KORLOY TECH-NEWS

FP Chip Breaker

Negative

Negative Turning Insert for Steel (Ultra finishing Type with Enhanced Chip Control)

- Two-step chip breaker design ensures excellent chip control in finishing to ultra finishing applications
- Sharp edge and side-sloping edge shape reduce cutting resistance and improve surface finish

KORLOY

Negative Turning Insert for Steel
(Ultra finishing Type with Enhanced Chip Control)

FP Chip Breaker (Negative)

Mild steel (low carbon steel), which is used in automobiles, general machinery parts, and more, has a low carbon content of 0.13~0.2%. This causes chips to be generated in a continuous flow during machining. Therefore, if these chips are not properly broken into appropriate sizes, the long chips can cause scratches on the workpiece and wrap around the tool or workpiece, making it difficult to use in automated processes.

KORLOY has newly launched the FP chip breaker, which delivers excellent performance in finishing operations requiring high surface finish and machining dimensional accuracy, especially in automated processes for materials like Mild steel that demand stable chip control.

The **FP chip breaker** features a two-step chip breaker shape, enabling effective chip curling from ultra finishing (ap 0.3mm) - finishing (ap 1mm) applications. Its first-step chip breaker shape, optimized for copying and taper machining, provides stable chip control in finishing complex shapes. Furthermore, the sharp edge reduces cutting load and minimizes vibration during machining, resulting in an excellent surface finish.

With a design optimized for finishing external Turning and combination with various grades, the FP chip breaker prevents from chip clogging in Mild steel as well as in Carbon steel, Alloy steel, and Bearing steel, providing the best solution for customers' needs with high surface finish and machining dimensional accuracy.

» Excellent chip control in finishing to ultra finishing applications
- Two-step chip breaker shape

» Good surface finish
- Minimized machining vibration with a sharp edge
- Excellent chip segmentation

» Machining stability in copying and taper machining
- Optimized design of the first-step chip breaker design for copying and taper machining

» Optimized for high-quality automated production lines
- Stable chip control
- Higher machining dimensional accuracy compared to existing M-grade

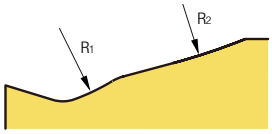
Features of Chip breaker

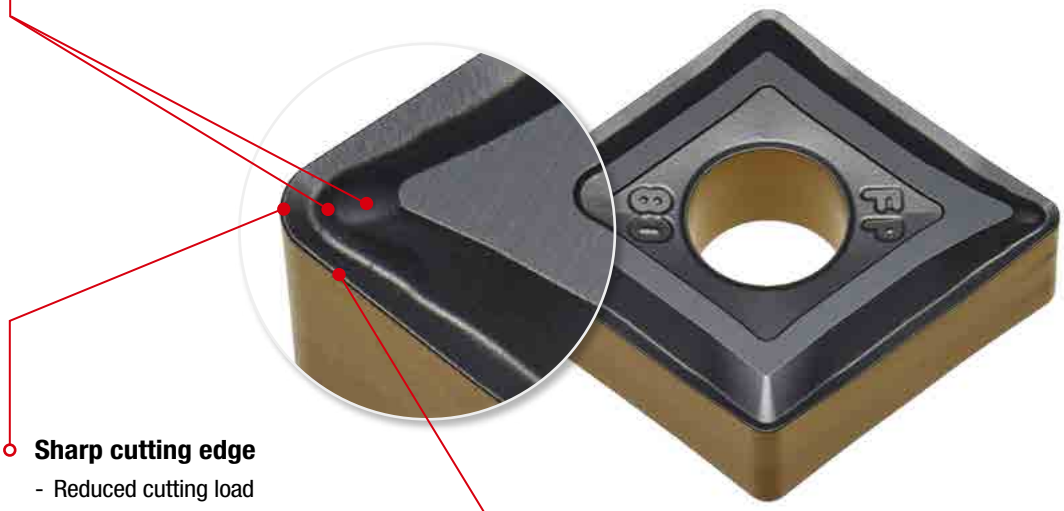
FP Chip breaker (for Mild steel ultra finishing)

- Two-step concave chip breaker shape enables effective chip control from low to high depths of cut within the finishing range
- Stable chip control is possible in small depths of cut (smaller than nose R), tapering and copying
- Sharp edge and side rake angle result in excellent surface finish and reduced cutting forces

Two-step chip breaker

- Effective chip control from ultra finishing to finishing applications.
- Optimized design for improving flank wear life.
- Optimized first-step chip breaker for copying and taper machining.





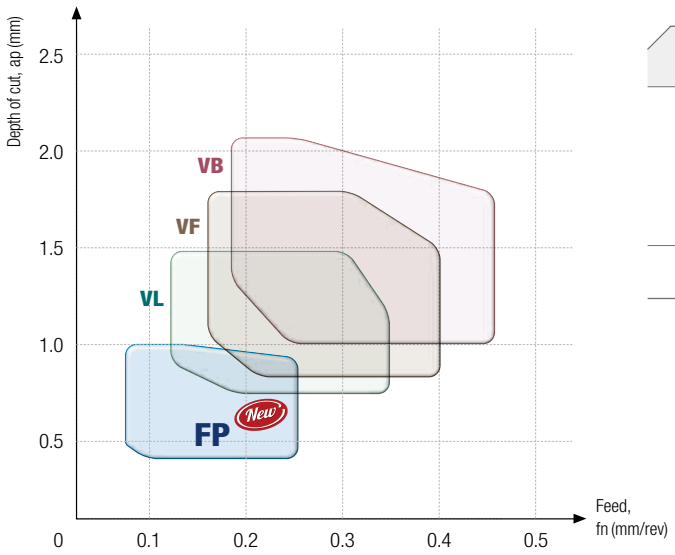
Sharp cutting edge

- Reduced cutting load
- High surface finish

Side rake angle

- Shearing function for long chips when they are generated.
- Improved surface finish and chip control.

Application range



Cutting range	Chip breaker	ap (mm)	fn (mm/rev)
Finishing	VB	1 ~ 2	0.18 ~ 0.45
	VF	0.8 ~ 1.8	0.15 ~ 0.4
	VL	0.7 ~ 1.5	0.12 ~ 0.35
Ultra finishing	FP (New)	0.3 ~ 1	0.08 ~ 0.25

Recommended cutting conditions

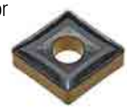
Workpiece					Specific cutting force Kc1 (N/mm²)	Brinell hardness (HB)	Wear resistance ⟷ Toughness				Ultra finishing	
							High speed and continuous cutting		Medium speed and low interrupted cutting			
ISO	Workpiece material		ISO	AISI			Grade				Chip breaker	
							NC3205	NC3215	NC5320	NC3225	FP	
							vc (m/min)				fn (mm/rev)	ap (mm)
P	Carbon steel	C=0.10-0.25%	C25	1025	1500	125	290	250	230	220	0.3	0.3~1
							410	**355**	**325**	**315**	**0.2**	
							530	460	420	410	0.1	
		C=0.25~0.55%	C35	1045	1600	150	260	225	210	200	0.28	
							370	**320**	**290**	**285**	**0.2**	
							475	415	375	370	0.1	
		C=0.55~0.80%	C45	1045	1700	170	230	200	185	175	0.25	
							330	**285**	**260**	**250**	**0.2**	
							425	370	335	325	0.08	
	Low-alloy steel ≤ 5%	Non-hardened	42CrMo4	4140	1700	180	245	210	195	185	0.25	
							345	**300**	**275**	**265**	**0.2**	
							445	385	350	345	0.08	
	High-alloy steel <5%	Annealed	-	D2	1950	200	210	185	170	160	0.25	
							300	**260**	**235**	**230**	**0.2**	
							390	335	310	300	0.08	
	Cast steel	Low-alloy (alloying elements ≤5%)	-	A148 (ASTM)	1600	200	160	140	125	120	0.25	
							225	**195**	**175**	**170**	**0.2**	
							290	250	230	225	0.08	
		Manganese steel 12~14% Mn	X120Mn13	3401	2900	250	85	75	70	65	0.2	
							120	**105**	**100**	**95**	**0.15**	
							160	135	125	120	0.05	

Grade features

CVD Coated grade	ISO	Feature
NC3205	P05~P15	• For high hardness general steel, forged steel and for high speed, continuous and mediem finishing • Applied high plastic deformation resistance materials and high heat resistance and wear resistance Alumina (Al_2O_3) increase surface • MT-TiCN + Al_2O_3 + TiN
NC3215	P10~P20	• Continuous machining of general steel and forged steel at high speed • Substrate with excellent thermal crack/plastic deformation resistance, coating with improved chipping resistance for continuous machining • MT-TiCN + Al_2O_3 + TiN
NC5320	P15~P20 K15~K25	• For medium hardness general steel, bearing steel, cast iron, medium to high speed cutting, medium interruption cutting, general cutting and medium cutting • Applied fracture resistance, chipping resistance and wear resistance Alumina(Al_2O_3) coating and materials increase tool life in hub bearing cutting • MT-TiCN + Al_2O_3 + TiN
NC3225	P20~P25	• High cutting performance in medium speed and medium interrupted cutting • 1st recommended grade for general machining with the use of high toughness substrate and coating layer with improved welding/chipping resistance • MT-TiCN + Al_2O_3 + TiN

Negative chip breaker selection guide

FP New

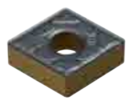


- For Ultra finishing (Enhanced Chip Control, For Mild Steel)
- Improved chip breaking and surface finish
- Stable chip control in taper and copying machining
- Higher machining dimensional accuracy compared to existing M-grade

VL

- For Finishing (Enhanced Edge Strength and Chip Control)
- Increased edge strength with a flat land
- Improved chip control with special dots and side rake angle
- Serves as a supplementary role to FP for mild steel

VF



- For Finishing (Balanced Chip Breaking and Toughness)
- Improved chip control at low depths of cut in the corner area by the special bumps
- Applicable to various feeds and depths of cut

VB

- For Finishing (Balanced Chip Breaking and Toughness)
- Excellent chip control in copying machining with varying depths of cut, due to 6 corner bumps
- Recommended for machining carbon steel and alloy steel cutting

Cutting range	Chip breaker	Surface finish	Chip cutting (Low depth of cut)	Precise cutting	Low interrupted cutting	High feed (High machinability)
Ultra finishing	FP New	★★★★	★★★★	★★★★	★★	★★
Finishing	VL	★★	★★★	★★	★★★★	★★
	VF	★★★	★★	★★	★★	★★★
	VB	★★	★★	★★	★★★	★★★★

Performance evaluation

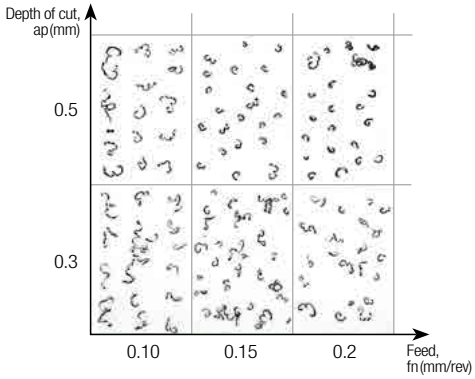
Chip control

Workpiece	Mild steel (20C), Ø30 Copying
Cutting condition	vc (m/min) = 380, fn (mm/rev) = 0.17, ap (mm) = 0.5, Wet
Tool	**Insert** DNMG150608-FP (NC3215) **Holder** DDJNL2525-M15

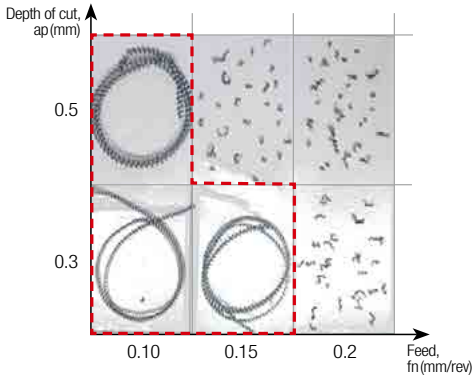
[FP]

[Competitor]

Workpiece	Mild steel (20C), Ø70 30° Taper machining
Cutting condition	vc (m/min) = 380, fn (mm/rev) = 0.1~0.2, ap (mm) = 0.3~0.5, Wet
Tool	**Insert** VNMG160408-FP (NC3215) **Holder** DVJNL2525-M16



[FP]



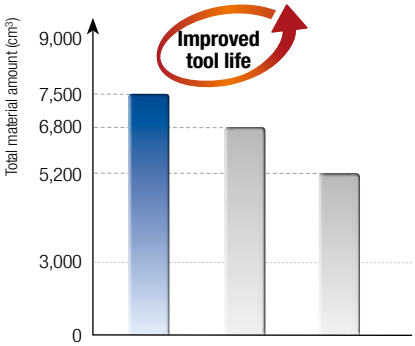
[Competitor]

» Achieving stable chip control performance with a optimized first-step chip breaker for copying and taper machining.

Wear resistance

Workpiece	Carbon steel (45C), External cutting
Cutting condition	vc (m/min) = 380, fn (mm/rev) = 0.2, ap (mm) = 0.5, Wet
Tool	**Insert** CNMG120408-FP (NC3215) **Holder** DCLNL2525-M12

[FP] [Competitor A] [Competitor B]

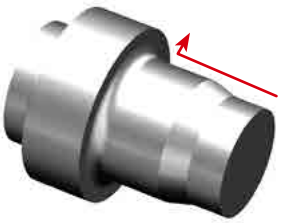


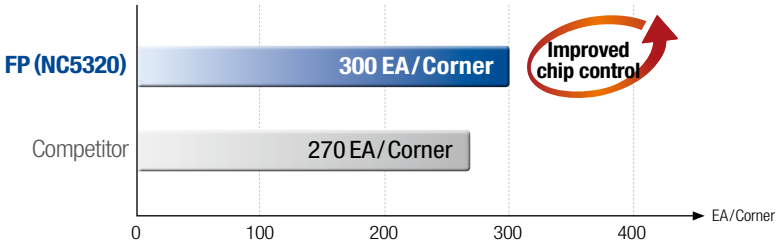
[FP] [Competitor A] [Competitor B]

Performance Evaluation

Forged steel (SCr420)

Workpiece use	Output shaft
Cutting condition	vc(m/min) = 280, fn(mm/rev) = 0.2~0.25, ap(mm) = 1.0, Wet
Tool	Insert DNMG150408-FP(NC5320) Holder MDQNL2525-M15

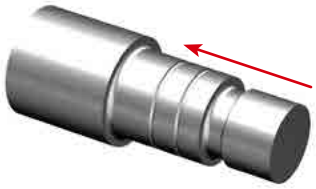


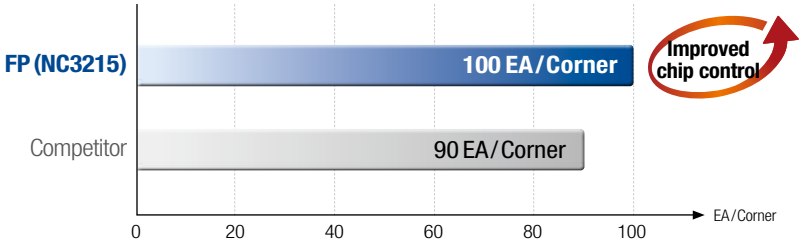


- Stable chip control with an optimized first-step chip breaker optimized for copying and tapering
- Our FP chip breaker segments chips at 4-8 curl intervals whereas competitor generates long chips and chip entanglement

Carbon steel (C45)

Workpiece use	Axle spindle
Cutting condition	vc(m/min) = 220, fn(mm/rev) = 0.1, ap(mm) = 0.8, Wet
Tool	Insert DNMG150608-FP(NC3215) Holder DDJNL2525-M15

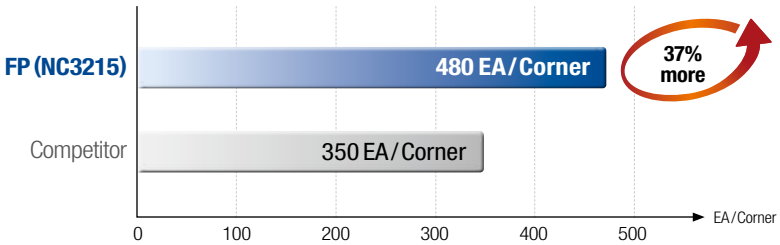




- Effective chip control in low depth-of-cut and low feed machining
- Our FP chip breaker segments chips at 6-10 curl intervals whereas competitor generates long chips and chip entanglement

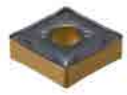
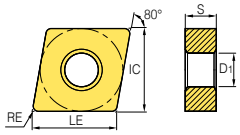
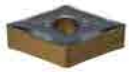
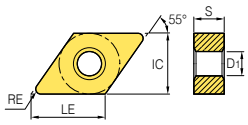
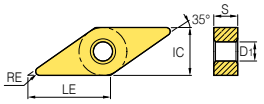
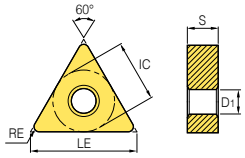
Alloy steel (42CrMo4)

Workpiece use	Hub bearing
Cutting condition	vc(m/min) = 230, fn(mm/rev) = 0.17~0.25, ap(mm) = 0.5, Wet
Tool	Insert DNMG150608-FP(NC3215) Holder PDJNL2525-M15



- Improved machining tool life with a chip breaker shape optimized for enhanced flank wear resistance
- Excellent surface finish with a sharp edge

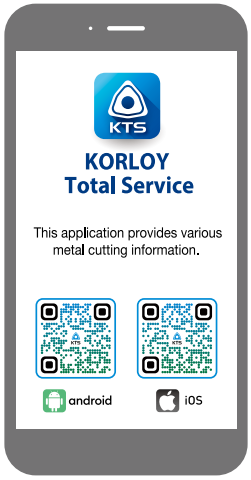
Stock items

Picture	Designation		Coated				Dimension (mm)					Cutting condition		Geometry
			NC3205	NC3215	NC3225	NC5320	IC	RE	S	LE	D1	fn (mm/rev)	ap (mm)	
	**CNMG**	120404-FP	●	●	●	●	12.7	0.4	4.76	12.896	5.16	0.08~0.25	0.3~1	
		120408-FP	●	●	●	●	12.7	0.8	4.76	12.896	5.16	0.08~0.25	0.3~1	
	**DNMG**	150404-FP	●	●	●	●	12.7	0.4	4.76	15.508	5.16	0.08~0.25	0.3~1	
		150408-FP	●	●	●	●	12.7	0.8	4.76	15.508	5.16	0.08~0.25	0.3~1	
		150604-FP	●	●	●	●	12.7	0.4	6.35	15.508	5.16	0.08~0.25	0.3~1	
		150608-FP	●	●	●	●	12.7	0.8	6.35	15.508	5.16	0.08~0.25	0.3~1	
	**VNMG**	160404-FP	●	●	●	●	9.525	0.4	4.76	16.606	3.81	0.08~0.25	0.3~1	
		160408-FP	●	●	●	●	9.525	0.8	4.76	16.606	3.81	0.08~0.25	0.3~1	
	**TNMG**	160404-FP	●	●	●	●	9.525	0.4	4.76	16.498	3.81	0.08~0.25	0.3~1	
		160408-FP	●	●	●	●	9.525	0.8	4.76	16.498	3.81	0.08~0.25	0.3~1	

●: Stock item

⚠ For the safe metalcutting

- Use safety supplies such as protective gloves to prevent possible injury while touching the edge of tools.
- Use safety glasses or safety cover to hedge possible dangers. Inappropriate usage or excessive cutting condition may lead tool's breakage or even the fragment's scattering.
- Clamp the workpiece tightly enough to prevent its movement while its machining.
- Properly manage the tool change phase because the inordinately used tool can be easily broken under the excessive cutting load or severe wear, and it may threat the operator's safety.
- Use safety cover because chips evacuated during cutting are hot and sharp and may cause burns and cuts. To remove chips safely, stop machining, put on protective gloves, and use a hook or other tools.
- Prepare for fire prevention measures as the use of the non-water soluble cutting oil may cause fire.
- Use safety cover and other safety supplies because the spare parts or the tools can be pulled out due to centrifugal force while high speed machining.



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