

K15 new grade for cast iron

NC6215



New grade for cast iron turning application

- Superb flaking resistance at high speed
- Outstanding performance at high feed
- Excellent durability



NC6215

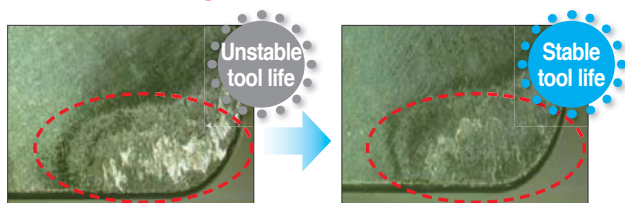
Cast iron high speed, high feed interrupted turning new grade

NC6215

Features

- New coating technology

→ Better flaking resistance

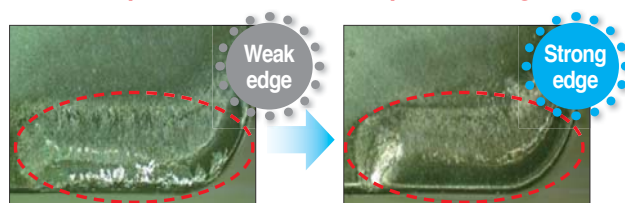


[Competitor]

[NC6215]

- Tough K15 substrate applied

→ Stable performance at interrupted turning

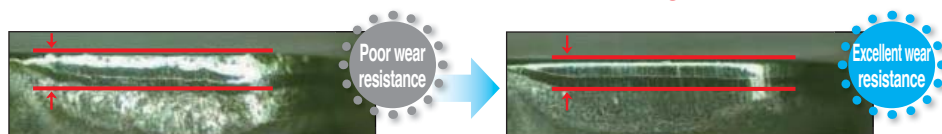


[Competitor]

[NC6215]

- New chip breaker 'VR' for high feed turning

→ Ideal for various condition of ductile cast iron turning



[Competitor]

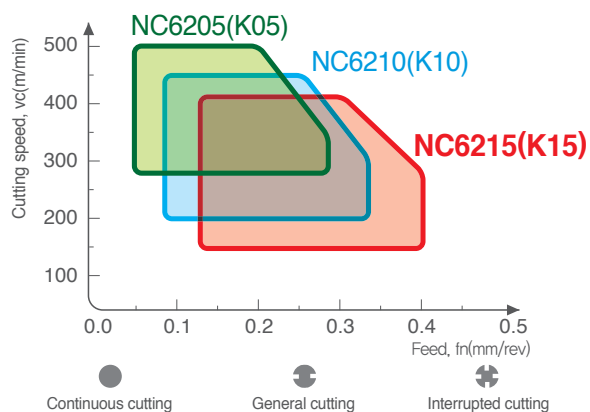
[NC6215]

Comparison of grade

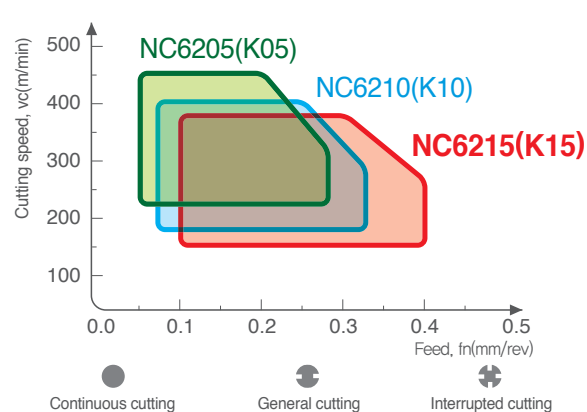
ISO	KORLOY	KYOCERA	TAEGUTEC	SUMITOMO	SANDVIK	KENAMTAL	TUNGALOY	ISCAR	WALTER	MITSUBISHI	SECO
K05-10	NC6205	CA4505	TT7005	AC405K	GC3205	KCK05	T5105	IC5005	WKK10S	UC5105	TK1001
K10-15	NC6210			AC415K	GC3210	KCK15	T5115 M0126			MC5105	
K15-20	NC6215	CA4515	TT7015	AC420K	GC3215	KCK20	T5125	IC5010	WKK20S	UC5115 MC5015	TK2001

Recommended cutting condition for workpiece and grade line up

K Gray cast iron



K Ductile cast iron



Recommended cutting speed for workpiece

Workpiece					NC6215 Recommended cutting speed (m/min)		
Division		KS	Tensile strength(N/mm ²)	Hardness(HB)	Minimum	Recommendation	Maximum
K	Ductile cast iron	GCD370	Over 370	Under 179	170	340	390
		GCD400	Over 400	Under 201	160	325	370
		GCD450	Over 450	143~217	150	315	360
		GCD500	Over 500	170~241	150	305	340
		GCD600	Over 600	192~269	150	295	320
		GCD700	Over 700	229~302	150	290	310
		GCD800	Over 800	248~352	150	285	300
K	Gray cast iron	GC100	Over 100	Under 201	180	395	450
		GC150	Over 186	Under 241	180	370	400
			Over 167	Under 223	180	375	410
			Over 150	Under 212	180	380	420
			Over 127	Under 201	180	385	430
			GC200	Over 235	Under 255	160	345
		Over 216		Under 235	160	350	380
		Over 200		Under 223	160	355	390
		Over 167		Under 217	160	360	400
		GC250	Over 275	Under 269	150	340	370
			Over 255	Under 248	150	343	375
			Over 250	Under 241	150	345	380
			Over 216	Under 229	150	350	390
		GC300	Over 304	Under 269	150	330	350
			Over 300	Under 262	150	335	360
			Over 260	Under 248	150	340	370
		GC350	Over 361	Under 285	150	315	320
			Over 350	Under 277	150	325	340
			Over 314	Under 269	150	330	350

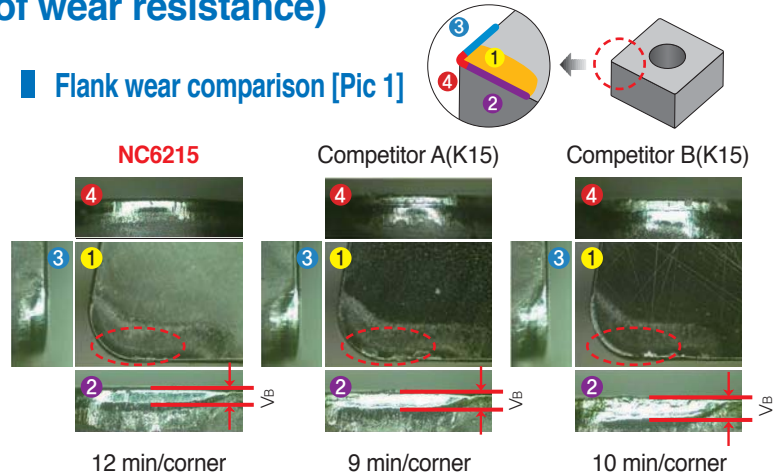
* According to cutting environment, condition can be changed.

NC6215

Cutting performance(Evaluation of wear resistance)



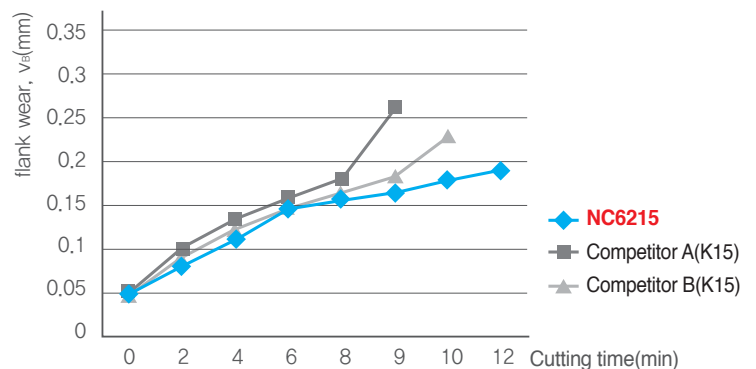
■ Flank wear comparison [Pic 1]



■ Cutting conditions

- **Workpiece** GCD600(KS)
80-55-06(AISI)
GGG60(DIN)
(Ø300 → Ø150 Face turning)
- **Cutting conditions** $vc(m/min) = 300$
 $fn(mm/rev) = 0.3$
 $ap(mm) = 2$
wet
- **Tools** Insert CNMA120408
Holder DCLNR2525-M12

■ Flank wear comparison [Pic 2]



[Evaluation of wear resistance] Superior wear resistance and tool life when machining ductile cast iron in continuous cutting condition

While the cutting insert is on the machining of the ductile cast iron in continuous cutting conditions, **the main problems are flank wear and the flaking of coated tools. Therefore, usually, the tool life is shorter than gray cast iron machining.** While machining ductile cast iron, the inserts are more damaged in comparison to gray cast iron because of the adhesion between the chip and the tool or the high temperature. Flank wear problems may also occur easily because the tensile strength and hardness of ductile cast iron are higher, and at the same time, conductivity is lower in comparison to gray cast iron.

Our new product NC6215 (CVD coated) for cast iron – turning applications (K15 grade) improves greatly the adhesion of the coated layer as well as wear resistance.

When machining with continuous cutting conditions, NC6215 accomplishes a superior wear resistance as well as an improved tool life. **By reducing the flank wear, the tool life can be increased on average from 10% to 30%.**

In the abrasive wear in the comparison graph [pic2], we can clearly see a sudden increase of wear after 8 minutes for competitors' products.

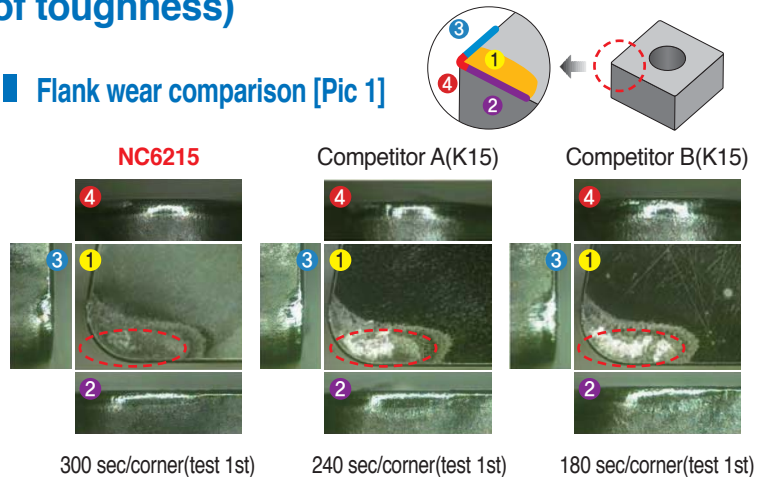
Essentially this is a case of delayed flank wear effect due to flaking of CVD coated layer because of adhesion happening between the chip and the tool.



Cutting performance(Evaluation of toughness)



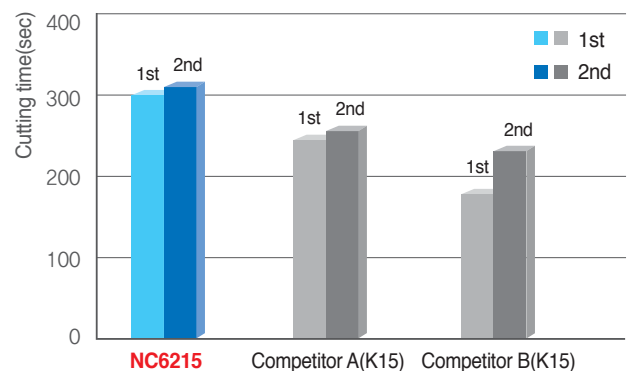
■ Flank wear comparison [Pic 1]



■ Cutting conditions

- **Workpiece** GCD500(KS),
80-55-06(AISI),
GGG50(DIN)
(Ø90(Triangle) → Ø30 Face turning)
- **Cutting conditions** vc(m/min) = 339 → 132
N = 1,200(fixed)
fn(mm/rev) = 0.35
ap(mm) = 1.5
wet
- **Tools** Insert CNMA120408
Holder DCLNR2525-M12

■ Cutting time(applied 2 corner edges of inserts) [Pic 2]



[Evaluation of toughness] Superior edge strength and tool life while machining ductile cast iron in interrupted cutting conditions

While the cutting tool is on the machining of ductile cast iron work pieces in interrupted cutting conditions, **the main problems are lower tool life and lower cutting quality because of the flank wear and the flaking of coated layer.** While machining ductile cast iron work pieces, the insert is more damaged in comparison to gray cast iron applications because of adhesion that may happen between the chip and the tool or the high temperature. Usually, due to higher tensile strength and higher hardness of ductile cast iron, flank wear, brokenness of cutting edges and a general decrease of tool life may appear.

But new product NC6215 (CVD coated) specially designed for cast iron – turning applications (K15 grade) has improved the adhesion of the coated layer and toughness. Being used with interrupted cutting conditions, NC6215 accomplishes a superior wear resistance and increased tool life. Thanks to a reduced flank wear and a cutting edge less likely to get broken, tool life increases drastically. In the abrasive wear comparison graph [pic2], we can clearly see a dramatic decrease of competitor' tool life after 200 seconds.

Essentially this is a case of delayed flank wear effect due to flaking of CVD coated tools because of adhesion happening between the chip and the tool, as well as cutting edge less likely to break.



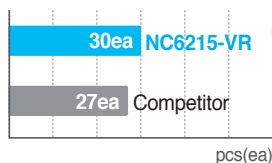
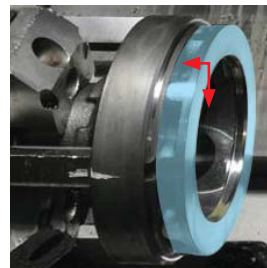
NC6215

Cutting performance

K Ductile cast iron (FCD600 / 80-55-06 / GGG60)

- **Workpiece** Diff. case(Ø154)
- **Cutting coditions** vc(m/min) = 350 ~ 580
fn(mm/rev) = 0.2 ~ 0.3
ap(mm) = 1.5 ~ 2.5
Wet
- **Tools** Insert WNMG080412-VR
holder Special holder

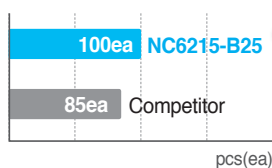
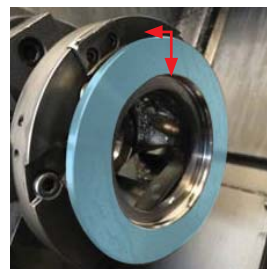
■ Result



K Ductile cast iron (FCD500 / 80-55-06 / GGG50)

- **Workpiece** Diff. case(Ø134)
- **Cutting coditions** vc(m/min) = 560
fn(mm/rev) = 0.08 ~ 0.2
ap(mm) = 1.5 ~ 2.5
Wet
- **Tools** Insert WNMG080412-B25
holder Special holder

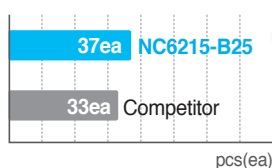
■ Result



K Ductile cast iron (FCD600 / 80-55-06 / GGG60)

- **Workpiece** Diff. case(Ø43)
- **Cutting coditions** vc(m/min) = 200
fn(mm/rev) = 0.2 ~ 0.3
ap(mm) = 1.5 ~ 2
Wet
- **Tools** Insert WNMG080412-B25
holder Special holder

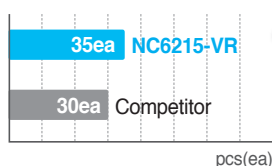
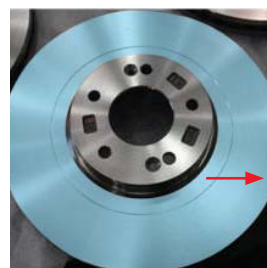
■ Result



K Gray cast iron (FC250 / No35B / GG25)

- **Workpiece** Brake disc(Ø270)
- **Cutting coditions** vc(m/min) = 550
fn(mm/rev) = 0.3
ap(mm) = 2
Wet
- **Tools** Insert CNMG120412-VR
holder PCLNR2525-M12

■ Result

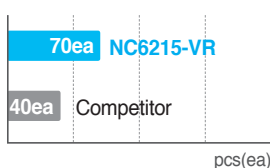


Cutting performance

K Ductile cast iron (FCD500 / 80-55-06 / GGG50)

- **Workpiece** Pully(Ø210)
- **Cutting coditions** vc(m/min) = 300
fn(mm/rev) = 0.2
ap(mm) = 1.2
Wet
- **Tools** Insert WNMG080408-VR
holder Special holder

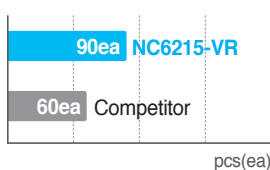
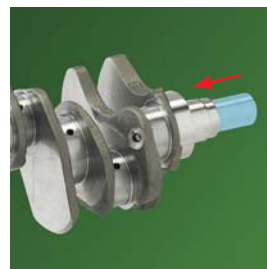
■ Result



K Ductile cast iron (FCD550D / 80-55-06 / GGG50)

- **Workpiece** Crank shaft(Ø50)
- **Cutting coditions** vc(m/min) = 300
fn(mm/rev) = 0.2 ~ 0.3
ap(mm) = 3
Wet
- **Tools** Insert DNMG150612-VR
holder Special holder

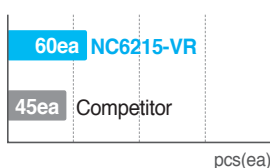
■ Result



K Ductile cast iron (FCD550D / 80-55-06 / GGG50)

- **Workpiece** Crank shaft(Ø50)
- **Cutting coditions** vc(m/min) = 300
fn(mm/rev) = 0.2 ~ 0.3
ap(mm) = 3
Wet
- **Tools** Insert CNMG120408-VR
holder Special holder

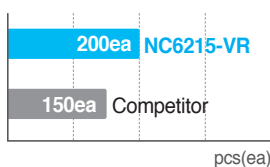
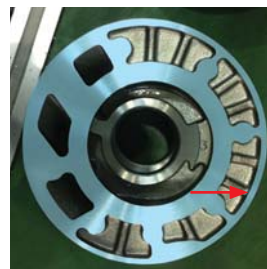
■ Result



K Ductile cast iron (FCD450 / 60-40-18 / GGG40.3)

- **Workpiece** Oil pump housing(Ø230)
- **Cutting coditions** vc(m/min) = 220
fn(mm/rev) = 0.25
ap(mm) = 2
Wet
- **Tools** Insert CNMG120412-VR
holder DCLNR2525-M12

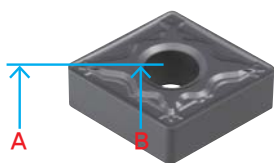
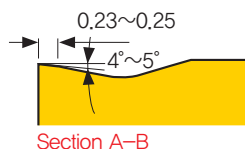
■ Result



NC6215

Feature of chip breaker

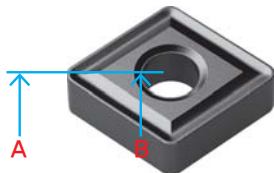
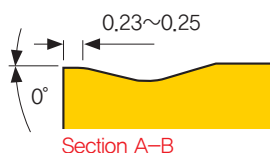
■ HM chip breaker



■ Finish and continuous turning of cast iron

- Good wear resistance at finish operation
- Low cutting force

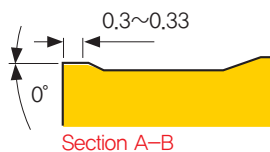
■ B25 chip breaker



■ Finish to medium turning of cast iron

- Reinforced cutting edge
- High quality and accuracy guaranteed
- Finish-medium continuous turning

■ VR chip breaker

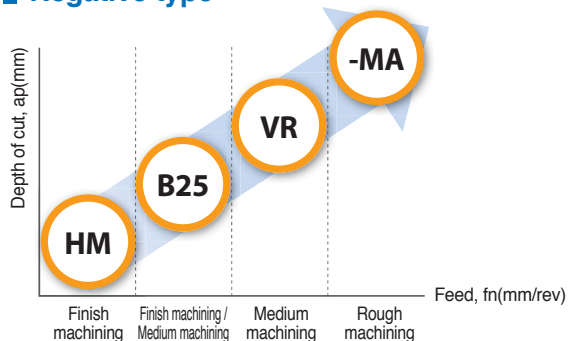


■ Roughing of cast iron

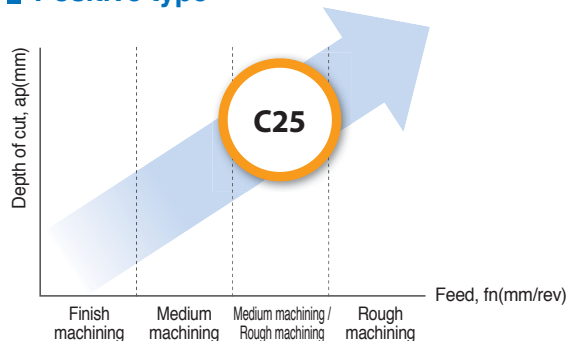
- Reinforced cutting edge
- Stability and long tool life guaranteed
- Roughing or interrupted turning

Recommended cutting condition for chip breaker

■ Negative type



■ Positive type



Comparison of chip breakers

Application		KORLOY		KYOCERA	TAEGUTEC	SUMITOMO	SANDVIK	KENNAMETAL	TUNGALOY	ISCAR	WALTER	MITSUBISHI	SECO
		1st choice	2nd choice										
Negative	Finish machining	HM		C	MT	UZ	KF	FN	CM	GN	NM	MA	M4
	Finish machining / Medium machining	B25		-	-	UZ	KF	FN	CF	TF	NM5	-	M4
	Medium machining	VR	GR	ZS	RT	GZ	KM	RP	CM	GN	MK5	GH	M5
	Rough machining	-MA		-MA	-MA	-MA	KR	UN	CH	-MA	-MA	-MA	MR7
Positive	Medium machining / Rough machining	C25		HQ	MT	MU	KR	MF	-	19	-	-	M5

Recommended cutting condition

■ Negative type

(mm)

Designation		Application	fn(mm/rev)			ap(mm)			Stock
			Minimum	Recommendation	Maximum	Minimum	Recommendation	Maximum	NC6215
CNMG	120404-HM	Finish machining	0.05	0.15	0.30	0.90	2.00	4.00	●
	120408-HM		0.10	0.25	0.50	1.00	2.50	5.00	●
DNMG	150404-HM		0.05	0.15	0.30	0.90	2.00	4.00	●
	150408-HM		0.10	0.25	0.50	1.00	2.50	5.00	●
	150604-HM		0.05	0.15	0.30	0.90	2.50	5.00	●
	150608-HM		0.10	0.25	0.50	1.00	2.50	5.00	●
SNMG	120404-HM		0.05	0.15	0.30	0.90	2.00	4.00	●
	120408-HM		0.10	0.25	0.50	1.00	2.50	5.00	●
TNMG	160404-HM		0.05	0.15	0.30	0.90	1.75	3.50	●
	160408-HM		0.10	0.25	0.50	1.00	2.00	4.00	●
	220408-HM		0.10	0.25	0.50	1.00	3.30	6.60	●
VNMG	160404-HM		0.08	0.23	0.45	0.50	1.50	3.00	●
	160408-HM		0.10	0.25	0.50	1.00	1.75	3.50	●
	160412-HM		0.20	0.25	0.50	1.50	2.00	4.00	●
WNMG	060404-HM		0.10	0.23	0.45	1.00	1.50	3.00	●
	060408-HM		0.10	0.25	0.50	1.00	1.75	3.50	●
CNMG	120404-B25	Finish machining / Medium machining	0.17	0.22	0.45	1.00	2.50	5.00	●
	120408-B25		0.23	0.30	0.60	1.50	2.50	5.00	●
	120412-B25		0.25	0.30	0.60	2.00	2.50	5.00	●
DNMG	150604-B25		0.17	0.28	0.55	1.50	2.00	4.00	●
	150608-B25		0.17	0.28	0.55	1.50	2.00	4.00	●
	150612-B25		0.25	0.28	0.55	1.50	2.00	4.00	●
TNMG	160404-B25		0.17	0.22	0.45	2.00	1.75	3.50	●
	160408-B25		0.17	0.28	0.55	2.00	1.75	3.50	●
	160412-B25		0.25	0.28	0.55	2.00	1.75	3.50	●
WNMG	080404-B25		0.17	0.22	0.45	1.00	2.50	5.00	●
	080408-B25		0.23	0.30	0.60	1.50	2.50	5.00	●
	080412-B25		0.25	0.30	0.60	2.00	2.50	5.00	●
CNMG	120408-GR	Medium machining	0.20	0.25	0.50	1.50	3.00	6.00	●
	120412-GR		0.25	0.25	0.50	1.80	3.00	6.00	●
	160608-GR		0.20	0.35	0.70	1.50	4.00	8.00	●
	160612-GR		0.25	0.35	0.70	2.00	4.00	8.00	●
	160616-GR		0.25	0.38	0.75	2.50	4.00	8.00	●
	190608-GR		0.20	0.35	0.70	2.00	5.00	10.00	●
	190612-GR		0.30	0.38	0.75	2.50	5.00	10.00	●
	190616-GR		0.30	0.40	0.80	3.00	5.00	10.00	●
DNMG	150408-GR		0.20	0.25	0.50	1.50	3.00	6.00	●
	150412-GR		0.25	0.25	0.50	1.80	3.00	6.00	●
	150608-GR		0.20	0.25	0.50	1.50	3.00	6.00	●
	150612-GR		0.25	0.25	0.50	1.80	3.00	6.00	●
SNMG	120408-GR		0.20	0.25	0.50	1.50	3.00	6.00	●
	120412-GR		0.25	0.25	0.50	1.80	3.00	6.00	●
	190608-GR		0.20	0.35	0.70	2.00	5.00	10.00	●
	190612-GR		0.30	0.38	0.75	2.50	5.00	10.00	●

* If the feed rate is faster than recommended feed rate, the depth of cut should be smaller than recommendable to maintain tool life.

NC6215

Recommended cutting condition

■ Negative type

(mm)

Designation		Application	fn(mm/rev)			ap(mm)			Stock
			Minimum	Recommendation	Maximum	Minimum	Recommendation	Maximum	NC6215
TNMG	160408-GR	Medium machining	0.20	0.25	0.50	1.50	2.50	5.00	●
	220408-GR		0.20	0.25	0.50	1.50	3.00	6.00	●
	220412-GR		0.25	0.25	0.50	1.80	3.00	6.00	●
	220416-GR		0.25	0.30	0.60	2.00	3.00	6.00	●
WNMG	080404-GR		0.05	0.15	0.30	0.90	2.00	4.00	●
	080408-GR		0.20	0.25	0.50	1.50	3.00	6.00	●
	080412-GR		0.25	0.25	0.50	1.80	3.00	6.00	●
CNMG	120408-VR	Medium machining	0.23	0.28	0.53	1.50	3.00	6.00	●
	120412-VR		0.28	0.28	0.53	1.80	3.00	6.00	●
	120416-VR		0.28	0.33	0.63	2.00	3.00	6.00	●
	160612-VR		0.28	0.38	0.73	2.00	4.00	8.00	●
	190612-VR		0.33	0.41	0.78	2.50	5.00	10.00	●
	190616-VR		0.33	0.43	0.83	3.00	5.00	10.00	●
DNMG	150408-VR		0.23	0.28	0.53	1.50	3.00	6.00	●
	150412-VR		0.28	0.28	0.53	1.80	3.00	6.00	●
	150608-VR		0.23	0.28	0.53	1.50	3.00	6.00	●
	150612-VR		0.28	0.28	0.53	1.80	3.00	6.00	●
SNMG	120408-VR		0.23	0.28	0.53	1.50	3.00	6.00	●
	120412-VR		0.28	0.28	0.53	1.80	3.00	6.00	●
	190612-VR		0.33	0.41	0.78	2.50	5.00	10.00	●
	190616-VR		0.33	0.43	0.83	3.00	5.00	10.00	●
TNMG	160408-VR		0.23	0.28	0.53	1.50	2.50	5.00	●
	160412-VR		0.28	0.28	0.53	1.80	2.50	5.00	●
	160416-VR		0.28	0.28	0.53	1.80	2.50	5.00	●
	220408-VR		0.23	0.28	0.53	1.50	3.00	6.00	●
	220412-VR		0.28	0.28	0.53	1.80	3.00	6.00	●
	220416-VR		0.28	0.33	0.63	2.00	3.00	6.00	●
WNMG	080408-VR		0.23	0.28	0.53	1.50	3.00	6.00	●
	080412-VR		0.28	0.28	0.53	1.80	3.00	6.00	●
CNMA	120404	Rough machining	0.15	0.30	0.60	1.00	2.50	5.00	●
	120408		0.15	0.30	0.60	1.00	3.00	6.00	●
	120412		0.15	0.35	0.70	1.50	3.00	6.00	●
	120416		0.20	0.40	0.80	2.00	3.00	6.00	●
	160612		0.15	0.35	0.70	2.00	3.00	6.00	●
	160616		0.15	0.25	0.50	2.00	5.00	10.00	●
	190612		0.15	0.35	0.70	2.00	5.00	10.00	●
	190616		0.20	0.50	1.00	3.00	5.00	10.00	●
DNMA	150408		0.25	0.28	0.55	0.80	2.00	4.00	●
	150412		0.25	0.33	0.65	1.50	2.00	4.00	●
	150608		0.25	0.28	0.55	0.80	2.00	4.00	●
	150612		0.25	0.33	0.65	1.20	2.00	4.00	●
SNMA	120408		0.15	0.35	0.70	1.00	3.00	6.00	●
	120412		0.20	0.40	0.80	1.50	3.00	6.00	●

* If the feed rate is faster than recommended feed rate, the depth of cut should be smaller than recommendable to maintain tool life.

Recommended cutting condition

■ Negative type

(mm)

Designation		Application	fn(mm/rev)			ap(mm)			Stock
			Minimum	Recommendation	Maximum	Minimum	Recommendation	Maximum	NC6215
TNMA	160404	Rough machining	0.10	0.15	0.30	1.00	2.00	4.00	●
	160408		0.10	0.20	0.40	1.00	2.00	4.00	●
	160412		0.10	0.25	0.50	1.50	2.25	4.50	●
	160416		0.15	0.28	0.55	1.50	2.25	4.50	●
	220408		0.15	0.20	0.40	1.50	2.50	5.00	●
	220412		0.20	0.25	0.50	1.50	2.50	5.00	●
	220416		0.25	0.28	0.55	1.50	2.50	5.00	●
WNMA	080404		0.15	0.30	0.60	1.00	2.50	5.00	●
	080408		0.15	0.30	0.60	1.00	3.00	6.00	●
	080412		0.15	0.35	0.70	1.50	3.00	6.00	●
	080416		0.20	0.40	0.80	2.00	3.00	6.00	●

■ Positive type

(mm)

Designation		Application	fn(mm/rev)			ap(mm)			Stock
			Minimum	Recommendation	Maximum	Minimum	Recommendation	Maximum	NC6215
VBMT	160404-HMP	Medium machining	0.07	0.10	0.20	0.20	1.35	2.70	●
	160408-HMP		0.09	0.14	0.27	0.50	1.35	2.70	●
CCMT	060204-C25		0.03	0.06	0.12	0.40	1.00	2.00	●
	060208-C25		0.05	0.08	0.15	0.60	1.15	2.30	●
	09T304-C25		0.08	0.13	0.25	0.80	1.50	3.00	●
	09T308-C25		0.10	0.15	0.30	1.00	1.50	3.00	●
	120404-C25		0.10	0.16	0.32	0.80	1.50	3.00	●
	120408-C25		0.12	0.18	0.36	1.20	1.75	3.50	●
	120412-C25		0.15	0.20	0.40	1.40	1.75	3.50	●
DCMT	070204-C25	Medium machining / Rough machining	0.05	0.10	0.20	0.50	1.25	2.50	●
	070208-C25		0.06	0.13	0.25	0.80	1.25	2.50	●
	11T304-C25		0.08	0.15	0.30	0.80	1.50	3.00	●
	11T308-C25		0.10	0.15	0.30	1.00	1.50	3.00	●
SCMT	09T304-C25		0.08	0.13	0.25	0.60	1.50	3.00	●
	09T308-C25		0.10	0.15	0.30	1.00	1.50	3.00	●
	120404-C25		0.10	0.15	0.30	0.80	1.90	3.80	●
	120408-C25		0.12	0.19	0.38	1.20	1.90	3.80	●
TCMT	090204-C25		0.06	0.09	0.18	0.40	1.25	2.50	●
	090208-C25		0.08	0.13	0.25	0.80	1.25	2.50	●
	110204-C25		0.06	0.10	0.20	0.60	1.25	2.50	●
	110208-C25		0.08	0.13	0.25	0.80	1.25	2.50	●
	16T304-C25		0.08	0.14	0.28	0.80	1.50	3.00	●
	16T308-C25		0.10	0.15	0.30	1.00	1.50	3.00	●

* If the feed rate is faster than recommended feed rate, the depth of cut should be smaller than recommendable to maintain tool life.



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