

Insert for hard-to-cut stainless steel milling

PC9540

KORLOY
TECH-NEWS



- 50% longer tool life with optimal high toughness substrate for hard-to-cut stainless steel (turbo chargers etc.) than the existing grade
- Stable machinability due to PVD oxide film for preventing wear and heating of inserts caused by high temperature in machining

Insert for hard-to-cut stainless steel milling

PC9540

Stainless steel is a kind of metal material widely used in industries such as food, medical appliances, automobile parts, and construction materials. It is widely used because of its resistance to corrosion and its strength and luster.

Lately, the demand of high strength and heat resistance stainless steel for turbo charger turbine housings has risen significantly.

High strength and heat resistance stainless steel is grouped into hard-to-cut stainless steel which more often provides high temperature occurring wear on inserts, fractures and chipping on tools due to heat and welding making high shear resistance than general stainless steel.

The existing grades of M25 to M35 grade reaches the limitation of improving tool life and cycle time in highly unstable and interrupted machining with hard-to-cut stainless steel.

Moreover, KORLOY recommends a new rising grade, **PC9540** for improving productivity in hard-to-cut stainless steel milling.

The PC9540 which is an exclusive grade for M40 grade stainless steel maximizes chipping and fracture resistance in medium to rough cutting and interrupted milling due to its **high toughness substrate**. It also allows stable machinability in high strength and heat resistance stainless steel by applying the new rising **PVD oxide film** with oxidation and heat resistance.

Therefore, the average tool life of the PC9540 is 50% longer in hard-to-cut stainless steel machining than the existing grade and it provides high productivity in general stainless steel machining.

The 9540 is the latest grade providing solutions to improve productivity and achieve stable stainless steel machining.



Long tool life

- Increased resistance to breakage due to high toughness in the substrate
- Long tool life in medium to rough cutting and highly interrupted machining

Stable machining

- Increased oxidation and welding resistance with PVD oxide film
- Preventing built-up edge, notch chipping and unexpected breakage

Generally usable for stainless steel machining

- General stainless steel: ferritic, martensitic, and austenitic stainless steels
- High strength and heat resisting stainless steel: duplex, precipitation hardening, and heat resistance stainless steels

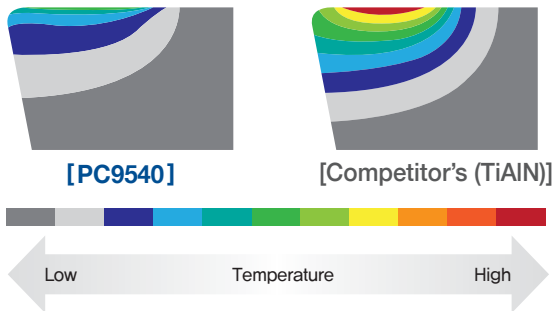
Features

- Optimal PVD grade for medium to rough cutting and highly interrupted milling in stainless steel
- Longer tool life due to higher breakage resistance applying high toughness substrate controlling crack growth
- Excellent and new PVD oxide film with oxidation and heat resistance overcoming the limit of hard-to-cut materials machining
- Stable machinability by preventing welding and chipping due to applying special coating surface treatment

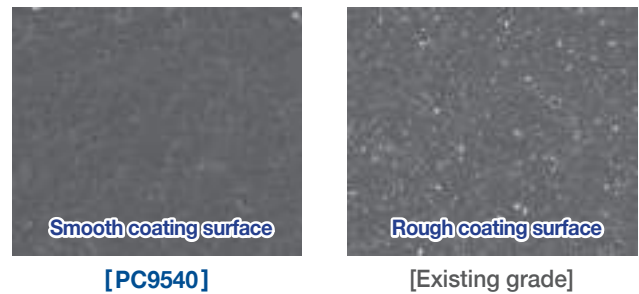


- PC9540** new
- Improved surface finish → Good welding resistance
 - PVD multilayer → Controlling crack growth
 - PVD oxide film → Good oxidation and heat resistance
 - PVD nitride film → Good wear resistance
 - High toughness substrate → Good breakage resistance

[New PVD oxide film (comparison of thermal conductivity)]



[Special coating surface treatment technology]

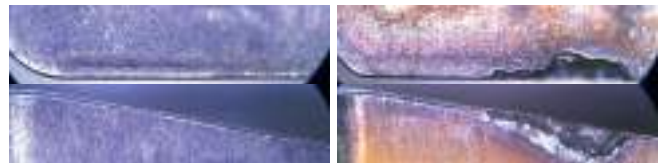


Development effect

Medium interrupted machining

- **Workpiece** Stainless steel (316)
- **Cutting conditions** vc (sfm) = 492, fz (ipt) = 0.004, ap (inch) = 0.079, dry

▶ Improved welding and chipping resistance



[PC9540]

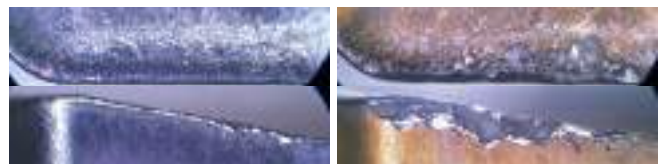
[Competitor's]

(*: DIN)

Highly interrupted machining

- **Workpiece** Heat resistance stainless steel (1.4848)*
- **Cutting conditions** vc (sfm) = 295, fz (ipt) = 0.008, ap (inch) = 0.079, dry

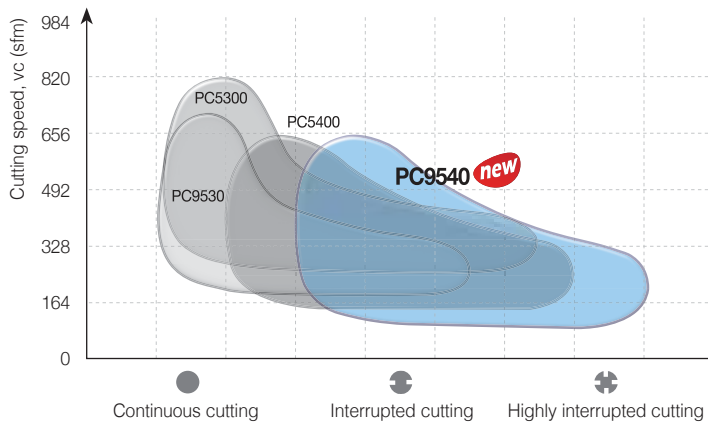
▶ Controlling unexpected breakage



[PC9540]

[Competitor's]

Application range



Guideline for grades application

Section	High speed and continuous cutting	Medium speed and interrupted cutting	Medium to low speed and highly interrupted cutting
ISO	M25 - M30	M35 - M40	M40
Recommended grade	PC5300, PC9530	PC5400, PC9540	PC9540
Parts	General stainless steel blocks, molds and large workpieces	Automobiles and machinery parts, turbo charger turbine housings	Oil pumps, aero parts, turbo charger turbine housings
Workpiece shape	<p>Low ← Hard-to-cut materials and interruptedly shaped workpieces → High</p>		

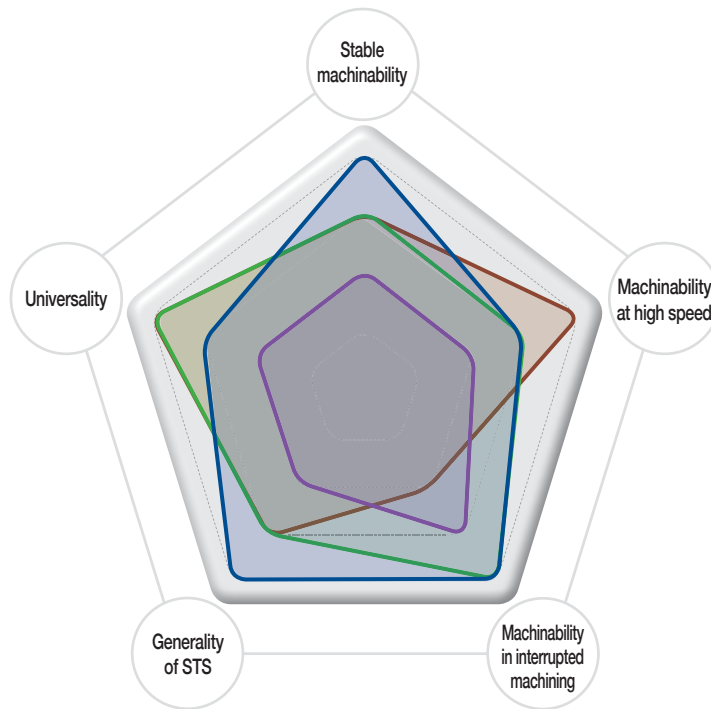
Main machining examples guideline (turbo charger turbine housings)

(*: DIN)

Section	Finishing	Medium cutting to roughing	Highly interrupted cutting
ISO	M25 - M30	M40	M40
Recommended grade	PC5300, PC9530	PC9540	PC9540
Workpiece	Heat resistance stainless steel (1.48□□)*	Heat resistance stainless steel (1.48□□)*	Heat resistance stainless steel (1.48□□)*
Machining	Wet machining with low depth of cut on rough machining	Dry machining with high depth of cut on wider machining	Unstable and highly interrupted machining
Machining part			

Grade for stainless steel milling selection guide

— PC9540 — PC5400 — PC9530 — PC5300



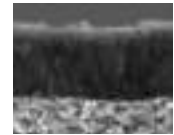
PC9540 (M40) new

- Stable machinability
- Medium to rough cutting and highly interrupted machining



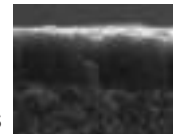
PC5400 (M35)

- Good wear resistance in interrupted machining
- Universal grade



PC9530 (M30)

- Good welding resistance in low speed machining
- Continuous cutting of general STS



PC5300 (M25)

- Good wear resistance in high speed machining
- Universal grade



Grade	Stable machinability	Machinability at high speed	Machinability in interrupted machining	Generality of STS	Universality
PC9540 (M40) new	★★★★	★★★	★★★★	★★★★	★★★
PC5400 (M35)	★★★	★★★	★★★★	★★★	★★★★
PC9530 (M30)	★★	★★	★★★	★★	★★
PC5300 (M25)	★★★	★★★★	★★	★★★	★★★★

Recommended cutting conditions

ISO	Workpiece	Workpiece			Hardness (HB)	Recommended cutting conditions	
		AISI	ISO (DIN)*	KS		vc (sfm)	fz (ipt)
M	Austenitic stainless steel	304	X5CrNi18-9	STS304	160 - 180	295 - 492	0.002 - 0.012
		316	X5CrNiMo17-12-2	STS316			
	Ferritic and martensitic stainless steel	430	X6Cr17	STS430	180 - 200	394 - 656	0.002 - 0.014
		410	X12Cr13	STS410			
Precipitation hardening stainless steel	630	X5CrNiCuNb16-4	STS630	280 - 300	230 - 394	0.002 - 0.010	
F60	(1.4462)*	-	-				
Heat resistance stainless steel	-	-	(1.4837)*	-	160 - 200	197 - 328	0.002 - 0.008
	-	-	(1.4848)*	-			

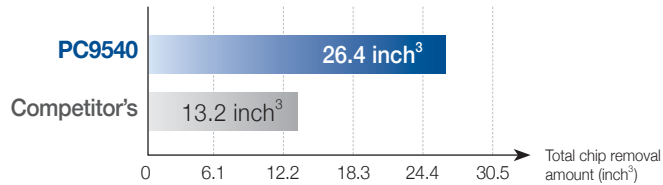
Performance evaluation

Austenitic stainless steel (304, HB160)

- **Workpiece** Square bar (11.8×7.87×3.94)
- **Cutting conditions** vc (sfm) = 394, fz (ipt) = 0.004, ap (inch) = 0.059, ae (inch) = 0.787, wet
- **Tools** **Insert** XNKT080508PNER-ML **Holder** RM3PCA4250HR



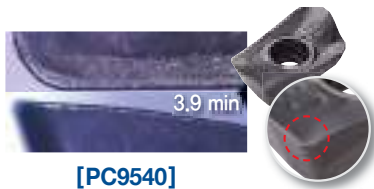
[Competitor's]



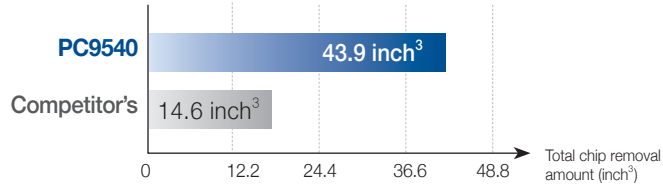
- Chip removal rate Q (inch³/min): 2.45
- Machining hours (min): 10.8

Austenitic stainless steel (316, HB160)

- **Workpiece** Square bar (11.8×7.87×3.94)
- **Cutting conditions** vc (sfm) = 394, fz (ipt) = 0.006, ap (inch) = 0.197, ae (inch) = 0.394, dry
- **Tools** **Insert** ADKT170608PESR-ML **Holder** AMXSA125R-3W125-500-AD17



[Competitor's]



- Chip removal rate Q (inch³/min): 3.72
- Machining hours (min): 11.8

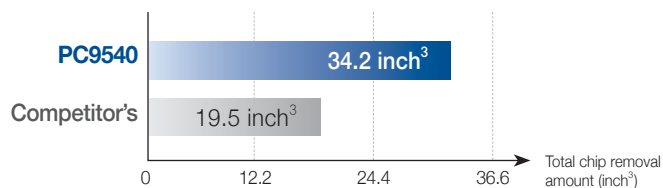
(*: DIN)

Heat resistance stainless steel (1.4848*, HB180)

- **Workpiece** Square bar (3.94×3.94×3.94)
- **Cutting conditions** vc (sfm) = 295, fz (ipt) = 0.008, ap (inch) = 0.079, ae (inch) = 0.984, wet
- **Tools** **Insert** SNMX1206ANN-MF **Holder** RM8ACA4250HR-H



[Competitor's]



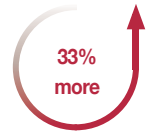
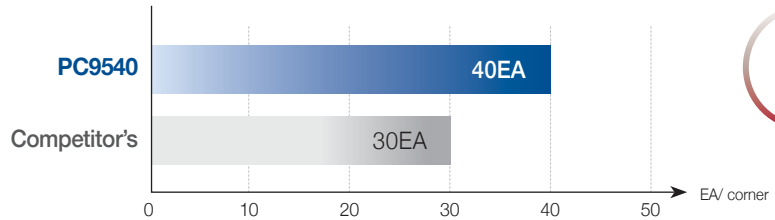
- Chip removal rate Q (inch³/min): 10.9
- Machining hours (min): 3.1

Application examples

(*: DIN)

Heat resistance stainless steel (1.4837)*

- **Workpiece use** Turbo charger turbine housing
- **Cutting conditions** vc (sfm) = 328, fz (ipt) = 0.006, ap (inch) = 0.087, dry
- **Tools** Insert SNMX1206ANN-MF Holder RM8ACA4400HR

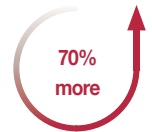
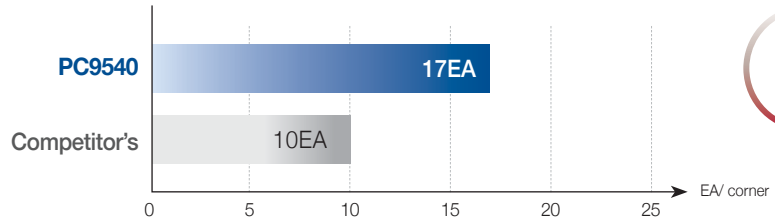


► Machining 33% more than competitor's

(*: DIN)

Heat resistance stainless steel (1.4848)*

- **Workpiece use** Turbo charger turbine housing
- **Cutting conditions** vc (sfm) = 262, fz (ipt) = 0.008, ap (inch) = 0.047, dry
- **Tools** Insert ONMX060608-MM Holder RM16ACA6400HR-M

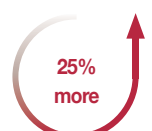
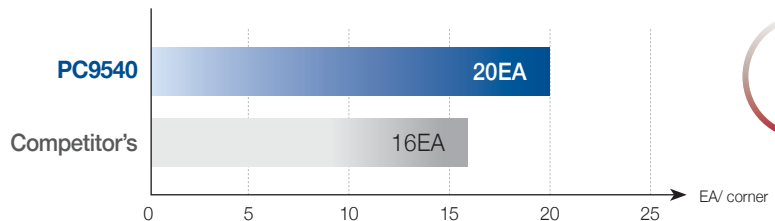


► Machining 70% more than competitor's

(*: DIN)

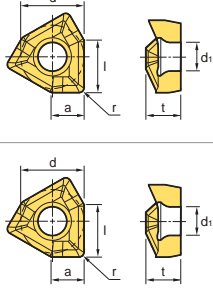


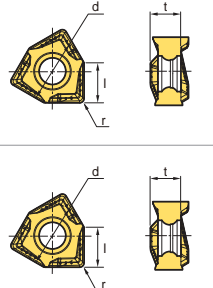


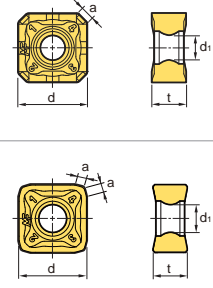



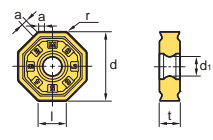
Heat resistance stainless steel (1.4848)*

- **Workpiece use** Turbo charger turbine housing
- **Cutting conditions** vc (sfm) = 328, fz (ipt) = 0.006, ap (inch) = 0.059, wet
- **Tools** Insert XNKT060405PNSR-MM Holder RM3PSA3100HR-3L100




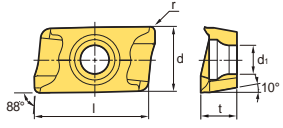
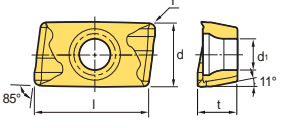
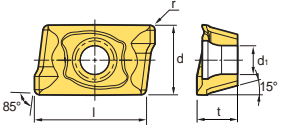

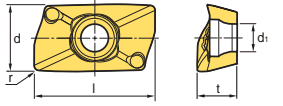
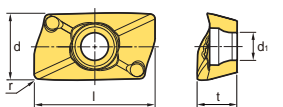

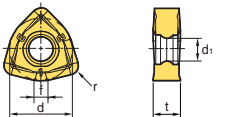

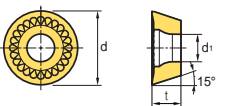

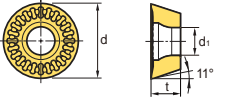
► Machining 25% more than competitor's

Stock items

Type	Designation	Coted	Dimensions (inch)								Figure
		PC9540	l	d	t	r	d ₁	a	f		
RM3		XNKT 060405PNER-ML	●	0.224	0.256	0.157	0.020	0.134	0.071	-	
		080508PNER-ML	●	0.323	0.394	0.217	0.031	0.177	0.114	-	
		120608PNER-ML	●	0.472	0.512	0.256	0.031	0.217	0.138	-	
		XNKT 060405PNSR-MM	●	0.224	0.256	0.157	0.020	0.134	0.071	-	
		080508PNSR-MM	●	0.323	0.394	0.217	0.031	0.177	0.114	-	
RM6		WNGX 080604PNER-ML	●	0.323	0.512	0.252	0.016	-	-	-	
		080608PNER-ML	●	0.323	0.512	0.252	0.031	-	-	-	
		WNGX 080608PNSR-MM	●	0.323	0.512	0.252	0.031	-	-	-	
RM8		SNMX 1206ANN-MF	●	-	1/2	1/4	-	0.177	0.093	-	
		SNMX 1206ENN-MF	●	-	1/2	1/4	-	0.205	0.072	-	
		SNMX 1206ANN-MM	●	-	1/2	1/4	-	0.177	0.093	-	
		SNMX 1206ENN-MM	●	-	1/2	1/4	-	0.205	0.072	-	
		SNMX 1206QNN-MM	●	-	1/2	1/4	1/32	0.177	0.093	-	
RM16		ONMX 060608-MM	●	17/64	5/8	15/64	1/32	0.220	-	-	

● : Stock item

Stock items

Type	Designation	Coted	Dimensions (inch)							Figure	
		PC9540	l	d	t	r	d ₁	a	f		
Alpha Mill		APMT 11T308PDSR-MM	●	0.441	0.255	0.142	0.031	0.112	-	-	
		APMT 1604PDSR-MM	●	0.646	0.370	0.227	0.031	0.177	-	-	
		APMT 1806PDSR-MM	●	0.685	0.432	0.250	0.031	0.177	-	-	
Alpha Mill-X		ADKT 170608PESR-ML	●	0.774	0.427	0.257	0.031	0.177	-	-	
		ADKT 170608PESR-MM	●	0.774	0.427	0.257	0.031	0.177	-	-	
HRMD		WNMX 130520ZNN-MM	●	-	0.500	0.219	0.079	0.185	-	0.098	
FMR P-positive		RPMT 1204M0E-MF	●	-	0.472	0.187	-	0.177	-	-	
		RPMT 1204M0S-MM	●	-	0.472	0.187	-	0.177	-	-	

● : Stock item

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