KYOCERA

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

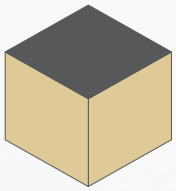
CA410K/CA415K

Machining Video

Newly developed coating and carbide substrate drastically extend tool life

Large lineup for a wide range of machining applications

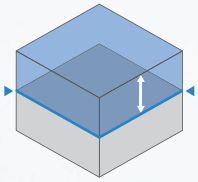
Tough Coating Technology



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

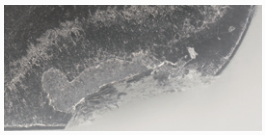
Durability required for cast iron machining

More resistant to delamination and wear
for stable machining

Problem

Insert Damage

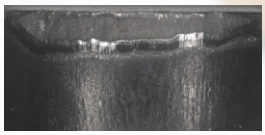
(Scale removal /
Interrupted machining)



Image

Quick Insert Wear

(Continuous machining)



Image

Solution

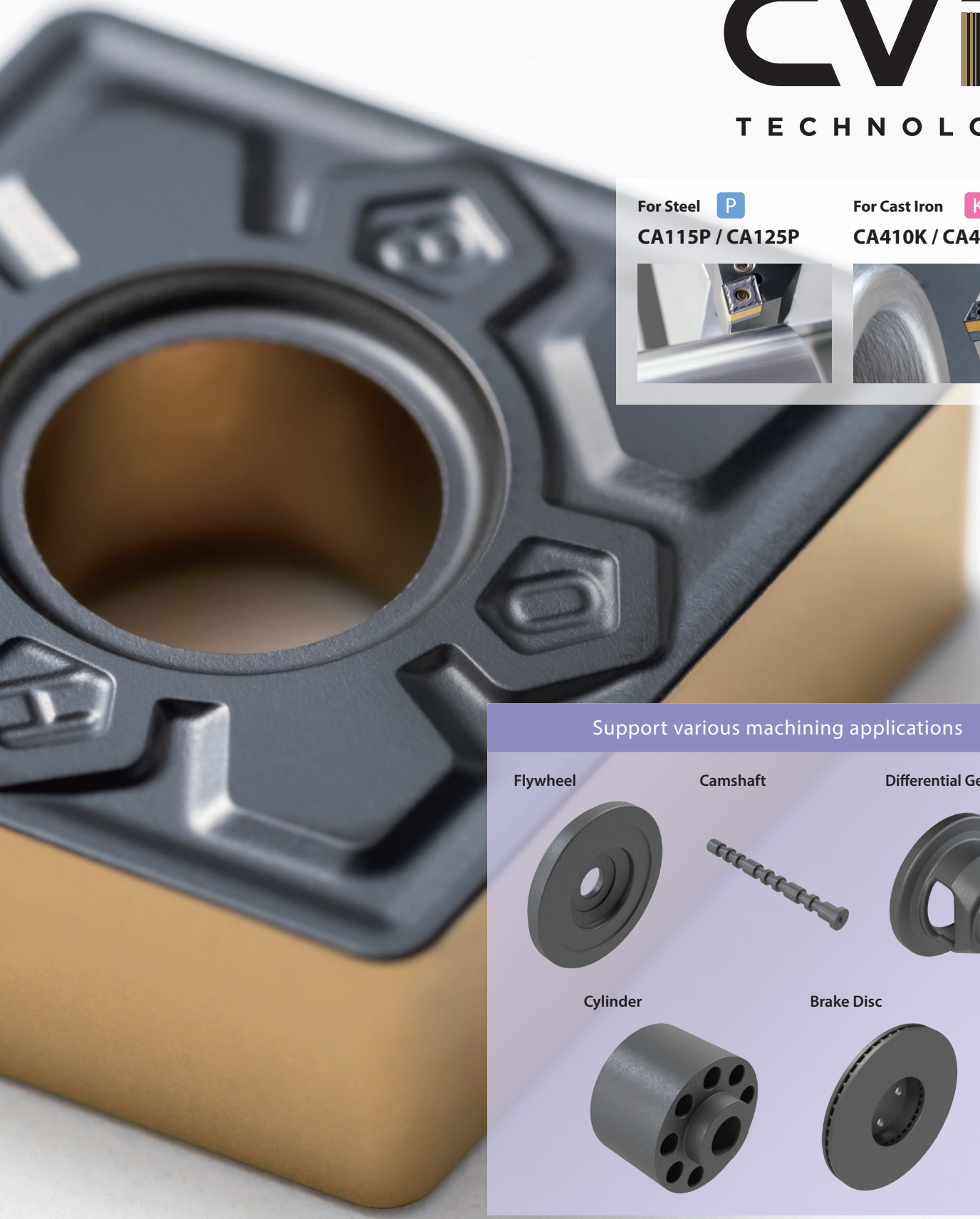
Stability **Long Tool Life**

Excellent chip resistance even under heavy machining

Excellent wear resistance suitable for high-strength cast iron

KYOCERA's New CVD Coating

CVD TECHNOLOGY

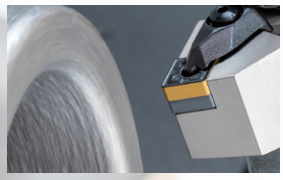


For Steel P

CA115P / CA125P

For Cast Iron K

CA410K / CA415K

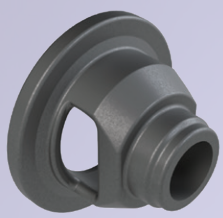


Support various machining applications

Flywheel

Camshaft

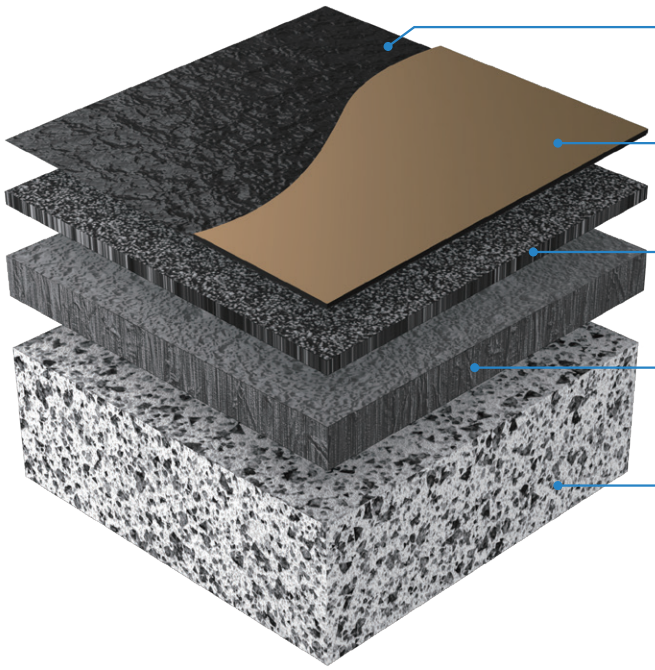
Differential Gear Case



Cylinder

Brake Disc

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



Rake Face

Mesh Processing Technology
Improved chip resistance by suppressing delamination

Flank Face

High Hardness Layer
Improved wear resistance

Alumina Layer + Middle Layer
The middle layer helps suppress delamination of the alumina film

TiCN Layer
Thick layer improves wear resistance

Carbide Substrate
Improve coating adhesion and suppressed delamination

Rake face

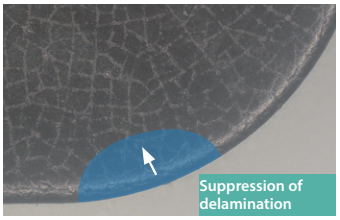
Mesh processing technology

Unique Technology

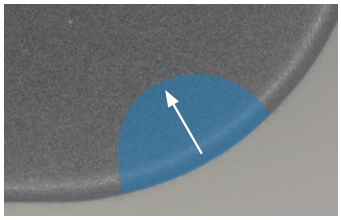
Special surface treatment technology reduces residual stress in coatings
The mesh pattern suppresses the progression of delamination and maintains excellent chipping resistance

Example of Delamination ■ Area of Delamination

Meshed



No Mesh

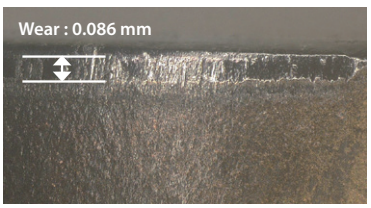


Flank Face

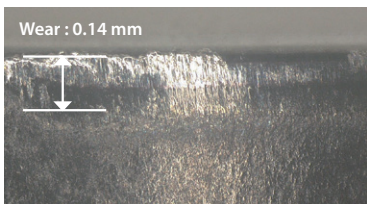
High Hardness Layer

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

With high hardness layer



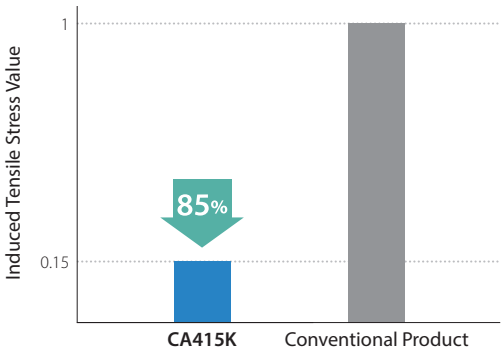
Without high hardness layer



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

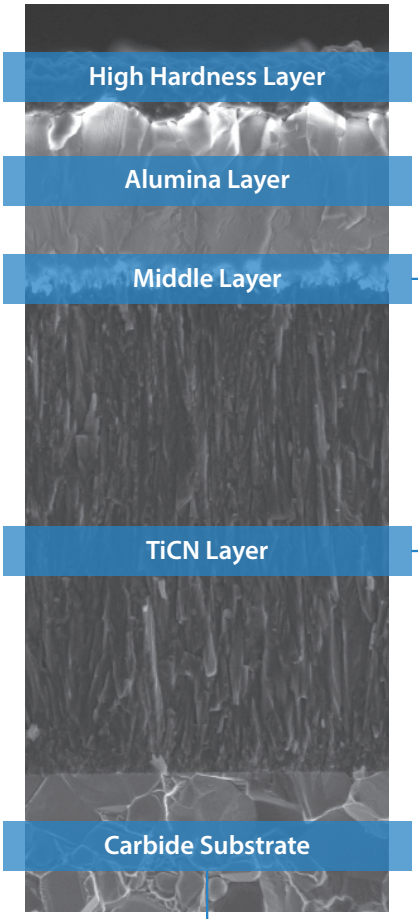
Induced Stress Comparison (Internal Evaluation)

Conventional product as 1



2 Thick layer and strong adhesion with stable machining with suppressed wear and delamination

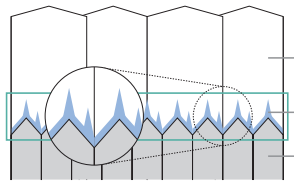
CA415K Coating Cross-Section



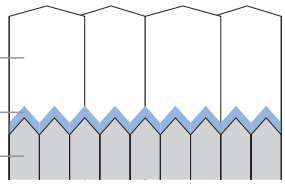
Middle Layer

Improve adhesion between alumina layer and TiCN layer
Improve wear resistance by suppressing delamination of alumina layer

CA410K/CA415K



Conventional product

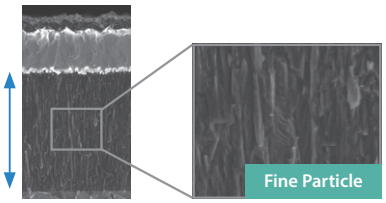


Refined middle layer provides an anchor effect

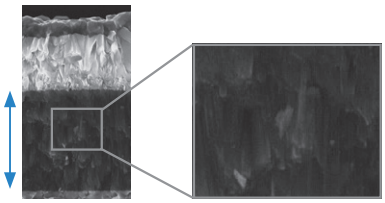
TiCN layer

Thick layer improves wear resistance

CA415K



Conventional Product (K15)

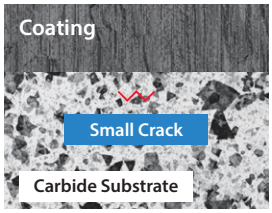


Surface-Hardened Technology

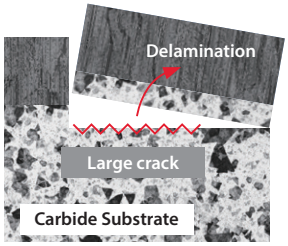
Unique Technology

Improved carbide toughness with crack resistance near coating to suppress delamination

Example of Delamination

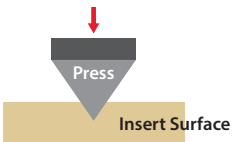


New Carbide Substrate

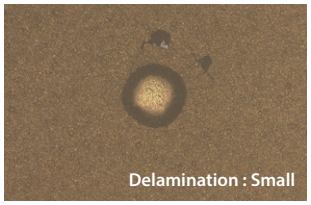


Conventional Carbide Substrate

Adhesion Comparison
(Internal Evaluation)



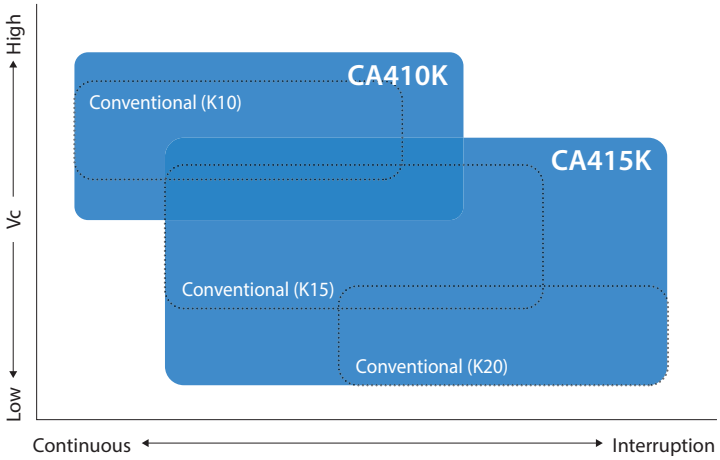
New Carbide Substrate

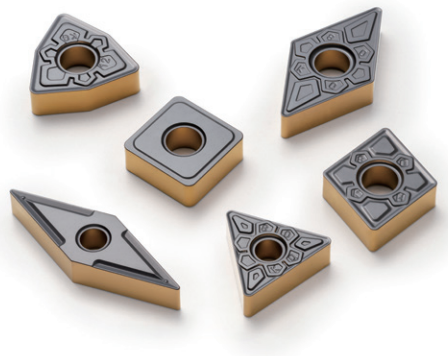


Conventional Carbide Substrate

3 Grades CA410K for high-speed machining and CA415K for stability

Application Map



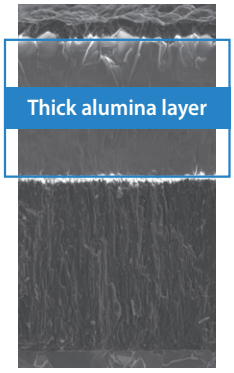


CA410K

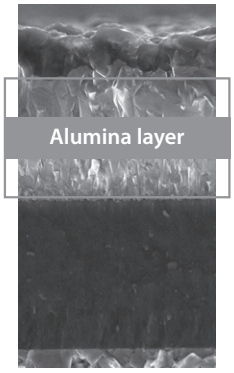
1st Recommendation : Continuous Machining

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

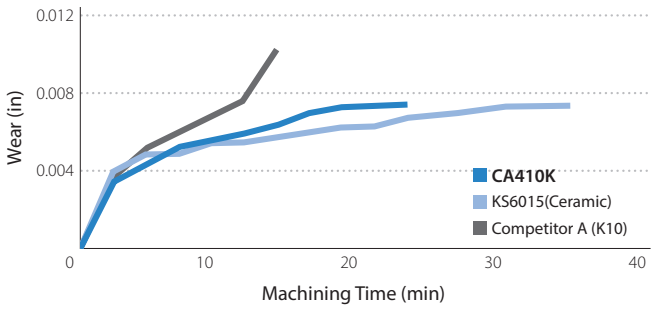
CA410K



Conventional product (K10)



Wear Resistance Comparison (Internal Evaluation)



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

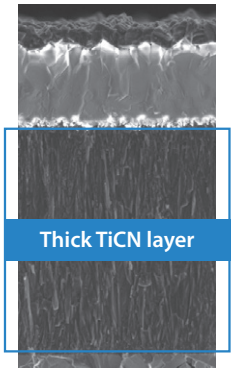
CA410K achieves high wear resistance close to that of ceramics

CA415K

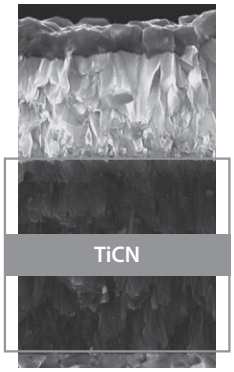
1st Recommendation : Interrupted / Heavy Interrupted Machining

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

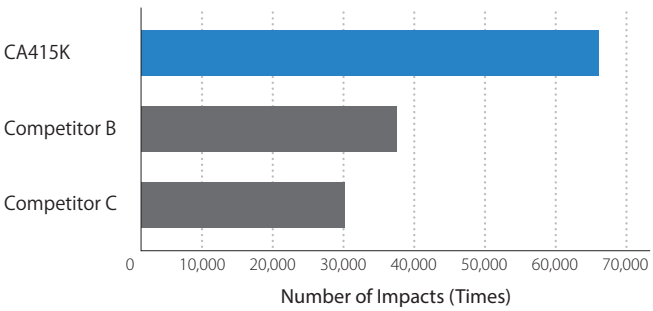
CA415K



Conventional Product (K15)



Chipping Resistance Comparison (Internal Evaluation)



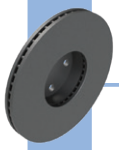
Vc = 590 sfm, D.O.C. = 0.059", f = 0.0157 ipr 80-60-03 Wet CNMG 433KH

4 Extensive chipbreaker lineup for a wide range of machining operations

Focus on Sharpness

Continuous machining

Low rigidity workpiece

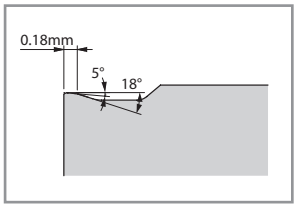


KQ Chipbreaker

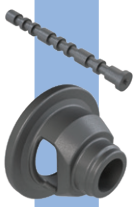
Recommended for continuous machining

Suitable for machining that requires sharpness such as thin workpieces

e.g.) D.O.C. = 0.020", f =0.008 ipr



Lightly interrupted/ Interruption

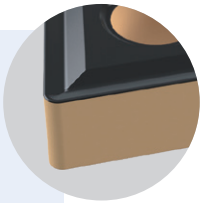


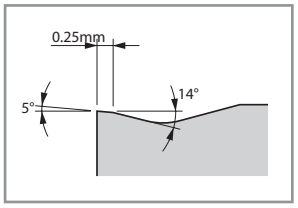
Standard

General purpose

Low cutting force

e.g.) D.O.C. = 0.079", f = 0.012 ipr



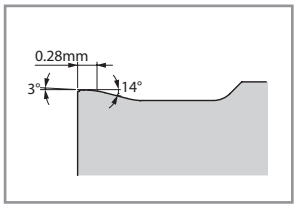


KG Chipbreaker

General purpose

Excellent sharpness and cutting edge strength

e.g.) D.O.C. = 0.079", f = 0.012 ipr



ZS Chipbreaker

Back-up chipbreaker for roughing

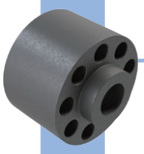
Sharpness and cutting edge strength

e.g.) D.O.C. = 0.118", f = 0.012 ipr

To suppress burr and chipping

Heavy interruption

High rigidity workpiece

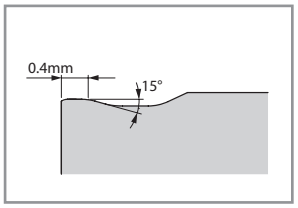


KH Chipbreaker

Recommended for heavy interruption machining

Suppresses vibration and cutting edge movement during machining with high seating stability

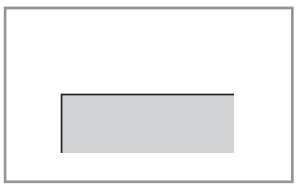
e.g.) D.O.C. = 0.118", f = 0.016 ipr



Without chipbreaker

Focus on toughness

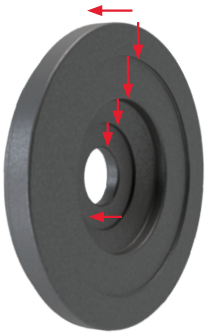
e.g.) D.O.C. = 0.118", f = 0.016 ipr



Focus on Toughness

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)

Number of Parts
CA415K 10 pcs/edge
Competitor D 5 pcs/edge
Tool Life 2x

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

Number of parts
CA415K 10 pcs/edge
Competitor D 5 pcs/edge
Tool Life 2x

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 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
Competitor A 40 pcs/edge
Tool Life 1.8x

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

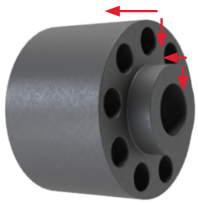
Vc = 750 sfm (Interrupted section 460 sfm)
D.O.C. = 0.039" ~ 0.118"
f = 0.012 ipr
Wet
WNMG433KH (CA415K)

Number of Parts
CA415K 200 pcs/edge 
Competitor C 100 pcs/edge 
Tool Life 2x

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



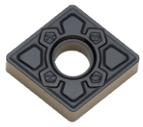
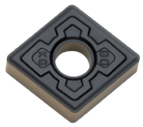
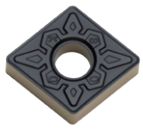
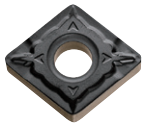
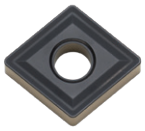
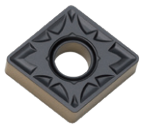
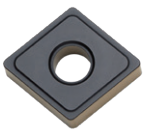
Vc = 390 sfm
D.O.C. = 0.118"
f = 0.014 ipr
Wet
CNMA432 (CA415K)

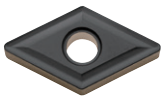
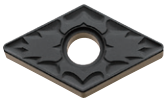
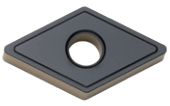
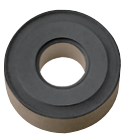
Number of Parts
CA415K 150 pcs/edge (Stable)
Competitor E (K05) 100 pcs/edge (Unstable)
Tool Life 1.5x

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

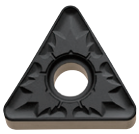
Shape	Part Number	Dimensions (in)				CA410K	CA415K
		IC	Thickness	Hole Dia.	Corner R (RE)		
 Roughing	CNMG 432KH	1/2	3/16	0.203	1/32	●	●
	CNMG 433KH				3/64	●	●
	CNMG 434KH				1/16	●	●
 Medium - Roughing	CNMG 431KG	1/2	3/16	0.203	1/64	●	●
	CNMG 432KG				1/32	●	●
	CNMG 433KG				3/64	●	●
 Finishing	CNMG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

Shape	Part Number	Dimensions (in)				CA410K	CA415K
		IC	Thickness	Hole Dia.	Corner R (RE)		
	DNMG 432KH	1/2	3/16	0.203	1/32	●	●
	DNMG 433KH				3/64	●	●
	DNMG 442KH	1/2	1/4	0.203	1/32	●	●
	DNMG 443KH				3/64	●	●
 Medium - Roughing	DNMG 431KG	1/2	3/16	0.203	1/64	●	●
	DNMG 432KG				1/32	●	●
	DNMG 433KG				3/64	●	●
	DNMG 441KG	1/2	1/4	0.203	1/64	●	●
	DNMG 442KG				1/32	●	●
	DNMG 443KG				3/64	●	●
 Finishing	DNMG 431KQ	1/2	3/16	0.203	1/64	●	●
	DNMG 432KQ				1/32	●	●
	DNMG 441KQ	1/2	1/4	0.203	1/64	●	●
	DNMG 442KQ				1/32	●	●
 Medium - Roughing	DNMG 431	1/2	3/16	0.203	1/64	●	●
	DNMG 432				1/32	●	●
	DNMG 433				3/64	●	●
	DNMG 441	1/2	1/4	0.203	1/64	●	●
	DNMG 442				1/32	●	●
	DNMG 443				3/64	●	●
 Roughing	DNMG 432ZS	1/2	3/16	0.203	1/32	●	●
	DNMG 433ZS				3/64	●	●
	DNMG 442ZS	1/2	1/4	0.203	1/32	●	●
	DNMG 443ZS				3/64	●	●
 Without Chipbreaker	DNMA 431	1/2	3/16	0.203	1/64	●	●
	DNMA 432				1/32	●	●
	DNMA 441	1/2	1/4	0.203	1/64	●	●
	DNMA 442				1/32	●	●
 Medium - Roughing	RNMG 43	1/2	3/16	0.203	-		●
	RNMG 54	5/8	1/4	0.250	-		●

● : Standard Item

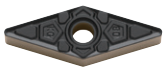
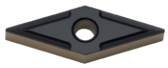
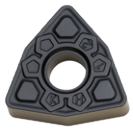
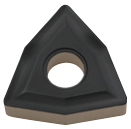
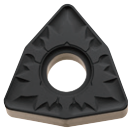
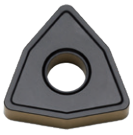
Negative Inserts

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	●	●
	SNMG 433KH				3/64	●	●
	SNMG 434KH				1/16	●	●
 Medium - Roughing	SNMG 432KG	1/2	3/16	0.203	1/32	●	●
	SNMG 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	●	●
	SNMG 432				1/32	●	●
	SNMG 433				3/64	●	●
	SNMG 434				1/16	●	●
	SNMG 435				5/64	●	●
 Roughing	SNMG 432ZS	1/2	3/16	0.203	1/32	●	●
	SNMG 433ZS				3/64	●	●
 Without Chipbreaker	SNMA 431	1/2	3/16	0.203	1/64	●	●
	SNMA 432				1/32	●	●
	SNMA 433				3/64	●	●
	SNMA 434				1/16	●	●
	SNMA 435				5/64	●	●
 Without Chipbreaker	SNMN 432	1/2	3/16	-	1/32	●	●
	SNMN 433				3/64	●	●

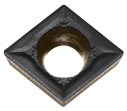
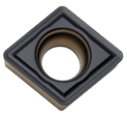
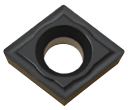
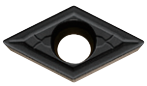
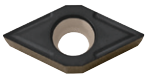
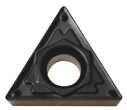
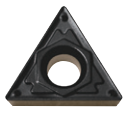
Shape	Part Number	Dimensions (in)				CA410K	CA415K
		IC	Thickness	Hole Dia.	Corner R (RE)		
 Roughing	TNMG 332KH	3/8	3/16	0.150	1/32	●	●
	TNMG 333KH				3/64	●	●
	TNMG 334KH				1/16	●	●
 Medium - Roughing	TNMG 331KG	3/8	3/16	0.150	1/64	●	●
	TNMG 332KG				1/32	●	●
	TNMG 333KG				3/64	●	●
 Finishing	TNMG 331KQ	3/8	3/16	0.150	1/64	●	●
	TNMG 332KQ				1/32	●	●
 Medium - Roughing	TNMG 331	3/8	3/16	0.150	1/64	●	●
	TNMG 332				1/32	●	●
	TNMG 333				3/64	●	●
	TNMG 334				1/16	●	●
	TNMG 335				5/64	●	●
	TNMG 431	1/2	3/16	0.203	1/64	●	●
	TNMG 432				1/32	●	●
	TNMG 433				3/64	●	●
 Roughing	TNMG 332ZS	3/8	3/16	0.150	1/32	●	●
	TNMG 333ZS				3/64	●	●
 Without Chipbreaker	TNMA 331	3/8	3/16	0.150	1/64	●	●
	TNMA 332				1/32	●	●
	TNMA 333				3/64	●	●
	TNMA 334				1/16	●	●
	TNMA 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	-	●	●
 Without Chipbreaker	SPMN 421	1/2	1/8	-	1/64	●	●
	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

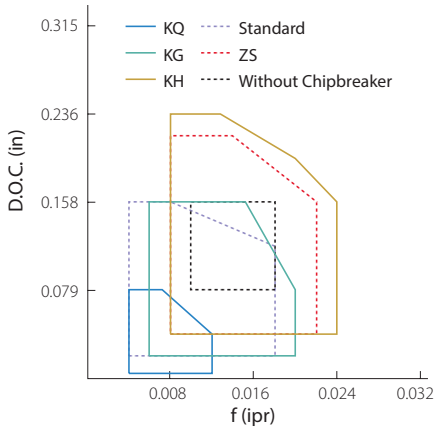
CA410K 1st Recommendation: Continuous Machining

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

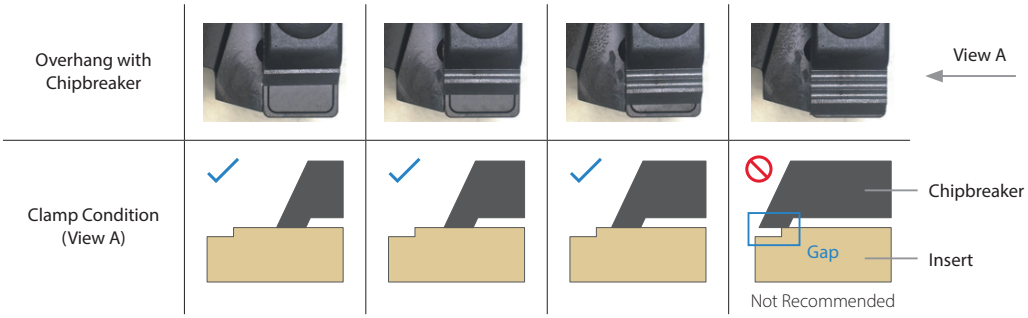
Installing SNMN Insert into toolholder

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



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

KYOCERA

KYOCERA Precision Tools

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