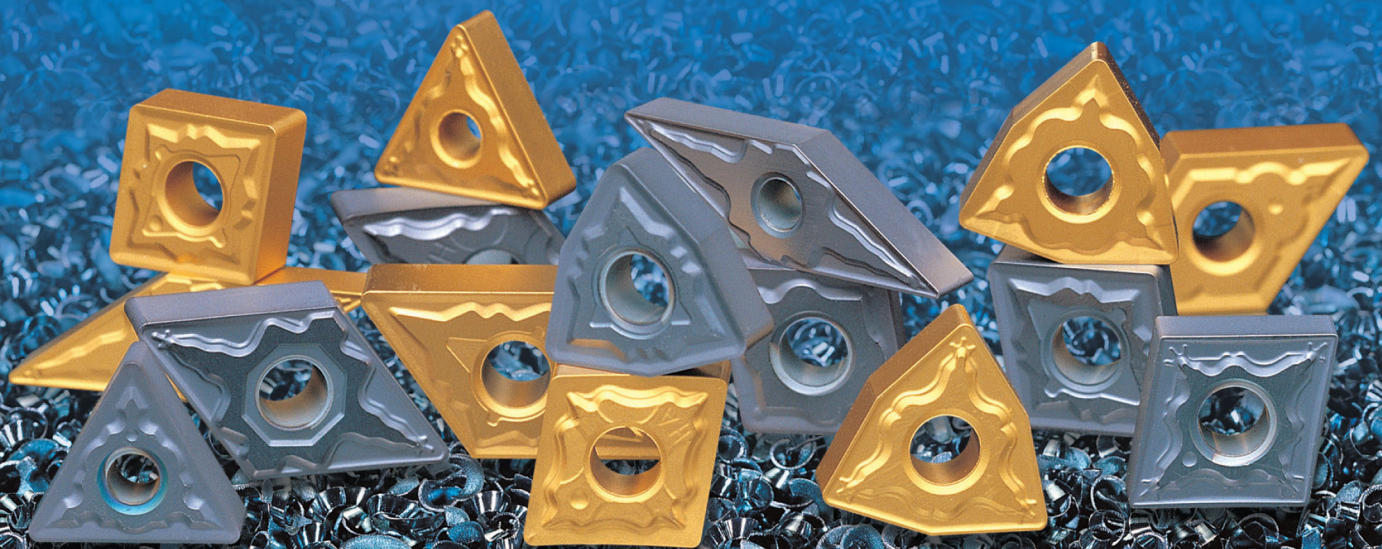




# New Grades & Chip-breakers for Machining of Stainless Steels

# KORLOY 9000 Series



# Directions for Stainless Steels Machining

Stainless Steels are well known thanks to its superior corrosion-resistance.

Superior corrosion-resistance of stainless steels results from higher Cr content as an alloy-element.

Cr content is more than 4% in general, mostly more than 10%.

## 1 Classification & Features of Stainless Steels

- 1) **Austenite series** : It is a most general kind of stainless steels and has the best corrosion-resistance due to high Cr content and Ni. On the other hand, High Ni content makes machining difficult. It is used for can of foods, chemical products and construction purposes. (AISI303, 304, 316, STS303, 304, 316)
- 2) **Ferrite series** : It has similar Cr content with Austenite series, but none of Ni content results in easy machining. (AISI410, 430, 434, STS410, 430, 434)
- 3) **Martensite series** : It is the only stainless steels able to be heat treated. It has high carbon content and corrosion resistance is not so good, so it is used for a parts that need higher hardness. (AISI410, 420, 432, STS410, 420, 432)
- 4) **Precipitate hardened series** : As a Cr-Ni alloy, it has improved hardness through low temperature heat-treatment and has superior corrosion-resistance and toughness at the same time. (AISI 17, 15)
- 5) **Austenite-Ferrite series** : Though it has similar properties with Austenite and Ferrite, it has much superior heat-resistance (approx. 2 times better). It can be used at the place where require thermal-corrosion stability such as condenser (AISI S2304, 2507)

## 2 Hard-to-cut Factors of Stainless Steels

- 1) Work-hardening – Cause premature wear of tool and makes it hard to chip control.
- 2) Low thermal conductivity – Cause plastic deformation of cutting edge and fast wear of tool.
- 3) Build-up-edge – Easy to make micro-chipping on cutting edge and cause bad surface-finish.
- 4) Chemical affinity between tool and work-piece caused by work-hardening and low thermal-conductivity of work-piece, generates easily not only normal-wear but also chipping and abnormal fracture.

## 3 Tips for machining of Stainless Steels

- 1) Using a tool has higher thermal-conductivity  
: Low thermal-conductivity of Stainless steels accelerates wear resulted from decline of hardness of cutting edge due to heat pile up.
- 2) Sharper cutting edge-line  
: It is necessary to make rake-angle bigger and chip-breaker land wider to reduce cutting-load and prevent build-up-edge so that chip is treated well.
- 3) Optimal cutting condition  
: Inappropriate machining conditions like extremely low or high-speed, too low feed rate, can cause poor tool life due to work-hardening of work piece.
- 4) tools  
: Tools for Stainless steels should have good toughness and strength on edge-line & film adhesion has to be higher.

# Exclusive new grade for

# KORLOY **Stainless Steel Turning**



## NC9020

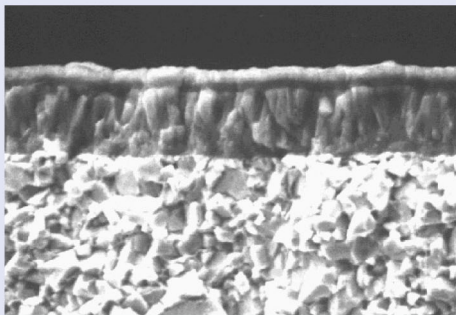
High speed machining for Stainless Steels



## PC9030

Middle&low speed machining for stainless steels

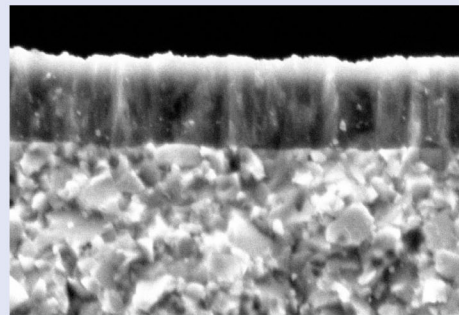
### NC9020 substrate & film



Applying CVD Film for high-Speed machining



Applying exclusive Substrate suitable for Stainless steel

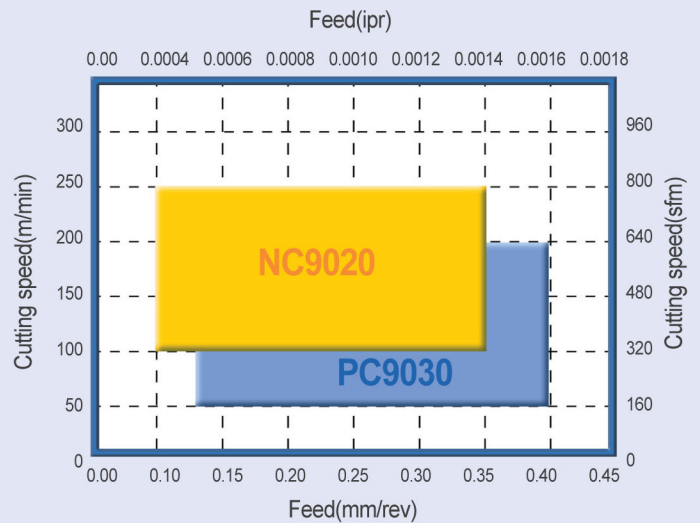
### PC9030 substrate & film



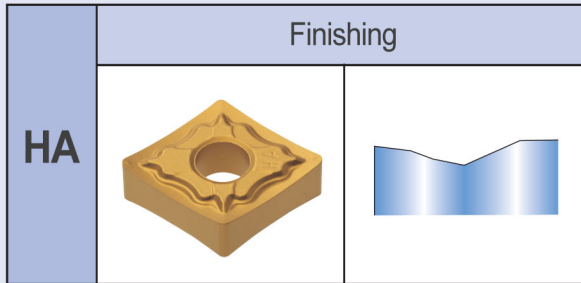
Applying PVD Film to Prevent Build-up-edge

Applying Fine Grain carbide for High-toughness

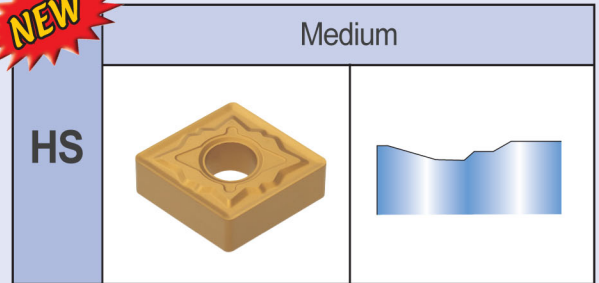
		Coating	
		CVD	PVD
M10	 Wear-resistance  Toughness	NC9020	NC90330
M20			
M30			
M40			



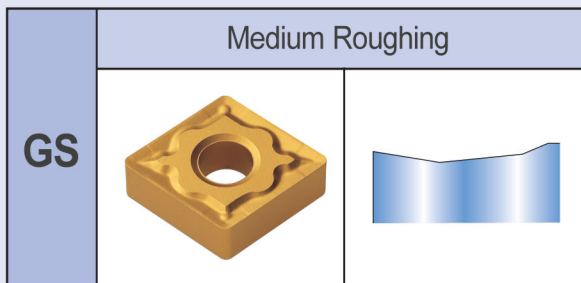
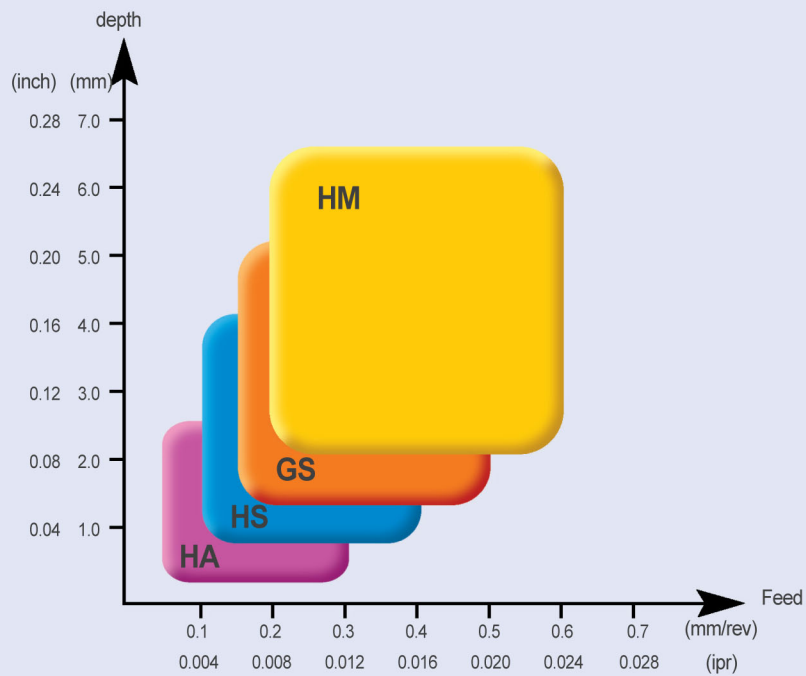
## Chip-breaker for Stainless Steels



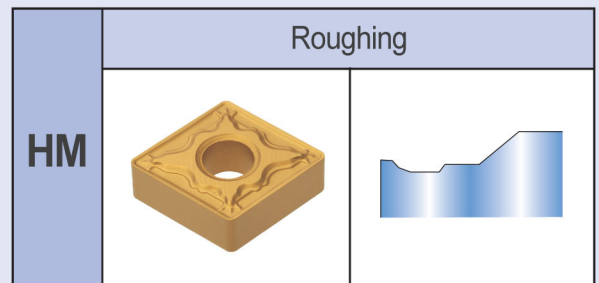
- Suitable for small depth-of-cut with sharp edge
- Enhanced tool life by reduction of chip flow friction during high-speed machining
- Good surface finish



- Enhanced cutting efficiency & tool life with Smoother chip-flow
- Wear-resistance strengthened shape as applying high-rake land angle
- Notching preventing & toughness reinforced shape



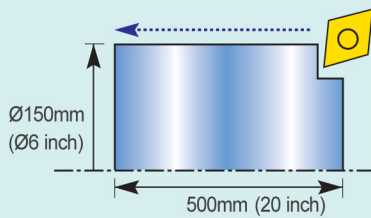
- Good tool life during minor intermittent cutting
- Enhanced chip flow by wider chip groove
- Preventing build up edge & reduce cutting force



- Securing good tool life during severe intermittent cutting
- Securing good chip-treatment as applying creative chip-breaker
- Securing good toughness as holding strong edge-line

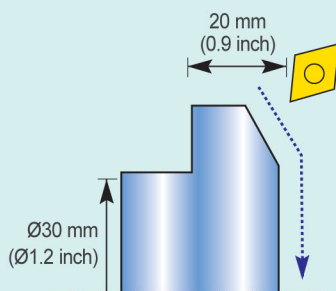
## Features of NC9020

- Applying substrate & film suitable for high-speed machining of stainless steels
- Superior cutting performance on condition that middle-speed cutting for low-carbon steel, low-carbon alloy steel
- Longer tool-life can be acquired thanks to superior chipping-resistance
- Better cutting performance can be expected in combination with exclusive chip-breaker(HS, GS) even in deeper depth of cut.



## NC9020

- Velocity V=240m/min (780sfm)
- Feed f=0.3mm/rev (0.012ipr)
- Depth of cut d=1.5mm (0.06inch)
- Work piece SS41(AISI1025)
- Spec. CNMG120408(432) - HS
- Toollife



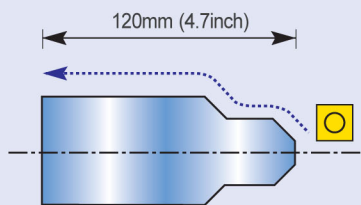
## NC9020

- Velocity V=220m/min (720sfm)
- Feed f=0.25mm/rev (0.010ipr)
- Depth of cut d=5.0mm (0.2ipr)
- Workpiece STS304 (AISI304)
- Spec. CNMG120408(432) - GS
- Toollife



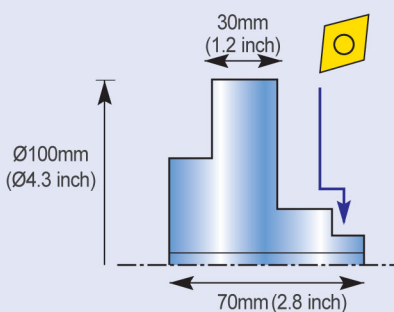
## Features of PC9030

- By using ultra fine carbide substrate, it has higher enough toughness from medium to roughing and intermittent cutting for Stainless steels
- Applying PVD coating for enhancing chipping-resistance and preventing of build-up-edge during machining of difficult-to-cut material
- Exclusive grade for stainless steels using high toughness carbide as substrate and PVD film having superior lubrication property.
- Enhancing surface finish and reducing burr thanks to using of chip-breaker exclusive for Stainless steels



## PC9030

- Velocity V=140m/min (460sfm)
- Feed f=0.05mm/rev (0.002ipr)
- Depth of cut d=1.5mm (0.06inch)
- Work piece Ni-Cr Steel
- Spec SNMG120408(432) - HA
- Toollife



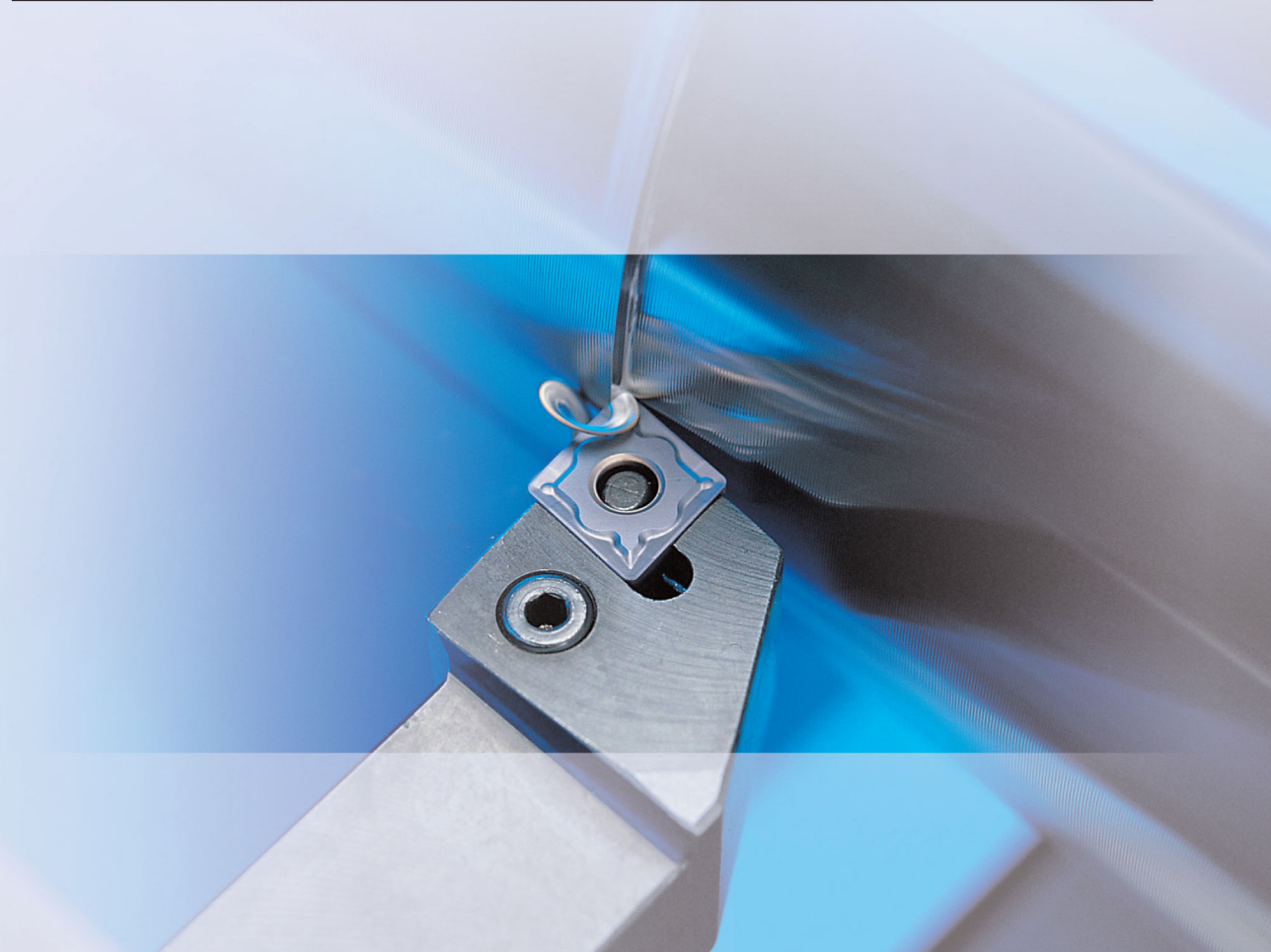
## PC9030

- Velocity V=130m/min (425sfm)
- Feed f=0.35mm/rev (0.014ipr)
- Depth of cut d=2.5mm (0.1inch)
- Workpiece STS304 (AISI304)
- Spec CNMG120408(432) - HM
- Toollife



## Recommended Cutting Condition by Workpiece

Workpiece	Use	C/B	Grade	Velocity		Feed	
				m/min	sfm	mm/rev	ipr
<b>Austenite Series</b> - STS(AISI)200 - STS(AISI)300	Finishing	HA	NC9020	150 - 230	490 - 750	0.30 - 0.03	0.012 - 0.0012
			PC9030	140 - 210	460 - 690	0.30 - 0.03	0.012 - 0.0012
	Medium	HS	NC9020	140 - 220	460 - 720	0.35 - 0.05	0.014 - 0.002
			PC9030	140 - 190	460 - 620	0.35 - 0.05	0.014 - 0.002
	Medium-Roughing	GS	NC9020	120 - 220	390 - 720	0.40 - 0.10	0.016 - 0.004
			PC9030	100 - 160	330 - 520	0.40 - 0.10	0.016 - 0.004
	Roughing	HM	PC9030	50 - 130	160 - 430	0.50 - 0.15	0.020 - 0.006
	<b>Austenite Ferrite Series</b> - STS(AISI)600	Finishing	HA	NC9020	140 - 200	460 - 660	0.30 - 0.10
PC9030				130 - 190	430 - 620	0.30 - 0.10	0.012 - 0.004
Medium		HS	NC9020	130 - 200	430 - 660	0.35 - 0.10	0.014 - 0.004
			PC9030	110 - 200	360 - 660	0.35 - 0.10	0.014 - 0.004
Medium-Roughing		GS	NC9020	120 - 200	390 - 660	0.40 - 0.15	0.016 - 0.006
			PC9030	100 - 160	330 - 520	0.40 - 0.15	0.016 - 0.006
Roughing		HM	PC9030	50 - 120	160 - 390	0.50 - 0.20	0.020 - 0.008
<b>Ferrite Martensite Series</b> - STS(AISI)400  <b>Low-content of carbon steel</b> (NC9020)		Finishing	HA	NC9020	160 - 250	520 - 820	0.30 - 0.03
	PC9030			150 - 230	490 - 750	0.30 - 0.03	0.012 - 0.0012
	Medium	HS	NC9020	160 - 240	520 - 790	0.35 - 0.05	0.014 - 0.002
			PC9030	160 - 210	520 - 690	0.35 - 0.05	0.014 - 0.002
	Medium-Roughing	GS	NC9020	140 - 240	460 - 790	0.40 - 0.10	0.016 - 0.004
			PC9030	120 - 180	390 - 590	0.40 - 0.10	0.016 - 0.004
	Roughing	HM	PC9030	70 - 140	230 - 460	0.50 - 0.15	0.020 - 0.006



## Chip-breaker series for Stainless Steel Turning

### NEGA TYPE

#### ● HA-Medium & Finishing

Designation				Stock item	
	ISO	ANSI	C/B	NC9020	PC9030
CNMG	120404	431	HA	●	●
CNMG	120408	432	HA	●	●
CNMG	120412	433	HA		
DNMG	150604	441	HA	●	●
DNMG	150608	442	HA	●	●
SNMG	120404	431	HA	●	●
SNMG	120408	432	HA	●	●
SNMG	120412	433	HA		
TNMG	160404	331	HA	●	●
TNMG	160408	332	HA	●	●
VNMG	160408	332	HA		
WNMG	080404	431	HA	●	●
WNMG	080408	432	HA	●	●
WNMG	080412	433	HA		

#### ● HS-Medium

Designation				Stock item	
	ISO	ANSI	C/B	NC9020	PC9030
CNMG	090304	321	HS		
CNMG	090308	322	HS		
CNMG	120404	431	HS	●	●
CNMG	120408	432	HS	●	●
CNMG	120412	433	HS	●	●
CNMG	160612	543	HS		
CNMG	160616	544	HS		
CNMG	190612	643	HS		
CNMG	190616	644	HS		
DNMG	150404	431	HS	●	●
DNMG	150408	432	HS	●	●
DNMG	150412	433	HS	●	●
DNMG	150604	441	HS	●	●
DNMG	150608	442	HS	●	●
DNMG	150612	443	HS	●	●
DNMG	110408	332	HS		
DNMG	110412	333	HS		
SNMG	120404	431	HS	●	●
SNMG	120408	432	HS	●	●
SNMG	120412	433	HS	●	●
SNMG	090304	321	HS		
SNMG	090308	322	HS		
SNMG	150612	543	HS		
SNMG	150616	544	HS		
SNMG	190612	643	HS		
SNMG	190616	644	HS		
TNMG	160404	331	HS	●	●
TNMG	160408	332	HS	●	●
TNMG	160412	333	HS	●	●
TNMG	220408	432	HS		
TNMG	220412	433	HS		
VNMG	160404	331	HS	●	●
VNMG	160408	332	HS	●	●
WNMG	060404	331	HS		
WNMG	060408	332	HS		
WNMG	080404	431	HS	●	●
WNMG	080408	432	HS	●	●
WNMG	080412	433	HS	●	●

#### ● GS-Medium & Roughing

Designation				Stock item	
	ISO	ANSI	C/B	NC9020	PC9030
CNMG	120404	431	GS	●	●
CNMG	120408	432	GS	●	●
CNMG	120412	433	GS	●	●
DNMG	150404	431	GS		
DNMG	150408	432	GS	●	●
DNMG	150412	433	GS		
DNMG	150604	441	GS	●	●
DNMG	150608	442	GS	●	●
DNMG	150612	443	GS	●	●
SNMG	120404	431	GS	●	●
SNMG	120408	432	GS	●	●
SNMG	120412	433	GS	●	●
SNMG	120416	434	GS		
TNMG	160404	331	GS	●	●
TNMG	160408	332	GS	●	●
WNMG	080404	431	GS	●	●
WNMG	080408	432	GS	●	●
WNMG	080412	433	GS	●	●
WNMG	060304	321	GS		
WNMG	060308	322	GS		
WNMG	060404	331	GS		
WNMG	060408	332	GS		



## Chip-breaker series for Stainless Steel Turning

### NEGA TYPE

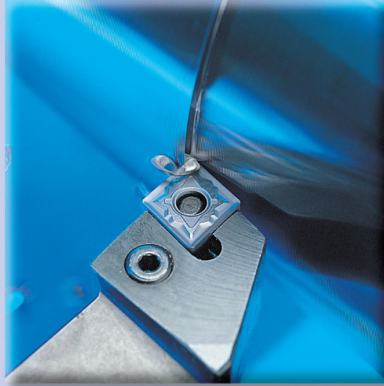
#### ● HM-Roughing

Designation	Stock item				
	ISO	ANSI	C/B	NC9020	PC9030
CNMG	120404	431	HM	●	●
CNMG	120408	432	HM	●	●
CNMG	120412	433	HM	●	●
CNMG	160608	542	HM		
CNMG	160612	543	HM		
DNMG	150404	431	HM		
DNMG	150408	432	HM		
DNMG	150412	433	HM		
DNMG	150604	441	HM	●	●
DNMG	150608	442	HM	●	●
DNMG	150612	443	HM	●	●
DNMG	110408	332	HM		
DNMG	110412	333	HM		
SNMG	120404	431	HM	●	●
SNMG	120408	432	HM	●	●
SNMG	120412	433	HM	●	●
SNMG	090304	321	HM		
SNMG	090308	322	HM		
SNMG	190612	643	HM		
TNMG	160404	331	HM		
TNMG	160408	332	HM	●	●
TNMG	110308	222	HM		
TNMG	220404	431	HM		
TNMG	220408	432	HM		
TNMG	160412	333	HM		
VNMG	160404	331	HM	●	●
VNMG	160408	332	HM	●	●
VNMG	160412	333	HM		
VNMG	220604	441	HM		
VNMG	220608	442	HM		
WNMG	060404	331	HM		
WNMG	060408	332	HM		
WNMG	060412	333	HM		
WNMG	080404	431	HM	●	●
WNMG	080408	432	HM	●	●
WNMG	080412	433	HM		

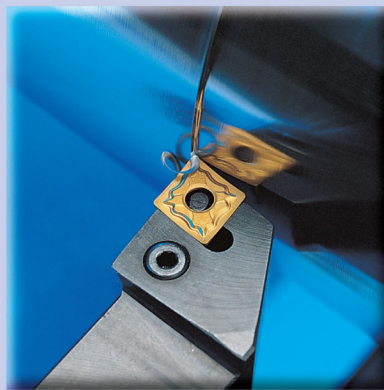
### POSI Type

Designation	Stock item				
	ISO	ANSI	C/B	NC9020	PC9030
CCMT	060204	21.51	HMP	●	●
CCMT	060208	21.52	HMP	●	●
CCMT	09T304	32.51	HMP	●	●
CCMT	09T308	32.52	HMP	●	●
CCMT	120404	431	HMP	●	●
CCMT	120408	432	HMP	●	●
CCMT	09T304	32.51	C25	●	●
CCMT	09T308	32.52	C25	●	●
CCGT	09T304	32.51	HMP		●
DCMT	070204	21.51	HMP	●	●
DCMT	11T304	32.51	HMP	●	●
DCMT	11T308	32.52	HMP	●	●
DCMT	11T304	32.51	C25	●	●
DCMT	11T308	32.52	C25	●	●
TCMT	110204	21.51	HMP	●	●
TCMT	16T304	32.51	HMP	●	●
TCMT	16T308	32.52	HMP	●	●
TCMT	16T304	32.51	C25	●	●
TCMT	16T308	32.52	C25	●	●





PC9030-HS



NC9020-HA



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