



COMPLETE METALWORKING SOLUTIONS

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ISO Certified

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CA410K/CA415K

CVD Coated Carbide for Cast Iron



Longer tool life and stable machining of cast iron

CVD coating provides excellent wear and fracture resistance

High stability with a tough carbide substrate

Supports a wide range of applications

CA410K

1st recommendation: Continuous machining

Designed for wear resistance

CA415K

1st recommendation:

Interrupted/heavily interrupted machining

Designed for stability



CVD Coated Carbide for Cast Iron

CA410K/CA415K

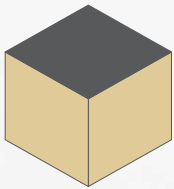


Machining Video

Newly developed coating and carbide substrate drastically extend tool life

Large lineup for a wide range of machining applications

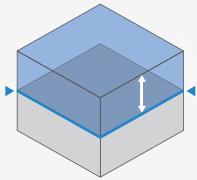
Tough Coating Technology



Black & Gold

Optimized coating properties on the rake face and flank face of the insert

Achieves a balance between wear resistance and fracture resistance



Thick Layer and Strong Adhesion

Durability required for cast iron machining

More resistant to delamination and wear for stable machining



Problem

Insert Damage

(Scale removal /
Interrupted machining)



Image

Quick Insert Wear

(Continuous machining)



Image

Solution

Stability

Long Tool Life

Excellent chip resistance even under heavy machining

Excellent wear resistance suitable for high-strength cast iron



KYOCERA's New CVD Coating

CVD

T E C H N O L O G Y

For Steel **P**

CA115P / CA125P



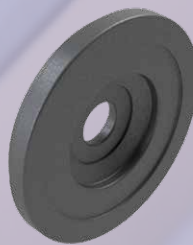
For Cast Iron **K**

CA410K / CA415K

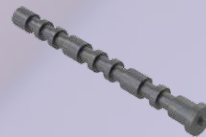


Support various machining applications

Flywheel



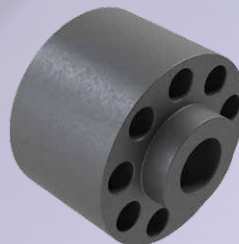
Camshaft



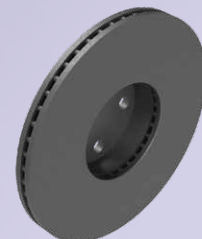
Differential Gear Case



Cylinder

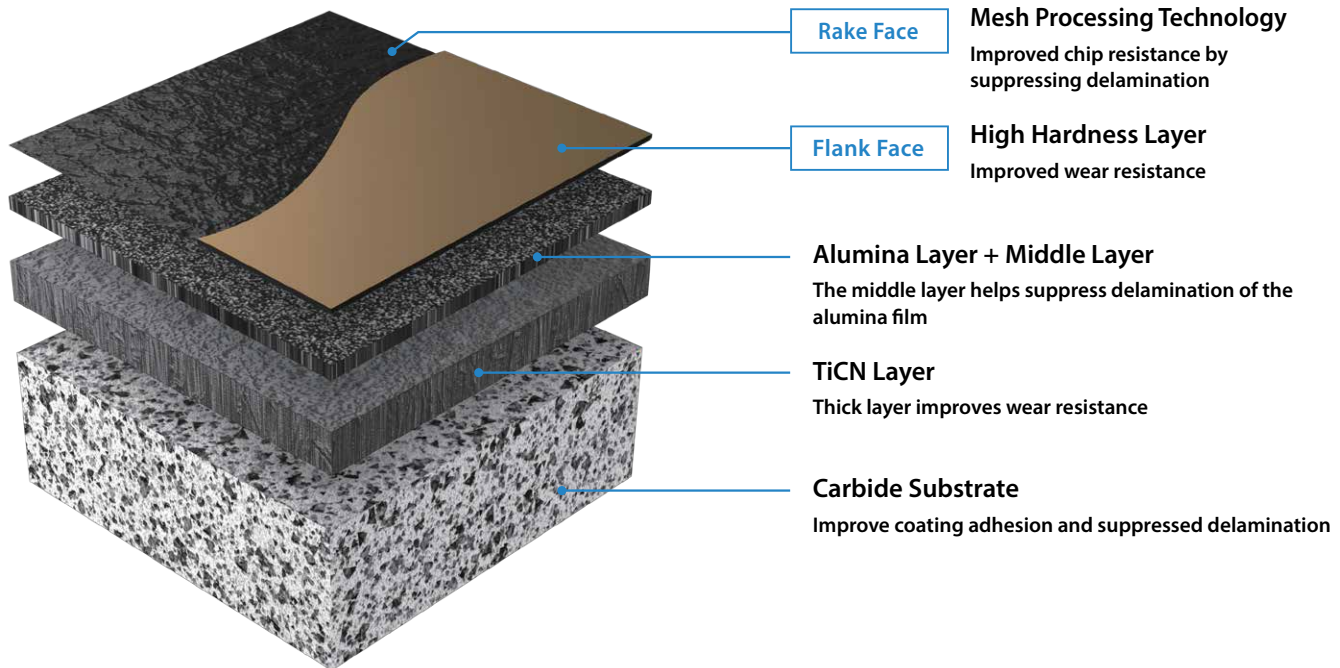


Brake Disc



1

"Black & Gold" Optimized coating properties on rake and flank faces



Rake face

Mesh processing technology

Unique Technology

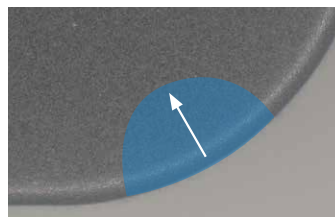
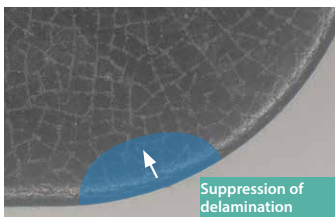
Special surface treatment technology reduces residual stress in coatings
The mesh pattern suppresses the progression of delamination and maintains excellent chipping resistance

Example of Delamination

Area of Delamination

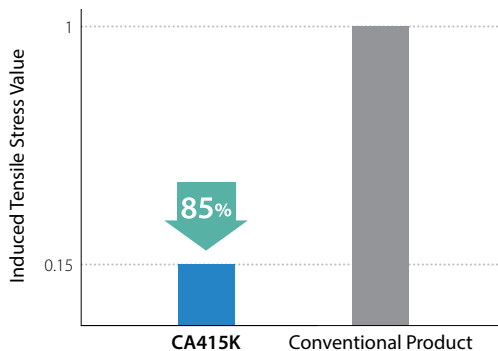
Meshed

No Mesh



Induced Stress Comparison (Internal Evaluation)

Conventional product as 1

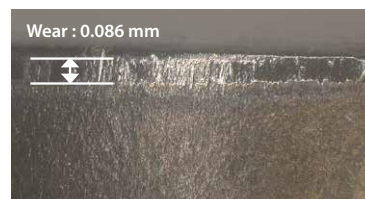


Flank Face

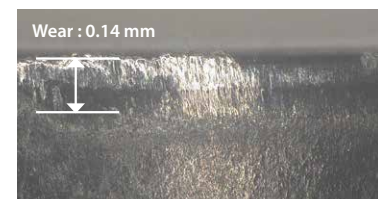
High Hardness Layer

High hardness surface layer suppresses wear
The gold-colored surface makes it easy to identify the used corner

With high hardness layer

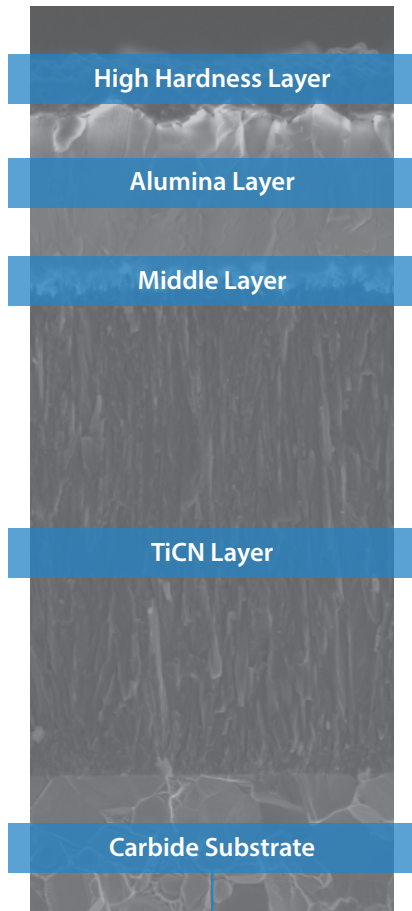


Without high hardness layer



Vc = 690 sfm, D.O.C. = 0.059", f = 0.016 ipr Wet 80-60-03 CNMA432 (Internal Evaluation)

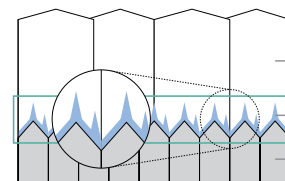
CA415K Coating Cross-Section

**Middle Layer**

Improve adhesion between alumina layer and TiCN layer

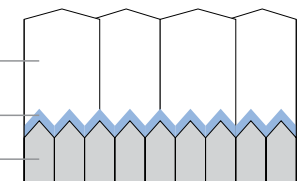
Improve wear resistance by suppressing delamination of alumina layer

CA410K/CA415K



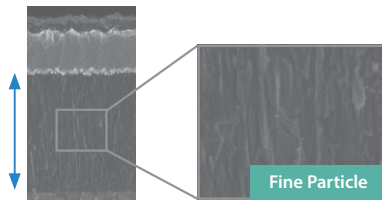
Refined middle layer provides an anchor effect

Conventional product

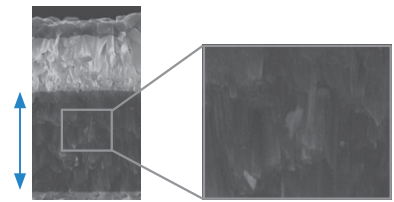
**TiCN layer**

Thick layer improves wear resistance

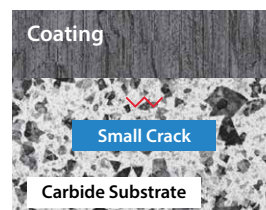
CA415K



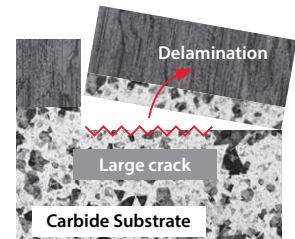
Conventional Product (K15)

**Surface-Hardened Technology****Unique Technology**

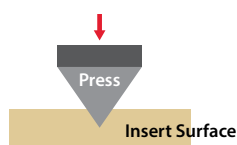
Improved carbide toughness with crack resistance near coating to suppress delamination

**Example of Delamination**

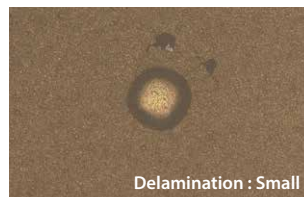
New Carbide Substrate



Conventional Carbide Substrate

Adhesion Comparison
(Internal Evaluation)

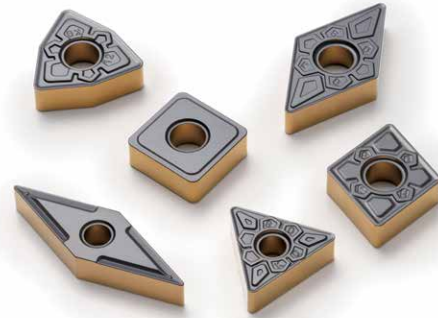
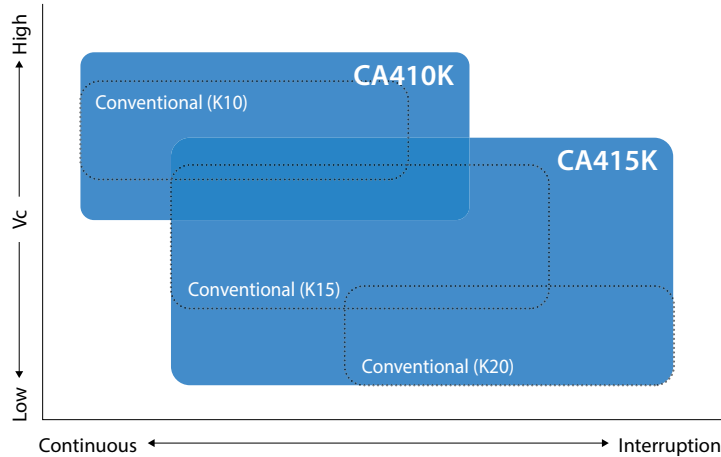
New Carbide Substrate



Conventional Carbide Substrate



Application map

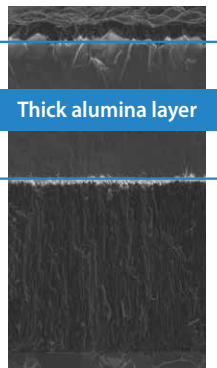


CA410K

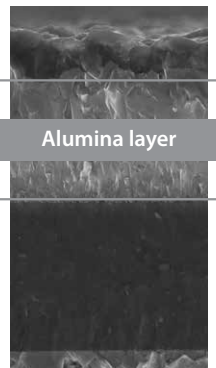
1st Recommendation : Continuous Machining

Thick alumina layer with excellent heat resistance during high-speed and dry machining, suppressing wear

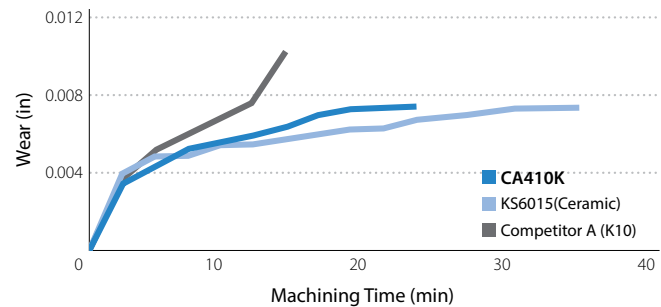
CA410K



Conventional product (K10)



Wear Resistance Comparison (Internal Evaluation)



Vc = 1970 sfm, D.O.C. = 0.059, 0.012 ipr No.45 Dry CNMG 433KG

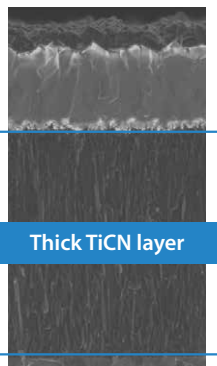
CA410K achieves high wear resistance close to that of ceramics

CA415K

1st Recommendation : Interrupted / Heavy Interrupted Machining

Thick, micro TiCN layer for stable machining with high wear and chipping resistance

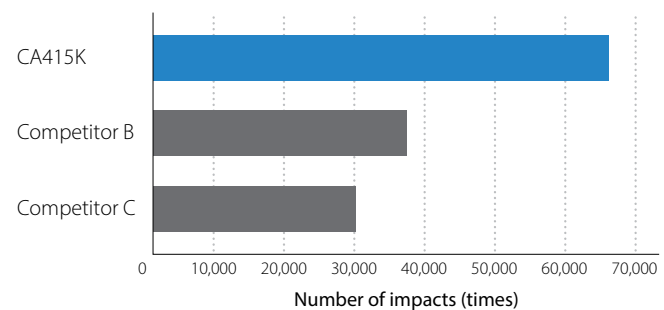
CA415K



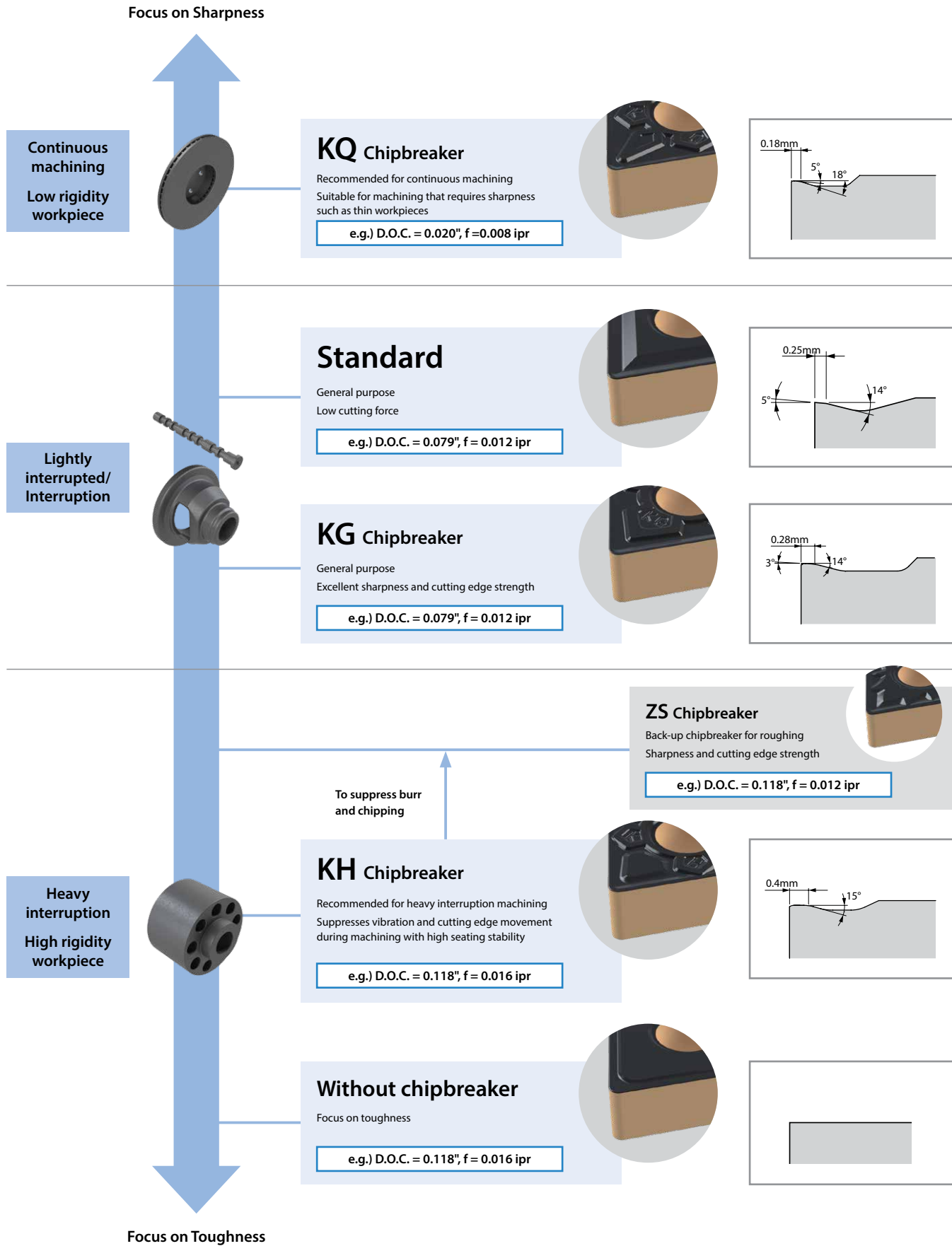
Conventional Product (K15)



Chipping Resistance Comparison (Internal Evaluation)

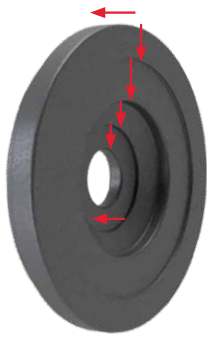


Vc = 590 sfm, D.O.C. = 0.059", f = 0.0157 ipr 80-60-03 Wet CNMG 433KH



Case Study

Flywheel 80-60-03



1) External Turning / Facing (Roughing)

Vc = 430 sfm, D.O.C. = 0.059", f = 0.010 ipr Wet
CNMG434KQ (CA415K)

2) Internal Turning

Vc = 430 sfm, D.O.C. = 0.059", f = 0.010 ipr Wet
CNMG434KQ (CA415K)

3) External Turning / Facing (Finishing)

Vc = 590 sfm, D.O.C. = 0.118", f = 0.004 ~ 0.006 ipr Wet
CNMG432KQ (CA415K)

Number of Parts

CA415K 10 pcs/edge

Competitor D 5 pcs/edge

Tool Life

2x

Number of parts

CA415K 10 pcs/edge

Competitor D 5 pcs/edge

Tool Life

2x

Number of parts

CA415K 14 pcs/edge

Competitor D 10 pcs/edge

Tool Life

1.4x

Achieved extended tool life in both roughing and finishing operations. Even after machining longer than the set lifespan of competitor products, the cutting edge remained in good condition.

In finishing operations with KQ chipbreaker, burr formation was more effectively suppressed compared to competitor products.

(User Evaluation)

Gear 100-70-03



Vc = 460 sfm
D.O.C. = 0.039"
f = 0.009 ipr
Wet
TNMG332KQ (CA410K)

Number of Parts

CA410K 75 pcs/edge

Tool Life

1.8x

Competitor A 40 pcs/edge

The combination of CA410K and KQ chipbreaker, suitable for continuous machining, achieved 1.8 times the tool life.

(User Evaluation)

Differential Gear Case 65-45-12



Vc = 750 sfm (Interrupted section 460 sfm)
D.O.C. = 0.039" ~ 0.118"
f = 0.012 ipr
Wet
WNMG433KH (CA415K)

Number of Parts

CA415K 200 pcs/edge

Tool Life

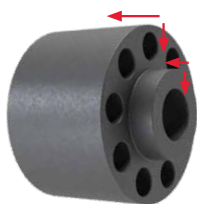
2x

Competitor C 100 pcs/edge

While delamination occurred with competitor products, CA415K maintained a good cutting edge condition even after double the machining. When combined with the KH chipbreaker, which excels in cutting edge strength, it remained stable even in interrupted cutting sections.

(User Evaluation)

Cylinder 80-60-03



Vc = 390 sfm
D.O.C. = 0.118"
f = 0.014 ipr
Wet
CNMA432 (CA415K)

Number of Parts

CA415K 150 pcs/edge (Stable)

Tool Life

1.5x

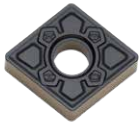
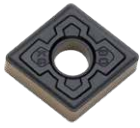
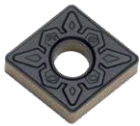
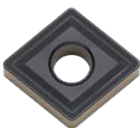
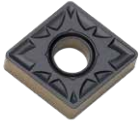
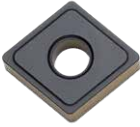
Competitor E (K05) 100 pcs/edge (Unstable)

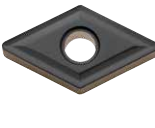
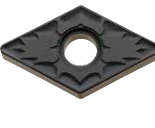
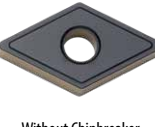
Variations in tool life during interrupted machining were a challenge, but with CA415K (w/o chipbreaker), stable machining was achieved. Even after machining longer than the set lifespan of competitor products, the cutting edge remained in good condition.

(User Evaluation)



Negative Inserts

Shape	Part Number	Dimensions (in)				CA410K	CA415K				
		IC	Thickness	Hole Dia.	Corner R (RE)						
 Finishing	CNMG 432KH 433KH 434KH	1/2	3/16	0.203	1/32 3/64 1/16	● ● ●	● ● ●				
 Medium - Roughing	CNMG 431KG 432KG 433KG				1/2	3/16	0.203	1/64 1/32 3/64	● ● ●	● ● ●	
 Finishing	CNMG 431KQ 432KQ 433KQ							1/2	3/16	0.203	1/64 1/32 3/64
 Finishing - Medium Wiper Edge	CNMG 432WQ 433WQ	1/2	3/16	0.203							1/32 3/64
 Medium - Roughing	CNMG 431 432 433 434				1/2	3/16	0.203				1/64 1/32 3/64 1/16
	CNMG 543 544							5/8	1/4	0.250	3/64 1/16
	CNMG 642 643 644	3/4	1/4	0.313							1/32 3/64 1/16
	 Roughing							CNMG 432ZS 433ZS	1/2	3/16	0.203
	 Without Chipbreaker				CNMA 431 432 433 434	1/2	3/16	0.203			

Shape	Part Number	Dimensions (in)				CA410K	CA415K	
		IC	Thickness	Hole Dia.	Corner R (RE)			
 Roughing	DNMG 432KH 433KH DNMG 442KH 443KH	1/2	3/16	0.203	1/32 3/64	● ●	● ●	
	1/2				1/4	0.203	1/32 3/64	● ●
		 Medium - Roughing	DNMG 431KG 432KG 433KG DNMG 441KG 442KG 443KG	1/2			3/16	0.203
	1/2		1/4		0.203	1/32 3/64		
 Finishing				DNMG 431KQ 432KQ DNMG 441KQ 442KQ		1/2	3/16	0.203
	1/2		1/4	0.203	1/64 1/32			
		 Medium - Roughing			DNMG 431 432 433 DNMG 441 442 443	1/2	3/16	0.203
	1/2		1/4	0.203	1/32 3/64			
 Roughing					DNMG 432ZS 433ZS DNMG 442ZS 443ZS	1/2	3/16	0.203
	1/2		1/4	0.203	1/32 3/64			
		 Without Chipbreaker			DNMA 431 432 DNMA 441 442	1/2	3/16	0.203
	1/2		1/4	0.203	1/64 1/32			
 Medium - Roughing					RNMG 43 RNMG 54	1/2	3/16	0.203

● : Standard Item

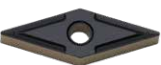
Negative Inserts

Shape	Part Number	Dimensions (in)				CA410K	CA415K
		IC	Thickness	Hole Dia.	Corner R (RE)		
 Roughing	SNMG 432KH	1/2	3/16	0.203	1/32	●	●
	433KH				3/64	●	●
	434KH				1/16	●	●
 Medium - Roughing	SNMG 432KG	1/2	3/16	0.203	1/32	●	●
	433KG				3/64	●	●
 Medium - 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 432ZS	1/2	3/16	0.203	1/32	●	●
	433ZS				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	SNMN 432	1/2	3/16	-	1/32	●	●
	433				3/64	●	●

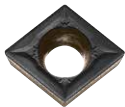
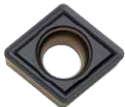
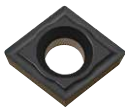
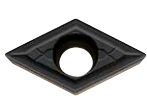
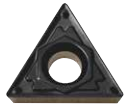
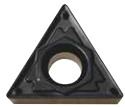
Shape	Part Number	Dimensions (in)				CA410K	CA415K
		IC	Thickness	Hole Dia.	Corner R (RE)		
 Roughing	TNMG 332KH	3/8	3/16	0.150	1/32	●	●
	333KH				3/64	●	●
	334KH				1/16	●	●
 Medium - Roughing	TNMG 331KG	3/8	3/16	0.150	1/64	●	●
	332KG				1/32	●	●
	333KG				3/64	●	●
 Finishing	TNMG 331KQ	3/8	3/16	0.150	1/64	●	●
	332KQ				1/32	●	●
 Medium - Roughing	TNMG 331	3/8	3/16	0.150	1/64	●	●
	332				1/32	●	●
	333				3/64	●	●
	334				1/16	●	●
	335				5/64	●	●
 Medium - Roughing	TNMG 431	1/2	3/16	0.203	1/64	●	●
	432				1/32	●	●
	433				3/64	●	●
 Roughing	TNMG 332ZS	3/8	3/16	0.150	1/32	●	●
	333ZS				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	●	●

● : Standard Item

Negative Inserts

Shape	Part Number	Dimensions (in)				CA410K	CA415K
		IC	Thickness	Hole Dia.	Corner R (RE)		
 Roughing	VNMG 332KH	3/8	3/16	0.150	1/32	●	●
	333KH				3/64	●	●
 Medium - Roughing	VNMG 332KG	3/8	3/16	0.150	1/32	●	●
	333KG				3/64	●	●
 Medium - 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	●	●
 Medium - Roughing	WNMG 431KG	1/2	3/16	0.203	1/64	●	●
	432KG				1/32	●	●
	433KG				3/64	●	●
 Finishing	WNMG 431KQ	1/2	3/16	0.203	1/64	●	●
	432KQ				1/32	●	●
	433KQ				3/64	●	●
 Medium - Roughing	WNMG 431	1/2	3/16	0.203	1/64	●	●
	432				1/32	●	●
	433				3/64	●	●
 Roughing	WNMG 432ZS	1/2	3/16	0.203	1/32	●	●
	433ZS				3/64	●	●
 Without Chipbreaker	WNMA 432	1/2	3/16	0.203	1/32	●	●
	433				3/64	●	●

Positive Inserts

Shape	Part Number	Dimensions (in)				CA410K	CA415K
		IC	Thickness	Hole Dia.	Corner R (RE)		
 Finishing - Medium	CCMT 2151GK	1/4	3/32	0.110	1/64	●	●
	CCMT 3251GK	3/8	5/32	0.173	1/64	●	●
	CCMT 431GK	1/2	3/16	0.217	1/64	●	●
	432GK				1/32	●	●
 Medium - Roughing	CCMT 3252	3/8	5/32	0.173	1/32	●	●
 Medium - Roughing	CPMH 25151	5/16	3/32	0.138	1/64	●	●
	25152				1/32	●	●
	CPMH 321	3/8	1/8	0.177	1/64	●	●
	322				1/32	●	●
 Finishing - Medium	DCMT 2151GK	1/4	3/32	0.110	1/64	●	●
	2152GK				1/32	●	●
	DCMT 3251GK	3/8	5/32	0.173	1/64	●	●
	3252GK				1/32	●	●
 Medium - Roughing	DCMT 3252	3/8	5/32	0.173	1/32	●	●
 Medium - Roughing	RCMX 1204M0	1/2	3/16	0.165	-	●	●
	SPMN 421	1/2	1/8	-	1/64	●	●
 Without Chipbreaker	422				1/32	●	●
	SPMN 432	1/2	3/16	-	1/32	●	●
	433				3/64	●	●
 Finishing - Medium	TCMT 2151HQ	1/4	3/32	0.110	1/64	●	●
	2152HQ				1/32	●	●
	TCMT 3252HQ	3/8	5/32	0.173	1/32	●	●
	3253HQ				3/64	●	●
 Finishing - Medium	TPMT 221HQ	1/4	1/8	0.130	1/64	●	●
	222HQ				1/32	●	●
	TPMT 321HQ	3/8	1/8	0.185	1/64	●	●
	322HQ				1/32	●	●
 Medium - Roughing	TPMR 221	1/4	1/8	-	1/64	●	●
	222				1/32	●	●
	TPMR 321	3/8	1/8	-	1/64	●	●
	322				1/32	●	●
 Without Chipbreaker	TPMN 221	1/4	1/8	-	1/64	●	●
	222				1/32	●	●
	TPMN 321	3/8	1/8	-	1/64	●	●
	322				1/32	●	●
	323				3/64	●	●

● : Standard Item

Recommended Cutting Conditions

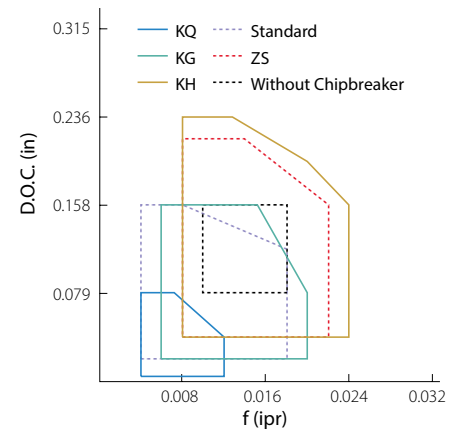
CA410K 1st Recommendation: Continuous Machining

CA415K 1st Recommendation: Interrupted / Heavily Interrupted Machining

Workpiece Material	Application	Vc (sfm)	
		CA410K	CA415K
Gray Cast Iron (NO.45)	Continuous	660 - 1,310 - 2,300	590 - 980 - 1,480
	Light Interruption ~ Interruption		
	Heavily Interrupted		
Nodular Cast Iron (65-45-12)	Continuous	660 - 1,150 - 1,640	490 - 820 - 1,150
	Light Interruption ~ Interruption		
	Heavily Interrupted		
Nodular Cast Iron (100-70-03)	Continuous	520 - 820 - 1,310	390 - 590 - 820
	Light Interruption ~ Interruption	-	
	Heavily interrupted	-	

Applicable Chipbreaker Range

CNM 432 Insert



Precautions

Installing SNMN Insert into toolholder

For the insert part numbers listed below, when using a top-clamp type holder with the CB-11 chipbreaker, it is not recommended to use chipbreaker with the maximum overhang.

Inserts : SNMN43... (CA410K/CA415K)

Holders : CS-N 2020K-12, CS-N 2525M-12, CSRN 3225P-12, CS-N 2525M-12



Overhang of the chipbreaker and the clamp condition

Overhang with Chipbreaker					View A
Clamp Condition (View A)					Chipbreaker Insert Gap Not Recommended

SNMN43... (CA310/CA315/CA320) can be installed.



KYOCERA Precision Tools

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