

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

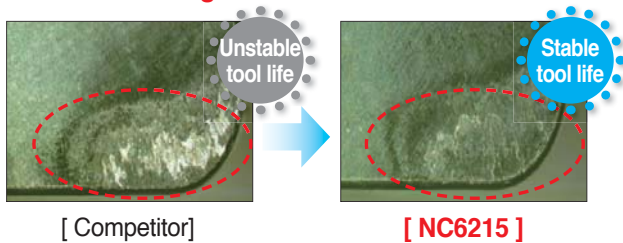


NC6215

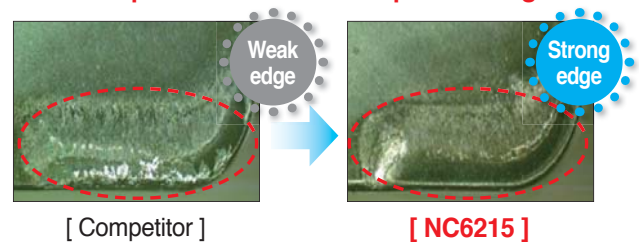
Cast iron high speed, high feed interrupted turning new grade NC6215

Features

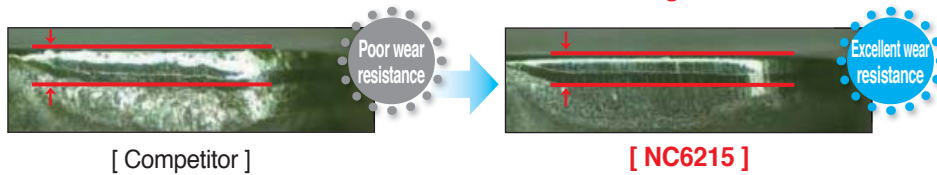
- New coating technology
→ **Better flaking resistance**



- Tough K15 substrate applied
→ **Stable performance at interrupted turning**



- New chip breaker 'VR' for high feed turning
→ **Ideal for various condition of ductile cast iron turning**

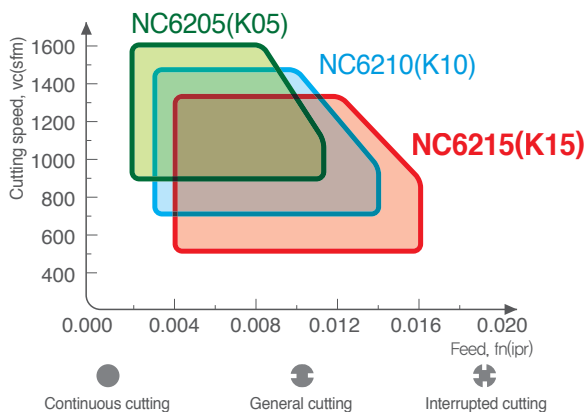


Comparison of grade

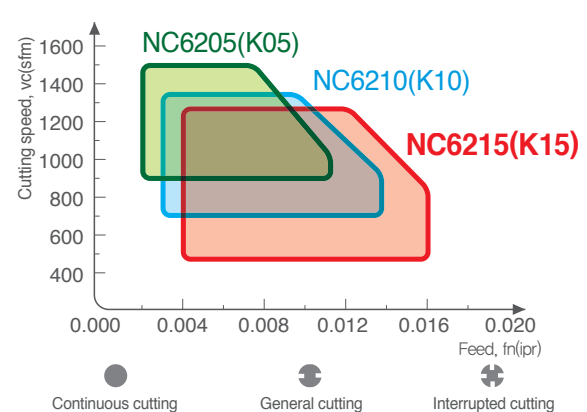
ISO	KORLOY	KYOCERA	TAEGUTEC	SUMITOMO	SANDVIK	KENNAMTAL	TUNGALOY	ISCAR	WALTER	MITSUBISHI	SECO
K05-10	NC6205	CA4505	TT7005	AC405K	GC3205	KCK05	T5105	IC5005	WKK10S	UC5105 MC5105	TK1001
K10-15	NC6210			AC415K	GC3210	KCK15	T5115 M0126				
K15-20	NC6215	CA4515	TT7015	AC420K	GC3215	KCK20	T5125	IC5010	WKK20S	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 (sfm)			
Division	KS	Tensile strength(lb/in ²)	Hardness(HB)	Minimum	Recommendation	Maximum	
K	Ductile cast iron	GCD370	Over 2.55	Under 179	558	1,115	1,280
		GCD400	Over 2.76	Under 201	525	1,066	1,214
		GCD450	Over 3.10	143~217	492	1,033	1,181
		GCD500	Over 3.45	170~241	492	1,001	1,115
		GCD600	Over 4.14	192~269	492	968	1,050
		GCD700	Over 4.83	229~302	492	951	1,017
		GCD800	Over 5.52	248~352	492	935	984
K	Gray cast iron	GC100	Over 0.69	Under 201	591	1,296	1,476
		GC150	Over 1.28	Under 241	591	1,214	1,312
			Over 1.15	Under 223	591	1,230	1,345
			Over 1.03	Under 212	591	1,247	1,378
			Over 0.88	Under 201	591	1,263	1,411
		GC200	Over 1.62	Under 255	525	1,132	1,214
			Over 1.49	Under 235	525	1,148	1,247
			Over 1.38	Under 223	525	1,165	1,280
			Over 1.15	Under 217	525	1,181	1,312
		GC250	Over 1.90	Under 269	492	1,115	1,214
			Over 1.76	Under 248	492	1,124	1,230
			Over 1.72	Under 241	492	1,132	1,247
			Over 1.49	Under 229	492	1,148	1,280
		GC300	Over 2.10	Under 269	492	1,083	1,148
			Over 2.07	Under 262	492	1,099	1,181
			Over 1.79	Under 248	492	1,115	1,214
		GC350	Over 2.49	Under 285	492	1,033	1,050
			Over 2.41	Under 277	492	1,066	1,115
			Over 2.17	Under 269	492	1,083	1,148

* According to cutting environment, condition can be changed.

NC6215

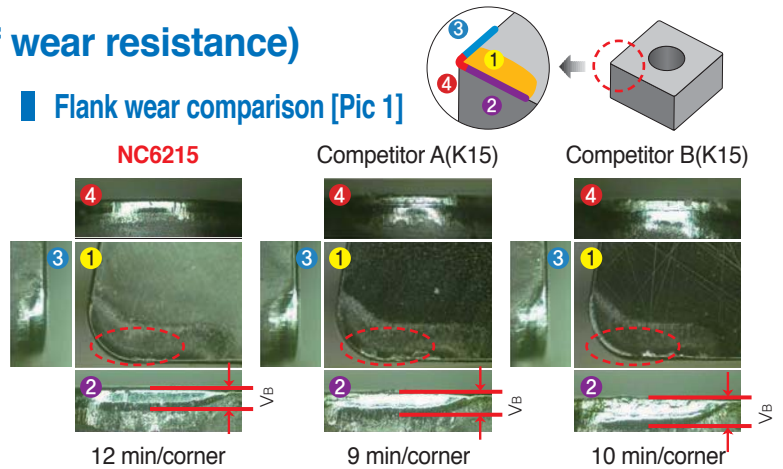
Cutting performance(Evaluation of wear resistance)



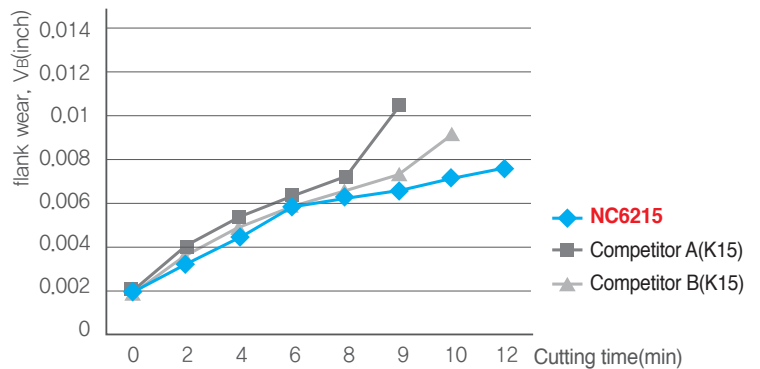
Cutting conditions

- **Workpiece** GCD600(KS)
80-55-06(AISI)
GGG60(DIN)
(Ø11.8 → Ø5.9 Face turning)
- **Cutting conditions** vc(sfm) = 984
fn(ipr) = 0.12
ap(inch) = 0.079
wet
- **Tools** Insert CNMA432
Holder DCLNR16-4D

Flank wear comparison [Pic 1]



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.



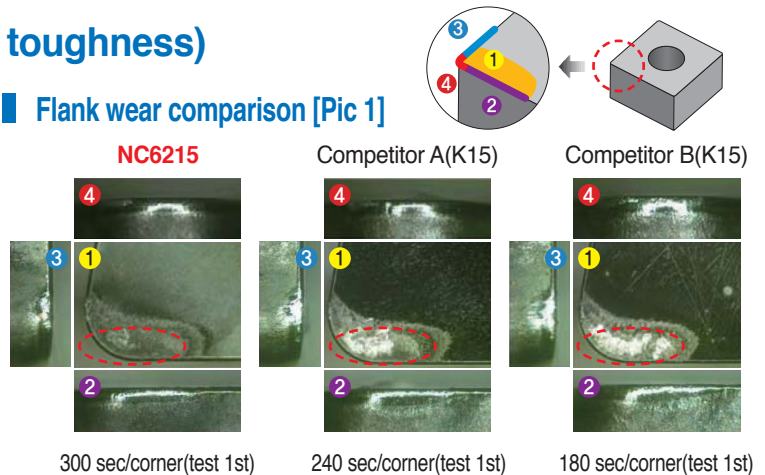
Cutting performance(Evaluation of toughness)



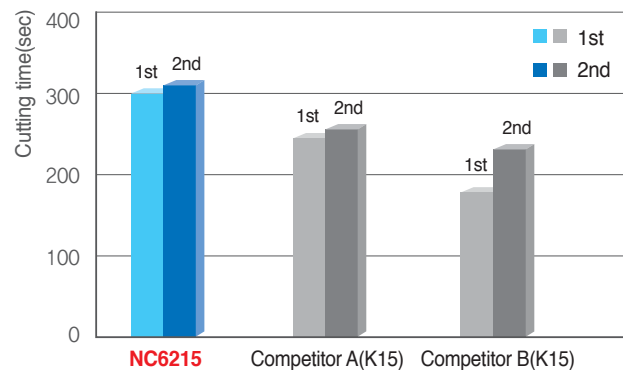
Cutting conditions

- **Workpiece** GCD500(KS),
80-55-06(AISI),
GGG50(DIN)
(Ø3.5(Triangle) → Ø1.2 Face turning)
- **Cutting conditions** vc(sfm) = 1,112 → 433
N = 1,200(fixed)
fn(ipr) = 0.014
ap(inch) = 0.059
wet
- **Tools** Insert CNMA432
Holder DCLNR16-4D

Flank wear comparison [Pic 1]



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.



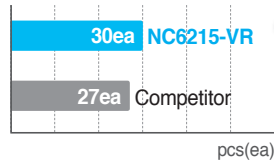
NC6215

Cutting performance

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

- **Workpiece** Diff. case(Ø6.1)
- **Cutting coditions** vc(sfm) = 1,148 ~ 1,903
fn(ipr) = 0.008 ~ 0.012
ap(inch) = 0.059 ~ 0.098
wet
- **Tools** Insert WNMG433-VR
holder Special holder

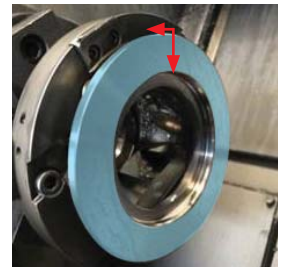
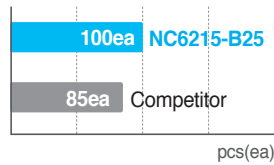
Result



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

- **Workpiece** Diff. case(Ø5.3)
- **Cutting coditions** vc(sfm) = 1,837
fn(ipr) = 0.003 ~ 0.008
ap(inch) = 0.059 ~ 0.098
wet
- **Tools** Insert WNMG433-B25
holder Special holder

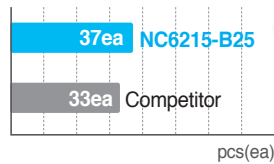
Result



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

- **Workpiece** Diff. case(Ø2.0)
- **Cutting coditions** vc(sfm) = 656
fn(ipr) = 0.008 ~ 0.012
ap(inch) = 0.059 ~ 0.079
wet
- **Tools** Insert WNMG433-B25
holder Special holder

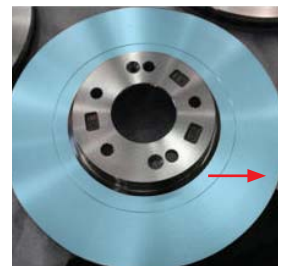
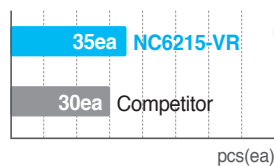
Result



K Gray cast iron (FC250 / No35B / GG25)

- **Workpiece** Brake disc(Ø10.6)
- **Cutting coditions** vc(sfm) = 1,804
fn(ipr) = 0.012
ap(inch) = 0.079
wet
- **Tools** Insert CNMG433-VR
holder PCLNR16-4D

Result



Cutting performance

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

- **Workpiece** Pully(Ø8.3)
- **Cutting coditions** vc(sfm) = 984
fn(ipr) = 0.008
ap(inch) = 0.047
wet
- **Tools** Insert WNMG432-VR
holder Special holder

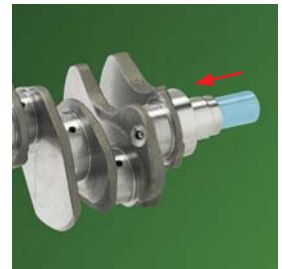
■ Result



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

- **Workpiece** Crank shaft(Ø2.7)
- **Cutting coditions** vc(sfm) = 984
fn(ipr) = 0.008 ~ 0.012
ap(inch) = 0.118
wet
- **Tools** Insert DNMG433-VR
holder Special holder

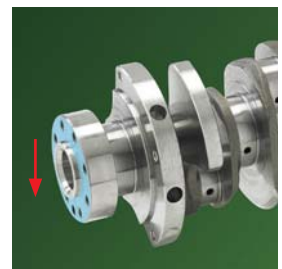
■ Result



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

- **Workpiece** Crank shaft(Ø2.7)
- **Cutting coditions** vc(sfm) = 984
fn(ipr) = 0.008 ~ 0.012
ap(inch) = 0.118
wet
- **Tools** Insert CNMG432-VR
holder Special holder

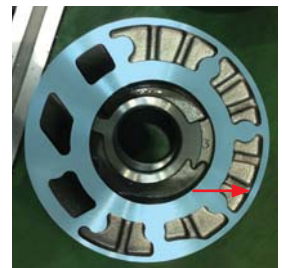
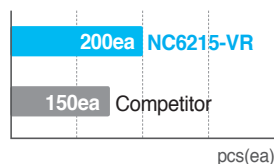
■ Result



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

- **Workpiece** Oil pump housing(Ø9.1)
- **Cutting coditions** vc(sfm) = 720
fn(ipr) = 0.010
ap(inch) = 0.079
wet
- **Tools** Insert CNMG433-VR
holder DCLNR16-4D

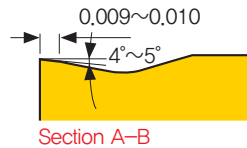
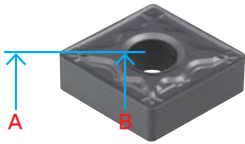
■ Result



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Feature of chip breaker

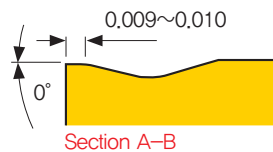
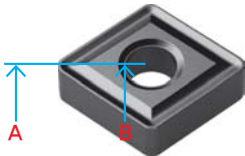
■ HM chip breaker



■ Finish and continuous turning of cast iron

- Good wear resistance at finish operation
- Low cutting force

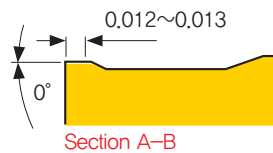
■ B25 chip breaker



■ Finish to medium turning of cast iron

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

■ VR chip breaker

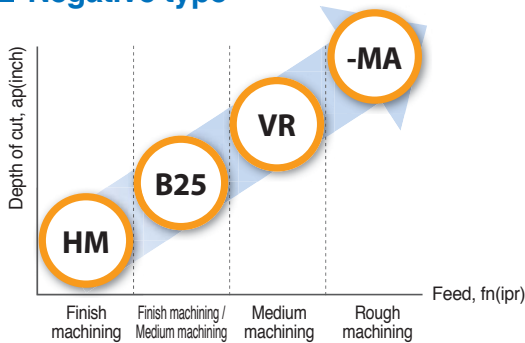


■ Roughing of cast iron

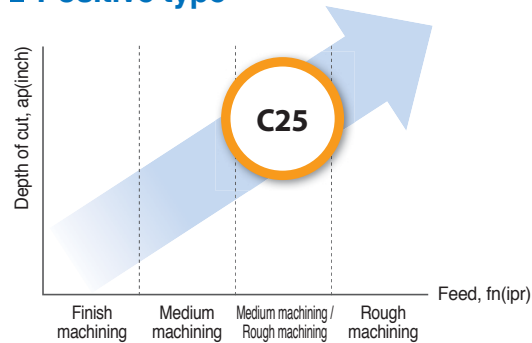
- Reinforced cutting edge
- Stability and long tool life guaranteed
- Roughing or interrupted turning

Recommended cutting condition for chip breaker

■ Negative type



■ Positive type



Comparison of chip breakers

Application	KORLOY		KYOCERA	TAEGUTEC	SUMITOMO	SANDVIK	KENNAMTAL	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

Designation		Application	fn(ipr)			ap(inch)			(inch)
			Minimum	Recommendation	Maximum	Minimum	Recommendation	Maximum	NC6215
CNMG	431-HM	Finish machining	0.002	0.006	0.012	0.035	0.079	0.157	●
	432-HM		0.004	0.010	0.020	0.039	0.098	0.197	●
DNMG	431-HM		0.002	0.006	0.012	0.035	0.079	0.157	●
	432-HM		0.004	0.010	0.020	0.039	0.098	0.197	●
	441-HM		0.002	0.006	0.012	0.035	0.098	0.197	●
SNMG	442-HM		0.004	0.010	0.020	0.039	0.098	0.197	●
	431-HM		0.002	0.006	0.012	0.035	0.079	0.157	●
TNMG	432-HM		0.004	0.010	0.020	0.039	0.098	0.197	●
	331-HM		0.002	0.006	0.012	0.035	0.069	0.138	●
	332-HM		0.004	0.010	0.020	0.039	0.079	0.157	●
VNMG	432-HM		0.004	0.010	0.020	0.039	0.130	0.260	●
	331-HM		0.003	0.009	0.018	0.020	0.059	0.118	●
	332-HM		0.004	0.010	0.020	0.039	0.069	0.138	●
WNMG	333-HM		0.008	0.010	0.020	0.059	0.079	0.157	●
	331-HM		0.004	0.009	0.018	0.039	0.059	0.118	●
CNMG	332-HM		0.004	0.010	0.020	0.039	0.069	0.138	●
	431-B25		0.007	0.009	0.018	0.039	0.098	0.195	●
	432-B25		0.009	0.012	0.023	0.059	0.098	0.195	●
DNMG	433-B25		0.010	0.012	0.023	0.078	0.098	0.195	●
	441-B25		0.007	0.011	0.021	0.059	0.078	0.156	●
	442-B25	0.007	0.011	0.021	0.059	0.078	0.156	●	
TNMG	443-B25	0.010	0.011	0.021	0.059	0.078	0.156	●	
	331-B25	0.007	0.009	0.018	0.078	0.068	0.137	●	
	332-B25	0.007	0.011	0.021	0.078	0.068	0.137	●	
WNMG	333-B25	0.010	0.011	0.021	0.078	0.068	0.137	●	
	431-B25	0.007	0.009	0.018	0.039	0.098	0.195	●	
	432-B25	0.009	0.012	0.023	0.059	0.098	0.195	●	
CNMG	433-B25	0.010	0.012	0.023	0.078	0.098	0.195	●	
	432-GR	0.008	0.010	0.020	0.059	0.118	0.236	●	
	433-GR	0.010	0.010	0.020	0.071	0.118	0.236	●	
DNMG	542-GR	0.008	0.014	0.028	0.059	0.157	0.315	●	
	543-GR	0.010	0.014	0.028	0.079	0.157	0.315	●	
	544-GR	0.010	0.015	0.030	0.098	0.157	0.315	●	
	642-GR	0.008	0.014	0.028	0.079	0.197	0.394	●	
	643-GR	0.012	0.015	0.030	0.098	0.197	0.394	●	
	644-GR	0.012	0.016	0.031	0.118	0.197	0.394	●	
	432-GR	0.008	0.010	0.020	0.059	0.118	0.236	●	
	433-GR	0.010	0.010	0.020	0.071	0.118	0.236	●	
SNMG	442-GR	0.008	0.010	0.020	0.059	0.118	0.236	●	
	443-GR	0.010	0.010	0.020	0.071	0.118	0.236	●	
	642-GR	0.008	0.014	0.028	0.079	0.197	0.394	●	
	643-GR	0.012	0.015	0.030	0.098	0.197	0.394	●	

* 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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Recommended cutting condition

Negative type

(inch)

Designation	Application	fn(ipr)			ap(inch)			Stock	
		Minimum	Recommendation	Maximum	Minimum	Recommendation	Maximum	NC6215	
TNMG	Medium machining	332-GR	0.008	0.010	0.020	0.059	0.098	0.197	●
		432-GR	0.008	0.010	0.020	0.059	0.118	0.236	●
		433-GR	0.010	0.010	0.020	0.071	0.118	0.236	●
		434-GR	0.010	0.012	0.024	0.079	0.118	0.236	●
WNMG		431-GR	0.002	0.006	0.012	0.035	0.079	0.157	●
		432-GR	0.008	0.010	0.020	0.059	0.118	0.236	●
		433-GR	0.010	0.010	0.020	0.071	0.118	0.236	●
CNMG		432-VR	0.009	0.011	0.021	0.059	0.118	0.236	●
	433-VR	0.011	0.011	0.021	0.071	0.118	0.236	●	
	434-VR	0.011	0.013	0.025	0.079	0.118	0.236	●	
	543-VR	0.011	0.015	0.029	0.079	0.157	0.315	●	
	643-VR	0.013	0.016	0.031	0.098	0.197	0.394	●	
	644-VR	0.013	0.017	0.033	0.118	0.197	0.394	●	
DNMG	Medium machining	432-VR	0.009	0.011	0.021	0.059	0.118	0.236	●
		433-VR	0.011	0.011	0.021	0.071	0.118	0.236	●
		442-VR	0.009	0.011	0.021	0.059	0.118	0.236	●
		443-VR	0.011	0.011	0.021	0.071	0.118	0.236	●
SNMG		432-VR	0.009	0.011	0.021	0.059	0.118	0.236	●
		433-VR	0.011	0.011	0.021	0.071	0.118	0.236	●
		643-VR	0.013	0.016	0.031	0.098	0.197	0.394	●
		644-VR	0.013	0.017	0.033	0.118	0.197	0.394	●
TNMG	Rough machining	332-VR	0.009	0.011	0.021	0.059	0.098	0.197	●
		333-VR	0.011	0.011	0.021	0.071	0.098	0.197	●
		334-VR	0.011	0.011	0.021	0.071	0.098	0.197	●
		432-VR	0.009	0.011	0.021	0.059	0.118	0.236	●
		433-VR	0.011	0.011	0.021	0.071	0.118	0.236	●
		434-VR	0.011	0.013	0.025	0.079	0.118	0.236	●
WNMG		432-VR	0.009	0.011	0.021	0.059	0.118	0.236	●
		433-VR	0.011	0.011	0.021	0.071	0.118	0.236	●
CNMA		431	0.006	0.012	0.024	0.039	0.098	0.197	●
		432	0.006	0.012	0.024	0.039	0.118	0.236	●
		433	0.006	0.014	0.028	0.059	0.118	0.236	●
		434	0.008	0.016	0.031	0.079	0.118	0.236	●
	543	0.006	0.014	0.028	0.079	0.118	0.236	●	
	544	0.006	0.010	0.020	0.079	0.197	0.394	●	
	643	0.006	0.014	0.028	0.079	0.197	0.394	●	
	644	0.008	0.020	0.039	0.118	0.197	0.394	●	
DNMA	432	0.010	0.011	0.022	0.031	0.079	0.157	●	
	433	0.010	0.013	0.026	0.059	0.079	0.157	●	
	442	0.010	0.011	0.022	0.031	0.079	0.157	●	
	443	0.010	0.013	0.026	0.047	0.079	0.157	●	
SNMA	432	0.006	0.014	0.028	0.039	0.118	0.236	●	
	433	0.008	0.016	0.031	0.059	0.118	0.236	●	

* 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

(inch)

Designation	Application	fn(ipr)			ap(inch)			Stock	
		Minimum	Recommendation	Maximum	Minimum	Recommendation	Maximum	NC6215	
TNMA	331	Rough machining	0.004	0.006	0.012	0.039	0.079	0.157	●
	332		0.004	0.008	0.016	0.039	0.079	0.157	●
	333		0.004	0.010	0.020	0.059	0.089	0.177	●
	334		0.006	0.011	0.022	0.059	0.089	0.177	●
	432		0.006	0.008	0.016	0.059	0.098	0.197	●
	433		0.008	0.010	0.020	0.059	0.098	0.197	●
	434		0.010	0.011	0.022	0.059	0.098	0.197	●
WNMA	431		0.006	0.012	0.024	0.039	0.098	0.197	●
	432		0.006	0.012	0.024	0.039	0.118	0.236	●
	433		0.006	0.014	0.028	0.059	0.118	0.236	●
	434		0.006	0.016	0.031	0.008	0.118	0.236	●

Positive type

(inch)

Designation	Application	fn(ipr)			ap(inch)			Stock	
		Minimum	Recommendation	Maximum	Minimum	Recommendation	Maximum	NC6215	
VBMT	331-HMP	Medium machining	0.003	0.004	0.008	0.008	0.053	0.106	●
	332-HMP		0.004	0.005	0.011	0.020	0.053	0.106	●
CCMT	21.51-C25	Medium machining / Rough machining	0.001	0.002	0.005	0.016	0.039	0.079	●
	21.52-C25		0.002	0.003	0.006	0.024	0.045	0.091	●
	32.51-C25		0.003	0.005	0.010	0.031	0.059	0.118	●
	32.52-C25		0.004	0.006	0.012	0.039	0.059	0.118	●
	431-C25		0.004	0.006	0.013	0.031	0.059	0.118	●
	432-C25		0.005	0.007	0.014	0.047	0.069	0.138	●
	433-C25		0.006	0.008	0.016	0.055	0.069	0.138	●
DCMT	21.51-C25		0.002	0.004	0.008	0.020	0.049	0.098	●
	21.52-C25		0.002	0.005	0.010	0.031	0.049	0.098	●
	32.51-C25		0.003	0.006	0.012	0.031	0.059	0.118	●
	32.52-C25		0.004	0.006	0.012	0.039	0.059	0.118	●
SCMT	32.51-C25		0.003	0.005	0.010	0.024	0.059	0.118	●
	32.52-C25		0.004	0.006	0.012	0.039	0.059	0.118	●
	431-C25		0.004	0.006	0.012	0.031	0.075	0.150	●
	432-C25	0.005	0.007	0.015	0.047	0.075	0.150	●	
TCMT	1.81.51-C25	0.002	0.004	0.007	0.016	0.049	0.098	●	
	1.81.52-C25	0.003	0.005	0.010	0.031	0.049	0.098	●	
	21.51-C25	0.002	0.004	0.008	0.024	0.049	0.098	●	
	21.52-C25	0.003	0.005	0.010	0.031	0.049	0.098	●	
	32.51-C25	0.003	0.006	0.011	0.031	0.059	0.118	●	
	32.52-C25	0.004	0.006	0.012	0.039	0.059	0.118	●	

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