

PC2005 / PC2010 / PC2015

Insert Series for Finishing High Hardness Steel



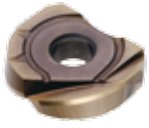
Laser Mill Series

New Laser Mill series for high hardness steel and for universal purpose covering all die steel

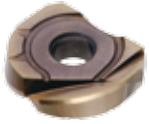
- ▣ **PC2005 / PC2010 / PC2015**
Outstanding increase of wear resistance through optimized grade per workpiece
- ▣ **KF / KH Chip Breaker**
Increased strength and design of cutting edges through optimized blade geometries per workpiece



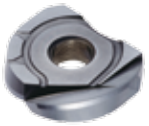
Insert Series for Finishing High Hardness Steel



PC2005 For high hardness steel and press die steel



PC2010 For pre hardened steel and plastic die steel



PC2015 For carbon steel and cast iron

Laser Mill Line-up optimized for machining die and mold die and mold using material such as high hardness steel, tool steel, pre hardened steel, etc.

PC2005 Tool steel or high hardness steel after heat treatment has very high hardness that causes severe wear on relief surface of cutting edges during cutting actions, as well as chipping due to heavy cutting loads. In order to prevent these problems, we progressively improved wear resistance and chipping resistance of the substrate by applying ultra fine raw materials to PC2005.

PC2010 In cutting conditions when cutting fluid is applied, thermal cracks occur on tool's surface due to repetitive thermal impact. To avoid thermal cracks, we applied a heat shield coating to PC2010. In addition, it was optimized for wet machining of pre hardened steel by using ultra fine raw materials and high binder on substrate and thus increasing stability.

PC2015 When machining carbon steel and mild steel, wear that looks like bites on tool's relief surface is caused by viscosity between tools and workpieces. PC2015 guarantees excellent tool life and machining stability with its characteristics of the high toughness substrate and the welding resistant coating with low reactivity to workpieces.



The diagram features a central circular graphic with the word "Advantages" in the center, surrounded by three colored segments (blue, purple, and green). Three callout boxes point to these segments, each containing a bullet point and a red arrow pointing to a specific benefit. The background of the diagram shows a laser mill tool cutting through a metal workpiece, with several finished, cylindrical parts scattered around.

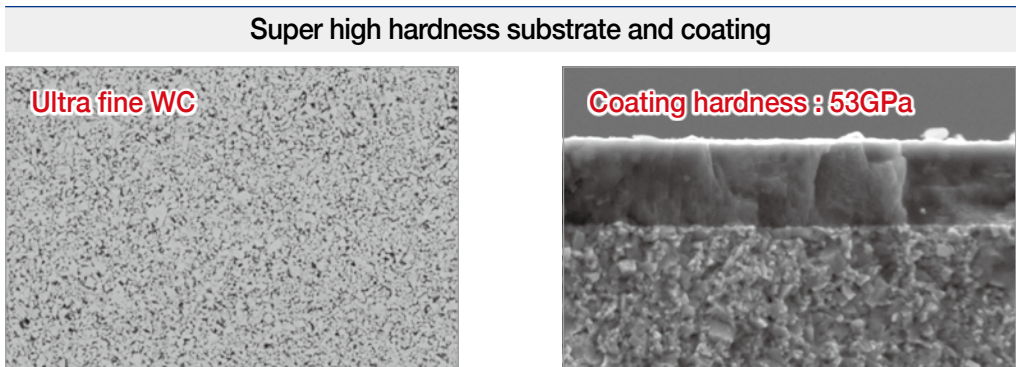
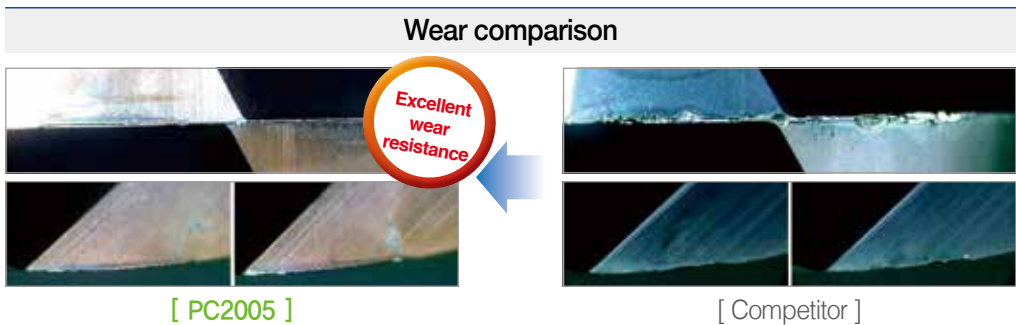
- Perfect harmony between grades and chip breakers
→ **Increased tool life and prevention against unexpected breakage**
- Increase wear resistance and breakage prevention
→ **Possible to various cutting conditions**

Available for all kinds of workpieces including high hardness steel, tool steel, pre hardened steel, carbon steel, cast iron, etc.

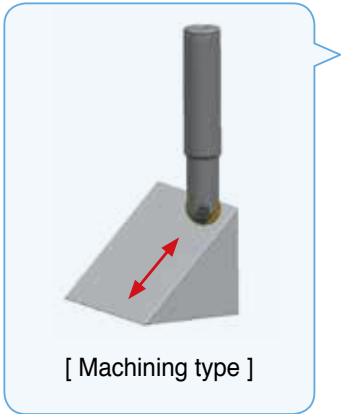
PC2005 (For high hardness workpiece and press die steel) **P**

- Super high hardness substrate and coating improve wear resistance dramatically.

High hardness substrate prevents chipping and wear on relief surface.

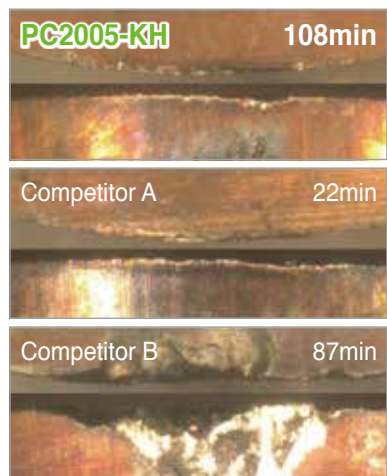
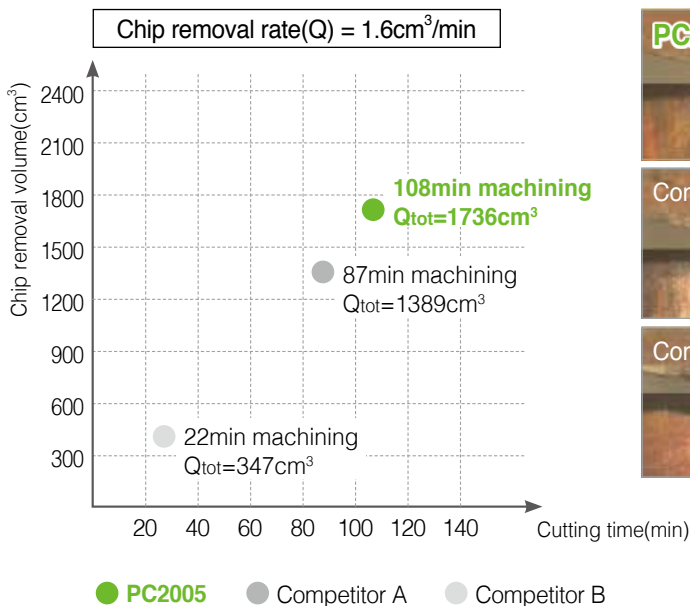


Performance Test



PC2005 tool life test

- Workpiece High hardness heat-treated steel [X100CrMoV5 1(DIN), heat-treated HRC60]
- Cutting conditions $vc(m/min) = 140$, $fz(mm/t) = 0.15$, $ap(mm) = 1.2$, $ae(mm) = 1.2$, dry
- Tools Insert LBH120-KH (PC2005)



Insert Series for Finishing High Hardness Steel

PC2010 (For pre hardened steel and plastic die steel)



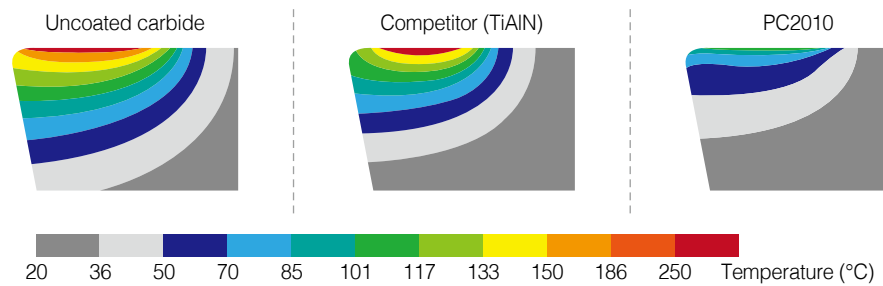
- Ultra fine WC and high contents cobalt were applied to the substrate to expand application range to high hardness steel and pre hardened steel.

- Heat shield coating was applied to prevent thermal crack.
- Ultra fine WC was combined with high contents cobalt to be optimized for machining pre hardened steel.

Wear comparison



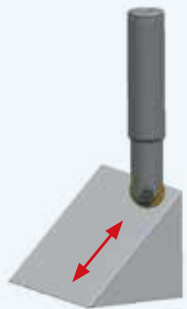
Result of heat conductivity



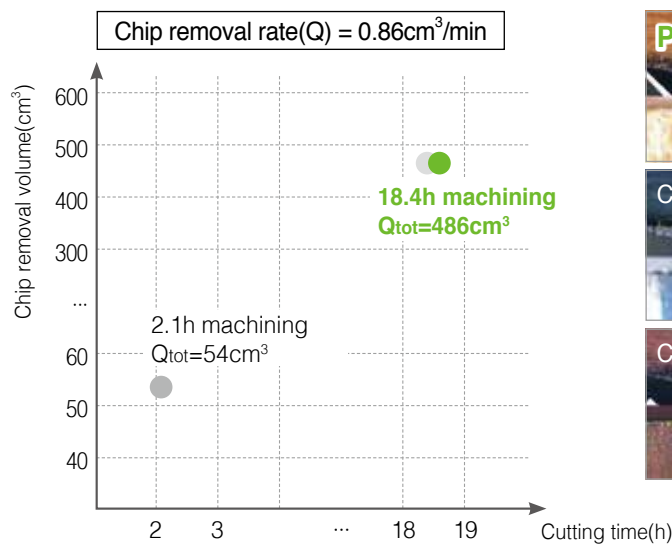
Performance Test

PC2010 tool life test

- Workpiece Pre hardened steel [1.2738 improved(DIN)]
- Cutting conditions $vc(m/min) = 276$, $fz(mm/t) = 0.15$, $ap(mm) = 0.3$, $ae(mm) = 1.2$, dry
- Tools Insert LBH120-KH (PC2010)



[Machining type]



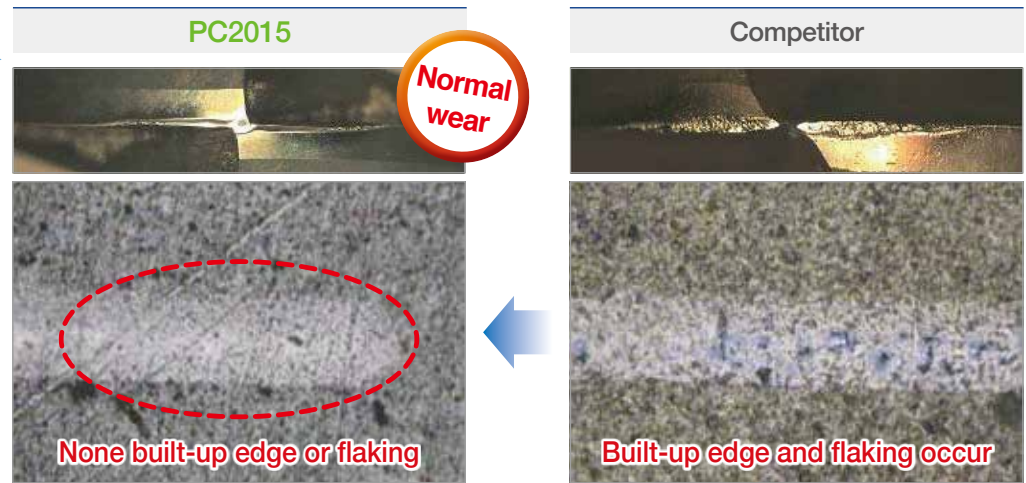
- PC2010
- Competitor A
- Competitor B

PC2015 (Exclusive for Laser Mill for machining cast iron and carbon steel)



- High toughness substrate based grade for general cutting of cast iron and HRSA with the use of lubricative coating layer.

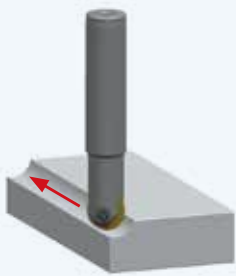
- High toughness substrate and coating layer less responsive to workpiece applied.
- Excellent tool life due to minimized wear and flaking



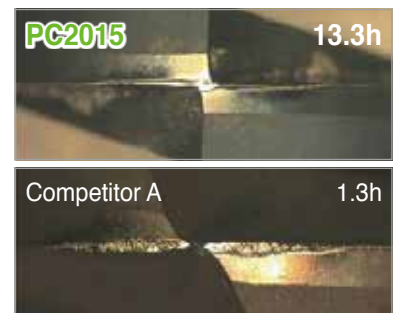
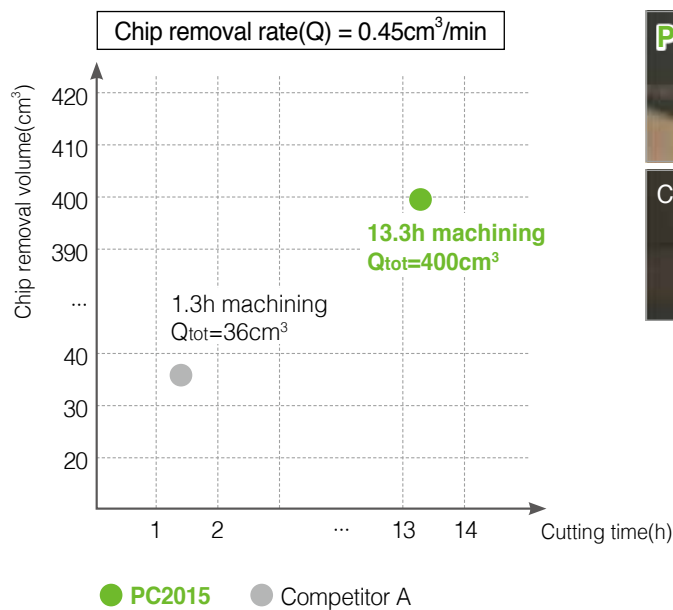
Performance Test

PC2015 tool life test

- Workpiece Carbon steel (C45)
- Cutting conditions $vc(m/min) = 250$, $fz(mm/t) = 0.35$, $ap(mm) = 0.3$, $ae(mm) = 0.3$, dry
- Tools Insert LBH120 (PC2015)

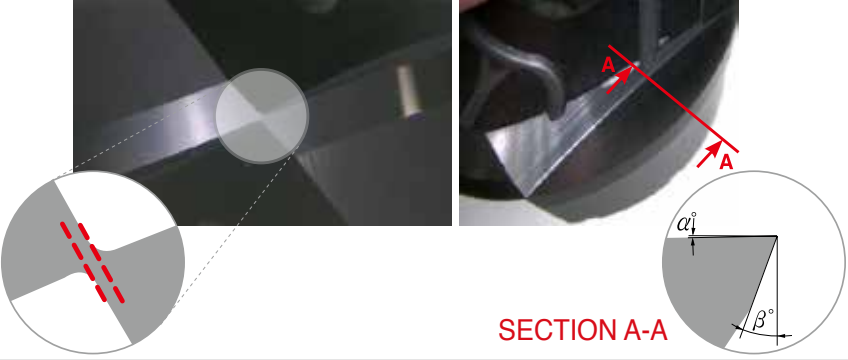
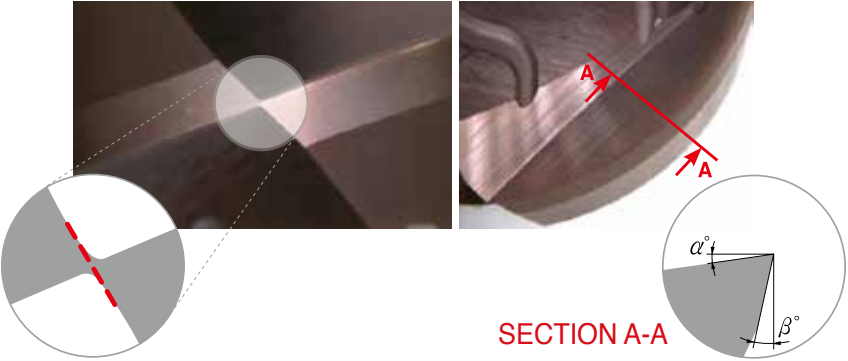
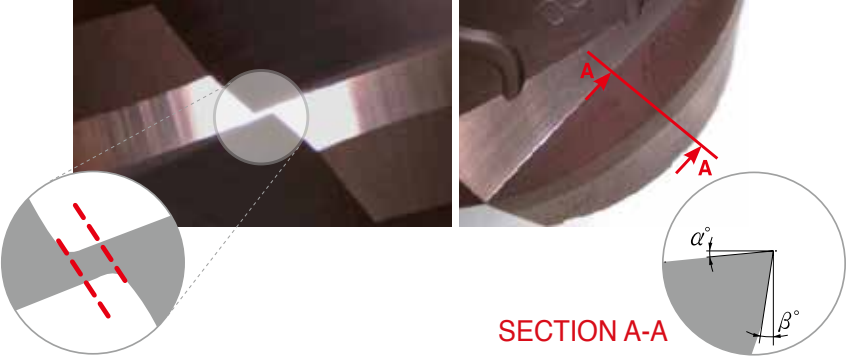


[Machining type]



➤ Features of KF / KH Chip Breaker

- **KF** : Exclusive chip breaker for stable machining of carbon steel with its characteristics of high wear resistance at center part and improved blade design.
- **KH** : Stronger insert with the combination of rake angle and relief angle that are ideal for machining high hardness workpiece.

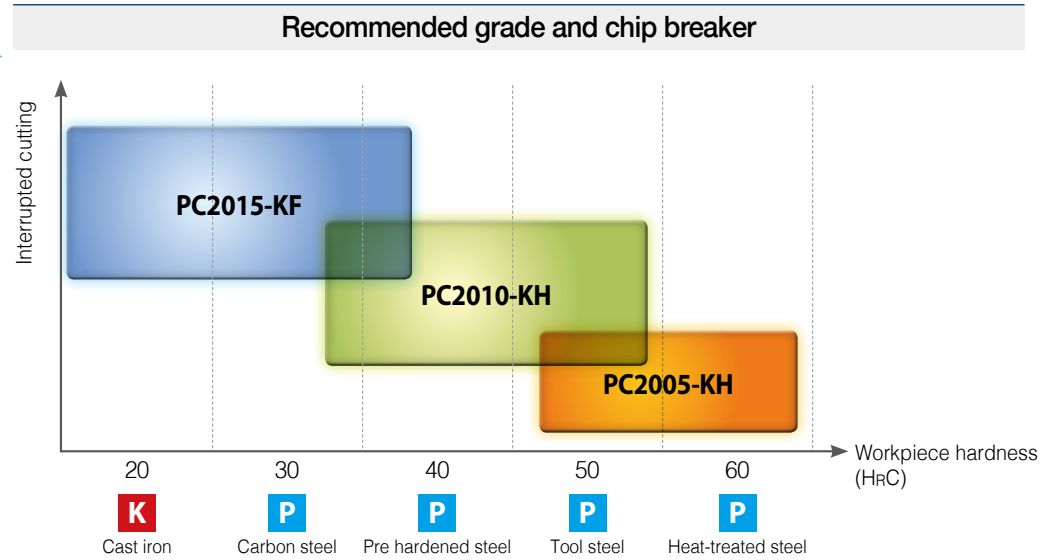
Type	Shape comparison
<p>Standard (For general cutting)</p>	 <p>SECTION A-A</p> <ul style="list-style-type: none"> ■ Proper to general cutting ■ Insert shape for uniform performance
<p>KF (For carbon steel)</p>	 <p>SECTION A-A</p> <ul style="list-style-type: none"> ■ Smaller chisel improves wear resistance at center for machining carbon steel. ■ Improved cutting edge design by higher rake angle(α°) ■ Longer tool life and better cutting performance with the use of excellent blade design
<p>KH (For high hardness steel)</p>	 <p>SECTION A-A</p> <ul style="list-style-type: none"> ■ Center shape proper for machining high hardness workpiece and uniformed tool life at center part ■ Improved cutting edge design by higher rake angle(α°) ■ Lower relief angle(β°) increases strength of cutting edges than universal inserts.

Exclusive for carbon steel with higher wear resistance at center and improved blade design
→ **Stable machining possible**

Perfect combination between center shape and rake / relief angle for machining high hardness workpiece
→ **Stronger insert**

➔ Application Guideline per Workpiece

- PC2005-KH :**
 Ideal for machining **heat-treated steel and high hardness steel** with its characteristics of excellent wear resistance and the harmony between improved blade design and strong chip breaker.
- PC2010-KH :**
 Ideal for machining **pre hardened steel** with its characteristics of the harmony between excellent thermal shock resistance and strong cutting edges.
- PC2015-KF :**
 Ideal for machining carbon steel with its characteristics of the harmony between excellent welding resistance and strong cutting edges/chip breakers.



➔ Recommended Cutting Conditions

Workpiece				Grade	Chip breaker	Recommended cutting conditions			
ISO	Material	HB(HrC)	vc(m/min)			fz(mm/t)	ap(mm)	ae(mm)	
K	Gray cast iron	GC250	180(8)	PC2015 PC2010 PC2005	KF	130~210	0.2~0.5	0.07D	0.07D
	Ductile cast iron	GCD600	250(24)						
P	Carbon steel	S20C~S50C	150			PC2010 PC2015 PC210F	KH	170~250	0.2~0.5
	Alloy steel	SCM21~SCM5H	270(28)						
	Pre hardened steel	KP4M	300(32)	100~160	0.1~0.3			0.5D	0.5D
		NIMAX	370(40)						
		CENA1	370(40)						
	High speed tool steel	SKH51 ~ SKH59	550(55)	PC2005 PC2010	KH	80~130	0.1~0.2	0.3D	0.3D
		STD11 (Cold forged)							

When the overhang is over 3D, adjust the feed and reduce cutting speed as shown in the following table

Overhang	vc(m/min)	fz(mm/t)
Under 3D	100%	100%
3D ~ 5D	70%	70%
5D ~ 8D	60%	60%
8D ~ 10D	50%	50%

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Application Example



Automobile press mold [X100CrMoV5 1(DIN), hot forged steel]

- Cutting conditions $vc(m/min) = 377$, $fz(mm/t) = 0.5$, $ap(mm) = 0.5$, $ae(mm) = 0.2$, dry
- Tools
 Insert LBH250-KH (PC2005)
 Holder LBE250140S-S25C

PC2005 **6.5hour/corner**
 Competitor 5hour/corner

30% longer

➔ 30% longer cutting time per corner than competitor's



Automobile press mold [1.2738 improved(DIN)]

- Cutting conditions $vc(m/min) = 200$, $fz(mm/t) = 0.1$, $ap(mm) = 0.1\sim0.5$, $ae(mm) = 0.1\sim0.5$, wet
- Tools
 Insert LBH160-KH (PC2010)
 Holder LBE160100S-S16C

PC2010 **10hour/corner**
 Competitor 8hour/corner

25% longer

➔ 25% longer cutting time per corner than competitor's



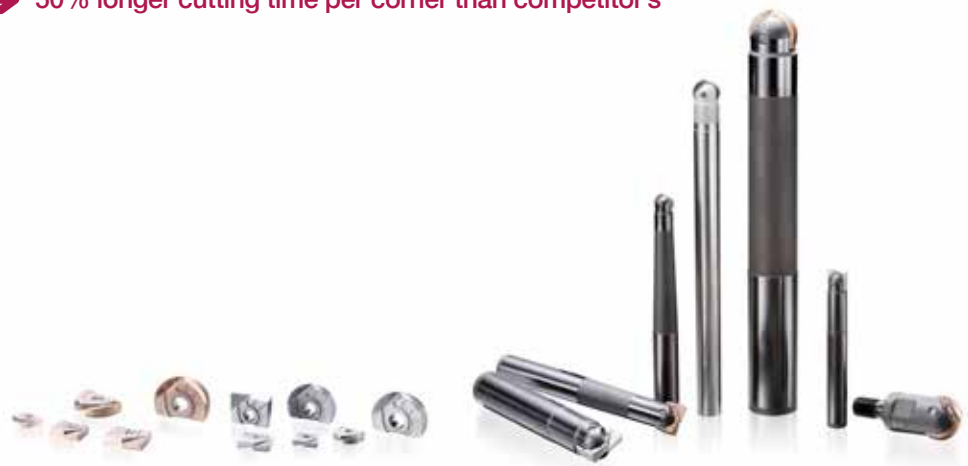
CV Joint (C55, forged steel)

- Cutting conditions $vc(m/min) = 200$, $fz(mm/t) = 0.25$, $ap(mm) = 0.5\sim2.0$, $ae(mm) = 0.5\sim1.0$, dry
- Tools
 Insert LBH230-KF (PC2015)
 Holder LBE230-HSKC63


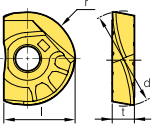

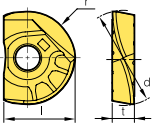
PC2015 **300ea/corner**
 Competitor 200ea/corner

50% longer

➔ 50% longer cutting time per corner than competitor's



➔ Insert

Shape	Designation	Stock			Dimension(mm)				Fig.	
		PC2005	PC2010	PC2015	l	d	t	r		
	LBH	080-KF	-	-	-	7.0	8	2.4	4	
		090-KF	-	-	-	7.5	9	2.4	4.5	
		100-KF	-	-	●	8.5	10	2.6	5	
		110-KF	-	-	-	9.0	11	2.6	5.5	
		120-KF	-	-	●	10.0	12	3.0	6	
		130-KF	-	-	●	10.5	13	3.0	6.5	
		160-KF	-	-	●	12.0	16	4.0	8	
		170-KF	-	-	●	12.5	17	4.0	8.5	
		200-KF	-	-	●	15.0	20	5.0	10	
		210-KF	-	-	●	15.5	21	5.0	10.5	
		250-KF	-	-	●	18.5	25	6.0	12.5	
		260-KF	-	-	-	19.0	26	6.0	13	
		300-KF	-	-	●	22.5	30	7.0	15	
		310-KF	-	-	-	23.0	31	7.0	15.5	
320-KF	-	-	-	23.5	32	7.0	16			
	LBH	080-KH	-	●	-	7.0	8	8	4	
		090-KH	-	-	-	7.5	9	9	4.5	
		100-KH	●	●	-	8.5	10	10	5	
		110-KH	-	-	-	9.0	11	11	5.5	
		120-KH	●	●	-	10.0	12	12	6	
		130-KH	-	●	-	10.5	13	13	6.5	
		160-KH	●	●	-	12.0	16	16	8	
		170-KH	●	●	-	12.5	17	17	8.5	
		200-KH	●	●	-	15.0	20	20	10	
		210-KH	-	●	-	15.5	21	21	10.5	
		250-KH	●	●	-	18.5	25	25	12.5	
		260-KH	-	●	-	19.0	26	26	13	
		300-KH	●	●	-	22.5	30	30	15	
		310-KH	-	-	-	23.0	31	31	15.5	
320-KH	-	●	-	23.5	32	32	16			



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