KYOCERA

CA3-Series

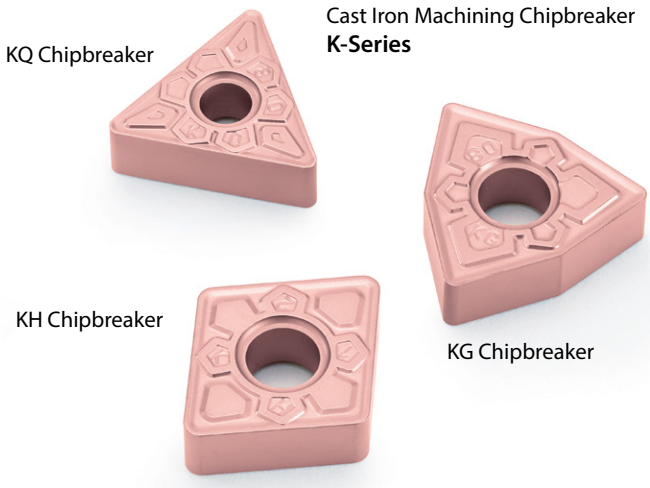
CVD Coated Carbide for Cast Iron

Coated Carbide for Highly Stable Cast Iron Machining

Improved Coating Adhesion Prevents Chipping and Provides Stable Machining

Micro TiCN Coating Provides Excellent Wear Resistance

Unique Insert Grades for Various Cast Iron Machining Applications (CA310 / CA315 / CA320)



CA3-Series

Coated Carbide for Highly Stable Cast Iron Machining
CA3-Series Coated Carbides Launched

New Coated Carbide Grades CA3-Series for Reliable & Efficient Cast Iron Turning

Prevents Adhesion due to Specialized Post-coating

Hard Surface Layer
Provides advanced wear resistance

High-Performance α-Al_2O_3 Layer
Excellent Wear and Chipping Resistance

Strong Intra-coating Adhesion
Higher adhesion between each layer with improved crystal structure

Micro TiCN Layer
Higher coating hardness is possible due to a micro TiCN crystal structure, resulting in increased wear resistance

1 High Coating Adhesion Results in Stable Machining

Strong Intra-coating Adhesion

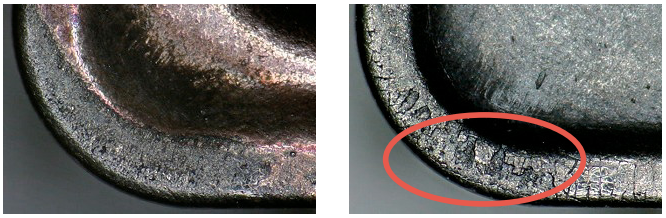
Micro Intra-coating Structure

Higher adhesion by increasing bonding surface with aluminum oxide layer

Impact-Resistant Intra-coating Structure

Interface strength is increased by 20% (compared to our products), which resists boundary destruction

Rake Face Condition (In-house Evaluation)

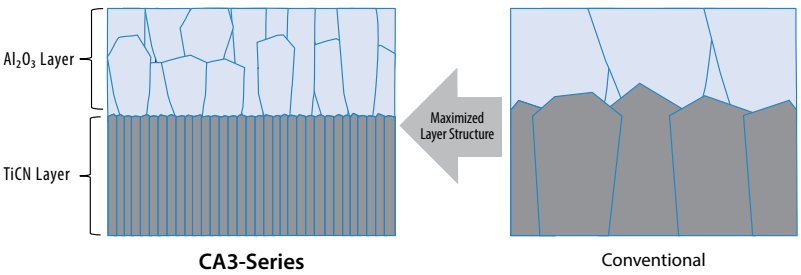


CA3-Series (CA315) Competitor A

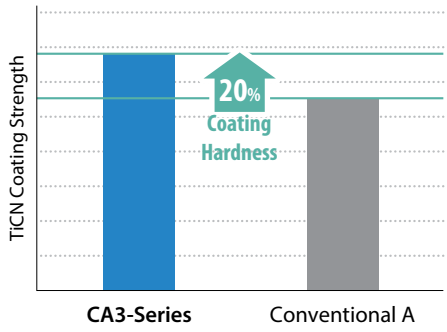
Cutting Conditions: Vc = 490 sfm, D.O.C. = 0.059", f = 0.012 ipr, Wet, CNMG432 Type, Facing, (After Withstanding 3,000 Impacts)
Workpiece: 100-70-03 (8 Grooves in Workpiece)

2 Micro TiCN Coating Provides Excellent Wear Resistance

Maximized Layer Structure (Pattern diagram)

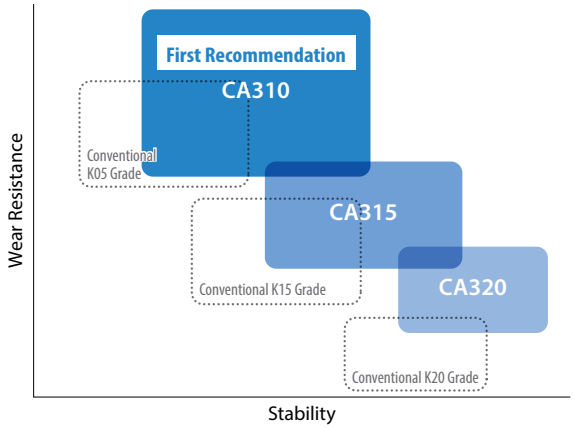


Coating Hardness Comparison (In-house Evaluation)

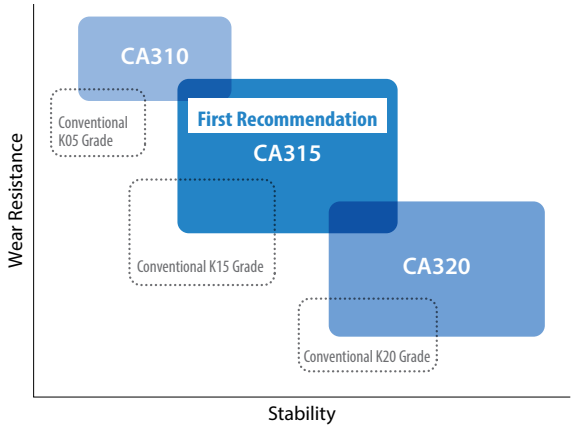


3 Unique Insert Grades For Various Cast Iron Machining Applications

Gray Cast Iron - First Recommendation CA310



Nodular Cast Iron - First Recommendation CA315

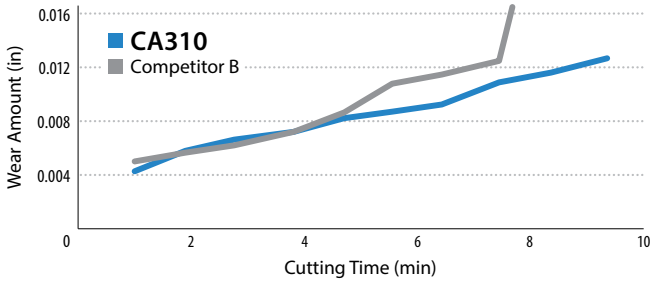


CA310 Gray Cast Iron (First Recommendation)

Grade for high-speed continuous machining and improved tool life through the deposition of a thickened alumina coating layer.

For finishing to roughing of gray cast iron.

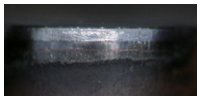
Wear Resistance Comparison (In-house Evaluation)



Cutting Conditions: Vc = 980 sfm, D.O.C. = 0.059", f = 0.012 ipr, Wet CNMG432 Type
Workpiece: 100-70-03

Machining Duration: About 7.4 Minutes

CA310



Competitor B

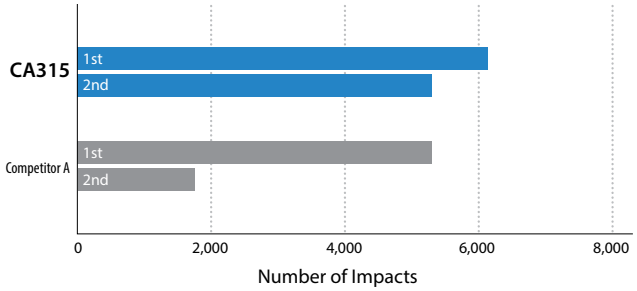
CA315 Nodular Cast Iron (First Recommendation)

For continuous to interrupted machining with a good balance of wear resistance and stability

Excellent performance for machining gray and nodular cast iron by optimizing the total coating layer thickness

High efficiency and long tool life

Fracture Resistance Comparison (In-house Evaluation)



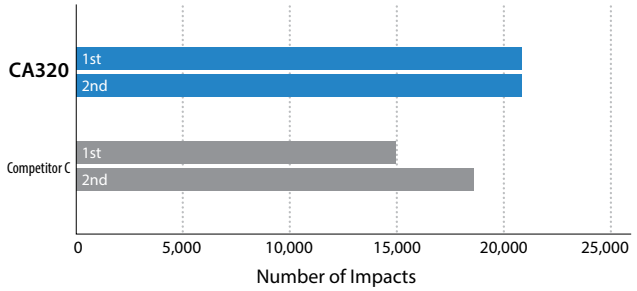
Cutting Conditions: Vc = 660 sfm, D.O.C. = 0.059", f = 0.018 ipr, Wet CNMG432 Type
Workpiece: 100-70-03 (8 Grooves in Workpiece) Interruption Evaluation: 2 Times

CA320 For Interrupted Machining

Improved stability with CVD layer structure with high adhesion

Long tool life for nodular cast iron during heavily interrupted or high-speed machining

Fracture Resistance Comparison (In-house Evaluation)

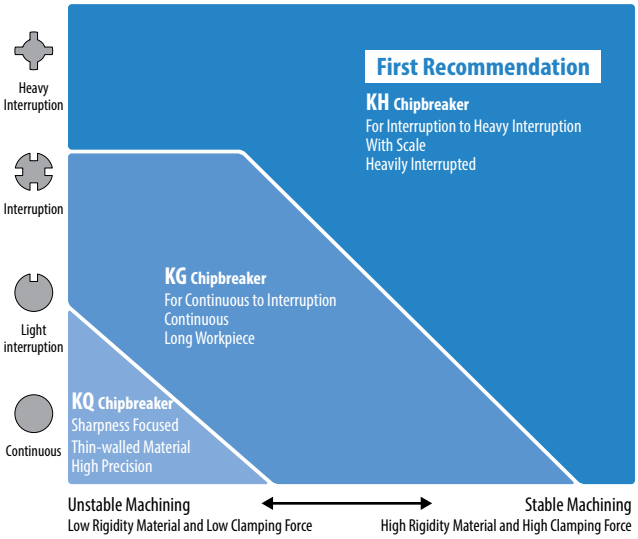


Cutting Conditions: Vc = 490 sfm, D.O.C. = 0.059", f = 0.012 ipr, Wet CNMG432 Type
Workpiece: 100-70-03 (8 Grooves in Workpiece) Interruption Evaluation: 2 Times

4 CA3 for Cast Iron Machining with New K-Series Chipbreakers

Great for a Large Range of Heavy Machining Operations due to Improved Chipping Resistance

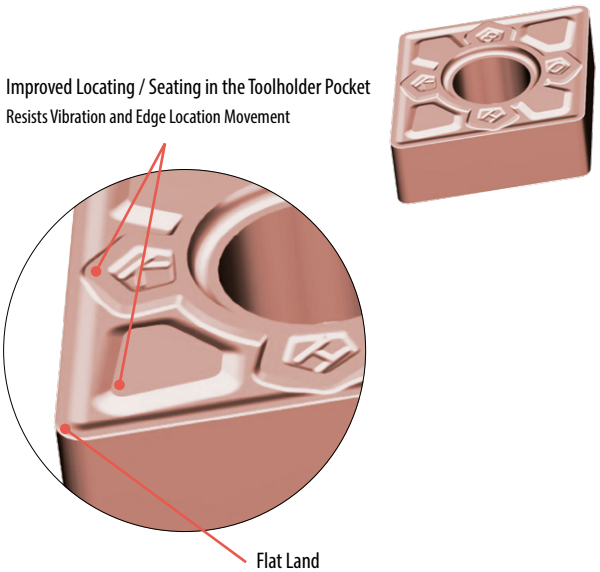
Recommended K-Series Chipbreakers



First Recommendation

KH Chipbreaker (For Interruption to Heavy Interruption)

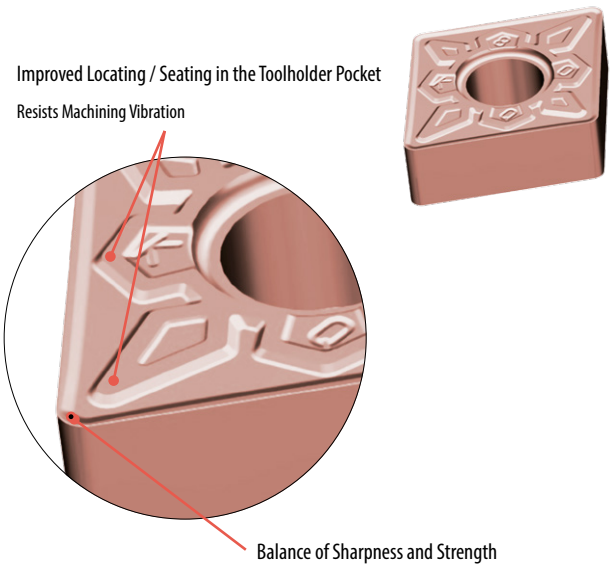
Good for Heavily Interrupted Machining
Focus on High Stability with Flat Land



Tough and Reliable Edge Security
High Feed to Heavily Interrupted Machining
First Recommended Edge Preparation with Breakage Resistance

KQ Chipbreaker (Sharpness Focused)

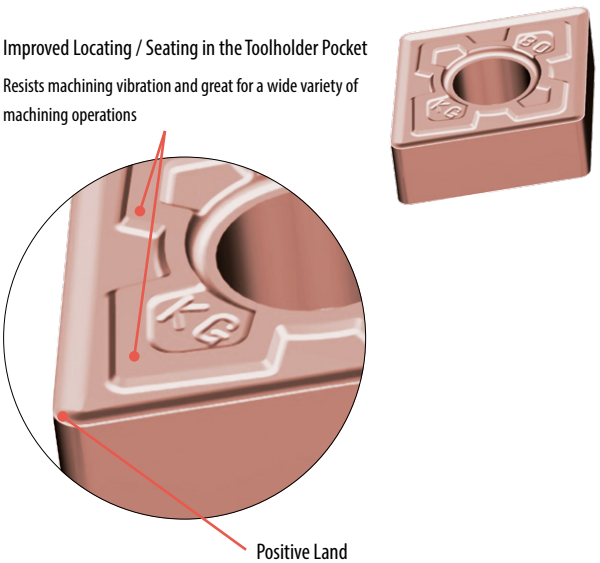
Good for Machining when Sharpness is Necessary Such as Thin-walled Material
Good Balance of Low Cutting Forces and Edge Strength



Edge Geometry is Appropriate for Thin-walled Workpieces

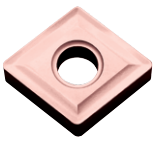
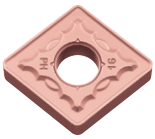
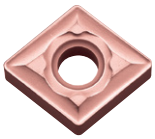
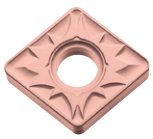
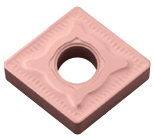
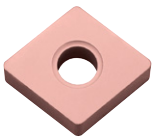
KG Chipbreaker (for Continuous to Interruption)

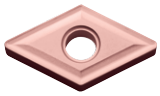
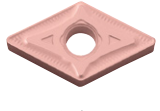
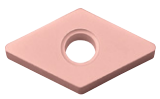
For Various Cast Iron Machining Applications
Chipping Resistance is Improved Despite Having a Positive Land



Excellent Balance of Sharpness and Strength
Machining from Continuous to Interruption

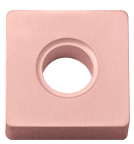
Negative Inserts

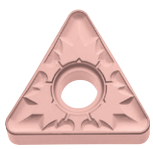
Shape Right-hand Shown	Description	Dimensions (in) I.C.	Thickness	Hole	Corner-R (rε)	CA310	CA315	CA320
 Roughing	CNMG 432KH	1/2	3/16	0.203	1/32	●	●	●
	433KH				3/64	●	●	●
	434KH				1/16	●	●	●
 Roughing	CNMG 431KQ	1/2	3/16	0.203	1/64	●	●	●
	432KQ				1/32	●	●	●
	433KQ				3/64	●	●	●
 Sharp Edge	CNMG 431KG	1/2	3/16	0.203	1/64	●	●	●
	432KG				1/32	●	●	●
	433KG				3/64	●	●	●
 Finishing-Medium / with Wiper Edge	CNMG 432WQ	1/2	3/16	0.203	1/32	●	●	●
	433WQ				3/64	●	●	●
 Roughing	CNMG 431	1/2	3/16	0.203	1/64	●	●	●
	432				1/32	●	●	●
	433				3/64	●	●	●
	434				1/16	●	●	●
	CNMG 543	5/8	1/4	0.250	3/64	●	●	●
	544				1/16	●	●	●
	CNMG 642	3/4	1/4	0.313	1/32	●	●	●
	643				3/64	●	●	●
	644				1/16	●	●	●
 Roughing	CNMG 432PH	1/2	3/16	0.203	1/32	●	●	●
	433PH				3/64	●	●	●
	434PH				1/16	●	●	●
	CNMG 543PH	5/8	1/4	0.250	3/64	●	●	●
	544PH				1/16	●	●	●
 Roughing	CNMG 431C	1/2	3/16	0.203	1/64	●	●	●
	432C				1/32	●	●	●
	433C				3/64	●	●	●
	434C				1/16	●	●	●
	CNMG 543C	5/8	1/4	0.250	3/64	●	●	●
 Roughing	CNMG 432ZS	1/2	3/16	0.203	1/32	●	●	●
	433ZS				3/64	●	●	●
 Roughing	CNMG 432GC	1/2	3/16	0.203	1/32	●	●	●
	433GC				3/64	●	●	●
 Without Chipbreaker	CNMA 431	1/2	3/16	0.203	1/64	●	●	●
	432				1/32	●	●	●
	433				3/64	●	●	●
	434				1/16	●	●	●

Shape Right-hand Shown	Description	Dimensions (in) I.C.	Thickness	Hole	Corner-R (rε)	CA310	CA315	CA320
 Roughing	DNMG 432KH	1/2	3/16	0.203	1/32	●	●	●
	433KH				3/64	●	●	●
	DNMG 442KH	1/2	1/4	0.203	1/32	●	●	●
	443KH				3/64	●	●	●
 Roughing	DNMG 431KG	1/2	3/16	0.203	1/64	●	●	●
	432KG				1/32	●	●	●
	433KG				3/64	●	●	●
	DNMG 441KG	1/2	1/4	0.203	1/64	●	●	●
	442KG				1/32	●	●	●
	443KG				3/64	●	●	●
 Sharp Edge	DNMG 431KQ	1/2	3/16	0.203	1/64	●	●	●
	432KQ				1/32	●	●	●
	DNMG 441KQ	1/2	1/4	0.203	1/64	●	●	●
	442KQ				1/32	●	●	●
 Roughing	DNMG 431	1/2	3/16	0.203	1/64	●	●	●
	432				1/32	●	●	●
	433				3/64	●	●	●
	DNMG 441	1/2	1/4	0.203	1/64	●	●	●
	442				1/32	●	●	●
	443				3/64	●	●	●
 Roughing	DNMG 432PH	1/2	3/16	0.203	1/32	●	●	●
	433PH				3/64	●	●	●
	DNMG 442PH	1/2	1/4	0.203	1/32	●	●	●
	443PH				3/64	●	●	●
 Roughing	DNMG 431C	1/2	3/16	0.203	1/64	●	●	●
	432C				1/32	●	●	●
	433C				3/64	●	●	●
	DNMG 441C	1/2	1/4	0.203	1/64	●	●	●
	442C				1/32	●	●	●
	443C				3/64	●	●	●
 Roughing	DNMG 432ZS	1/2	3/16	0.203	1/32	●	●	●
	433ZS				3/64	●	●	●
	DNMG 442ZS	1/2	1/4	0.203	1/32	●	●	●
	443ZS				3/64	●	●	●
 Roughing	DNMG 432GC	1/2	3/16	0.203	1/32	●	●	●
	433GC				3/64	●	●	●
	DNMG 442GC	1/2	1/4	0.203	1/32	●	●	●
	443GC				3/64	●	●	●
 Without Chipbreaker	DNMA 431	1/2	3/16	0.203	1/64	●	●	●
	432				1/32	●	●	●
	DNMA 441	1/2	1/4	0.203	1/64	●	●	●
	442				1/32	●	●	●
 Medium-Roughing	RNMG 43	1/2	3/16	0.203	-	●	●	●
	RNMG 54	5/8	1/4	0.250	-	●	●	●

● : U.S. Stock

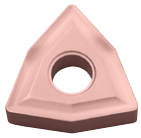
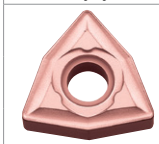
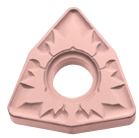
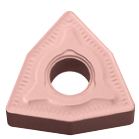
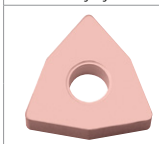
Negative Inserts

Shape Right-hand Shown	Description	Dimensions (in) I.C.	Thickness	Hole	Corner-R (rε)	CA310	CA315	CA320
 Roughing	SNMG 432KH	1/2	3/16	0.203	1/32	●	●	●
	433KH				3/64	●	●	●
	434KH				1/16	●	●	●
 Roughing	SNMG 432KG	1/2	3/16	0.203	1/32	●	●	●
	433KG				3/64	●	●	●
 Roughing	SNMG 322	3/8	1/8	0.150	1/32	●	●	●
	SNMG 431	1/2	3/16	0.203	1/64	●	●	●
	432				1/32	●	●	●
	433				3/64	●	●	●
	434				1/16	●	●	●
	435				5/64	●	●	●
 Roughing	SNMG 432PH	1/2	3/16	0.203	1/32	●	●	●
	433PH				3/64	●	●	●
	434PH				1/16	●	●	●
	SNMG 543PH	5/8	1/4	0.250	3/64	●	●	●
	544PH				1/16	●	●	●
 Roughing	SNMG 432C	1/2	3/16	0.203	1/32	●	●	●
	433C				3/64	●	●	●
 Roughing	SNMG 432ZS	1/2	3/16	0.203	1/32	●	●	●
	433ZS				3/64	●	●	●
 Roughing	SNMG 432GC	1/2	3/16	0.203	1/32	●	●	●
	433GC				3/64	●	●	●
 Without Chipbreaker	SNMA 431	1/2	3/16	0.203	1/64	●	●	●
	432				1/32	●	●	●
	433				3/64	●	●	●
	434				1/16	●	●	●
	435				5/64	●	●	●
 Without Chipbreaker	SNM 432	1/2	3/16	-	1/32	●	●	●
	433				3/64	●	●	●

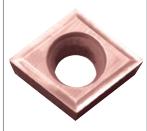
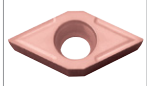
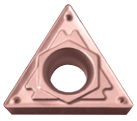
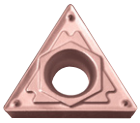
Shape Right-hand Shown	Description	Dimensions (in) I.C.	Thickness	Hole	Corner-R (rε)	CA310	CA315	CA320
 Roughing	TNMG 332KH	3/8	3/16	0.150	1/32	●	●	●
	333KH				3/64	●	●	●
	334KH				1/16	●	●	●
 Roughing	TNMG 331KG	3/8	3/16	0.150	1/64	●	●	●
	332KG				1/32	●	●	●
	333KG				3/64	●	●	●
 Sharp Edge	TNMG 331KQ	3/8	3/16	0.150	1/64	●	●	●
	332KQ				1/32	●	●	●
 Roughing	TNMG 331	3/8	3/16	0.150	1/64	●	●	●
	332				1/32	●	●	●
	333				3/64	●	●	●
	334				1/16	●	●	●
	335				5/64	●	●	●
	TNMG 431	1/2	3/16	0.203	1/64	●	●	●
	432				1/32	●	●	●
	433				3/64	●	●	●
 Roughing	TNMG 332PH	3/8	3/16	0.150	1/32	●	●	●
	333PH				3/64	●	●	●
 Roughing	TNMG 331C	3/8	3/16	0.150	1/64	●	●	●
	332C				1/32	●	●	●
	333C				3/64	●	●	●
 Roughing	TNMG 332ZS	3/8	3/16	0.150	1/32	●	●	●
	333ZS				3/64	●	●	●
 Roughing	TNMG 332GC	3/8	3/16	0.150	1/32	●	●	●
	333GC				3/64	●	●	●
 Without Chipbreaker	TNMA 331	3/8	3/16	0.150	1/64	●	●	●
	332				1/32	●	●	●
	333				3/64	●	●	●
	334				1/16	●	●	●
	335				5/64	●	●	●

● : U.S. Stock

Negative Inserts

Shape Right-hand Shown	Description	Dimensions (in) I.C.	Thickness	Hole	Corner-R (rε)	CA310	CA315	CA320
 Roughing	VNMG 332KH	3/8	3/16	0.150	1/32	●	●	●
	333KH				3/64	●	●	●
 Roughing	VNMG 332KG	3/8	3/16	0.150	1/32	●	●	●
	333KG				3/64	●	●	●
 Roughing	VNMG 331	3/8	3/16	0.150	1/64	●	●	●
	332				1/32	●	●	●
 Roughing	WNMG 432KH	1/2	3/16	0.203	1/32	●	●	●
	433KH				3/64	●	●	●
	434KH				1/16	●	●	●
 Roughing	WNMG 431KG	1/2	3/16	0.203	1/64	●	●	●
	432KG				1/32	●	●	●
	433KG				3/64	●	●	●
 Sharp Edge	WNMG 431KQ	1/2	3/16	0.203	1/64	●	●	●
	432KQ				1/32	●	●	●
	433KQ				3/64	●	●	●
 Roughing	WNMG 431	1/2	3/16	0.203	1/64	●	●	●
	432				1/32	●	●	●
	433				3/64	●	●	●
 Roughing	WNMG 432PH	1/2	3/16	0.203	1/32	●	●	●
	433PH				3/64	●	●	●
 Roughing	WNMG 431C	1/2	3/16	0.203	1/64	●	●	●
	432C				1/32	●	●	●
	433C				3/64	●	●	●
 Roughing	WNMG 432ZS	1/2	3/16	0.203	1/32	●	●	●
	433ZS				3/64	●	●	●
 Roughing	WNMG 432GC	1/2	3/16	0.203	1/32	●	●	●
	433GC				3/64	●	●	●
 Without Chipbreaker	WNMA 432	1/2	3/16	0.203	1/32	●	●	●
	433				3/64	●	●	●

Positive Inserts

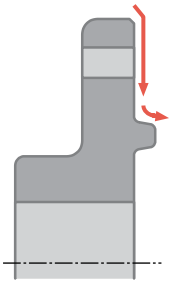
Shape Right-hand Shown	Description	Dimensions (in) I.C.	Thickness	Hole	Corner-R (rε)	Relief Angle	CA310	CA315	CA320
 Finishing-Medium	CCMT 2151GK	1/4	3/32	0.110	1/64	7°	●	●	●
	CCMT 3251GK	3/8	5/32	0.173	1/64	7°	●	●	●
	CCMT 431GK	1/2	3/16	0.217	1/64	7°	●	●	●
	432GK				1/32		●	●	●
 Medium	CCMT 3252	3/8	5/32	0.173	1/32	7°	●	●	●
 Medium	CPMH 25151	5/16	3/32	0.138	1/64	11°	●	●	●
	25152				1/32		●	●	●
	CPMH 321	3/8	1/8	0.177	1/64	11°	●	●	●
	322				1/32		●	●	●
 Finishing-Medium	DCMT 2151GK	1/4	3/32	0.110	1/64	7°	●	●	●
	2152GK				1/32		●	●	●
	DCMT 3251GK	3/8	5/32	0.173	1/64	7°	●	●	●
	3252GK				1/32		●	●	●
 Medium	DCMT 3252	3/8	5/32	0.173	1/32	7°	●	●	●
 Medium	RCMX 1204M0	0.472	3/16	0.165	-	7°	●	●	●
 Without Chipbreaker	SPM 421	1/2	1/8	-	1/64	11°	●	●	●
	422				1/32		●	●	●
	SPM 432	1/2	3/16	-	1/32	11°	●	●	●
	433				3/64		●	●	●
 Finishing-Medium	TCMT 2151HQ	1/4	3/32	0.110	1/64	7°	●	●	●
	2152HQ				1/32		●	●	●
	TCMT 3252HQ	3/8	5/32	0.173	1/32	7°	●	●	●
	3253HQ				3/64		●	●	●
 Finishing-Medium	TPMT 221HQ	1/4	1/8	0.130	1/64	11°	●	●	●
	222HQ				1/32		●	●	●
	TPMT 321HQ	3/8	1/8	0.173	1/64	11°	●	●	●
	322HQ				1/32		●	●	●
 Medium	TPMR 221	1/4	1/8	-	1/64	11°	●	●	●
	222				1/32		●	●	●
	TPMR 321	3/8	1/8	-	1/64	11°	●	●	●
	322				1/32		●	●	●
 Without Chipbreaker	TPM 221	1/4	1/8	-	1/64	11°	●	●	●
	222				1/32		●	●	●
	TPM 321	3/8	1/8	-	1/64	11°	●	●	●
	322				1/32		●	●	●
	323				3/64		●	●	●

● : U.S. Stock

Case Studies

Differential Gear Case
FCD450

Vc = 1,080 - 1,310 sfm
D.O.C. = 0.059"
f = 0.006 - 0.010 ipr Wet
CNMG433KH (CA315)



Tool Life

CA315 **100 pcs /edge** Tool Life x2

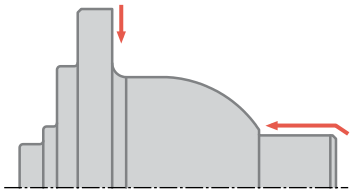
Competitor D (Molded Chipbreaker) **50 pcs /edge**

CA315 KH Chipbreaker doubled tool life compared to competitor D.

(User Evaluation)

Differential Gear Case
FCD660

Vc = 590 sfm
D.O.C. = 0.071"
f = 0.012 ipr Wet
WNMG433KH (CA315)



Tool Life

CA315 **20 pcs /edge** Tool Life x2

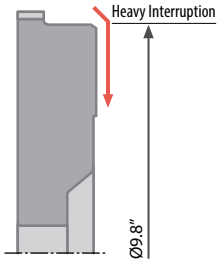
Competitor E (Molded Chipbreaker) **10 pcs /edge**

Competitor E's insert broke after machining 10 pieces but CA315 with KH Chipbreaker doubled tool life without insert breakage.

(User Evaluation)

Flywheel
Gray Cast Iron

Vc = 980 sfm
D.O.C. = 0.071"
f = 0.012 - 0.014 ipr Dry
WNMG433KH (CA315)



Tool Life

CA315 **100 pcs /edge** Tool Life x2

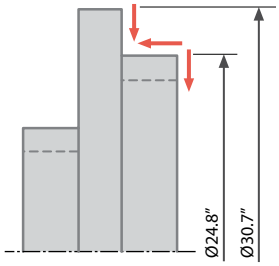
Competitor F (Molded Chipbreaker) **50 pcs /edge**

Competitor F shows unstable tool life with insert breakage when machining over 50 pieces/edge but CA315 provides stable tool life while machining over 100 pieces/edge.

(User Evaluation)

Disc
Nodular Cast Iron

Vc = 460 sfm
D.O.C. = 0.098"
f = 0.011 - 0.018ipr Wet
CNMG433KH (CA315)



Tool Life

CA315 **10 pcs/edge** Tool Life x1.4

Competitor G (Molded Chipbreaker) **7 pcs/edge**

CA315 achieves 1.4 times the tool life of competitor G.

(User Evaluation)

KYOCERA

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