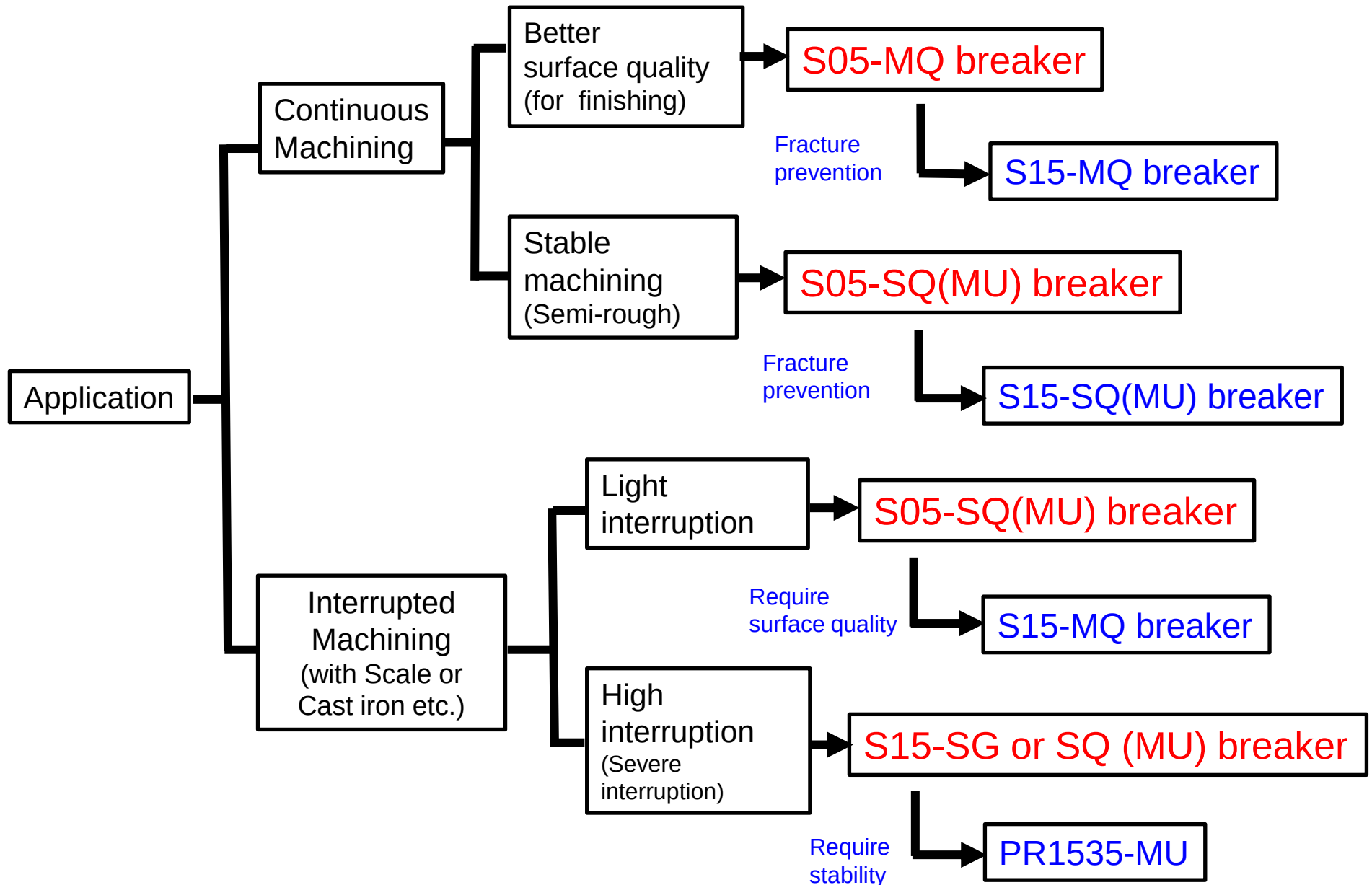


Conventional Substrate



- (1) Improve thermal conductivity by optimum distribution of WC coarse grains
⇒ Prevent heat concentration on cutting edge
- (2) Improve high-temperature properties by addition and distribution of heat-resisting composition
⇒ Prevent hardness deterioration by heat-oxidation

PR005S/ PR015S



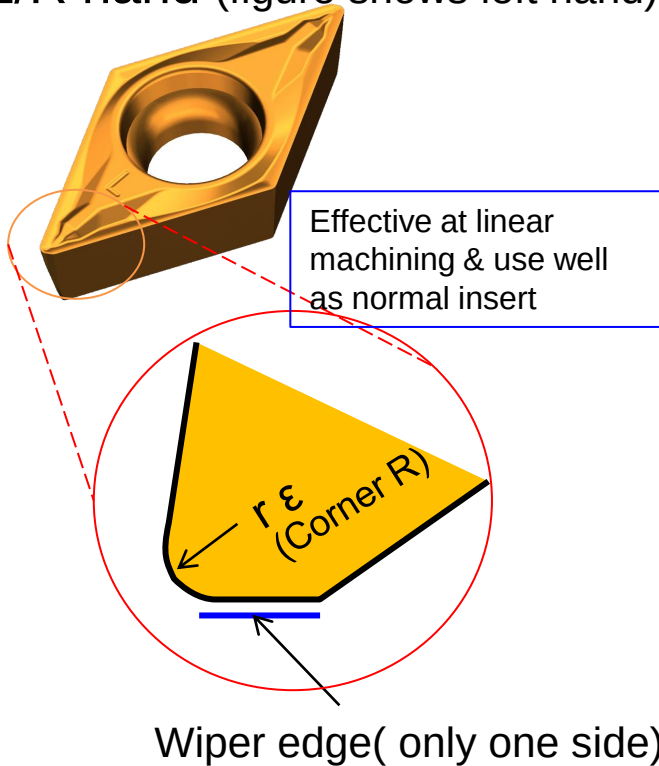
Positive wiper **WP** breaker L/R hand expansion

■ Product Summary

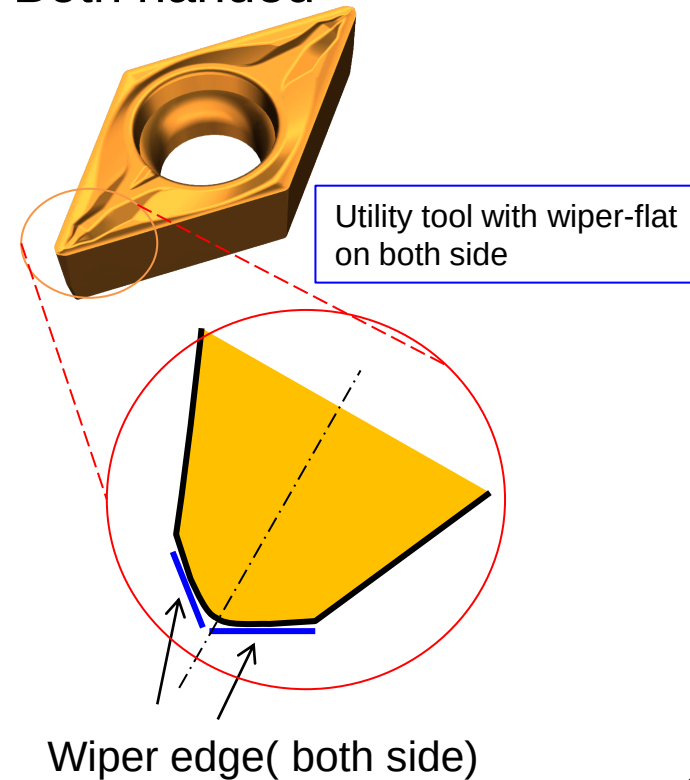
Positive wiper WP breaker
Addition L/R hand (D type, T type)



◆ L/R hand (figure shows left hand)



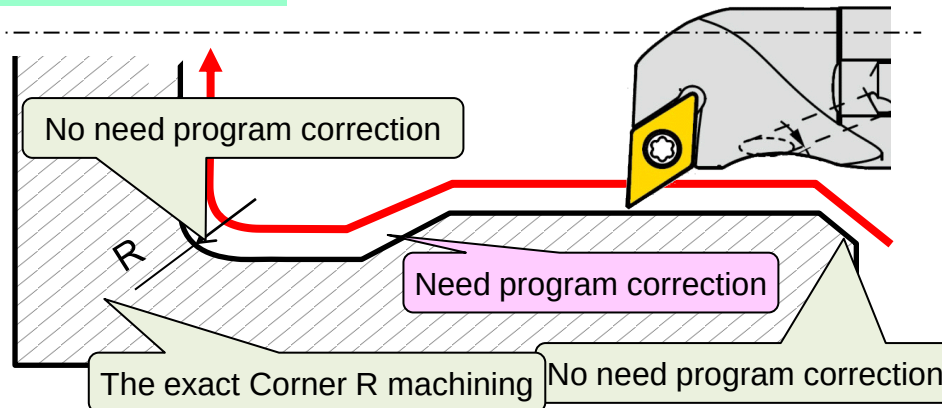
◆ Both handed



Positive wiper *WP* breaker L/R hand expansion

■ Advantage of L/R hand

★with L/R hand



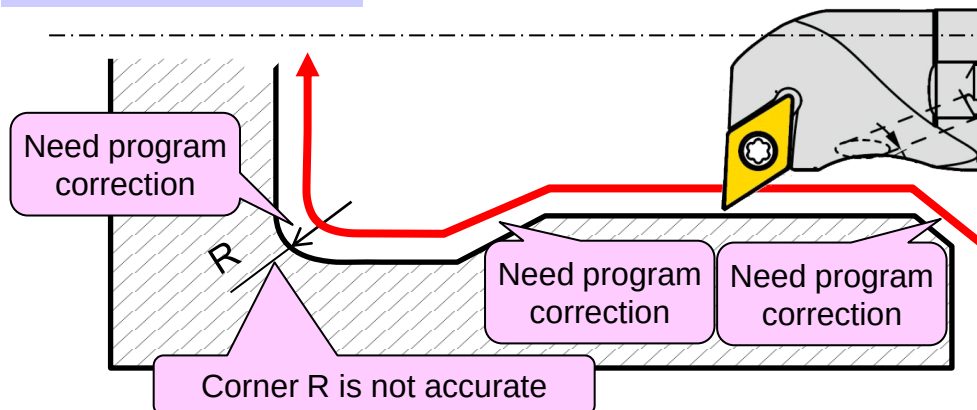
- For L/R hand wiper
- Program corrections only ramping
 - The exact corner R machining



Use well as normal insert

*Edge position is different from usual edge
Need to Edge position corrections

★Both handed

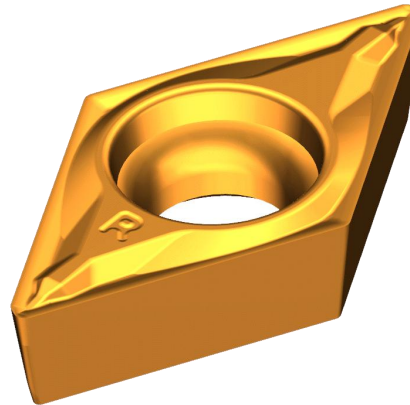


- Need program corrections of 3 points
- Not complete perfect radius

Positive wiper *WP* breaker L/R hand expansion

■ Repertoire

Shape	Description	Grade		
		PR1425	TN620	PV720
	DCMX 070204R-WP	●	●	●
	070204L-WP	●	●	●
	DCMX 11T304R-WP	●	●	●
	11T304L-WP	●	●	●
	TPMX 110304R-WP	●	●	●
	110304L-WP	●	●	●



Positive wiper **WP** breaker L/R hand expansion

■ L/R hand WP breaker holder matching list

Insert	App	Tool holder	Conformance
DCMX07/11	ID	A-SDUC-AE	○ *1
		S-SDUC-A	
		E-SDUC-A	
		HA-SDUC11	
		A-SDZC-AE	○ *2
		S-SDZC-A	
		E-SDZC-A	
		A-SDQC-AE	×
		S-SDQC-A	
		E-SDQC-A	

Conformance cutting edge angle

DCMX07/11 - - - 93°

TPMX11 - - - 95°

*1 Left hand(L) insert for right hand(R) tool holder,
Right hand(R) insert for left hand(L) tool holder
*2 Right hand(R) insert for right hand(R) tool holder,
Left hand(L) insert for left hand(L) tool holder

Insert	App	Tool holder	Conformance
DCMX07/11	OD	ADJC-FF	○ *2
		SDJC-FF	
		SDJC	
		S-SDUC	○ *1
		SDLC-FF	△ Note *2
TPMX11	ID	S-SDLC	△ Note *1
		SDXC	×
		SDNC-F	
		SDNC	
		A-STLP-AE	○ *1
TPMX11	ID	S-STLP-A	
		E-STLP-A	×
	OD	S-ST WP-E	
		S-STWP	×
TPMX11	OD	STGP	

Note:

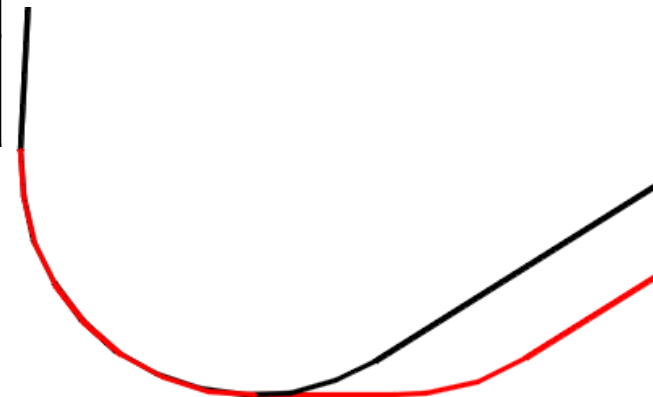
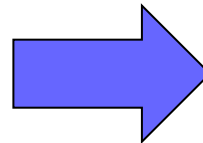
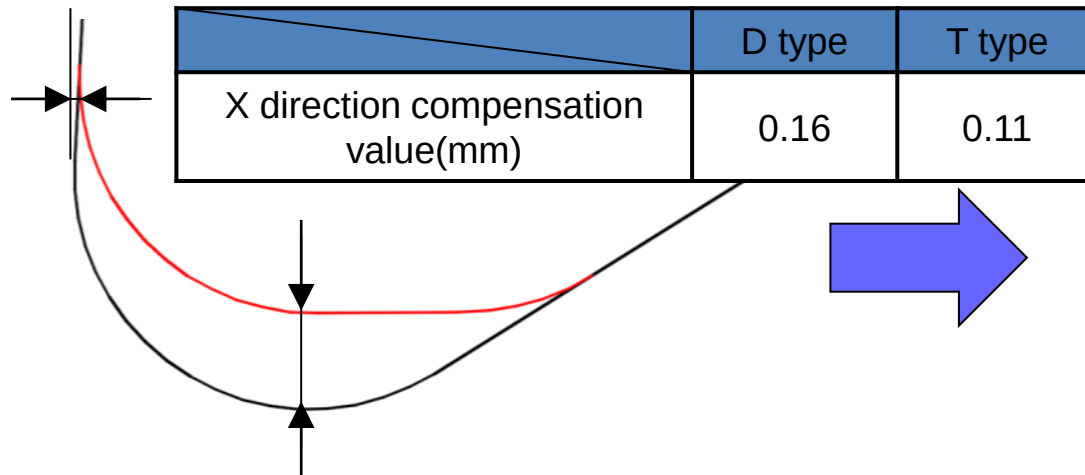
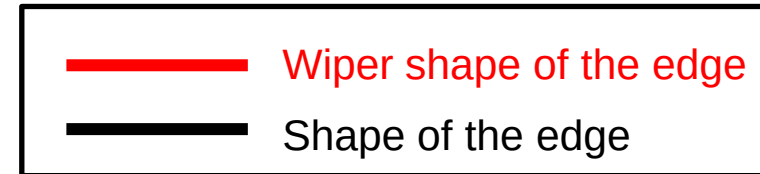
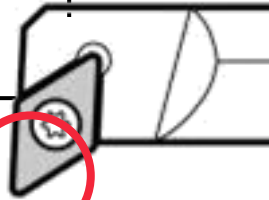
SDLC-FF and S-SDLC tool holder with wiper insert improve surface roughness than standard insert, but wiper insert original performance is not utilized.

Positive wiper *WP* breaker L/R hand expansion

■ Tools offset cancellation

L/R hand WP need for edge position corrections as well as WP without hand (compensation value is different from the without hand type)

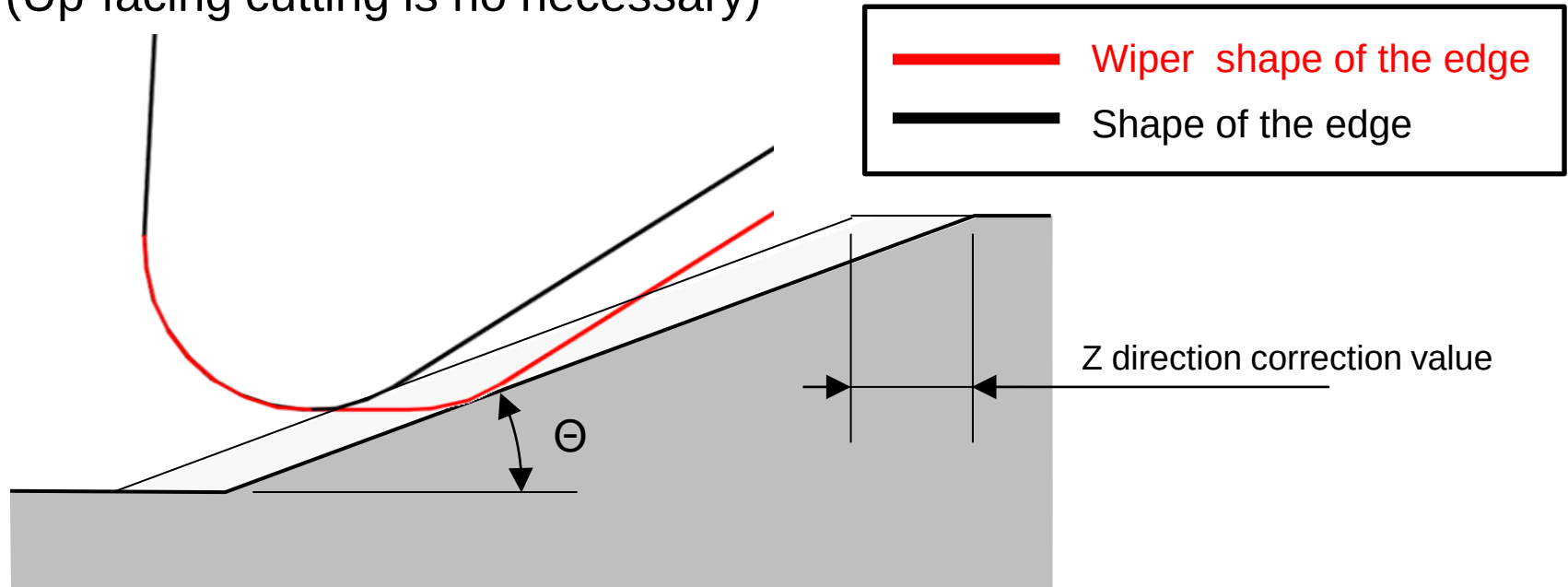
	D type	T type
Z direction compensation value(mm)	0.01	0.01



Positive wiper **WP** breaker L/R hand expansion

■ Program corrections(Ramping cutting)

Ramping cutting needs program corrections
(Up-facing cutting is no necessary)



Ramping angle θ	0°	5°	10°	15°	20°	25°
Z direction compensation value(mm) D Type	0	-0.22	-0.24	-0.24	-0.25	-0.25
Z direction compensation value(mm) T Type	0	-0.24	-0.24	-0.25	-0.24	-

TF Breaker line-up expansion

■ New Insert Grade for TF Breaker

New Grade for TF breaker

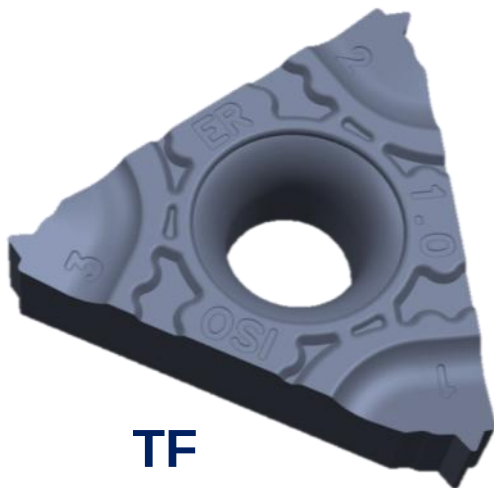
Same as TQ breaker : PR1215, PR1515, PR1535 are available

Steel : PR1215

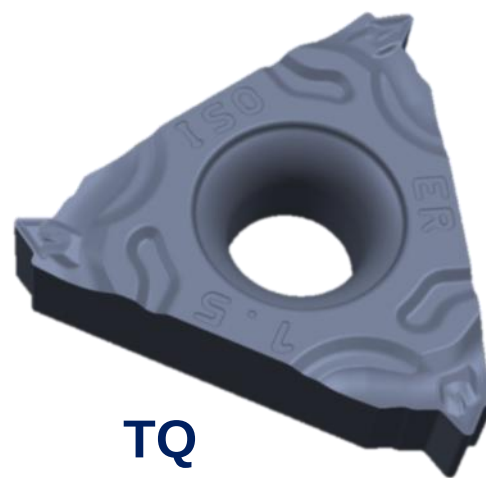
SUS : PR1515, PR1535 (Stable machining)

TQ breaker Line-up expansion

Expanding as Same as TF breaker Line-up



TF



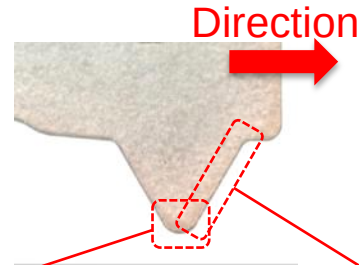
TQ

TF Breaker line-up expansion

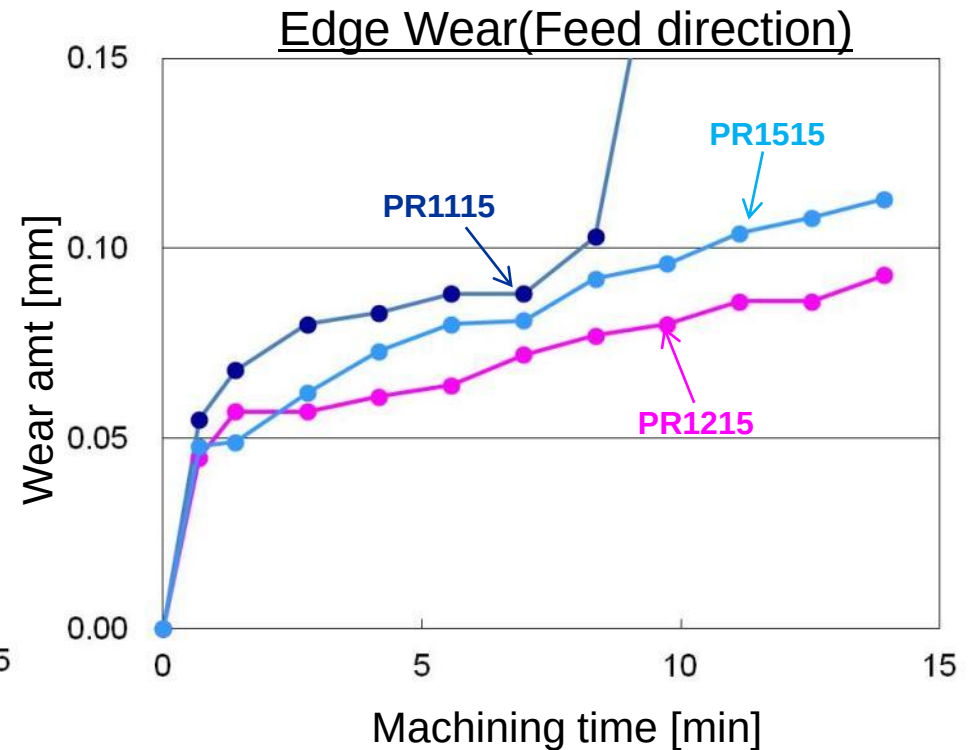
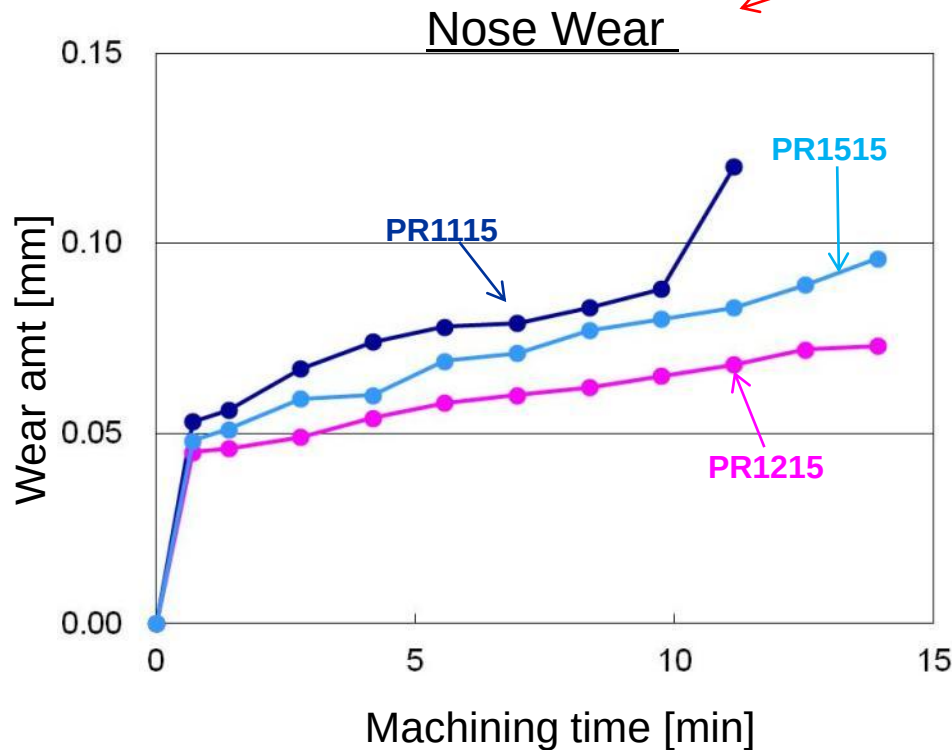
■ New Insert Grade for TF Breaker

Material: SCM435 (AISI 4130)

Tool life comparison



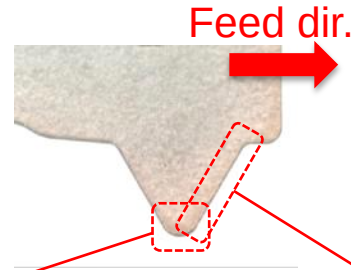
Condition:
Insert : 16ER150ISO-TF
Vc = 150m/min, No. of passes=6,
Wet



TF Breaker line-up expansion

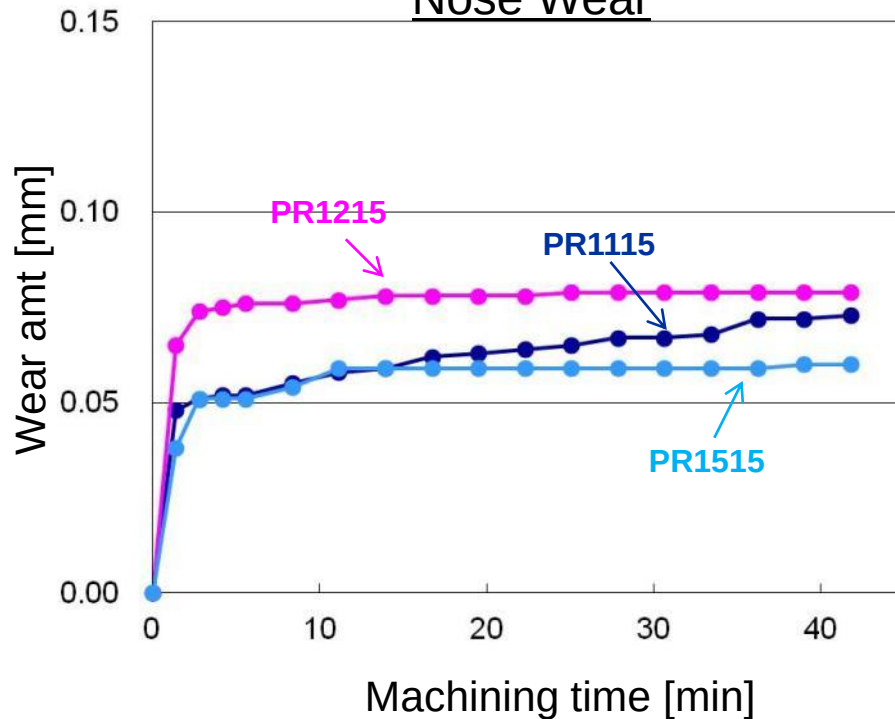
■ New Insert Grade for TF Breaker

SUS304 Tool life comparison

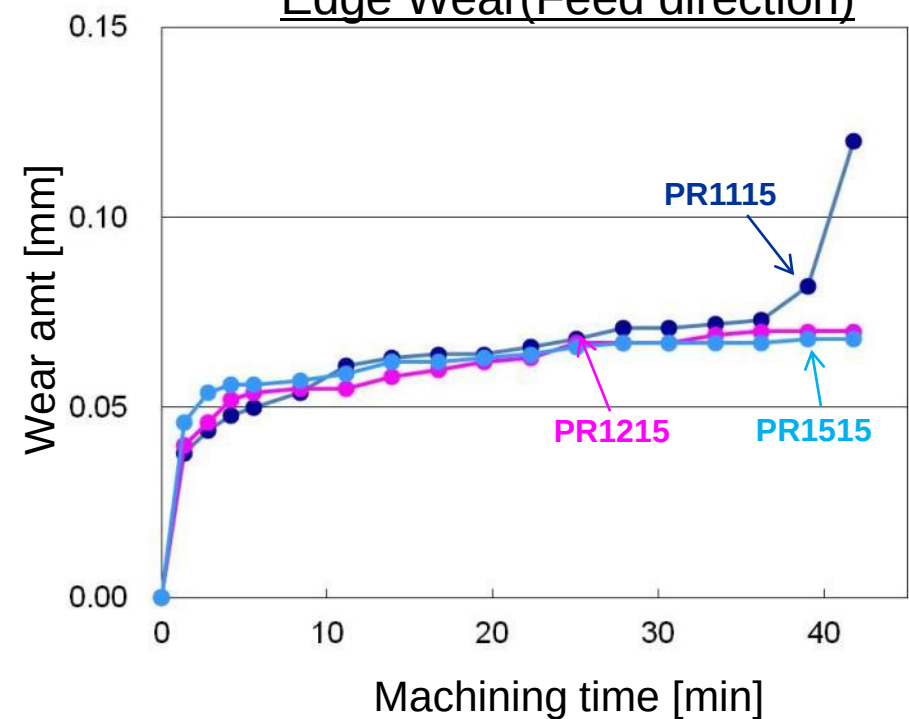


Condition:
Insert : 16ER150ISO-TF
Vc = 100m/min, No.of passes=8
Wet

Nose Wear



Edge Wear(Feed direction)



TQ & TF Breaker line-up expansion

■ TQ breaker Line-up

*Same as TF breaker Line-up

Metric		UN		W	BSPT
16ER100ISO	11IR100ISO	16ER24UN	16IR24UN	16ER19W	16ER28BSPT
16ER125ISO	11IR125SIO	16ER20UN	16IR20UN	16ER16W	16ER19BSPT
16ER150ISO	11IR150ISO	16ER18UN	16IR18UN	16ER14W	16ER14BSPT
16ER175ISO	11IR175ISO	16ER16UN	16IR16UN	16ER11W	16ER11BSPT
16ER200ISO	16IR100ISO	16ER14UN	16IR14UN	16IR19W	11IR28BSPT
16ER250ISO	16IR125ISO	16ER13UN	16IR13UN	16IR16W	11IR19BSPT
16ER300ISO	16IR150ISO	16ER12UN	16IR12UN	16IR14W	11IR14BSPT
	16IR175ISO	16ER10UN	16IR10UN	16IR11W	16ER14BSPT
	16IR200ISO	16ER08UN	16IR08UN		16ER11BSPT
	16IR250ISO				
	16IR300ISO				
		Std 60°	Std 55°		
		16ERA60	16ERA55		
		16ERG60	16ERG55		
		16ERAG60	16ERAG55		

 : New Line-up

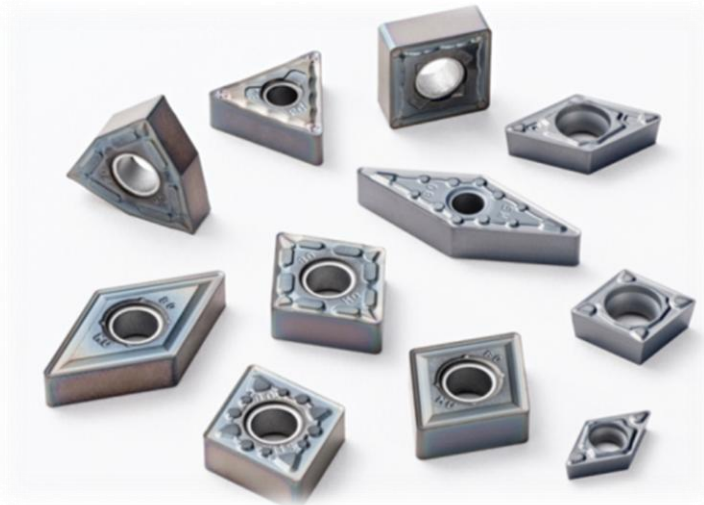
23 items→59 items

MEGACOAT NANO **PR1535** Line-up Expansion

PR1535

Turning New Line-up Expansion

New 14 Items
(Positive : 7 items)
(Negative : 7 items)



Type	Description	Grade
Positive	CCMT09T304MQ	PR1535
	CCMT09T308MQ	
	DCMT070202MQ	
	DCMT070204MQ	
	DCMT11T302MQ	
	DCMT11T304MQ	
	DCMT11T308MQ	
Negative	VNMG160404MQ	
	VNMG160404MS	
	VNMG160404MU	
	VNMG160408MQ	
	VNMG160408MS	
	VNMG160408MU	
	VNMG160412MS	

Diamond Insert for *MEC*

MEC Series

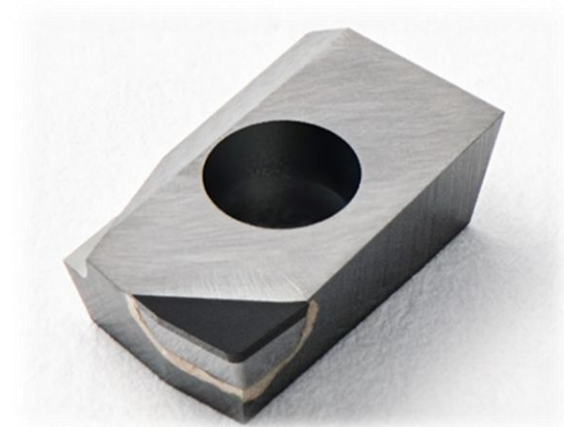
BDGT type New line-up

Total 12 Items

(KPD001 : 6 Items)

(KPD230 : 6 Items)

※LE : Long Edge type



Description	Grade	
	KPD001	KPD230
BDGT11T302FR	●	●
BDGT11T302FR-LE	●	●
BDGT11T304FR	●	●
BDGT11T304FR-LE	●	●
BDGT11T308FR	●	●
BDGT11T308FR-LE	●	●

