PVD Coating for Heat-Resistant Alloy

PR115S/PR120S NEW

Solves various machining issues for heat-resistant alloys and stainless steel

Longer tool life for heat-resistant alloy machining

Unique heat-resistant carbide substrate and newly developed PVD coating technology "MEGACOAT TOUGH"

MEGACOAT TOUGH | HRSA |

Specialized chipbreakers for heat-resistant alloys available (SQ/SG/SX)
Positive inserts for small parts machining also available

PVD Coating for Heat-Resistant Alloy

PR115S/PR120S

Unique carbide substrate with excellent heat-resistant properties and new coating technology "MEGACOAT TOUGH" provides longer tool life for heat-resistant alloy machining. Low cutting force and stable machining with specialized chipbreakers (SQ/SG/SX)

1 Longer tool life for heat-resistant alloy machining

Challenges of Machining Heat-Resistant Alloys

When machining heat-resistant alloys that can withstand high temperatures above 1,000 temperature (℃), the workpiece is likely to harden and insert damage is extremely rapid.

Crater wear
Worsening chip control, etc.

Diminishing damage from notching
Burr occurs

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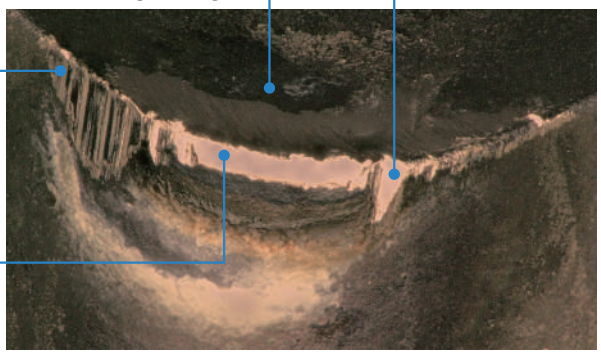


Diminishing wear damage from notching
Surface roughness
Deteriorating dimensional accuracy, etc.

Abrasive wear
Cutting force
Increased cutting heat

SOLUTION

With excellent heat resistance, wear resistance and stability, achieving long tool life and stable machining of heat-resistant alloys

- Excellent heat resistance : **Unique carbide substrate**
- To control wear : **New coating "MEGACOAT TOUGH"**
- Low cutting force and stable machining : **Specialized chipbreakers (SQ/SG/SX)**

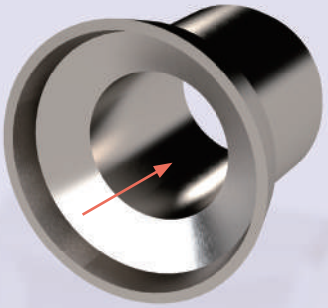
Video

HRSA(Heat Resistant Super Alloy)
Exceptional Endurance. Maximum Tool Life.

Case Studies

SOLUTION ❶ Airplane parts Ni-based heat-resistant alloy

Cutting conditions : Vc = 30 m/min, ap = 1.0 mm, f = 0.08 mm/rev, Wet
CCGT09T304MFP-GQ PR115S



Tool life

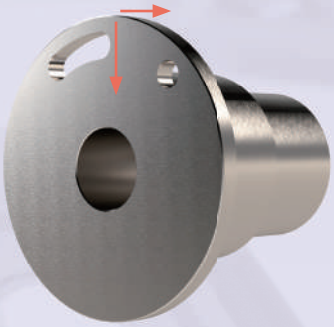
PR115S	**20**pcs/edge	Tool life 1.3x
Competitor A	**15**pcs/edge	

PR115S provides 1.3 times longer tool life in airplane parts machining, which requires high heat resistance

(User evaluation)

SOLUTION ❷ Agricultural machine engine parts SUH600

Cutting conditions : Vc = 45 m/min, ap = 0.4 mm, f = 0.15 mm/rev, Wet
WNMG080408MQ PR120S



Tool life

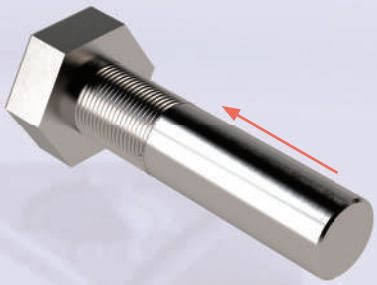
PR120S	**140**pcs/edge	Tool life 1.5x
Competitor B	**90**pcs/edge	

PR120S provides longer tool life in all six edges and ensures stable machining

(User evaluation)

SOLUTION ❸ Bolt SUS304

Cutting conditions : Vc = 135 m/min, ap = 1.5 mm , f = 0.25 mm/rev, Wet
TNMG160408MQ PR120S



Tool life

PR120S	**22**pcs/edge	Tool life 1.5x
Competitor C	**15**pcs/edge	

Improved tool life of stainless steel

(User evaluation)

Longer tool life of heat-resistant alloys

INCONEL718 cutting performance

PR115S
Cutting edge condition after 7.4 min machining
(Internal evaluation)

PR115S (SG)

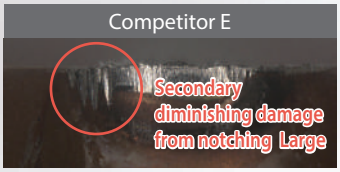
Competitor D

Cutting conditions :
Vc = 60 m/min, ap = 0.5 mm, f = 0.1 mm/rev,
Wet INCONEL718 CNMG120408 Type

PR120S
Cutting edge condition after 15 min machining
(Internal evaluation)

PR120S (SG)

Competitor E

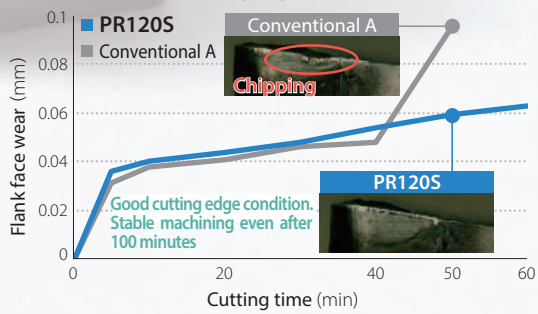


Cutting conditions :
Vc = 40 m/min, ap = 0.5 mm, f = 0.1 mm/rev,
Wet INCONEL718 CNMG120408 Type

Supports small parts machining of stainless steel

SUS316L cutting performance

PR120S
Wear resistance comparison (Internal evaluation)
Cutting edge comparison (after 50 min)



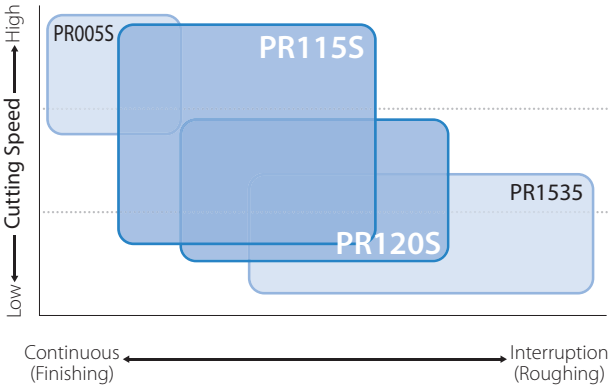
Cutting conditions : Vc = 150 m/min, ap = 1.0 mm, f = 0.08 mm/rev,
Wet, SUS316L, DCGT11T304 Type

2 Unique carbide substrate with excellent heat resistance and New coating “MEGACOAT TOUGH”

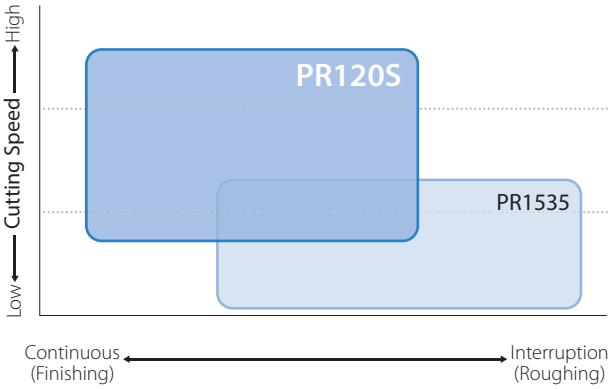
PR115S **Covers a wide range of difficult-to-cut material machining applications**
1st recommendation for continuous finishing of heat-resistant alloys

PR120S **Long tool life and stable machining in interrupted machining of heat-resistant alloys**
1st recommendation for continuous finishing to light interrupted machining of stainless steel
Longer tool life extension possible for stainless steel machining

S Heat-Resistant Alloys Application map



M Stainless Steel Application map



Carbide Substrate and Coating

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“MEGACOAT TOUGH” has a special adhesive layer

1. Wear resistant layer AlTiCrN layer
Thick-film PVD **suppresses abrasive wear**

2. Middle layer TiAlN layer
Excellent oxidation resistance to **surpress crater wear**

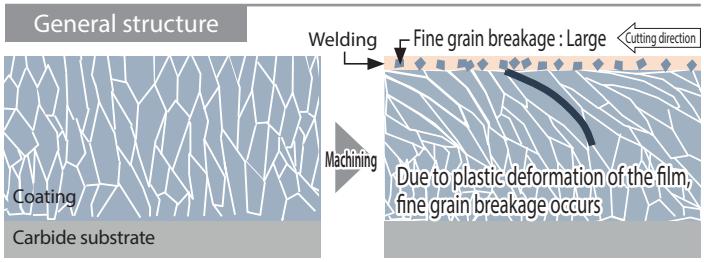
3. Special adhesive layer Check
Improved adhesion of the coating with **notching control**

4. Unique carbide substrate Specializes in heat-resistant alloys

1. Wear resistant layer

Thick-film PVD suppresses abrasive wear
Reduces notch damage with ultra-fine grain structure

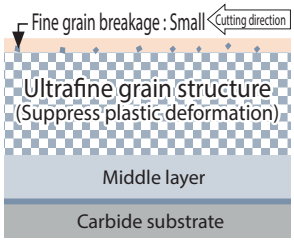
Damage to the coating during machining of heat-resistant alloys (Image)



PR115S/PR120S

Due to ultrafine structure of the membrane, controls fine grain breakage

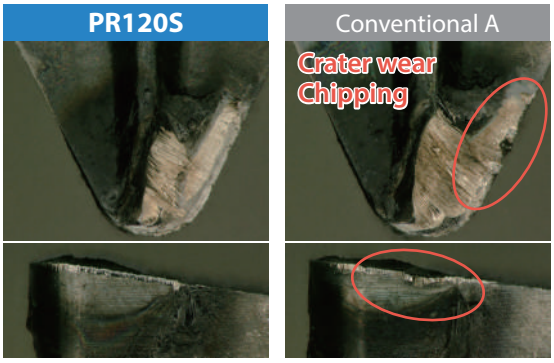
Due to grain breakage and dropping of welding, controls wear and tear



2. Middle layer

TiAlN layer provides superior oxidation resistance
Controls crater wear

Crater wear comparison (Internal evaluation) After machining for 50 min



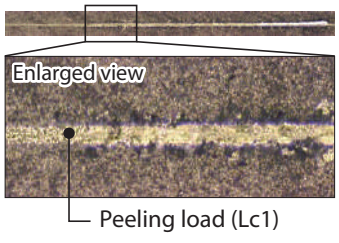
Cutting conditions : Vc = 150 m/min, ap = 1.0 mm, f = 0.08 mm/rev, Wet SUS316L DCGT11T304 Type

3. Special adhesive layer

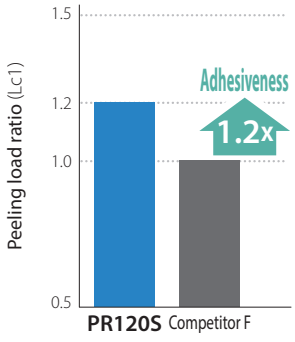
Check

Adhesion layer at carbide substrate-main layer interface, high affinity and improved adhesion

Scratch test results

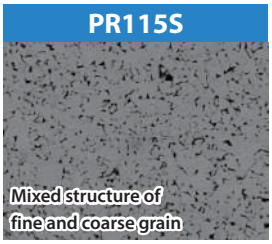


Peeling load (Lc1)
(Internal evaluation)

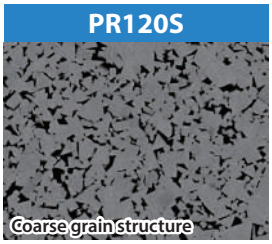


4. Unique carbide substrate

Carbide substrate for heat-resistant alloy machining
Excellent thermal properties with high thermal conductivity



Excellent heat resistance



Excellent heat resistance and stability

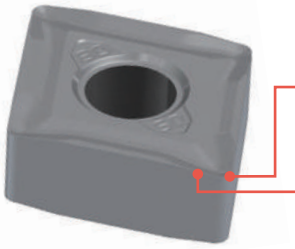
3 New chipbreaker designs (SQ/SG/SX) improve machining stability

Finishing to medium machining SQ chipbreaker

Extended tool life and improved efficiency for mid-range to finishing applications in heat-resistant alloys

SQ chipbreaker benefits

Reduced temperature at the cutting edge → Extended tool life
Reduces burring → Extended tool life and efficiency improvements



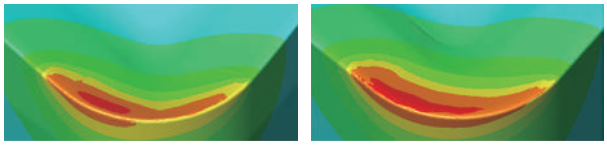
Special rake face design decreases cutting edge temperature

Optimal design achieved with simulation technology

Slant cutting edge

Inclined in (-) direction
Effective for burr suppression and reducing notching

Edge temperature comparison (Simulation) (Internal evaluation)

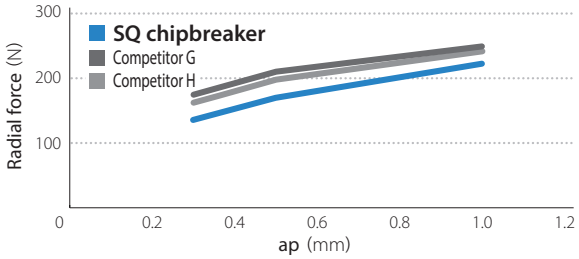


SQ chipbreaker | Conventional B

Cutting conditions : Vc = 40 m/min, ap = 1.0 mm, f = 0.15 mm/rev, Dry CNMG120408 Type
Workpiece : Ni-based heat-resistant alloy

The newly developed chipbreaker lowers the temperature of the cutting edge, This improves tool life and machining efficiency in semi-finishing applications.

Cutting force comparison (Internal evaluation)



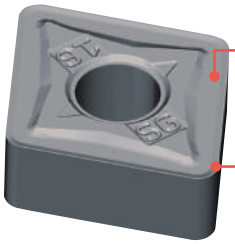
Cutting conditions :
Vc = 40 m/min, f = 0.15 mm/rev, Wet, CNMG120408 Type
Workpiece : Ni-based heat-resistant alloy

SG chipbreaker for roughing

Supports roughing of heat-resistant alloys

SG chipbreaker benefits

Well-balanced rake face shape → Extended tool life
Shallow bottom chipbreaker design → Smooth chip control



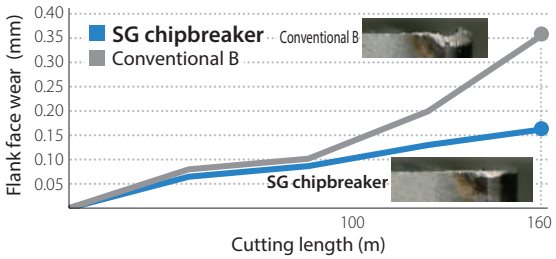
Standard chipbreaker

Stable chip control during heavy machining applications

Well-balanced rake face shape

High-strength and low cutting force design

Wear resistance comparison (Internal evaluation)



Cutting conditions :
Vc = 80 m/min, ap = 1.0 mm, f = 0.20 mm/rev, Wet, CNMG120408 Type
Workpiece : INCONEL718

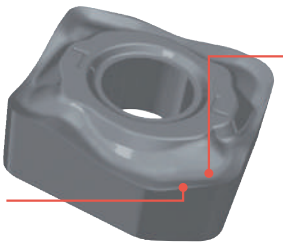
SX chipbreaker for high efficiency roughing

Improved efficiency for roughing in heat-resistant alloys

SX chipbreaker benefits

Decreased edge temperature
→ Extended tool life
Suppresses burr formation
→ Greater depths of cut
Decreased radial forces
→ Resists edge build-up and improves efficiency

Please refer to the back cover for precautions when using the SX chipbreaker.

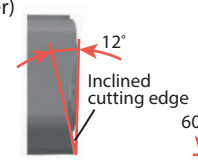


Rake design decreases temperature at the cutting edge

Optimal design achieved with CNC simulation technology

Unique cutting edge design (Handed insert)

- 60° lead angle (when Installed in the toolholder)
- 12° rake angle

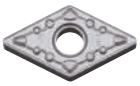
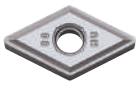


- Can be installed in standard Kyocera toolholders (DCLN/PCLN) by changing to corresponding SX shim
- Single-sided handed insert

Stock Items (Negative) M Class

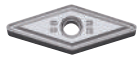
Shape (Handed Insert shows Right-hand)	Description	I.C.	Thickness	Hole Diameter	Corner R (RE)	PR115S	PR120S	PR1535
 Finishing-Medium	CNMG 120404SQ	12.70	4.76	5.16	0.4	●	●	
	CNMG 120408SQ				0.8	●	●	
	CNMG 120412SQ				1.2	●	●	
	CNMG 160612SQ	15.875	6.35	6.35	1.2	●	●	
	CNMG 160616SQ				1.6	●	●	
	CNMG 190612SQ	19.05	6.35	7.94	1.2	●	●	
	CNMG 190616SQ				1.6	●	●	
 Finishing-Medium	CNMG 120404MQ	12.70	4.76	5.16	0.4	●	●	●
	CNMG 120408MQ				0.8	●	●	●
 Medium-Roughing	CNMG 120404MS	12.70	4.76	5.16	0.4	●	●	●
	CNMG 120408MS				0.8	●	●	●
	CNMG 120412MS				1.2	●	●	●
	CNMG 120416MS				1.6	●	●	●
 Medium-Roughing	CNMG 120404MU	12.70	4.76	5.16	0.4	●	●	●
	CNMG 120408MU				0.8	●	●	●
	CNMG 120412MU				1.2	●	●	●
	CNMG 160608MU	15.875	6.35	6.35	0.8	●	●	●
	CNMG 160612MU				1.2	●	●	●
	CNMG 160616MU				1.6	●	●	●
	CNMG 190612MU	19.05	6.35	7.94	1.2	●	●	●
	CNMG 190616MU				1.6	●	●	●
 Medium-Roughing	CNMG 120404TK	12.70	4.76	5.16	0.4	●	●	●
	CNMG 120408TK				0.8	●	●	●
 Roughing	CNMG 120408SG	12.70	4.76	5.16	0.8	●	●	●
	CNMG 120412SG				1.2	●	●	●
	CNMG 160612SG	15.875	6.35	6.35	1.2	●	●	●
	CNMG 160616SG				1.6	●	●	●
	CNMG 190612SG	19.05	6.35	7.94	1.2	●	●	●
	CNMG 190616SG				1.6	●	●	●
 Roughing/ Single-sided	CNMM 1204X$^{R}_{L}$-SX	12.70	4.42	5.16	–	●	●	
	CNMM 1606X$^{R}_{L}$-SX	15.875	5.96	6.35	–	●	●	
	CNMM 1906X$^{R}_{L}$-SX	19.05	5.93	7.94	–	●	●	
 Finishing-Medium	DNMG 150404SQ	12.70	4.76	5.16	0.4	●	●	
	DNMG 150408SQ				0.8	●	●	
	DNMG 150412SQ				1.2	●	●	
	DNMG 150604SQ	12.70	6.35	5.16	0.4	●	●	
	DNMG 150608SQ				0.8	●	●	
	DNMG 150612SQ				1.2	●	●	
 Finishing-Medium	DNMG 150404MQ	12.70	4.76	5.16	0.4	●	●	●
	DNMG 150408MQ				0.8	●	●	●
	DNMG 150604MQ	12.70	6.35	5.16	0.4	●	●	●
	DNMG 150608MQ				0.8	●	●	●

CNMM…X$^{R}_{L}$-SX inserts are single-sided with 2 cutting edges

Shape	Description	I.C.	Thickness	Hole Diameter	Corner R (RE)	PR115S	PR120S	PR1535
 Medium-Roughing	DNMG 150404MS	12.70	4.76	5.16	0.4	●	●	●
	DNMG 150408MS				0.8	●	●	●
	DNMG 150412MS				1.2	●	●	●
	DNMG 150604MS	12.70	6.35	5.16	0.4	●	●	●
	DNMG 150608MS				0.8	●	●	●
	DNMG 150612MS				1.2	●	●	●
 Medium-Roughing	DNMG 150404MU	12.70	4.76	5.16	0.4	●	●	●
	DNMG 150408MU				0.8	●	●	●
	DNMG 150604MU	12.70	6.35	5.16	0.4	●	●	●
	DNMG 150608MU				0.8	●	●	●
 Roughing	DNMG 150408SG	12.70	4.76	5.16	0.8	●	●	●
	DNMG 150412SG				1.2	●	●	●
	DNMG 150608SG	12.70	6.35	5.16	0.8	●	●	●
	DNMG 150612SG				1.2	●	●	●
 Finishing-Medium	SNMG 120404MQ	12.70	4.76	5.16	0.4	●	●	●
	SNMG 120408MQ				0.8	●	●	●
 Medium-Roughing	SNMG 120404MS	12.70	4.76	5.16	0.4	●	●	●
	SNMG 120408MS				0.8	●	●	●
	SNMG 120412MS				1.2	●	●	●
	SNMG 120416MS				1.6	●	●	●
 Medium-Roughing	SNMG 190612MU	19.05	6.35	7.94	1.2	●	●	●
	SNMG 190616MU				1.6	●	●	●
 Roughing	SNMG 120408SG	12.70	4.76	5.16	0.8	●	●	●
	SNMG 120412SG				1.2	●	●	●
	SNMG 150612SG	15.875	6.35	6.35	1.2	●	●	
	SNMG 150616SG				1.6	●	●	
	SNMG 190612SG	19.05	6.35	7.94	1.2	●	●	●
	SNMG 190616SG				1.6	●	●	●
 Finishing-Medium	TNMG 160404MQ	9.525	4.76	3.81	0.4	●	●	●
	TNMG 160408MQ				0.8	●	●	●
 Medium-Roughing	TNMG 160404MS	9.525	4.76	3.81	0.4	●	●	●
	TNMG 160408MS				0.8	●	●	●
	TNMG 160412MS				1.2	●	●	●
 Medium-Roughing	TNMG 160404MU	9.525	4.76	3.81	0.4	●	●	●
	TNMG 160408MU				0.8	●	●	●
 Roughing	TNMG 160408SG	9.525	4.76	3.81	0.8	●	●	●
	TNMG 160412SG				1.2	●	●	●
	TNMG 220408SG	12.70	4.76	5.16	0.8	●	●	●
	TNMG 220412SG				1.2	●	●	●

●: Standard Stock

Stock Items (Negative) M Class

Shape	Description	Dimensions (mm) I.C.	Thickness	Hole Diameter	Corner R (RE)	PR115S	PR120S	PR1535
 Finishing-Medium	VNMG 160404MQ	9.525	4.76	3.81	0.4	●	●	●
	160408MQ				0.8	●	●	●
 Medium-Roughing	VNMG 160404MS	9.525	4.76	3.81	0.4	●	●	●
	160408MS				0.8	●	●	●
	160412MS				1.2	●	●	●
 Medium-Roughing	VNMG 160404MU	9.525	4.76	3.81	0.4	●	●	●
	160408MU				0.8	●	●	●
 Roughing	VNMG 160404SG	9.525	4.76	3.81	0.4	●	●	●
	160408SG				0.8	●	●	●

Shape	Description	Dimensions (mm) I.C.	Thickness	Hole Diameter	Corner R (RE)	PR115S	PR120S	PR1535
 Finishing-Medium	WNMG 080404MQ	12.70	4.76	5.16	0.4	●	●	●
	080408MQ				0.8	●	●	●
 Medium-Roughing	WNMG 080404MS	12.70	4.76	5.16	0.4	●	●	●
	080408MS				0.8	●	●	●
	080412MS				1.2	●	●	●
 Medium-Roughing	WNMG 080404MU	12.70	4.76	5.16	0.4	●	●	●
	080408MU				0.8	●	●	●
 Roughing	WNMG 080408SG	12.70	4.76	5.16	0.8	●	●	●
	080412SG				1.2	●	●	●

● : Standard Stock

Stock Items (Negative) G Class

Shape	Description	Dimensions (mm) I.C.	Thickness	Hole Diameter	Corner R (RE)	PR115S	PR120S	PR1535
 Finishing-Medium / Sharp Edge / Polished	CNGG 120402MFP-SK	12.70	4.76	5.16	<0.2	●	●	●
	120404MFP-SK				<0.4	●	●	●
 Finishing-Medium / Sharp Edge / Polished	DNGG 150402MFP-SK	12.70	4.76	5.16	<0.2	●	●	●
	150404MFP-SK				<0.4	●	●	●

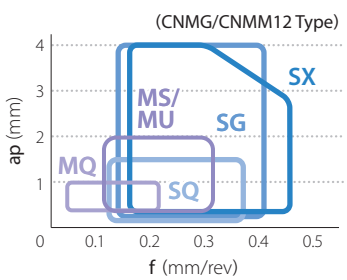
Insert with corner R (RE) dimension expressed with less than sign (e.g. <0.1, <0.2 etc.) indicates models with minus tolerance for corner R (RE)

Shape	Description	Dimensions (mm) I.C.	Thickness	Hole Diameter	Corner R (RE)	PR115S	PR120S	PR1535
 Finishing-Medium / Sharp Edge / Polished	TNGG 160401MFP-SK	9.525	4.76	3.81	<0.1	●	●	●
	160402MFP-SK				<0.2	●	●	●
	160404MFP-SK				<0.4	●	●	●
 Finishing-Medium / Sharp Edge / Polished	VNGG 160402MFP-SK	9.525	4.76	3.81	<0.2	●	●	●
	160404MFP-SK				<0.4	●	●	●

● : Standard Stock

Applicable Chipbreaker Range (ap Indicates radial depth of cut per side)

Heat-Resistant Alloys



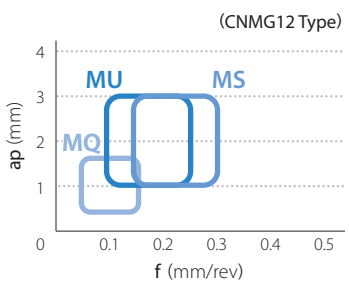
Cutting Range	Recommended Chipbreaker			
Finishing ap : 0.2 - 1.0 mm	SQ Chipbreaker	Advantage Notching control	MQ Chipbreaker	Advantage Low Cutting Force/ Chip Control
	Issue : Finished surfaces, chip control			
Medium-Roughing ap : 0.5 - 4.0 mm	SG Chipbreaker	Advantage General Purpose/ 1st Recommendation	MS Chipbreaker (Cutting Range ap : 0.5 - 2.0 mm)	Advantage Cutting Edge Damage Control
	Issue : Finished surfaces, chip control		MU Chipbreaker	Advantage Low Cutting Force/ Chip Control
Medium-Roughing ap : 0.5 – 4.0 mm	SX Chipbreaker	Advantage Minimize Burrs ⇒ Greater Depths of Cut		

Recommended Cutting Conditions

Workpiece	Cutting Range	Application	Recommended Chipbreaker	Recommended Grade	Min. – **Recommendation** – Max.		
					Vc (m/min)	ap (mm)	f (mm/rev)
Heat-Resistant Alloys	Finishing	Continuous	MQ	PR115S	25 – **45** – 70	0.2 – **0.5** – 1.0	0.05 – **0.1** – 0.2
		Light Interruption		PR120S	25 – **40** – 60		
	Finishing-Medium	Continuous	SQ	PR115S	25 – **45** – 70	0.3 – **0.5** – 1.5	0.1 – **0.17** – 0.35
		Light Interruption		PR120S	25 – **40** – 60		
		Continuous	SK	PR115S	25 – **45** – 70	0.5 – **1.0** – 1.5	0.03 – **0.05** – 0.1
		Light Interruption		PR120S	25 – **40** – 60		
	Medium-Roughing	Continuous	MU	PR115S	25 – **45** – 70	0.5 – **1.0** – 2.0	0.1 – **0.15** – 0.3
		Light Interruption		PR120S	25 – **40** – 60		
		Heavy Interruption		PR1535	25 – **30** – 45		
		Continuous	MS	PR115S	25 – **45** – 70	0.5 – **1.0** – 2.0	0.1 – **0.15** – 0.3
		Light Interruption		PR120S	25 – **40** – 60		
		Heavy Interruption		PR1535	25 – **30** – 45		
		Continuous	TK	PR115S	25 – **45** – 70	1.0 – **2.0** – 3.0	0.12 – **0.2** – 0.3
		Light Interruption		PR120S	25 – **40** – 60		
		Heavy Interruption		PR1535	25 – **30** – 45		
	Roughing	Continuous	SG	PR115S	25 – **45** – 70	0.5 – **2.0** – 4.0	0.1 – **0.3** – 0.4
		Light Interruption		PR120S	25 – **40** – 60		
		Heavy Interruption		PR1535	25 – **30** – 45		
		Continuous	SX	PR115S	25 – **45** – 70	0.5 – **2.0** – 4.0	0.15 – **0.3** – 0.45
		Light Interruption		PR120S	25 – **40** – 60		
		Heavy Interruption		PR1535	25 – **30** – 45		
Stainless Steel (Austenitic related)	Finishing	Continuous	MQ	PR120S	100 – **140** – 180	0.5 – **1.0** – 1.5	0.05 – **0.1** – 0.15
		Interruption		PR1535			
	Finishing-Medium	Continuous	SK	PR120S	80 – **120** – 150	0.5 – **1.5** – 2.0	0.03 – **0.05** – 0.1
		Interruption		PR1535			
	Medium-Roughing	Continuous	MU	PR120S	80 – **120** – 150	1.0 – **2.0** – 3.0	0.1 – **0.15** – 0.25
		Interruption		PR1535			0.15 – **0.25** – 0.3
		Continuous	MS	PR120S	80 – **120** – 150	1.0 – **2.0** – 3.0	0.15 – **0.2** – 0.3
		Interruption		PR1535			0.2 – **0.3** – 0.4
		Continuous	TK	PR120S	80 – **120** – 150	1.0 – **2.0** – 4.0	0.1 – **0.2** – 0.3
		Interruption		PR1535			0.2 – **0.3** – 0.4
Stainless Steel (Precipitation Hardening)	Finishing	Continuous	MQ	PR120S	80 – **100** – 120	0.5 – **1.0** – 1.5	0.05 – **0.1** – 0.15
		Interruption		PR1535			
	Medium-Roughing	Continuous	MU	PR120S	80 – **100** – 120	1.0 – **2.0** – 3.0	0.1 – **0.15** – 0.25
		Interruption		PR1535			0.15 – **0.25** – 0.3
		Continuous	MS	PR120S	80 – **100** – 120	1.0 – **2.0** – 3.0	0.15 – **0.2** – 0.3
		Interruption		PR1535			0.2 – **0.3** – 0.4
		Continuous	TK	PR120S	80 – **100** – 120	1.0 – **2.0** – 4.0	0.1 – **0.2** – 0.3
		Interruption		PR1535			0.2 – **0.3** – 0.4

The **bold-faced number** indicates a center value of recommended cutting condition

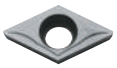
Stainless Steel



Cutting Range	Recommended Chipbreaker
Finishing ap : 0.5 - 1.5 mm	MQ Chipbreaker  Advantage: Low Cutting Force/ Chip Control
Finishing-Medium ap : 1.0 - 3.0 mm	MS Chipbreaker  Advantage: Cutting Edge Damage Control
Issue : Finished surfaces, chip control	MU Chipbreaker  Advantage: Low Cutting Force/ Chip Control

Stock Items (Positive)

Shape	Description		Dimensions (mm)					PR115S	PR120S	PR1535
			I.C.	Thickness	Hole Diameter	Corner R (RE)	Relief Angle			
 Finishing / Sharp Edge / Polished	CCGT	0602005MFP-SKS	6.35	2.38	3	<0.05	7°	●	●	●
		060201MFP-SKS				<0.1		●	●	●
		060202MFP-SKS				<0.2		●	●	●
	CCGT	09T3005MFP-SKS	9.525	3.97	4.7	<0.05	7°	●	●	●
		09T301MFP-SKS				<0.1		●	●	●
		09T302MFP-SKS				<0.2		●	●	●
		09T304MFP-SKS				<0.4		●	●	●
 Finishing / Sharp Edge / Polished	CCGT	060201MFP-SK	6.35	2.38	3	<0.1	7°	●	●	●
		060202MFP-SK				<0.2		●	●	●
		060204MFP-SK				<0.4		●	●	●
	CCGT	09T301MFP-SK	9.525	3.97	4.7	<0.1	7°	●	●	●
		09T302MFP-SK				<0.2		●	●	●
		09T304MFP-SK				<0.4		●	●	●
 Finishing-Medium / Sharp Edge / Polished	CCGT	060201MFP-GQ	6.35	2.38	3	<0.1	7°	●	●	●
		060202MFP-GQ				<0.2		●	●	●
		060204MFP-GQ				<0.4		●	●	●
	CCGT	09T301MFP-GQ	9.525	3.97	4.7	<0.1	7°	●	●	●
		09T302MFP-GQ				<0.2		●	●	●
		09T304MFP-GQ				<0.4		●	●	●
 Finishing-Medium	CCMT	09T304MQ	9.525	3.97	4.7	0.4	7°	●	●	●
		09T308MQ				0.8		●	●	●
 Finishing / Sharp Edge / Polished	DCGT	0702005MFP-SKS	6.35	2.38	3	<0.05	7°	●	●	●
		070201MFP-SKS				<0.1		●	●	●
		070202MFP-SKS				<0.2		●	●	●
	DCGT	11T3005MFP-SKS	9.525	3.97	4.7	<0.05	7°	●	●	●
		11T301MFP-SKS				<0.1		●	●	●
		11T302MFP-SKS				<0.2		●	●	●
		11T304MFP-SKS				<0.4		●	●	●

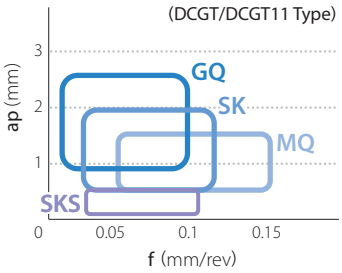
Shape	Description		Dimensions (mm)					PR115S	PR120S	PR1535
			I.C.	Thickness	Hole Diameter	Corner R (RE)	Relief Angle			
 Finishing / Sharp Edge / Polished	DCGT	070201MFP-SK	6.35	2.38	3	<0.1	7°	●	●	●
		070202MFP-SK				<0.2		●	●	●
		070204MFP-SK				<0.4		●	●	●
	DCGT	11T301MFP-SK	9.525	3.97	4.7	<0.1	7°	●	●	●
		11T302MFP-SK				<0.2		●	●	●
		11T304MFP-SK				<0.4		●	●	●
 Finishing-Medium / Sharp Edge / Polished	DCGT	070201MFP-GQ	6.35	2.38	3	<0.1	7°	●	●	●
		070202MFP-GQ				<0.2		●	●	●
		070204MFP-GQ				<0.4		●	●	●
	DCGT	11T301MFP-GQ	9.525	3.97	4.7	<0.1	7°	●	●	●
		11T302MFP-GQ				<0.2		●	●	●
		11T304MFP-GQ				<0.4		●	●	●
 Finishing-Medium	DCMT	070202MQ	6.35	2.38	3	0.2	7°	●	●	●
		070204MQ				0.4		●	●	●
	DCMT	11T304MQ	9.525	3.97	4.7	0.4	7°	●	●	●
		11T308MQ				0.8		●	●	●
 Finishing / Sharp Edge / Polished	VCGT	110301MFP-SKS	6.35	3.18	2.8	<0.1	7°	●	●	●
		110302MFP-SKS				<0.2		●	●	●
		110304MFP-SKS				<0.4		●	●	●
 Finishing / Sharp Edge / Polished	VPGT	110301MFP-SKS	6.35	3.18	3	<0.1	11°	●	●	●
		110302MFP-SKS				<0.2		●	●	●
		110304MFP-SKS				<0.4		●	●	●

● : Standard Stock

Insert with corner R (RE) dimension expressed with less than sign (e.g. <0.1, <0.2 etc.) indicates models with minus tolerance for corner R (RE)

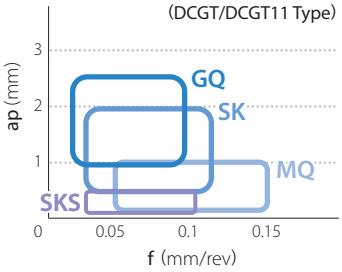
Applicable Chipbreaker Range (ap Indicates radial depth of cut per side)

Heat-Resistant Alloys



Cutting Range	Recommended Chipbreaker
Finishing ap : 0.5 - 2.0 mm	SK Chipbreaker → Issue : Chip control during low cutting Advantage: General Purpose/ 1st Recommendation Cutting Range ap : 0.1 – 0.5 mm SKS Chipbreaker Advantage: Chip Control
Finishing-Medium ap : 1.0 - 2.5 mm	GQ Chipbreaker Advantage: Chipbreaker width according to ap range ⇒ Can be cut in a wide range of conditions

Stainless Steel



Cutting Range	Recommended Chipbreaker
Finishing ap : 0.5 - 1.5 mm	SK Chipbreaker → Issue : Chip control during low cutting Advantage: General Purpose/ 1st Recommendation Cutting Range ap : 0.1 – 0.5 mm SKS Chipbreaker Advantage: Chip Control
Finishing-Medium ap : 1.0 - 2.5 mm	GQ Chipbreaker Advantage: Chipbreaker width according to ap range ⇒ Can be cut in a wide range of conditions

Recommended Cutting Conditions

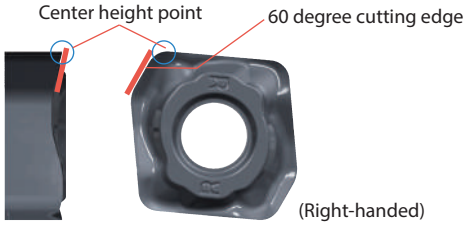
Workpiece	Cutting Range	Recommended Chipbreaker	Recommended Grade	Min. – **Recommendation** – Max.		
				Vc (m/min)	ap (mm)	f (mm/rev)
Heat-Resistant Alloys	Finishing	MQ	PR115S	25 – **45** – 70	0.5 – **1.0** – 1.5	0.05 – **0.1** – 0.15
			PR120S	25 – **40** – 60		
			PR1535	25 – **30** – 45		0.08 – **0.15** – 0.2
		SKS	PR115S	25 – **45** – 70	0.1 – **0.3** – 0.5	0.03 – **0.05** – 0.1
			PR120S	25 – **40** – 60		
			PR1535	25 – **30** – 45	0.3 – **0.5** – 1.0	0.05 – **0.1** – 0.15
		SK	PR115S	25 – **45** – 70	0.5 – **1.0** – 2.0	0.03 – **0.08** – 0.12
			PR120S	25 – **40** – 60		
			PR1535	25 – **30** – 45	0.5 – **1.5** – 3.0	0.05 – **0.1** – 0.15
	Finishing-Medium	GQ	PR115S	25 – **45** – 70	1.0 – **1.5** – 2.5	0.02 – **0.05** – 0.08
			PR120S	25 – **40** – 60		
			PR1535	25 – **30** – 45	1.0 – **3.0** – 5.0	0.04 – **0.07** – 0.1
Stainless Steel (Austenitic related)	Finishing	MQ	PR120S	80 – **100** – 120	0.3 – **0.5** – 1.0	0.05 – **0.1** – 0.15
			PR1535	60 – **80** – 100	0.5 – **1.0** – 1.5	0.08 – **0.15** – 0.2
		SKS	PR120S	80 – **100** – 120	0.1 – **0.3** – 0.5	0.03 – **0.05** – 0.1
			PR1535	60 – **80** – 100	0.3 – **0.5** – 1.0	0.05 – **0.1** – 0.15
		SK	PR120S	80 – **100** – 120	0.5 – **1.0** – 2.0	0.03 – **0.08** – 0.12
			PR1535	60 – **80** – 100	0.5 – **1.5** – 3.0	0.05 – **0.1** – 0.15
	Finishing-Medium	GQ	PR120S	80 – **100** – 120	1.0 – **1.5** – 2.5	0.02 – **0.05** – 0.08
			PR1535	60 – **80** – 100	1.0 – **3.0** – 5.0	0.04 – **0.07** – 0.1
Stainless Steel (Precipitation Hardening)	Finishing	MQ	PR120S	40 – **60** – 80	0.3 – **0.5** – 1.0	0.05 – **0.1** – 0.15
			PR1535	30 – **50** – 70	0.5 – **1.0** – 1.5	0.08 – **0.15** – 0.2
		SKS	PR120S	40 – **60** – 80	0.1 – **0.3** – 0.5	0.03 – **0.05** – 0.1
			PR1535	30 – **50** – 70	0.3 – **0.5** – 1.0	0.05 – **0.1** – 0.15
		SK	PR120S	40 – **60** – 80	0.5 – **1.0** – 2.0	0.03 – **0.08** – 0.12
			PR1535	30 – **50** – 70	0.5 – **1.5** – 3.0	0.05 – **0.1** – 0.15
	Finishing-Medium	GQ	PR120S	40 – **60** – 80	1.0 – **1.5**– 2.5	0.02 – **0.05** – 0.08
			PR1535	30 – **50** – 70	1.0 – **3.0** – 5.0	0.04 – **0.07** – 0.1

The **bold-faced number** indicates a center value of recommended cutting condition

SX Chipbreaker Usage Precautions

1. Cutting Edge Height

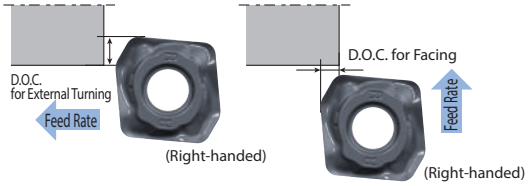
The center of the cutting edge height of the nose is slanted by 60 degrees based on circled portions in image below.



2. Recommended D.O.C.

Recommended depth of cut is no greater than the 60° lead angle; however, larger depths of cut are possible.

Description	Recommended D.O.C. External Turning (mm)	Max. D.O.C. Facing (mm)
CNMM1204X R/L-SX	0.5 - **2.0** - 4.0	2.0
CNMM1606X R/L-SX	0.5 - **2.5** - 4.5	2.0
CNMM1906X R/L-SX	0.5 - **3.0** - 5.0	2.5



3. Applicable Toolholder

The SX chipbreaker insert requires a different shim than standard inserts. No additional toolholder modifications are necessary when using the applicable Kyocera holders.

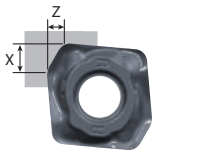
Insert Description	Applicable Toolholder (Kyocera)	Standard Shim	Shim for SX Chipbreaker
CNMM1204X R/L-SX	DCLN R/L2020K-12 DCLN R/L2525M-12	DC-44	DC-44-C
	PCLN R/L2020H-12 PCLN R/L2020K-12 PCLN R/L2525M-12 PCLN R/L3225P-12	LC-42N	LC-42N-C
CNMM1606X R/L-SX	PCLN R/L2525M-16 PCLN R/L3232P-16	LC-53N	LC-53N-C
CNMM1906X R/L-SX	PCLN R/L3232P-19	LC-63	LC-63-C

Boring is not recommended

4. Unmachined Portion Varies with Insert Size

Unmachined portion is reflected below.

Description	Amount Uncut (mm)	
	X	Z
CNMM1204X R/L-SX	4.1	2.9
CNMM1606X R/L-SX	4.8	3.3
CNMM1906X R/L-SX	5.4	3.6



5. Facing

Facing is possible, but turning is recommended.
Cutting edge may drop below center in facing operations.
Boss remains at the center of the workpiece.

Description	Run-out Amount when Facing (mm)
CNMM1204X R/L-SX	0.75
CNMM1606X R/L-SX	0.85
CNMM1906X R/L-SX	1.05

The SX Chipbreaker is Uniquely Designed for High Efficiency Roughing. It Differs from Standard Inserts by the Following.

- Handed single-sided 2-corner insert
- Requires a dedicated shim
- Unmachined portion remains at corner (4. Unmachined portion varies with insert size)
- Position of insert is below the center when facing(5. Facing)

CP483 CAT/25T2304DNK