

Turning insert for mild steel machining

# FP Chip Breaker

(Positive)

KORLOY  
TECH-NEWS



- Actualized low cutting resistance and excellent surface finish by 3-dimensional cutting edge
- Enhanced chip removal in 0.1 mm depth of cut machining and 30% longer tool life due to chip breaker with semicircle-shaped bumps

Turning insert for mild steel machining

## FP Chip Breaker (Positive)

Continuous and long chip flowing on the tools is formed while machining mild steel (containing 0.13-0.2% of carbon) used for components of automobile and general machinery machining. Remaining long chips create scratches on the workpiece and the chip can curl up with the tool or workpiece which can cause poor machinability in automatic Swiss lathe machining.

KORLOY's newly launched FP chip breaker enhances chip control and surface finish in mild steel machining.

The **FP chip breaker** applied optimal 3-dimensional cutting edge and semicircle-shaped bump actualize chip curling in finishing and prevent chip blockage providing convenience for automatic machining.

In addition, its concave form and assistant bump on flank surface ensure perfect chip control in machining with lower depth of cut than nose R and back cutting. The sharp cutting edge is suitable for good surface finish per customers' needs and low cutting load prevents chattering in deep machining.

The FP chip breaker with various grades, cermet, coated cermet, CVD and PVD etc. is available for mild steel, carbon steel, alloy steel, stainless steel machining.

The optimal structure of FP chip breaker for internal machining and its high performance in mild steel machining without chip blockage provides the best solutions for customers.



### Stable chip evacuation

- Enhanced chip curling in various cutting conditions by chip breaker with semicircle-shaped bumps
- Preventing chip blockage in internal machining

### Convenient to automation in internal machining

- Optimized automatic production due to improved chip evacuation in 0.1 mm depth of cut machining

### Excellent surface finish

- Enhanced surface finish and lowered cutting load from 3-dimensional cutting edge
- Applied to finish in finishing

### Parts made of mild steel and low carbon steel

- Various materials of automobile components
- General use for mild steel, alloy steel, and stainless steel etc. depending on grades

# Chip breaker features

## FP chip breaker (For chip control in finishing)

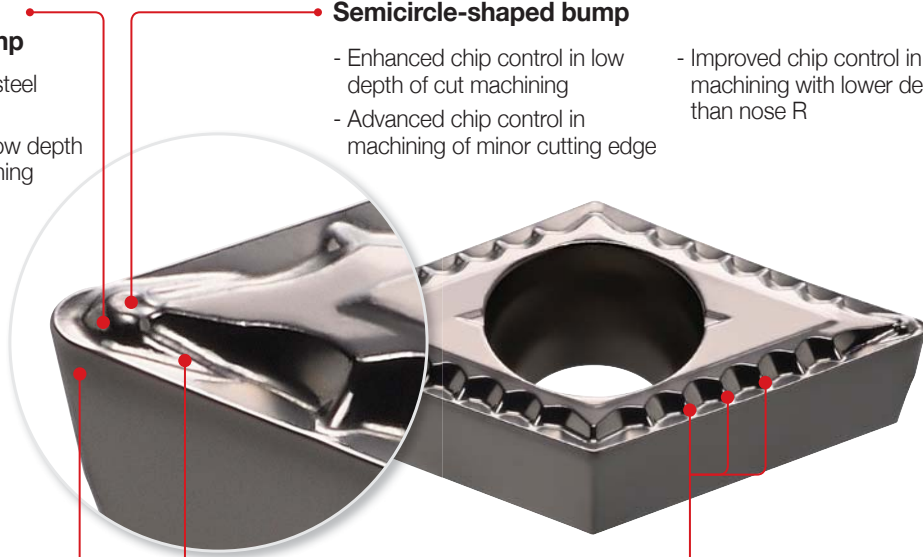
- Chip breaker applied on one side of insert controls chip in mild steel machining with low depth of cut
- Chip control in poor machining (with lower depth of cut than nose R, in machining minor cutting edge and in back cutting)
- Decreased cutting load and excellent surface finish due to 3-dimensional cutting edge and side rake angle

### Concave form of semicircle-shaped bump

- Better chip curling in mild steel machining
- Enhanced chip control in low depth of cut and low feed machining

### Semicircle-shaped bump

- Enhanced chip control in low depth of cut machining
- Advanced chip control in machining of minor cutting edge
- Improved chip control in machining with lower depth of cut than nose R



### 3-dimensional side rake angle

- Ensuring surface finish and guiding chip to right direction

### Assistant bump on flank surface

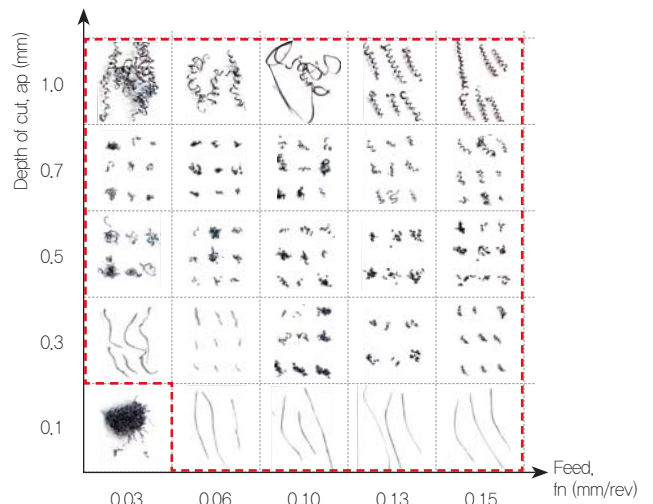
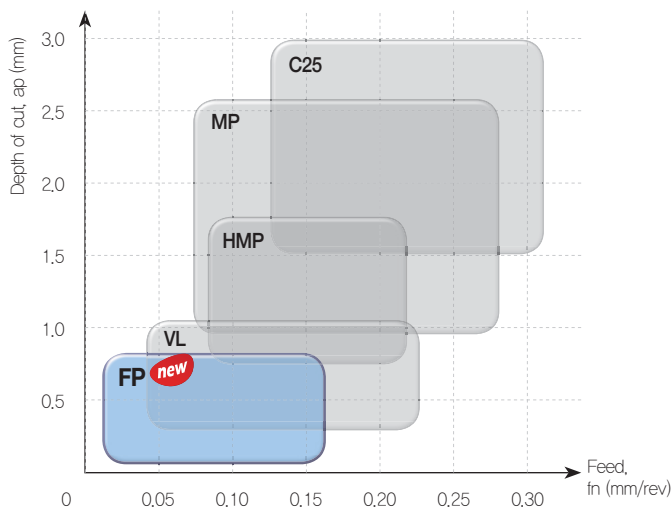
- Better chip curling in high depth of cut and low feed machining
- Preventing chip twist

### Continuous bump on flank surface

- Cutting long chip

# Application range

- **Workpiece** Mild steel [C22 (DIN)], Ø30 Internal machining
- **Cutting conditions**  $vc$  (m/min) = 200,  $n$  (rpm) = 2,000,  $f_n$  (mm/rev) = 0.03-0.15,  $a_p$  (mm) = 0.1-1.0, wet
- **Tools** **Insert** CCMT09T304-FP (NC3215) **Holder** SCLCR2020-M09



# Performance evaluation

## Chip control

- **Workpiece** Mild steel [C22 (DIN)], Ø40 Internal machining
- **Cutting conditions**  $vc$  (m/min) = 200,  $n$  (rpm) = 1,600,  $f_n$  (mm/rev) = 0.03,  $a_p$  (mm) = 0.5, wet
- **Tools** **Insert** CCMT09T304-FP (NC3215) **Holder** S16M-SCLCR-M09



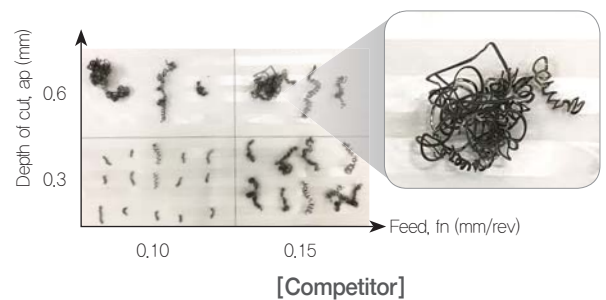
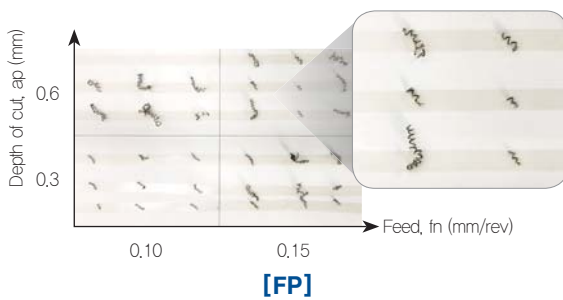
[FP]



Excellent chip control



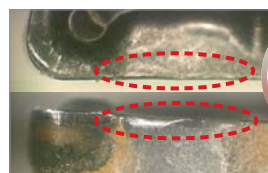
[Competitor]



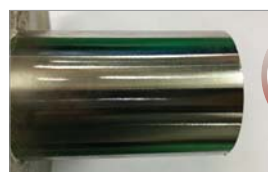
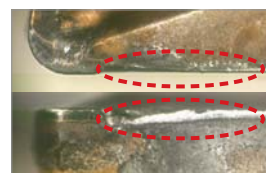
► Concave-designed main chip breaker with semicircle-shaped bump and assistant bump actualizes excellent chip evacuation in internal machining.

## Surface finish

- **Workpiece** Mild steel [C22 (DIN)], Ø30 External machining
- **Cutting conditions**  $vc$  (m/min) = 200,  $n$  (rpm) = 2,000,  $f_n$  (mm/rev) = 0.08,  $a_p$  (mm) = 0.8, wet
- **Tools** **Insert** CCMT09T304-FP (NC3215) **Holder** SCLCR1616-M09



Improved wear resistance



Good surface finish



[FP]

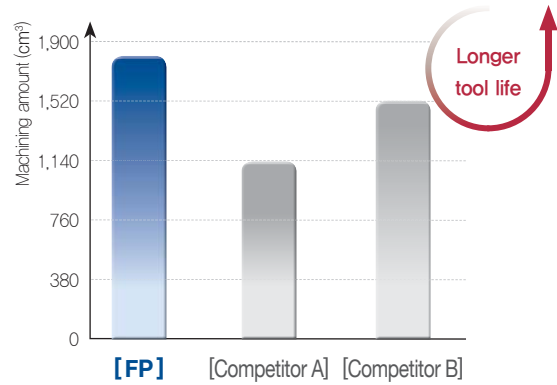
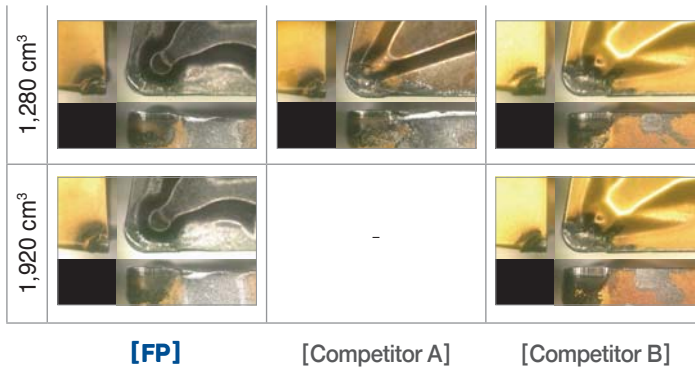
[Competitor]

► 3-dimensional cutting edge and side rake angle ensure excellent surface finish.  
 ► The assistant bump letting chip out of workpiece minimizes scratch on the workpiece.

## Performance evaluation

### Surface finish

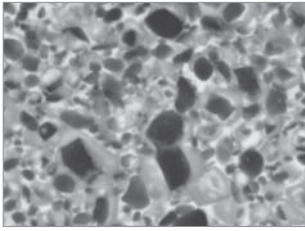
- **Workpiece** Alloy steel (42CrMo4), Ø30 External machining
- **Cutting conditions** vc (m/min) = 220, n (rpm) = 2,300, fn (mm/rev) = 0.1, ap (mm) = 0.8, wet
- **Tools** **Insert** CCMT09T304-FP (NC3215) **Holder** S16M-SCLCR-M09



## The comparison of chip breakers and grades

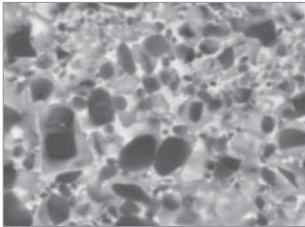
Category	Application	KORLOY	Competitor A	Competitor B	Competitor C	Competitor D	Competitor E	Competitor F	Competitor G	Competitor H	Competitor I	Competitor J	
Chip breaker	Medium cutting	C25	MT	All round	All round	PM	MU	PR	MF	19	RP4	M5	
	Medium to finishing	HMP, MP	FM, PC	XQ, HQ	MP	PS	SU	PM	MP	SM	MP4	MF2	
	Finishing	VL, VF	FG	GP	LP, SV	PF	LB, SS	UM	FF	14	-	F1	
		FP <sup>new</sup>	FA	XP, PP	FP, FV	PSF	FB, FP	PF	UF	F3P	FP4	FF	
Grade	Cermet	CN1500 CN2500	CT3000	TN610 TN620 TN6020	NX2525 NX3035	NS520 NS9530	T110A T1500A	CT5015	HT2 HT5	IC520N IC530N	-	C15M TP1020	
	Coated cermet	CC1500 CC2500	PV3000	PV710 PV720 PV7010	UP35N AP25N	GT720 GT9530	T2000Z T3000Z	GC1525	-	-	WTA43 WTA41	TP1030	
	CVD		NC3215	TT8115	CA5515	MC6015	T9115	AC810P	GC4315	KCP10	IC8150	WPP10S	TP1501
			NC3225	TT8125	CA5525	MC6025	T9125	AC820P	GC4325	KCP25	IC8250	WPP20S	TP2501
			NC9125	TT9225	CA6525	MC704	T6130	AC6030M	GC2025	KCM25B	IC6025	WAM20	TM4000
	PVD		PC8110	TT5080	PR1310	VP10RT	SH725	AC510U	GC1105	KC5010	IC907	WSM10	CP200
		PC5300	TT9080	RP1225	VP15TF	SH730	AC530U	GC1125	KC5025	IC908	WSM30	CP500	

## Grade features



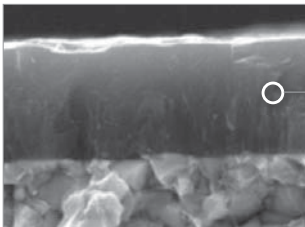
### CN1500

- Ti (C, N)-WC-Co/Ni high hardness cermet
- Optimized microstructure for continuous cutting



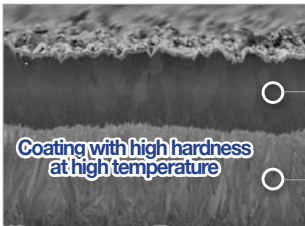
### CN2500

- Ti (C, N)-WC-Co/Ni high toughness cermet
- Optimized microstructure for interrupted and high feed cutting



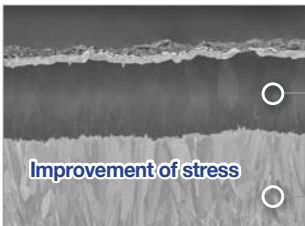
### CC1500/CC2500

- Excellent surface finish and wear resistance due to coating layer with high lubrication and oxidation resistance



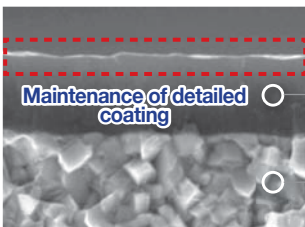
### NC3215

- Applied coating layer with high hardness and wear resistance at high temperature
  - Available for continuous/interrupted machining of hot/ cold forging steel and bearing steel
- Longer tool life actualized by new coating technology
  - Enhanced wear resistance and welding resistance



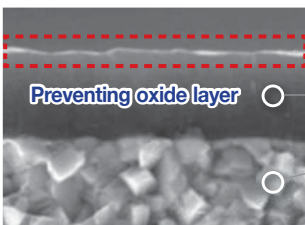
### NC3225

- Less chipping and enhanced productivity due to stress improvement
  - Available for continuous/interrupted machining of general steel, forging steel for automobile components and bearing steel
- High reliability and durability of cutting edge
  - Enhanced welding resistance and chipping resistance



### PC5300

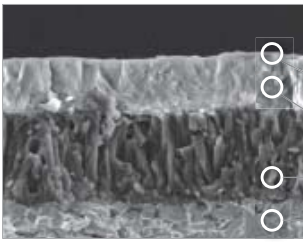
- Excellent coating with high hardness and oxidation resistance grade at high temperature
  - Enhanced oxidation resistance in steel, cast iron, stainless steel and HRSA machining
- Applied high toughness ultrafine substrate technology
  - Enhanced welding resistance and chipping resistance



### PC8110

- Preventing wear at high temperature due to coating layer with high hardness, oxidation resistance and surface finish
- Ensuring stable machinability, enhanced chipping resistance and wear resistance of corners by controlling ultra-fine micro structure evenly

## Grade features

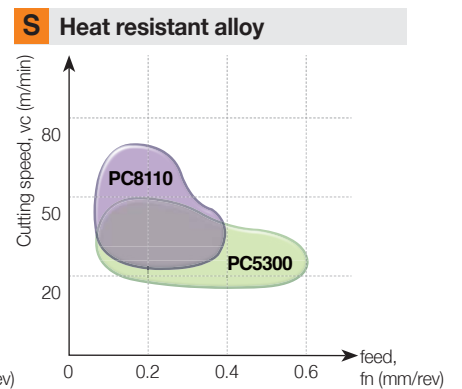
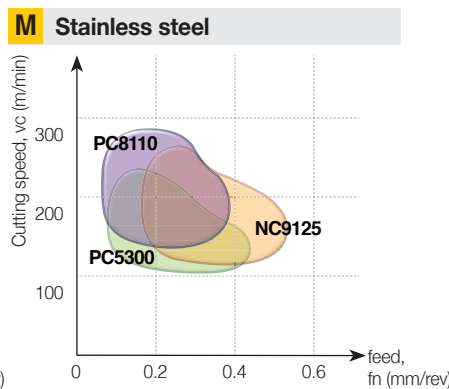
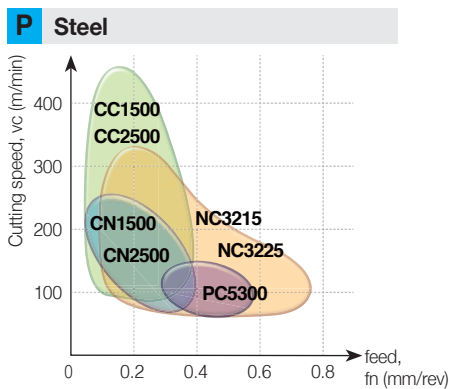


### NC9125

- Top coat with higher welding resistance
- Alumina layer for high speed machining
- MT CVD-TiCN layer with higher chipping resistance
- High toughness substrate optimal for all continuous/low or high interrupted machining

## Grades and recommended cutting conditions

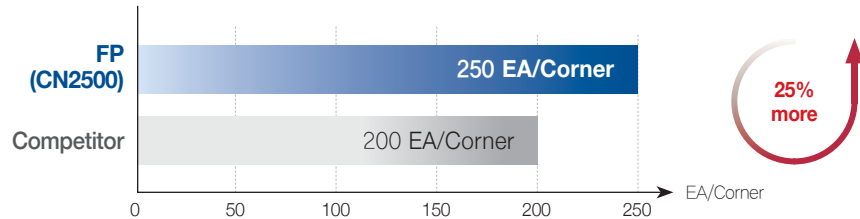
Workpiece	Grade	Recommended cutting speed, vc (m/min)				
		50	100	200	300	400
P Steel	CN1500			150	350	
	CN2500			130	300	
	CC1500			200	400	
	CC2500			180	350	
	NC3215			200	350	
	NC3225			150	300	
	PC5300	60	160			
M Stainless steel	NC9125		120	220		
	PC8110		80	130		
	PC5300		80	160		
S HRSA	PC8110	35	65			
	PC5300	25	55			



## Application examples

### Mild steel [C22 (DIN)]

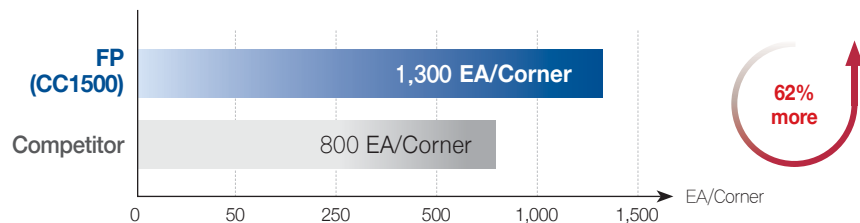
- **Workpiece use** Cam shaft journal
- **Cutting conditions**  $vc$  (m/min) = 280,  $n$  (rpm) = 2,500,  $fn$  (mm/rev) = 0.08,  $ap$  (mm) = 0.3, wet
- **Tools** **Insert** CCGT09T302-FS (PC5300) **Holder** SCLCL1212-X09A



- Main semicircle-shaped bump and side assistant bump enhance chip evacuation and surface finish in back cutting having poor chip control.
- Cermet, CN2500 ensures stable tool life in high speed and continuous machining.

### Mild steel [C22 (DIN)]

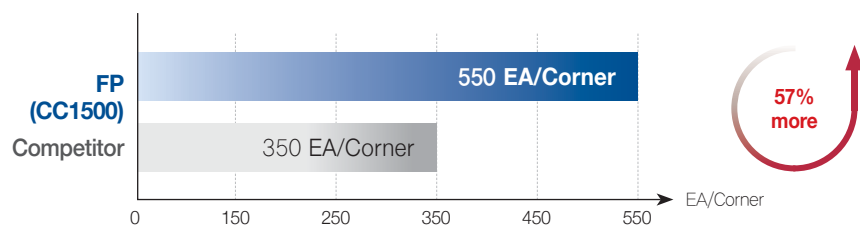
- **Workpiece use** OAD shaft
- **Cutting conditions**  $vc$  (m/min) = 350,  $n$  (rpm) = 3,200,  $fn$  (mm/rev) = 0.03,  $ap$  (mm) = 0.1, wet
- **Tools** **Insert** CCGT09T302-FS (PC5300) **Holder** SCLCL1212-X09A



- The combination of 3-dimensional cutting edge, semicircle-shaped bump and concave form increases chip evacuation and chip control and prevents chip blockage.
- Applied coated cermet increases tool life with excellent lubrication, welding resistance and oxidation resistance.

### Mild steel (41CrNiMo2)

- **Workpiece use** Ball sleeve
- **Cutting conditions**  $vc$  (m/min) = 265,  $n$  (rpm) = 3,300,  $fn$  (mm/rev) = 0.03,  $ap$  (mm) = 0.1, wet
- **Tools** **Insert** CCGT09T302-FS (PC5300) **Holder** SCLCL1212-X09A



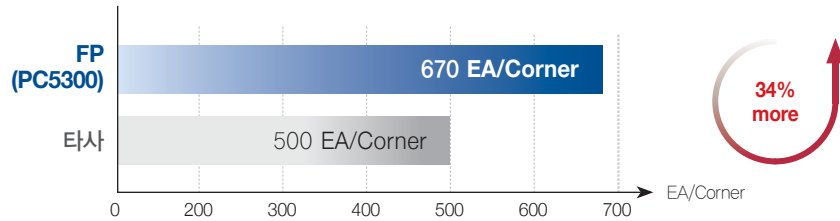
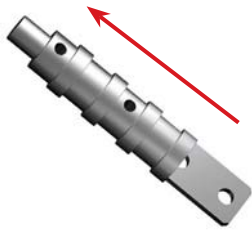
- Sharp cutting edge and semicircle-shaped main bump enhance chip evacuation and prevent chip blockage.
- Applied cermet, CN1500 enhances surface finish and reduces crater wear on rake surface.



# Stock items

## Stainless steel (X5CrNiMo17-12-2)

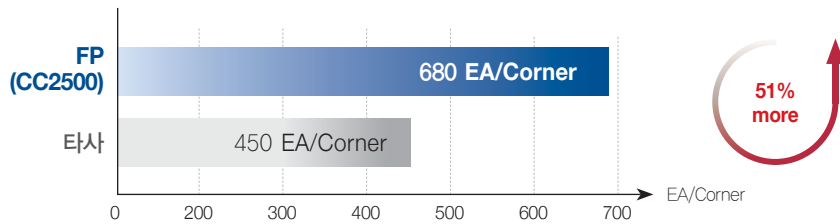
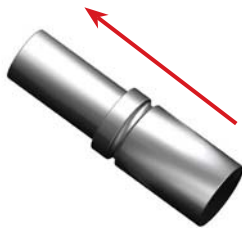
- **Workpiece use** Valve
- **Cutting conditions**  $vc$  (m/min) = 160,  $n$  (rpm) = 1,700,  $fn$  (mm/rev) = 0.06,  $ap$  (mm) = 0.3, wet
- **Tools** **Insert** CCMT060204-FP (PC5300) **Holder** SCLCL1010-E06



- 3-dimensional designed and sharp cutting edge enhances chip evacuation and prevents welding.
- PVD coating and high hardness substrate ensure stable tool life in stainless steel machining.

## Bearing steel (B1)

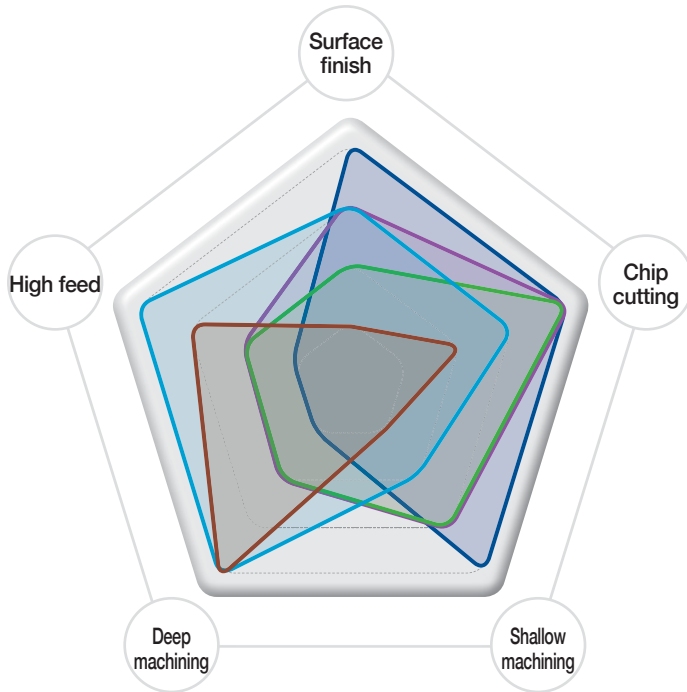
- **Workpiece use** Pump shaft
- **Cutting conditions**  $vc$  (m/min) = 103,  $n$  (rpm) = 820,  $fn$  (mm/rev) = 0.15,  $ap$  (mm) = 0.2, wet
- **Tools** **Insert** VBMT160408-FP (CC2500) **Holder** SVJBR1616-H16



- The combination of 3-dimensional cutting edge, semicircle-shaped bump and concave form increases chip evacuation and chip control and prevents chip blockage.
- Applied coated cermet increases tool life with excellent lubrication, welding resistance and oxidation resistance.

# Positive chip breaker selection guide

— FP — VL — HMP — MP — C25

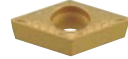


## FP <sup>new</sup>



- Excellent chip control (in mild steel finishing)
- Available for poor chip control machining by round-shaped bump and concave-formed assistant bump

## VL



- Strong cutting edge (in finishing)
- Assistant for FP in mild steel machining
- For medium to finishing in general alloy steel
- For steel or cast iron finishing

## HMP



- For medium to finishing (better chip control)
- Enhanced chip control due to bump
- 2<sup>nd</sup> recommended chip breaker in medium cutting
- Machining versatility over a wide cutting condition

## MP



- For medium to finishing (for general use)
- Available for general machining due to round-shaped rear bump
- 1<sup>st</sup> recommended chip breaker for steel machining
- Suitable for steel or cast iron medium cutting

## C25



- Strong cutting edge (in medium cutting)
- Cutting edge with flat negative land structure
- Suitable for machining with large tool diameter and toughness
- Suitable for steel or cast iron medium cutting

Machining	Chip breaker	Surface finish	Chip cutting	Shallow machining	Deep machining	High feed
Finishing	FP <sup>new</sup>	★★★★★	★★★★★	★★★★★	★	★
	VL	★★★	★★★★★	★★★	★★	★★
Medium to finishing	HMP	★★	★★★★★	★★★	★★	★★
	MP	★★★	★★★	★★	★★★★★	★★★★★
Medium cutting	C25	★	★★	★	★★★★★	★★★

# Stock items

Picture	Designation	Cermet				Coated				Dimensions (mm)					Cutting condition		Geometries
		CN1500	CN2500	CC1500	CC2500	NC3215	NC3225	NC9125	PC8110	l	d	t	r	d <sub>1</sub>	f <sub>n</sub> (mm/rev)	a <sub>p</sub> (mm)	
	CCMT 060202-FP	●				●				6.2	6.35	2.38	0.2	2.8	0.01-0.10	0.05-0.08	
	060204-FP	●	●	●	●	●	●	●	●	6.0	6.35	2.38	0.4	2.8	0.01-0.10	0.10-0.90	
	09T302-FP	●				●				9.4	9.525	3.97	0.2	4.4	0.01-0.10	0.05-1.00	
	09T304-FP	●	●	●	●	●	●	●	●	9.2	9.525	3.97	0.4	4.4	0.01-0.10	0.10-1.00	
	09T308-FP	●	●	●	●	●	●	●	●	8.8	9.525	3.97	0.8	4.4	0.04-0.12	0.10-1.00	
	DCMT 070202-FP	●				●				7.5	6.35	2.38	0.2	2.8	0.01-0.10	0.05-0.08	
	070204-FP	●	●	●	●	●	●	●	●	7.3	6.35	2.38	0.4	2.8	0.01-0.10	0.10-0.90	
	070208-FP	●	●	●	●	●	●	●	●	6.8	6.35	2.38	0.8	2.8	0.01-0.10	0.10-1.00	
	11T302-FP	●				●				11.4	9.525	3.97	0.2	4.4	0.01-0.10	0.05-1.00	
	11T304-FP	●	●	●	●	●	●	●	●	11.2	9.525	3.97	0.4	4.4	0.01-0.10	0.10-1.00	
	SCMT 09T304-FP									9.1	9.525	3.97	0.4	4.4	0.01-0.10	0.10-1.00	
	09T308-FP									8.7	9.525	3.97	0.8	4.4	0.04-0.12	0.10-1.00	
	TCMT 060201-FP									6.4	3.97	2.38	0.1	2.15	0.00-0.08	0.05-0.07	
	110202-FP									10.5	6.35	2.38	0.2	2.8	0.01-0.10	0.05-0.08	
	110204-FP									10.0	6.35	2.38	0.4	2.8	0.01-0.10	0.10-0.90	
	TPMT 090202-FP	●	●	●	●	●	●	●	●	9.1	5.56	2.38	0.2	2.5	0.01-0.09	0.05-0.07	
	090204-FP	●	●	●	●	●	●	●	●	8.6	5.56	2.38	0.4	2.5	0.01-0.09	0.08-0.10	
	110302-FP	●	●	●	●	●	●	●	●	10.5	6.35	3.18	0.2	3.4	0.01-0.10	0.05-0.08	
	110304-FP	●	●	●	●	●	●	●	●	10.0	6.35	3.18	0.4	3.4	0.01-0.10	0.10-0.90	
	110308-FP	●	●	●	●	●	●	●	●	9.0	6.35	3.18	0.8	3.4	0.04-0.10	0.10-1.00	
	160404-FP	●				●	●	●	●	15.5	9.525	4.76	0.4	4.4	0.01-0.10	0.10-1.00	
	VBMT 110302-FP					●				11.0	6.35	3.18	0.2	3.4	0.01-0.10	0.05-0.08	
	110304-FP	●				●				10.0	6.35	3.18	0.4	3.4	0.01-0.10	0.10-0.90	
	110308-FP	●				●				9.0	6.35	3.18	0.8	3.4	0.01-0.10	0.10-1.00	
	160404-FP					●	●	●	●	15.6	9.525	4.76	0.4	4.4	0.01-0.10	0.10-1.00	
	160408-FP	●	●	●	●	●	●	●	●	14.6	9.525	4.76	0.8	4.4	0.04-0.12	0.10-1.00	
	VCMT 080202-FP									8.0	4.76	2.38	0.2	2.3	0.01-0.10	0.05-0.08	
	080204-FP									7.5	4.76	2.38	0.4	2.3	0.01-0.10	0.10-0.90	
	080408-FP									7.0	4.76	4.76	0.8	2.3	0.04-1.00	0.10-1.00	
	160404-FP									15.6	9.525	4.76	0.4	4.4	0.01-0.10	0.10-1.00	
	160408-FP									14.6	9.525	4.76	0.8	4.4	0.04-0.12	0.10-1.00	

● : Stock item

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Holystar B/D, 1350, Nambusunhwan-ro, Geumcheon-gu, Seoul, 08536, Korea  
Tel : +82-2-522-3181 Fax : +82-2-522-3184, +82-2-3474-4744 Web : www.korloy.com E-mail : sales.khq@korloy.com

### **KORLOY AMERICA**

620 Maple Avenue, Torrance, CA 90503, USA  
Tel : +1-310-782-3800 Toll Free : +1-888-711-0001 Fax : +1-310-782-3885  
E-mail : sales.kai@korloy.com

### **KORLOY INDIA**

Plot No. 415, Sector 8, IMT Manesar, Gurgaon 122051, Haryana, India  
Tel : +91-124-4391790 Fax : +91-124-4050032  
E-mail : sales.kip@korloy.com

### **KORLOY TURKEY**

Orucreis Mah. Vadi Cad. No: 108 Istanbul Ticaret Sarayi  
Kat 5 No: 318 Giyimkent Sitesi-Esenler/Istanbul, Turkey  
Tel : +90-212-438-5197 E-mail : sales.ktl@korloy.com

### **KORLOY RUSSIA**

Krasivy Dom office No. 305, Bld. 5, Novovladykinskiy proezd 8, 127106,  
Moscow, Russia  
Tel : +7-495-280-1458 Fax : +7-495-280-1459 E-mail : sales.krc@korloy.com

### **KORLOY FACTORY QINGDAO**

Ground Dongjing Road 56(B) District Free Trade Zone. Qingdao, China  
Tel : +86-532-86959880 Fax : +86-532-86760651  
E-mail : pro.ktq@korloy.com

### **KORLOY EUROPE**

Gablونzer Str. 25-27, 61440 Oberursel, Germany  
Tel : +49-6171-277-83-0 Fax : +49-6171-277-83-59  
E-mail : sales.keg@korloy.com

### **KORLOY BRASIL**

Av. Aruana 280, conj.12, WLC, Alphaville, Barueri,  
CEP06460-010, SP, Brasil  
Tel : +55-11-4193-3810 E-mail : sales.kbl@korloy.com

### **KORLOY CHILE**

Av. Providencia 1650, Office 1009, 7500027  
Providencia-Santiago, Chile  
Tel : +56-229-295-490 E-mail : sales.kcs@korloy.com

### **KORLOY MEXICO**

Queretaro, Mexico  
E-mail : sales.kml@korloy.com

### **KORLOY FACTORY INDIA**

Plot No. 415, Sector 8, IMT Manesar, Gurgaon 122051, Haryana, India  
Tel : +91-124-4391790 Fax : +91-124-4050032  
E-mail : pro.kim@korloy.com