

THE NEW VALUE FRONTIER



# CA65 Series and PR1125

CVD and PVD coated carbide for stainless steel



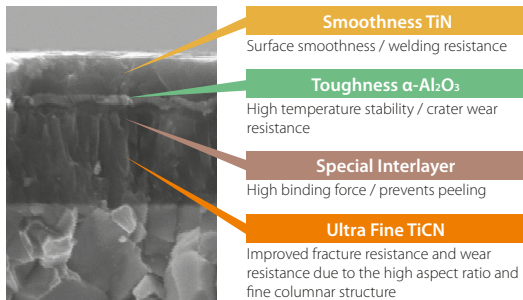
# CVD and PVD coated carbide grades for stainless steel machining

CA6515/CA6525 (CVD) and PR1125 (PVD) are applicable to heat-resistant steel and steel as well.

## CA65<sup>15/25</sup>

### Thin ultra fine TiCN

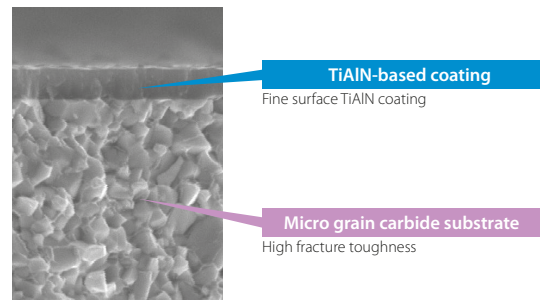
CVD coated carbide grade improves wear resistance.



## PR11<sup>25</sup>

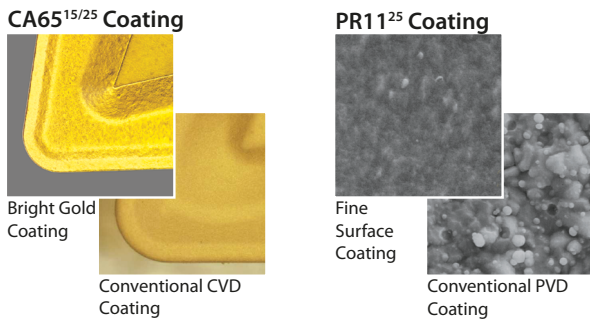
### Fine surface thin TiAlN

Stable machining with tough substrate and low cutting force on fine surface.



### Smooth coating film surface

Reduces adhesion and edge build-up. Low cutting force on smooth surface.

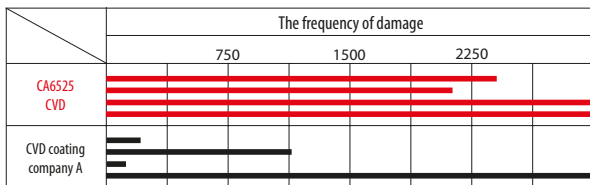


### Application range

Cutting speed	High speed	CA65 <sup>15</sup>		
	Low speed	CA65 <sup>25</sup> (1st recommendation)		PR11 <sup>25</sup>
Application		Continuous 	Light interruption 	Heavy interruption 

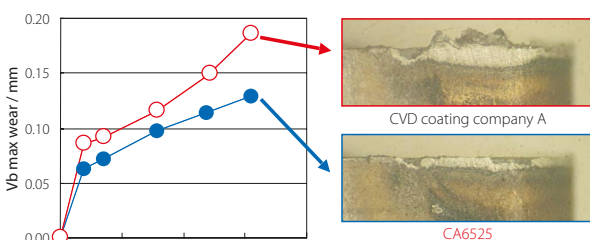
### Cutting Performance of CA6525

#### Stabilization



Vc: 100 m/min D = 0.5 mm f = 0.3 mm/rev, wet, CNMG120408, 1.4301, four grooves

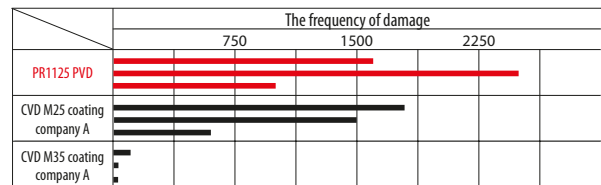
#### Wear resistance



Vc: 200 m/min D = 1.5 mm f = 0.3 mm/rev, wet, CNMG120408, 1.4301

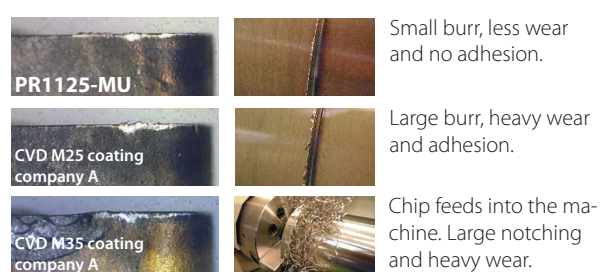
### Cutting performance of PR1125

#### Stabilization



Vc = 100 m/min, D = 1.5 mm, f = 0.3 mm/rev, wet, CNMG120408, 1.4301, four grooves

#### Wear resistance and burr condition



Vc = 120 m/min, D = 1.0 mm, f = 0.15 mm/rev, wet, CNMG120408, 1.4301, machining time: 30 min

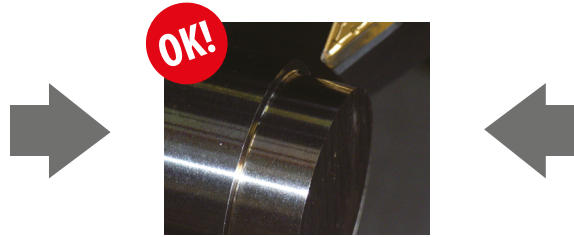


# The edge preparation is the key to machine stainless steel

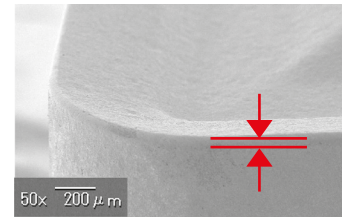
- The 'FET Technology' (Fine edge treatment) realizes large edge strength and sharp rake angle.
- Small R honring.



No good (Company A)



Prevents burrs

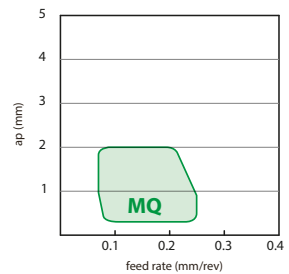
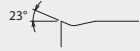


Cutting edge condition by FET technology

## Chipbreaker for stainless steel machining

### MQ chipbreaker finishing to medium

- Large rake angle
- Circular edge line
- Low cutting force
- Good chip control

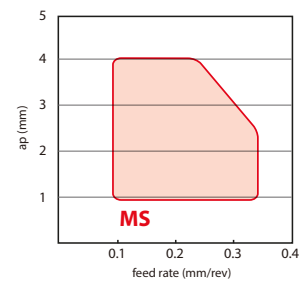
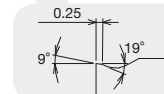
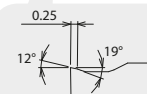


### MS chipbreaker medium to roughing

- First recommended chipbreaker from medium to roughing
- Positive land
- Tough cutting edge
- Good chip control



Chip control oriented type

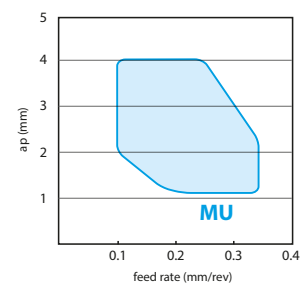


### MU chipbreaker medium to roughing

- Large rake angle
- Low cutting force
- Reduces notching and burrs
















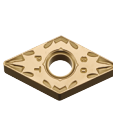




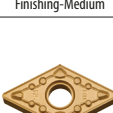







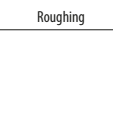




Sharpness oriented type



The combination of CA65<sup>15/25</sup>, PR11<sup>25</sup> and chipbreaker for stainless steel is preferable to prevent welding and burr as well as chattering for low carbon steel or heat resistance alloy machining.

## Negative type inserts



















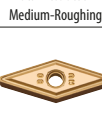






Shape	Description	Dimension (mm)					CVD			PVD
		I.C.	Thickness	Hole	Corner-R (r <sub>e</sub> )	Relief Angle	CA6515	CA6525	PR1125	
	CNMG 120404HQ	12.70	4.76	5.16	0.4	-	●	●	●	
	120408HQ				0.8		●	●	●	
	120412HQ				1.2		●	●	●	
	CNMG 120404PS	12.70	4.76	5.16	0.4	-	●	●	●	
	120408PS				0.8		●	●	●	
	120412PS				1.2		●	●	●	
	120416PS				1.6		●	●	●	
CNMG 160612PS	15.875	6.35	6.35	1.2	-	●	●			
	CNMG 120408PT	12.70	4.76	5.16	0.8	-	●	●		
	120412PT				1.2		●	●		
	CNMG 160608PT				15.875		6.35	6.35	0.8	●
160612PT	1.2	●	●							
CNMG 160616PT	1.6	●	●							
	CNMG 120404	12.70	4.76	5.16	0.4	-	●	●	●	
	120408				0.8		●	●	●	
	120412				1.2		●	●	●	
	CNMG 120404GU	12.70	4.76	5.16	0.4	-	○	○		
	120408GU				0.8		○	○		
	CNMG 120408HU	12.70	4.76	5.16	0.8	-	○	○		
	120412HU				1.2		○	○		
	CNMG 120404MQ	12.70	4.76	5.16	0.4	-	●	●	●	
	120408MQ				0.8		●	●	●	
	CNMG 120404MS	12.70	4.76	5.16	0.4	-	●	●	●	
	120408MS				0.8		●	●	●	
	120412MS				1.2		●	●	●	
	120416MS				1.6		●	●	●	
	CNMG 120404MU	12.70	4.76	5.16	0.4	-	●	●	●	
	120408MU				0.8		●	●	●	
	120412MU				1.2		●	●	●	
	CNMG 120404TK	12.70	4.76	5.16	0.4	-	●	●	●	
	120408TK				0.8		●	●	●	
	DNMG 150404HQ	12.70	4.76	5.16	0.4	-	●	●	●	
	150408HQ				0.8		●	●	●	
	DNMG 150604HQ	12.70	6.35	5.16	0.4	-	●	●	●	
	150608HQ				0.8		●	●	●	
	DNMG 150404PS	12.70	4.76	5.16	0.4	-	●	●	●	
	150408PS				0.8		●	●	●	
	150412PS				1.2		●	●	●	
	150604PS				12.70		6.35	5.16	0.4	●
150608PS	0.8	●	●	●						
150612PS	1.2	●	●	●						

Shape	Description	Dimension (mm)					CVD			PVD
		I.C.	Thickness	Hole	Corner-R (r <sub>e</sub> )	Relief Angle	CA6515	CA6525	PR1125	
	DNMG 150408PT	12.70	4.76	5.16	0.8	-		●		
	150412PT				1.2			●		
	DNMG 150608PT	12.70	6.35	5.16	0.8	-		●		
	150612PT				1.2			●		
	DNMG 150404GU	12.70	4.76	5.16	0.4	-	○	○		
	150408GU				0.8		○	○		
	DNMG 150604GU	12.70	6.35	5.16	0.4	-	○	○		
	150608GU				0.8		○	○		
	DNMG 150408HU	12.70	4.76	5.16	0.8	-	○	○		
	150412HU				1.2		○	○		
	DNMG 150608HU	12.70	6.35	5.16	0.8	-	○	○		
	150612HU				1.2		○	○		
	DNMG 150404MQ	12.70	4.76	5.16	0.4	-	●	●	●	
	150408MQ				0.8		●	●	●	
	DNMG 150604MQ	12.70	6.35	5.16	0.4	-	●	●	●	
	150608MQ				0.8		●	●	●	
	DNMG 150404MS	12.70	4.76	5.16	0.4	-	●	●	●	
	150408MS				0.8		●	●	●	
	150412MS				1.2		●	●	●	
	DNMG 150604MS	12.70	6.35	5.16	0.4	-	●	●	●	
	150608MS				0.8		●	●	●	
	150612MS				1.2		●	●	●	
	DNMG 150404MU	12.70	4.76	5.16	0.4	-	●	●	●	
	150408MU				0.8		●	●	●	
	DNMG 150604MU	12.70	6.35	5.16	0.4	-	●	●	●	
	150608MU				0.8		●	●	●	
	DNMG 150404TK	12.70	4.76	5.16	0.4	-	●	●	●	
	150408TK				0.8		●	●	●	
	DNMG 150604TK	12.70	6.35	5.16	0.4	-	●	●	●	
	150608TK				0.8		●	●	●	
	SNMG 120408HQ	12.70	4.76	5.16	0.8	-	●	●	●	
	SNMG 120408PS	12.70	4.76	5.16	0.8	-	●	●	●	
	120412PS				1.2		●	●	●	
	SNMG 120408PT	12.70	4.76	5.16	0.8	-		●		
	120412PT				1.2			●		
	SNMG 120408	12.70	4.76	5.16	0.8	-	●	●	●	
	120412				1.2			●		

● : Std. Item ○ : Check availability








## Negative type inserts

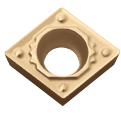


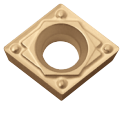




Shape	Description	Dimension (mm)					CVD			PVD
		I.C.	Thickness	Hole	Corner-R (r <sub>e</sub> )	Relief Angle	CA6515	CA6525	PR1125	
 Stainless Steel Finishing-Medium	SNMG 120404MQ 120408MQ	12.70	4.76	5.16	0.4 0.8	-	●	●	●	
 Stainless Steel Medium-Roughing	SNMG 120404MS 120408MS 120412MS 120416MS	12.70	4.76	5.16	0.4 0.8 1.2 1.6	-	●	●	●	
 Finishing-Medium	TNMG 160404HQ 160408HQ	9.525	4.76	3.81	0.4 0.8	-	●	●	●	
 Medium-Roughing	TNMG 160404PS 160408PS 160412PS	9.525	4.76	3.81	0.4 0.8 1.2	-	●	●	●	
	TNMG 220408PS 220412PS				12.70					4.76
 Medium-Roughing High Feed	TNMG 160408PT	9.525	4.76	3.81	0.8	-	●			
 Roughing	TNMG 160404 160408 160412	9.525	4.76	3.81	0.4 0.8 1.2	-	●	●	●	
 Stainless Steel Finishing	TNMG 160404GU 160408GU	9.525	4.76	3.81	0.4 0.8	-	○	○		
 Stainless Steel Medium-Roughing	TNMG 160408HU 160412HU	9.525	4.76	3.81	0.8 1.2	-	○	○		
 Stainless Steel Finishing-Medium	TNMG 160404MQ 160408MQ	9.525	4.76	3.81	0.4 0.8	-	●	●	●	
 Stainless Steel Medium-Roughing	TNMG 160404MS 160408MS 160412MS	9.525	4.76	3.81	0.4 0.8 1.2	-	●	●	●	
 Stainless Steel Medium-Roughing	TNMG 160404MU 160408MU	9.525	4.76	3.81	0.4 0.8	-	●	●		
 Stainless Steel Medium-Roughing	TNMG 160404TK 160408TK	9.525	4.76	3.81	0.4 0.8	-	●	●	●	
 Stainless Steel Medium-Roughing	TNMG 160404 <sup>FL</sup> -ST 160408 <sup>FL</sup> -ST	9.525	4.76	3.81	0.4 0.8	-	●	●	●	
 Finishing/Surface Roughness Oriented	TNMG 160402 <sup>FL</sup> -S 160404 <sup>FL</sup> -S 160408 <sup>FL</sup> -S	9.525	4.76	3.81	0.2 0.4 0.8	-			●	
 Medium-Roughing Low Cutting Resistance	TNMG 160404 <sup>FL</sup> -25R 160408 <sup>FL</sup> -25R	9.525	4.76	3.81	0.4 0.8	-			●	
 Roughing	VNMG 160404 160408	9.525	4.76	3.81	0.4 0.8	-	●	●		
 Stainless Steel Finishing	VNMG 160404GU 160408GU	9.525	4.76	3.81	0.4 0.8	-	○	○		
 Stainless Steel Finishing-Medium	VNMG 160404MQ 160408MQ	9.525	4.76	3.81	0.4 0.8	-	●	●	●	
 Stainless Steel Medium-Roughing	VNMG 160404MS 160408MS 160412MS	9.525	4.76	3.81	0.4 0.8 1.2	-	●	●	●	
 Stainless Steel Medium-Roughing	VNMG 160404MU 160408MU	9.525	4.76	3.81	0.4 0.8	-	●	●	●	
 Medium-Roughing	WNMG 080404HQ 080408HQ	12.70	4.76	5.16	0.4 0.8	-	●	●	●	
 Medium-Roughing	WNMG 080404PS 080408PS 080412PS	12.70	4.76	5.16	0.4 0.8 1.2	-	●	●	●	
 Medium-Roughing High Feed	WNMG 080408PT 080412PT	12.70	4.76	5.16	0.8 1.2	-	●	●		
 Roughing	WNMG 080404 080408 080412	12.70	4.76	5.16	0.4 0.8 1.2	-	●	●	●	
 Stainless Steel Finishing	WNMG 080404GU 080408GU	12.70	4.76	5.16	0.4 0.8	-	○	○		

● : Std. Item ○ : Check availability







## Negative type inserts

Shape	Description	Dimension (mm)					CVD		PVD
		I.C.	Thickness	Hole	Corner-R (rε)	Relief Angle	CA6515	CA6525	PR1125
 Stainless Steel Medium-Roughing	WNMG 080408HU 080412HU	12.70	4.76	5.16	0.8 1.2	-	○ ○	○ ○	
 Stainless Steel Finishing-Medium	WNMG 080404MQ 080408MQ	12.70	4.76	5.16	0.4 0.8	-	● ●	● ●	● ●
 Stainless Steel Medium-Roughing	WNMG 080404MS 080408MS 080412MS	12.70	4.76	5.16	0.4 0.8 1.2	-	● ● ●	● ● ●	● ● ●
 Stainless Steel Medium-Roughing	WNMG 080404MU 080408MU	12.70	4.76	5.16	0.4 0.8	-	● ●	● ●	● ●
 Stainless Steel Medium-Roughing	WNMG 080404TK 080408TK	12.70	4.76	5.16	0.4 0.8	-	● ●	● ●	● ●

# Positive type inserts

Shape	Description	Dimension (mm)					CVD			PVD
		I.C.	Thickness	Hole	Corner-R (rε)	Relief Angle	CA6515	CA6525	PR1125	
 Finishing-Medium	CCMT 060202HQ 060204HQ	6.35	2.38	2.8	0.2 0.4	7°	●	●	●	
	CCMT 09T302HQ 09T304HQ 09T308HQ	9.525	3.97	4.4	0.2 0.4 0.8	7°	●	●	●	
 Finishing-Medium	CCMT 060202GK 060204GK	6.35	2.38	2.8	0.2 0.4	7°	●	●	●	
	CCMT 09T302GK 09T304GK	9.525	3.97	4.4	0.2 0.4	7°	●	●	●	
	CCMT 120404GK 120408GK 120412GK	12.70	4.76	5.5	0.4 0.8 1.2	7°	●	●	●	
 Medium	CCMT 09T308	9.525	3.97	4.4	0.8	7°	●	●	●	
 Finishing-Medium	CPMH 080204HQ 080208HQ	7.94	2.38	3.5	0.4 0.8	11°	●	●	●	
	CPMH 090304HQ 090308HQ	9.525	3.18	4.5	0.4 0.8	11°	●	●	●	
 Medium	CPMH 080204 080208	7.94	2.38	3.5	0.4 0.8	11°	●	●	●	
	CPMH 090304 090308	9.525	3.18	4.5	0.4 0.8	11°	●	●	●	
 Finishing-Medium	DCMT 070202GK 070204GK 070208GK	6.35	2.38	2.8	0.2 0.4 0.8	7°	●	●	●	
	DCMT 11T302GK 11T304GK 11T308GK	9.525	3.97	4.4	0.2 0.4 0.8	7°	●	●	●	
	DCMT 070204HQ 070208HQ	6.35	2.38	2.8	0.4 0.8	7°	●	●	●	
 Finishing-Medium	DCMT 11T302HQ 11T304HQ 11T308HQ	9.525	3.97	4.4	0.2 0.4 0.8	7°	●	●	●	
	 Finishing-Medium	TPMT 090204HQ	5.56	2.38	2.8	0.4	11°	●	●	●
TPMT 110304HQ 110308HQ		6.35	3.18	3.3	0.4 0.8	11°	●	●	●	
TPMT 160304HQ 160308HQ		9.525	3.18	4.4	0.4 0.8	11°	●	●	●	

● : Std. Item ○ : Check availability

Shape	Description	Dimension (mm)					CVD			PVD
		I.C.	Thickness	Hole	Corner-R (rε)	Relief Angle	CA6515	CA6525	PR1125	
 Finishing-Medium	VBMT 110304HQ 110308HQ	6.35	3.18	2.8	0.4 0.8	5°	●	●	●	
	VBMT 160404HQ 160408HQ	9.525	4.76	4.4	0.4 0.8	5°	●	●	●	
 Finishing-Medium	VCMT 080204HQ	4.76	2.38	2.3	0.4	7°	●	●	●	
 Finishing-Medium	WPMT 110204HQ	6.35	2.38	2.8	0.4	11°	●	●	●	
	WPMT 160304HQ 160308HQ	9.525	3.18	4.4	0.4 0.8	11°	●	●	●	
 Medium	SPMR 090304 090308	9.525	3.18	-	0.4 0.8	11°	●	●	●	
	SPMR 120304 120308	12.70	3.18	-	0.4 0.8	11°	●	●	●	
 Finishing-Medium	TPMR 110304HQ 110308HQ	6.35	3.18	-	0.4 0.8	11°	●	●	●	
	TPMR 160304HQ 160308HQ	9.525	3.18	-	0.4 0.8	11°	●	●	●	
 Medium	TPMR 110304 110308	6.35	3.18	-	0.4 0.8	11°	●	●	●	
	TPMR 160304 160308	9.525	3.18	-	0.4 0.8	11°	●	●	●	



## Case studies

1.4401 (Austenitic stainless steel)	
<ul style="list-style-type: none"> <li>Connector</li> <li>Vc = 120 m/min</li> <li>ap = 2 mm</li> <li>f = 0.2 mm/rev</li> <li>WET</li> <li>CNMG120408MS (CA6525)</li> </ul>	
<b>CA65<sup>25</sup></b>	580 pcs/edge
Competitor A	200 pcs/edge
Compared to competitor coated A, MS chipbreaker (CA6525) shows good chip evacuation and wear resistance, and improved the tool life by almost 300 %.	

1.4401 (Austenitic stainless steel)	
<ul style="list-style-type: none"> <li>Nipple</li> <li>Vc = 120 m/min</li> <li>ap = 2.5 mm</li> <li>f = 0.15 mm/rev</li> <li>WET</li> <li>CNMG120408MS (CA6525)</li> </ul>	
<b>CA65<sup>25</sup></b>	30 pcs/edge
Competitor B	15 pcs/edge
Kyocera's coating is two times longer than Competitor B.	

1.4301 (Austenitic stainless steel)	
<ul style="list-style-type: none"> <li>Pump cover</li> <li>Vc = 121 - 160 m/min</li> <li>ap = 0.08 - 0.1 mm</li> <li>f = 0.07 - 0.165 mm/rev</li> <li>WET</li> <li>CNMG120404MQ (CA6515)</li> </ul>	
<b>CA65<sup>15</sup></b>	10 pcs/edge
Competitor C	5 pcs/edge
Compared to competitor C, Kyocera's coating improves chip evacuation and leads to longer tool life.	

1.4301 (Austenitic stainless steel)	
<ul style="list-style-type: none"> <li>Pump parts</li> <li>Vc = 150 m/min</li> <li>ap = 1.5 mm</li> <li>f = 0.2 mm/rev</li> <li>WET</li> <li>WNMG080408MS (CA6525)</li> </ul>	
<b>CA65<sup>25</sup></b>	100 pcs/edge
Competitor D	50 pcs/edge
MS chipbreaker (CA6525) doubled the tool life compared to competitor D.	

1.4301 (Austenitic stainless steel)	
<ul style="list-style-type: none"> <li>Jig</li> <li>Vc = 100 m/min</li> <li>ap = 1.0 mm</li> <li>f = 0.20 mm/rev</li> <li>WET</li> <li>WNMG080412MS (CA6525)</li> </ul>	
<b>CA65<sup>25</sup></b>	150 pcs/edge
Competitor E	80 pcs/edge
Kyocera's coating is 1.8 times longer than Competitor E.	

1.4301 (Austenitic stainless steel)	
<ul style="list-style-type: none"> <li>Pin</li> <li>Vc = 140 m/min</li> <li>ap = 2.0 mm</li> <li>ap = 0.3 mm/rev</li> <li>WET</li> <li>CNMG120408MS (CA6525)</li> </ul>	
<b>CA65<sup>25</sup></b>	400 pcs/edge
Competitor F	350 pcs/edge
Compared to competitor F, CA6525 demonstrated a better edge condition with longer tool life. MS chipbreaker provided better chip control.	

## Case studies

1.4305 (Austenitic stainless steel)	
<ul style="list-style-type: none"> <li>Connector</li> <li>Vc = 100 - 120 m/min</li> <li>ap = 1.5 - 2.0 mm</li> <li>f = 0.12 - 0.15 mm/rev</li> <li>WET</li> <li>CNMG120408MS (PR1125)</li> </ul>	
<b>PR11<sup>25</sup>-MS</b>	180 pcs/edge
Competitor G	120 pcs/edge
Kyocera's coating is 1.3 times longer than Competitor G.	

1.4404 (Austenitic stainless steel)	
<ul style="list-style-type: none"> <li>Shaft</li> <li>Vc = 100 m/min</li> <li>ap = 0.5 - 1.0 mm</li> <li>f = 0.15 mm/rev</li> <li>WET</li> <li>DNMG150404MS (PR1125)</li> </ul>	
<b>PR11<sup>25</sup>-MS</b>	1 pcs/edge
Competitor H	0.5 pcs/edge
Kyocera's tool life is 2 times longer than Competitor H. (Competitor H was not able to cut even 1 workpiece). Edge condition is excellent compared to Competitor H.	


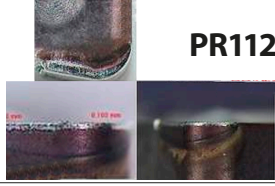

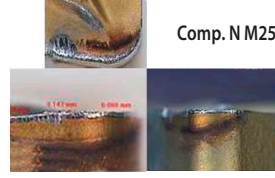




1.4125 (Martensitic stainless steel)	
<ul style="list-style-type: none"> <li>Housing</li> <li>Vc = 122 m/min</li> <li>ap = 1 - 2 mm</li> <li>f = 0.18 mm/rev</li> <li>WET</li> <li>CNMG120408MS (CA6525)</li> </ul>	
<b>CA65<sup>25</sup></b>	More than 4,000 pcs/edge
Competitor I	2,000 pcs/edge
MS chipbreaker (CA6525) doubled the tool life.	

1.4542 (Precipitation hardening stainless steel)	
<ul style="list-style-type: none"> <li>Sleeve</li> <li>Vc = 100 m/min</li> <li>ap = 0.4 mm</li> <li>f = 0.15 mm/rev</li> <li>WET</li> <li>TNMG160408MU (CA6525)</li> </ul>	
<b>CA65<sup>25</sup></b>	350 pcs/edge
Competitor J	200 pcs/edge
Compared to competitor J, CA6525 provided better chip control with longer tool life.	

Permalloy (Fe-Ni)	
<ul style="list-style-type: none"> <li>Housing</li> <li>Vc = 80 m/min</li> <li>ap = 0.7 mm</li> <li>f = 0.12 mm/rev</li> <li>WET</li> <li>WNMG080408MU (CA6525)</li> </ul>	
<b>CA65<sup>25</sup></b>	34 pcs/edge
Competitor K	12 pcs/edge
By changing the edge face machining and the chipbreaker, chip evacuation was improved and the machine did not stop operating. This also helped to extend tool life.	

1.4410 (Stainless steel cast steel)	
<ul style="list-style-type: none"> <li>Valve seat</li> <li>Vc = 120 m/min</li> <li>ap = 1.0 mm</li> <li>f = 0.10 mm/rev</li> <li>WET</li> <li>CNMG120408MS (CA6525)</li> </ul>	
<b>CA65<sup>25</sup>-MS</b>	69 pcs/edge
Competitor L	30 pcs/edge
The coating life is two times longer than competitor L. The chip evacuation is the same as others.	

# Heat resistance alloy machining

Inconel 718 (High-temp. alloy)		Inconel 718 (High-temp. alloy)	
<ul style="list-style-type: none"> <li>• Shaft</li> <li>• Round bar</li> <li>• Vc = 50 m/min</li> <li>• ap = 2 mm</li> <li>• f = 0.1 mm/rev</li> <li>• Wet</li> <li>• CNMG120408PS</li> </ul>	 <p><b>CA6525</b></p>	<ul style="list-style-type: none"> <li>• Shaft</li> <li>• Round bar</li> <li>• Vc = 50 m/min</li> <li>• ap = 2 mm</li> <li>• f = 0.1 mm/rev</li> <li>• Wet</li> <li>• CNMG120408MS</li> </ul>	 <p><b>PR1125</b></p>
	 <p>Comp. M M35CVD</p>		 <p>Comp. N M25PVD</p>
<b>CA6525</b>	 3 pcs/edge	<b>PR1125</b>	 3 pcs/edge
Competitor M	 1 ½ pcs/edge	Competitor N	 3 pcs/edge
CA65 <sup>25</sup> machined more than 2 times as many workpieces as competitor M. Cutting edge condition of CA65 <sup>25</sup> was better than competitor M.		PR11 <sup>25</sup> showed superior wear resistance and machining stability compared with Competitor N.	

## Recommended Cutting Speeds

Workpiece Material	CVD coated carbide		PVD coated carbide
	CA65 <sup>15</sup>	CA65 <sup>25</sup>	PR11 <sup>25</sup>
	Continuous	Continuous / Interruption	Continuous / Interruption
Austenitic stainless	(120 - <b>180</b> - 240)	(80 - <b>150</b> - 220)	(70 - <b>120</b> - 160)
Ferritic stainless	(130 - <b>190</b> - 250)	(90 - <b>160</b> - 230)	(80 - <b>130</b> - 170)
Martensitic stainless	(130 - <b>190</b> - 250)	(90 - <b>160</b> - 230)	-
Precipitation hardening stainless	(50 - <b>80</b> - 110)	(40 - <b>70</b> - 100)	-

Case of troubles	Troubleshooting
Notching (breakage)	<ul style="list-style-type: none"> <li>• Select grades with high flexural strength such as CA6525, PR1125 to lessen notching (breakage).</li> <li>• Select MU (MS) chipbreaker (with large rake angle, improved cutting performance and less work hardening).</li> </ul>
Burrs	<ul style="list-style-type: none"> <li>• Make depth of cut deeper than work-hardened layer from pre-process.</li> <li>• Vary depth of cut to disperse concentration of work-hardened layer at notched section.</li> <li>• Increase the feed rate (higher than 0.1 mm/rev), and lessen work hardening.</li> <li>• Increase cutting edge angle to lessen concentration of load on the edge.</li> </ul>
Adhesion / built-up edge	<ul style="list-style-type: none"> <li>• Choose bright coating CA6515, CA6525 for surface smoothness.</li> <li>• Select MS/MU chipbreaker with large rake angle.</li> <li>• Increase the cutting speed, increase the coolant concentration.</li> </ul>
Crater wear	<ul style="list-style-type: none"> <li>• Select SUS grades CA6515 and CA6525.</li> <li>• Select MU chipbreaker with large rake angle (to improve cutting performance and control rise in edge temperature).</li> <li>• Decrease the cutting speed to control the rise in edge temperature.</li> <li>• Decrease the feed rate to reduce tool load.</li> </ul>
Chip control	<ul style="list-style-type: none"> <li>• MS chipbreaker: First recommended chipbreaker form medium to roughing.</li> <li>• MQ chipbreaker: Good chip control from finishing to medium.</li> </ul>



# Recommended grade for stainless steel machining

## Austenitic stainless steel (1.4301, 1.4845, 1.4401)

Machinability (Hardest to cut)	<ul style="list-style-type: none"> <li>Significant work hardening, poor cutting performance, acceleration of wear at cutting edge (notching).</li> <li>Heat conductivity is extremely poor (one-quarter of carbon steel), temperature at edge rises and likely to wear.</li> <li>Welding or built-up edge occurs easily, cutting resistance increases and edge breakage or chipping is likely.</li> <li>Chips tend to become longer and stronger, resulting in poor machinability.</li> </ul>
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### Recommended grade

Classification	Grade	Cutting speed (m/min)				
		50	100	150	200	250
M15	CA6515			180 (120 - 240)		
M25	CA6525			150 (80 - 220)		
M30	PR1125		120 (70 - 160)			

### Recommended chipbreaker

Application ap (mm)	Continuous	Light interruption	Interruption	Heavy interruption
< 1 mm	MQ	MQ	MS	
> 1 mm	MS/MU	MS/MU		
< 1 mm	MQ	MQ	MS/MU	MS
> 1 mm	MS/MU	MS/MU		
< 1 mm	MQ	MQ	MS/MU	MS
> 1 mm	MS/MU	MS/MU		

## Ferritic stainless steel (1.4002, 1.4006, 1.4016)

Machinability	<ul style="list-style-type: none"> <li>Limited work hardening and more machinable than austenitic steel (less notching and burring).</li> <li>Lower hardness due to ferritic structure (will not harden when quenched).</li> <li>Heat conductivity is poor (half of carbon steel), temperature at edge rises and likely to wear.</li> </ul>
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### Recommended grade

Classification	Grade	Cutting speed (m/min)				
		50	100	150	200	250
M15	CA6515			190 (130 - 250)		
M25	CA6525			160 (90 - 230)		
M30	PR1125		130 (80 - 170)			

### Recommended chipbreaker

Application ap (mm)	Continuous	Light interruption	Interruption	Heavy interruption
< 1 mm	MQ	MQ	MS	
> 1 mm	MS/MU	MS/MU		
< 1 mm	MQ	MQ	MS/MU	MS
> 1 mm	MS/MU	MS/MU		
< 1 mm	MQ	MQ	MS/MU	MS
> 1 mm	MS/MU	MS/MU		

## Martensitic stainless steel (1.4000, 1.4006, 1.4021)

Machinability	<ul style="list-style-type: none"> <li>Limited work hardening and more machinable than austenitic steel (less notching and burring).</li> <li>High in hardness, likely to cause crater wear.</li> <li>Heat conductivity is poor (half of carbon steel), temperature at edge rises and likely to wear.</li> </ul>
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### Recommended grade

Classification	Grade	Cutting speed (m/min)				
		50	100	150	200	250
M15	CA6515			190 (130 - 250)		
M25	CA6525			160 (90 - 230)		

### Recommended chipbreaker

Application ap (mm)	Continuous	Light interruption	Interruption	Heavy interruption
< 1 mm	MQ	MQ	MS	
> 1 mm	MS/MU	MS/MU		
< 1 mm	MQ	MQ	MS/MU	MS
> 1 mm	MS/MU	MS/MU		

## Precipitation hardening (PH) stainless steel (1.4542, 1.4568)

Machinability (Hard to cut)	<ul style="list-style-type: none"> <li>High tensile strength (approx. twice that of other stainless steels), high cutting resistance and hard to machine/low machinability.</li> <li>Heat conductivity is poor, temperature at edge rises and likely to wear.</li> </ul>
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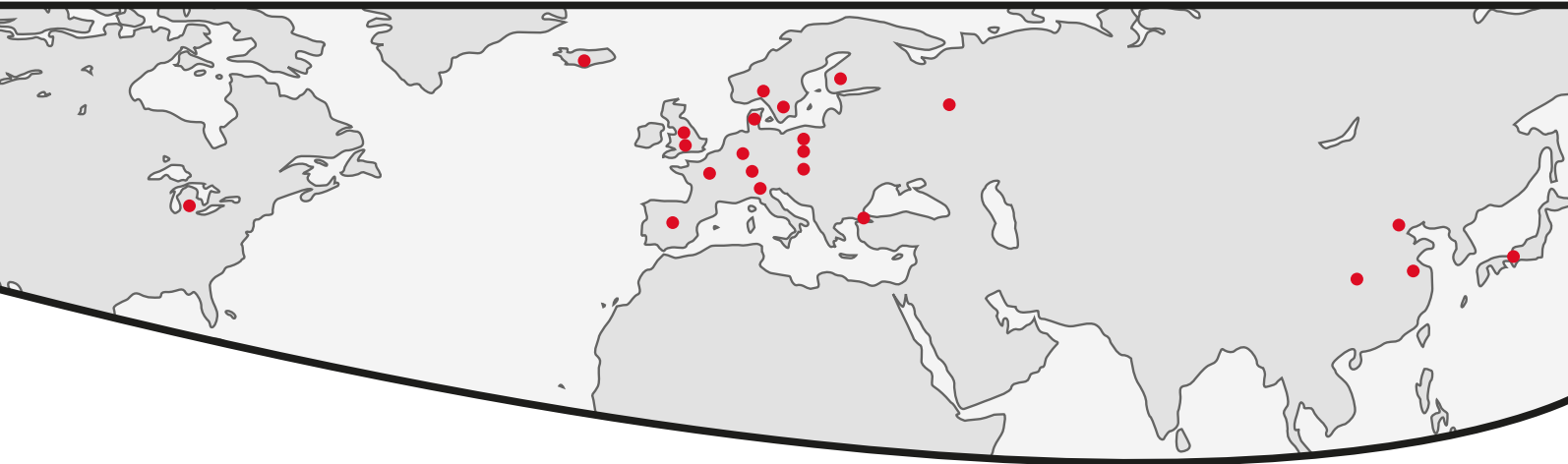
### Recommended grade

Classification	Grade	Cutting speed (m/min)				
		50	100	150	200	250
M15	CA6515		80 (50 - 110)			
M25	CA6525		70 (40 - 100)			

### Recommended chipbreaker

Application ap (mm)	Continuous	Light interruption	Interruption	Heavy interruption
< 1 mm	MQ	MQ	MS	
> 1 mm	MS/MU	MS/MU		
< 1 mm	MQ	MQ	MS/MU	MS
> 1 mm	MS/MU	MS/MU		

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