High Efficiency End Mill for Aluminum Machining

MEAS

High Reliability, High Speed and High Efficiency Machining for Aluminum

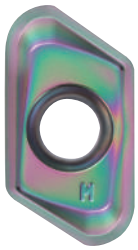
Grooved Insert Pockets for Excellent Scatter Prevention to Ensure Stable, High Speed Machining

Sharp Cutting Edge with Low Cutting Force

Simultaneous 3-axis with a Max. Ramping Angle of 20° (ø25)

Kyocera's Proprietary Hydrogen-free DLC Coating PDL025

NEW **AM Chipbreaker with Tough Edge**



High Efficiency End Mill for Aluminum Machining

MEAS

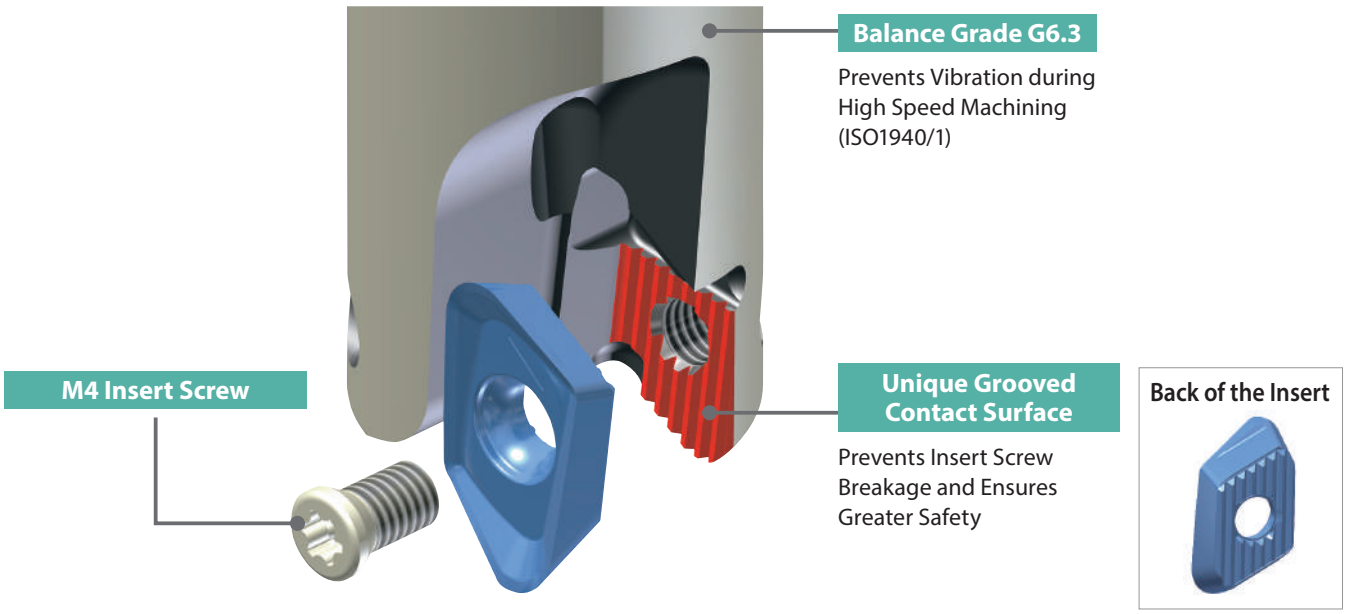
Excellent Scatter Prevention to Ensure Stable, High Speed Aluminum Machining
Simultaneous 3-axis with Large Ramping Angle for a Wide Range of Machining Applications

1 High Reliability and High Efficiency Machining

Grooved Connection Between the Insert and Holder

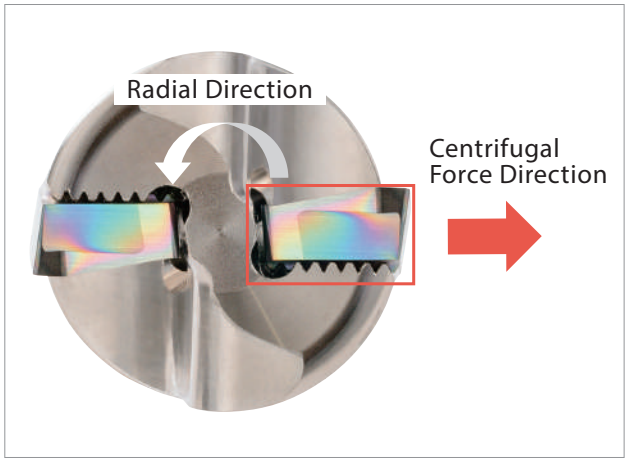
Provides High Speed Aluminum Machining (ø32 : Recommended Max. Cutting Speed Vc = 3,000m/min)

*When using AL chipbreaker

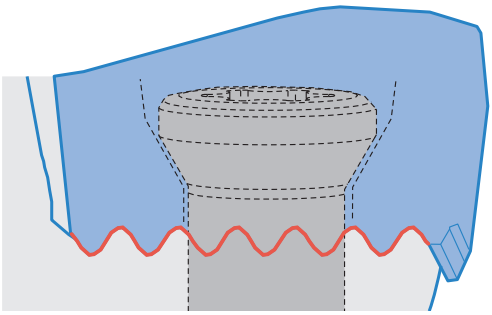


Grooved Insert Pocket Example

Centrifugal force is applied across the grooved surface to reduce pressure on the insert screw
Prevents insert screw breakage and safely secures the insert during high-speed revolutions



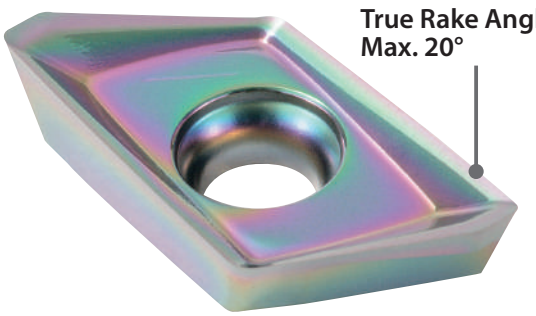
Grooved Contact Surface



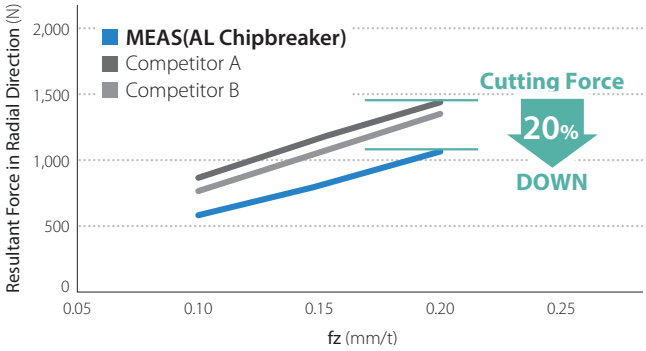
2 Low Cutting Force with Sharp Cutting Edge

True Rake Angle Max. 20°

Low Cutting Force and Excellent Chattering Resistance



Cutting Force Comparison (Internal evaluation)

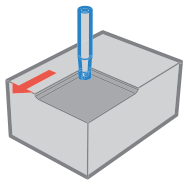


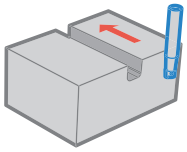
Cutting Conditions : Vc = 390 m/min, ap × ae = 8 × 5 mm, Dry
Cutter Dia. ø25 mm (2 Inserts) Workpiece : A7075

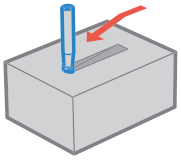
3 Machining for a Wide Variety of Applications

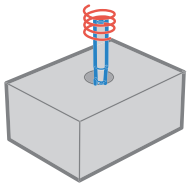
Max. Ramping Angle 20° (ø25)

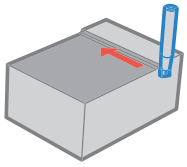
The MEAS can be used for shouldering, slotting, ramping, and helical milling applications

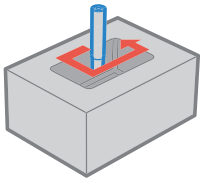

Face Milling & Shouldering

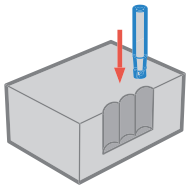

Slotting


Ramping


Helical Milling

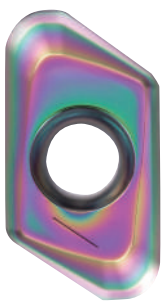

Contouring

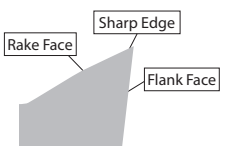

Pocketing


Plunging

Two Different Chipbreaker Available

AL Chipbreaker with Low Cutting Force Design



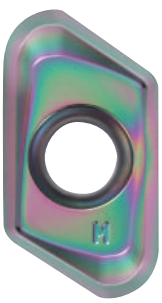


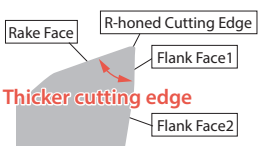
Chipbreaker cross section

Large rake angle and sharp edge design provide stable machining with low cutting force

Cutting conditions can be increased even for equipment with weak rigidity to increase efficiency

NEW AM Chipbreaker with Tough Edge





Chipbreaker cross section

Optimized rake angle, adopted 2-step rake angle and R honing improve cutting edge strength

Supports high-speed aluminum milling of Vc = 3,000 m/min or more
(When machining aluminum with a Si ratio 12.5% or less)

MEAS | End Mill

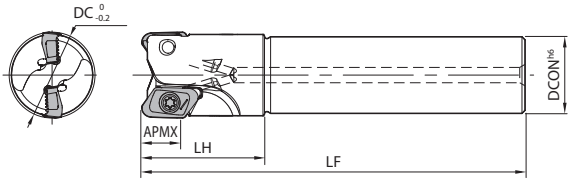


Fig.1

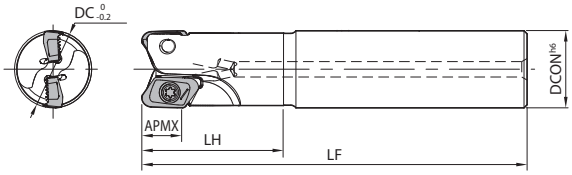


Fig.2

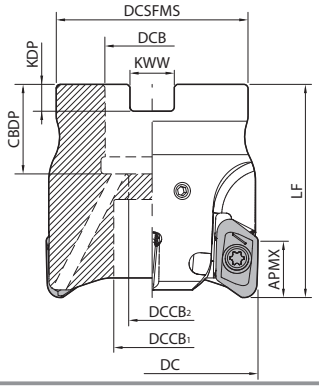
Toolholder Dimensions

Description			Stock	No. of Inserts	Dimensions (mm)					Rake Angle		Coolant Hole	Weight (kg)	Drawing	Spare Parts			Max. Revolution (min^{-1})
					DC	DCON	LF	LH	APMX	A.R. (MAX.)	R.R.				Clamp Screw	Wrench	Anti-seize Compound	
Straight Shank	Standard	MEAS 28-S25-13-2T	●	2	28	25	125	40	12	+10°	-13°	Yes	0.4	Fig. 1	SB-4090TRP	DTPM-15 Recommended Torque for Insert Clamp 3.5N-m	P-37	54,000
		35-S32-13-2T	●		35	32	150	50			-13°		0.9					46,000
		40-S32-13-3T	●	3	40						-12°		0.9					42,000
	Same Size	MEAS 25-S25-13-2T	●	2	25	25	125	49	12	+10°	-14°	Yes	0.4	Fig. 2	SB-4075TRP			59,000
		32-S32-13-2T	●		32	32	150	69			-13°		0.8		SB-4090TRP			49,000
	Long	MEAS 25-S25-13-2T-170	●	2	25	25	170	89	12	+10°	-14°	Yes	0.5	Fig. 2	SB-4075TRP			49,000
		32-S32-13-2T-200	●		32	32	200	119			-13°		1.1		SB-4090TRP			39,000

When using inserts with a corner-R(RE) of 3.2 or larger, additional modifications is necessary. (Please see back cover for more details.)
Coat Anti-seize Compound (P-37) thinly on portion of taper and thread when insert is fixed.

● : Standard Stock

MEAS | Face Mill



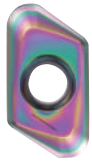
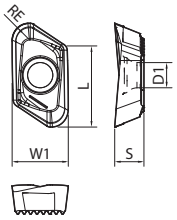
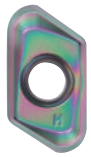
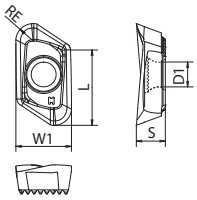
Toolholder Dimensions

Description	Stock	No. of Inserts	Dimensions (mm)										Rake Angle		Coolant Hole	Weight (kg)	Spare Parts				Max. Revolution (min^{-1})
			DC	DCSFMS	DCB	$DCCB_1$	$DCCB_2$	LF	CBDP	KDP	KWW	APMX	A.R. (MAX.)	R.R.			Clamp Screw	Mounting Bolt	Wrench	Anti-seize Compound	
MEAS 050R-13-4T-M	●	4	50	45	22	18	11	50	21	6.3	10.4	12	+10°	-11°	Yes	0.4	SB-4090TRP	HH10X30H	DTPM-15 Recommended Torque for Insert Clamp 3.5N-m	P-37	36,000

When using inserts with a corner-R(RE) of 3.2 or larger, additional modifications is necessary. (Please see back cover for more details.)
Coat Anti-seize Compound (P-37) thinly on portion of taper and thread when insert is fixed.

● : Standard Stock

Applicable Inserts

Shape		Description		Dimension (mm)					DLC Coating
				W1	S	D1	L	RE	PDL025
		KCGT	130504FR-AL	9.9	5.1	4.4	14.1	0.4	●
			130508FR-AL				13.9	0.8	●
			130512FR-AL				13.8	1.2	●
			130516FR-AL				13.3	1.6	●
			130520FR-AL					2.0	●
			130524FR-AL					2.4	●
			130530FR-AL					3.0	●
			130532FR-AL				12.8	3.2	●
			130540FR-AL					4.0	●
			130550FR-AL					5.0	●
NEW  Tough Edge		KCGT	130504ER-AM	9.9	5.1	4.4	13.7	0.4	●
			130508ER-AM					0.8	●
			130516ER-AM				13.3	1.6	●
			130525ER-AM					2.5	●
			130530ER-AM					3.0	●
			130540ER-AM				12.8	4.0	●

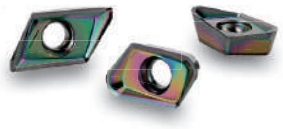
● : Standard Stock

DLC Coating

PDL025

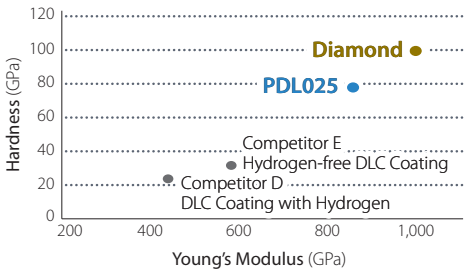
Kyocera's Proprietary Hydrogen-free DLC Coating

Achieves Long Tool Life with Hardness Close to that of Diamond

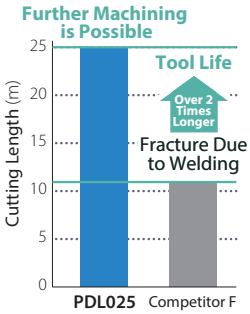


1 Long and Stable Tool Life

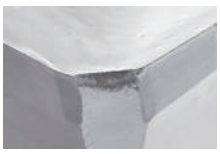
Coating Properties (Internal evaluation)



Tool Life (Internal evaluation)



PDL025
After Machining 25 m



Competitor F
After Machining 11 m

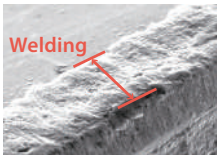
Cutting Conditions : Vc = 500 m/min, ap × ae = 3 × 5 mm, fz = 0.2 mm/t, Dry
Cutter Dia. : ø25 mm Workpiece : A7075

2 Excellent Surface Finish

Excellent Surface Finish with Aluminum Welding Resistance

Welding Resistance Comparison (Internal evaluation)

PDL025



Competitor G

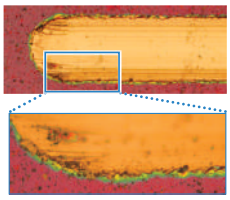
Cutting Conditions : Vc = 800 m/min, ap × ae = 3 × 5 mm, fz = 0.1 mm/t, Dry
Cutter Dia. ø25 mm Workpiece : A5052 Cutting Length : 57 m

3 Stable Machining

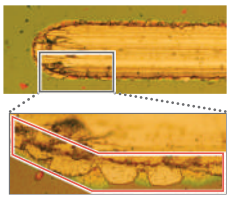
Stable Machining Due to DLC Coating Layer with Excellent Peeling Resistance. Improved Chip Evacuation Due to High Lubrication

Scratch Test : Coating Conditions Comparison with Load 80 N (Internal evaluation)

PDL025



Competitor H (DLC Coating)



Film Peeling

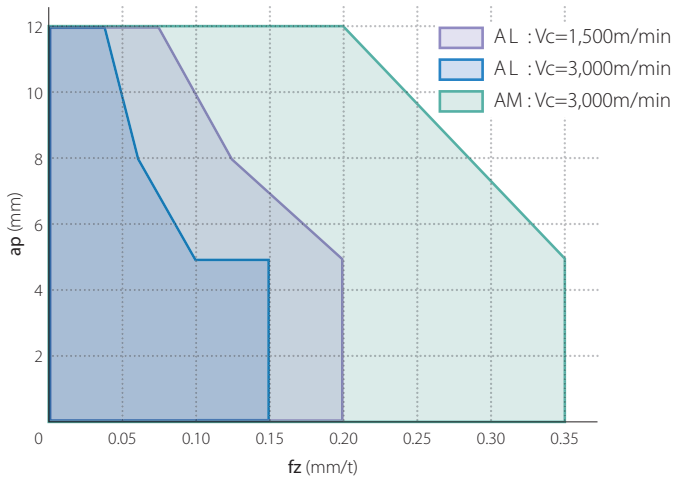
Recommended Cutting Conditions

Workpiece		Chipbreaker	Cutting Speed Vc (m/min)	Cutting Width ae (mm)	Cutting Diameter/Feed ap = 0.5 mm (Reference value)	
				Cutting Diameter DC	Cutting Dia.ø28 or less	Cutting Dia.ø32 or more
Aluminum Alloy	Si Ratio 12.5% or Below	AL	200 ~ **1,000** ~ 3,000	≤0.5DC	0.05 ~ **0.15** ~ 0.25	
				0.5DC <	0.05 ~ **0.15** ~ 0.25	
		AM	*200 ~ **1,000** ~ 5,000	≤0.5DC	0.05 ~ **0.15** ~ 0.3	0.05 ~ **0.2** ~ 0.35
				0.5DC <	0.05 ~ **0.15** ~ 0.25	0.05 ~ **0.15** ~ 0.3
	Si Ratio 12.5% or Above	AL	200 ~ **300** ~ 400	≤0.5DC	0.05 ~ **0.1** ~ 0.2	
				0.5DC <	0.05 ~ **0.1** ~ 0.2	
		AM	*200 ~ **300** ~ 800	≤0.5DC	0.05 ~ **0.15** ~ 0.3	0.05 ~ **0.2** ~ 0.35
				0.5DC <	0.05 ~ **0.15** ~ 0.25	0.05 ~ **0.15** ~ 0.3

1. *Please note that the cutting speed is different between AL chipbreaker and AM chipbreaker.
2. Adjust the cutting speed and feed within the recommended machining range according to the actual cutting conditions. (machine rigidity, work rigidity, etc.)
3. Do not use it under conditions that exceed the recommended conditions.
4. When using at high speed rotation (10,000 min^{-1} or more), take effective safety measures by adjusting the balance of the combination of the tool body and arbor at the speed you are using, referring to the balance grade table below.
5. For high-speed machining, check the condition of the screws and replace them regularly. (When the cutting speed is 3,000 m/min, replace the screws when replacing inserts.)

MEAS Cutting Performance

ø50 (4 Inserts) Shouldering ae = 25 mm Workpiece : A7075



• Reduce the feed rate when machining at high speed.

Spindle Revolution (min^{-1})	ISO Balance Grade ISO 1940-1/8821 (JIS B0905)
~20,000	G16
~30,000	G6.3
30,000~	G2.5

Max. Revolution for Each Cutting Diameter

Cutting Diameter DC (mm)	Cutter Max. Revolution n (min^{-1})
25	59,000 (Long Shank : 49,000)
28	54,000
32	49,000
35	46,000 (Long Shank : 39,000)
40	42,000
50	36,000

Maximum revolution without balance adjustment in combination with arbor

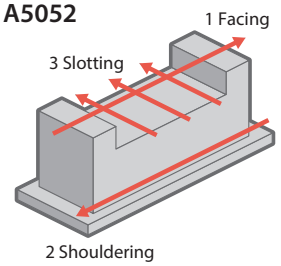
Cutting Diameter DC (mm)	Cutter Max. Revolution n (min^{-1})
25	12,500
28	11,500
32	9,600
35	8,800
40	7,700
50	6,300

Case Study

Industrial Machine Parts A5052

Vc = 1,500 m/min (n = 9,550 min^{-1})
1. ap x ae = 3 x 40 mm
   fz = 0.2 mm/t (Vf = 7,640 mm/min)
2. ap x ae = 8 x 5 mm
   fz = 0.2 mm/t (Vf = 7,640 mm/min)
3. ap x ae = 2 x ~ 50 mm
   fz = 0.15 mm/t (Vf = 5,730 mm/min)
   Wet

MEAS050R-13-4T-M
KCGT130504FR-AL PDL025



Cutting Time

MEAS ø50-4T **190** Sec

Cutting Time 50%

Competitor C ø50-3T **430** Sec

MEAS showed 50% faster cycle time or more compared to competitor C.
(User evaluation)

Ramping Reference Data

Cutting Dia. DC (mm)	25	28	32	35	40	50
Max. Ramping Angle RMPX	20°	16°	12.5°	11°	8.5°	6°
tan RMPX	0.363	0.287	0.221	0.194	0.149	0.105

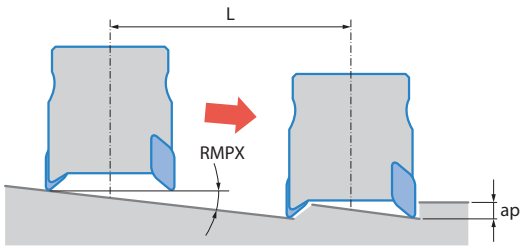
Ramping Tips

Recommended ramping angle is ≤ RMPX.
(see chart above for recommended ramp angle.)

Reduce recommended feed rate by 50%.

Formula for Max. Cutting max Length (L) at Max. Ramping Angle

$$L = \frac{ap}{\tan RMPX}$$



Plunging Tips

* Reduce feed rate to fz ≤ 0.1mm/t when plunging.

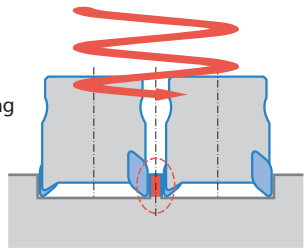
Insert Description	Maximum Width of Cut (ae)
KCGT13 Type	8 mm

Helical Milling Tips

For Helical milling, use between Min. drilling dia. and Max. drilling dia.

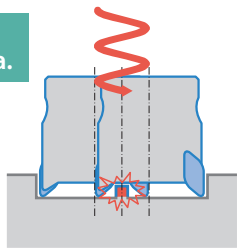
Exceeding Max. Machining Dia.

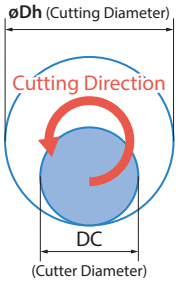
Center Core Remains After Machining



Under Min. Machining Dia.

Center Core Hits Holder Body



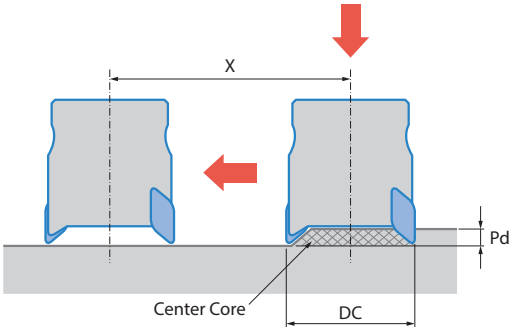


Description	Min. Cutting Dia.	Max. Cutting Dia.	Maximum ramping depth per cycle
MEAS···13···	2×DC-16	2×DC-3	3.5

Unit : mm

- Use climb milling. (Refer to detail on right)
- Feed rates should be reduced to 50% of recommended cutting.
- Use caution to eliminate incidences caused by producing long chips.

Drilling Tips



Drilling Depth

Please refer to the figure above. (Pd : Max. Drilling depth)

Traversing after Drilling

1. It is recommended to reduce feed by fz = 0.15 (mm/t) or less until the center core is removed.
2. Axial feed rate recommendation per revolution is f = 0.1mm/rev or less.

Description	Max. Drilling Depth Pd	Min. Cutting Length X for Flat Bottom Surface
MEAS···-13-···	3.5	DC-16

Unit : mm

How to Mount Inserts

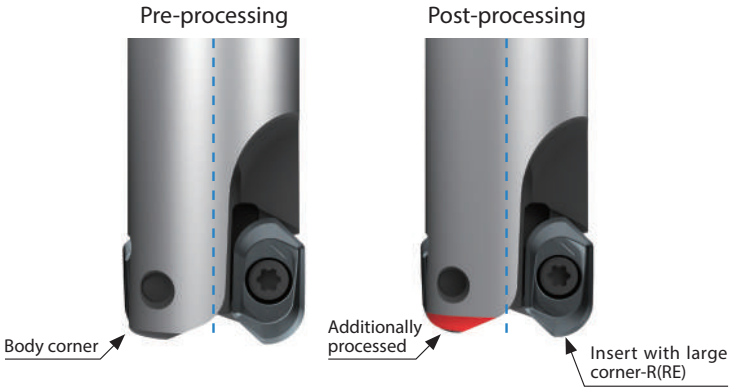
1. Completely eliminate chips and dust from the insert mounting side.
2. Insert Screw
   • Coat anti-seize compound (P-37) thinly on portion of taper and thread.
   • Attach screw to the magnetized wrench tip and tighten while gently pressing the outside edge of the insert toward the insert pocket surface. (grooved surface)
   (see the picture on the right)
   (Recommended Torque 3.5N·m)

When using inserts with a corner-R(RE) of 3.2 or larger

When using inserts with corner-R(RE) 3.2 or larger, additional modifications of the cutter body will be necessary.
Additional modifications for the body will be necessary.
Ref. to the chart below for the recommended modifications.
After the additional modifications, adjust the balance grade to G6.3 at a speed of 10,000 min^{-1}.
Make sure that there is no burr on the insert pocket surface (grooved surface).
(If corner-R is 3.0 mm or smaller, additional modifications are not needed.)

Insert Corner-R(RE) (mm)	Additional Processing Dimension to Body Corner (mm)
3.2	R2.0
4.0	R2.5
5.0	R3.0

* Round- shaped additional processing is recommended.
  Do not make any additional chamfering.



Cautions

While in Use

⚠ Caution

Please use within recommended cutting conditions.

Do not run the cutter at revolutions exceeding the printed maximum revolution limit of the cutter body.

Do not use the end mill at the maximum revolution or higher since the centrifugal force may cause inserts and parts to scatter even under no load.

Please do not use under the following conditions :

When cutter is not fully loaded with inserts.
If the body is damaged.

Please wear protective equipment such as protective glove when changing inserts.

Injury can occur when touching the cutting edge.

Dynamic Balance

Balance adjustment on the cutter is completed before shipping.

Balance adjustment has been made with special high precision inserts to be ISO balance grade (ISO1940/1) G6.3.

When using at a higher revolution (10,000min^{-1} or over), refer to the table below to adjust the balance of MEAS and arbor.

Do not operate the balance adjustment screw on the outer periphery of the cutter. This could lead to improper dynamic balance.

Spindle Revolution (min^{-1})	ISO Balance Grade ISO 1940-1/8821 (JIS B0905)
~20,000	G16
~30,000	G6.3
30,000~	G2.5

CP433-1