CVD Coated Carbide for Cast Iron

CA410K/CA415K NEW

Achieve 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

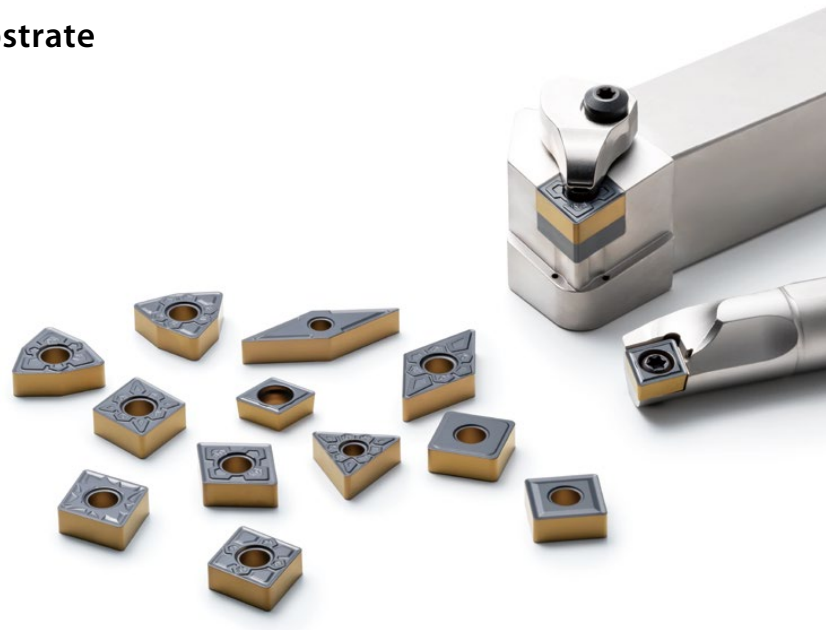
1st recommendation : Continuous machining

Designed for wear resistance

CA415K

1st recommendation :
Interrupted/heavily interrupted machining

Designed for stability



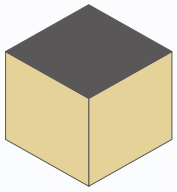
CVD Coated Carbide for Cast Iron

CA410K/CA415K

Machining video

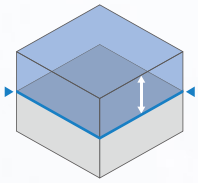
Newly developed coating and carbide substrate drastically extend tool life
Large lineup for a wide range of machining applications

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

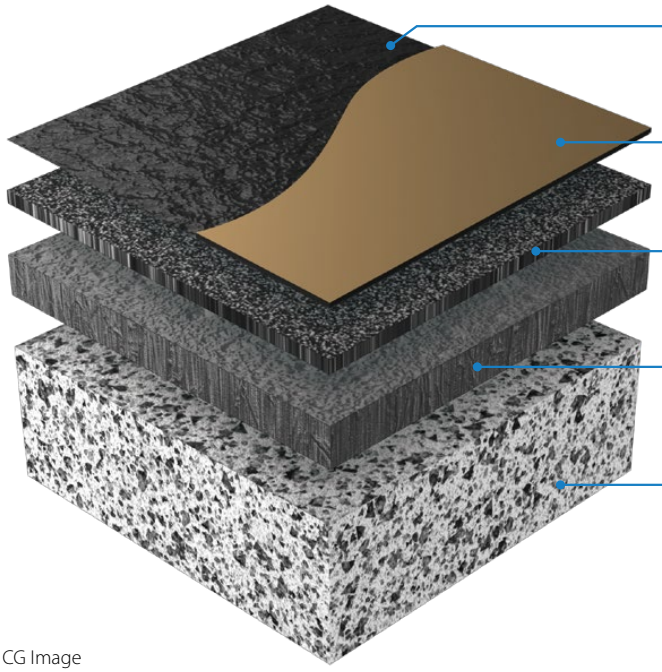
Camshaft

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

CG Image

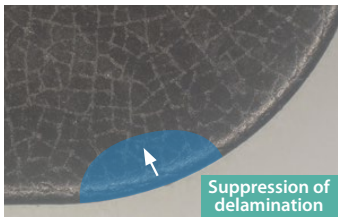
Rake face

Mesh processing technology Unique Technology

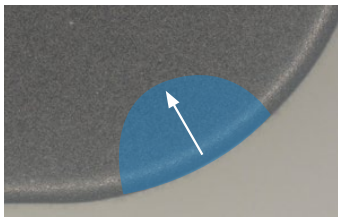
Special surface treatment technology reduces residual stress in coatings
The mesh pattern suppresses the progression of delamination and maintains excellent chipping resistance

Example of delamination ■ Area of delamination

Meshed

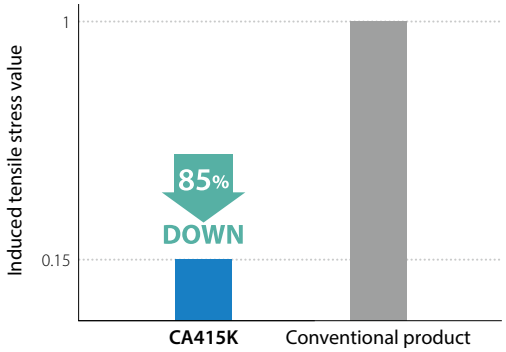


No mesh



Induced stress comparison (Internal evaluation)

Conventional product as 1

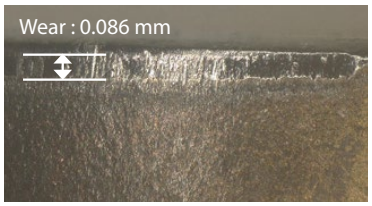


Flank face

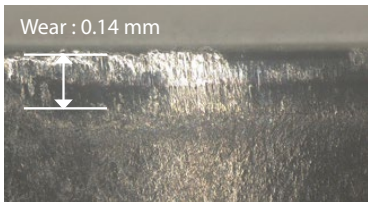
High hardness layer

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

With high hardness layer



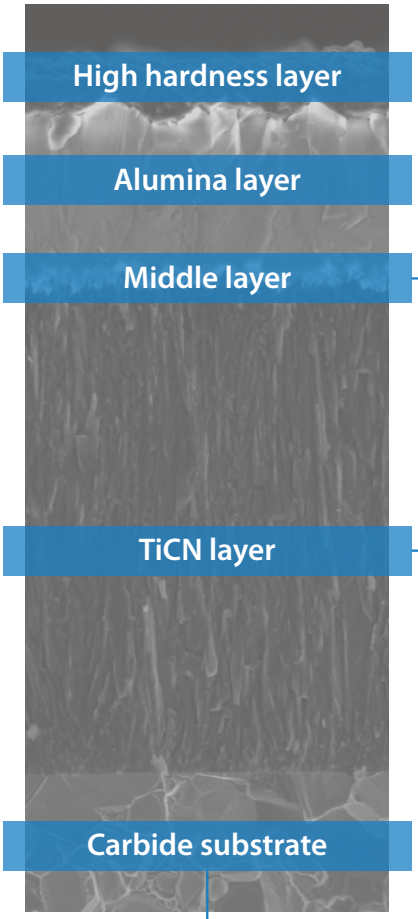
Without high hardness layer



Vc = 210 m/min, ap = 1.5 mm, f = 0.4 mm/rev Wet FCD600 CNMA120412 (Internal evaluation)

2 Thick layer and strong adhesion
Stable machining through suppressed wear and delamination

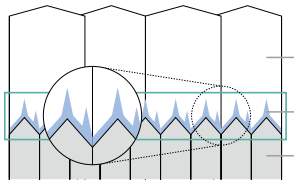
CA415K Coating cross-section



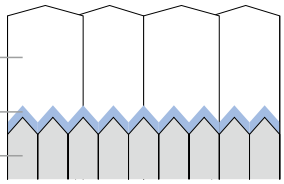
Middle layer

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

CA410K/CA415K



Conventional product

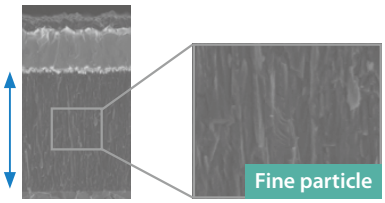


Refined middle layer provides an anchor effect

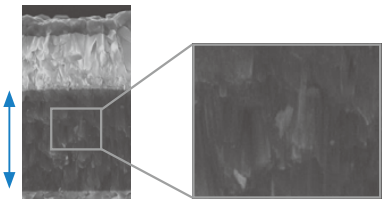
TiCN layer

Thick layer improves wear resistance

CA415K

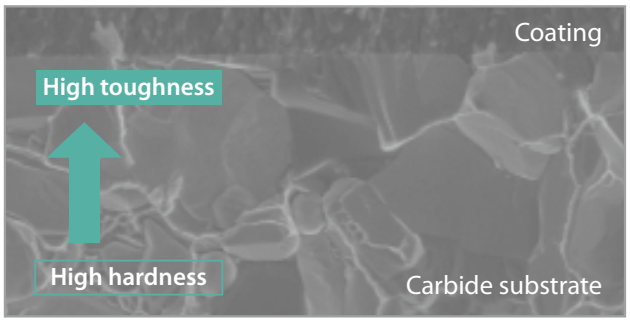


Conventional product (K15)

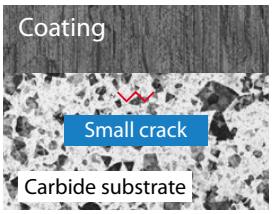


Surface-hardened technology Unique Technology

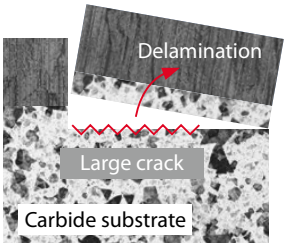
Improved carbide toughness. Crack resistance near coating suppresses delamination



Example of delamination

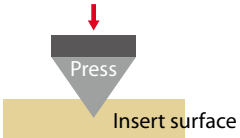


New carbide substrate

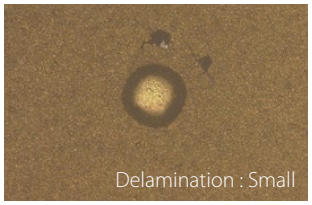


Conventional carbide substrate

Adhesion comparison
(Internal evaluation)



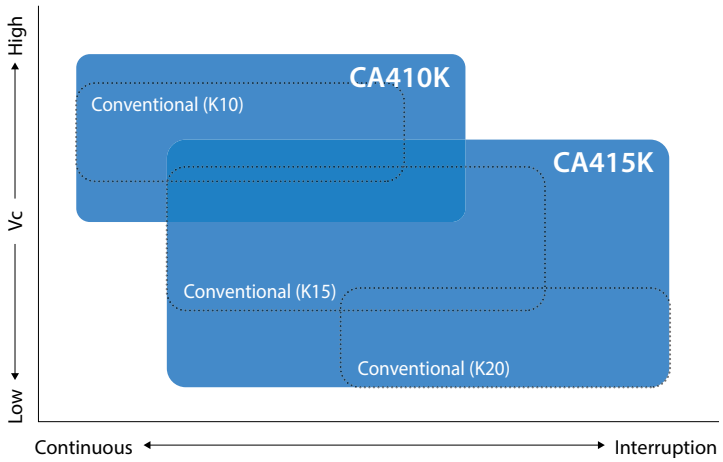
New carbide substrate



Conventional carbide substrate

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

Application map

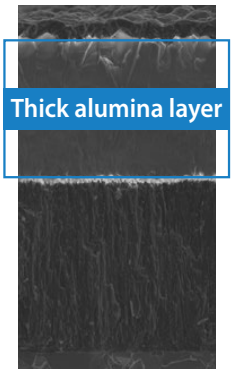


CA410K

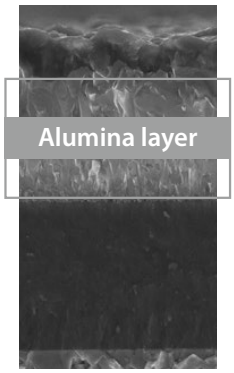
1st recommendation : Continuous machining

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

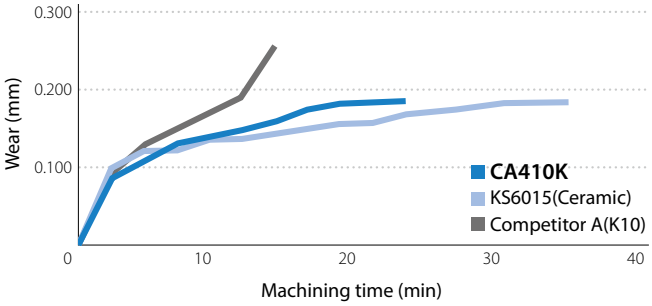
CA410K



Conventional product (K10)



Wear resistance comparison (Internal evaluation)



Vc = 600 m/min, ap = 1.5 mm, f = 0.3 mm/rev FC230 Dry CNMG120412KG

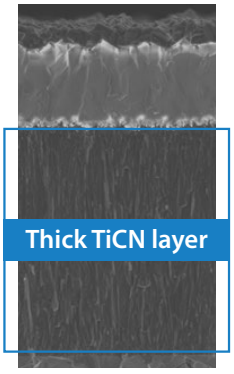
CA410K achieves high wear resistance close to ceramics

CA415K

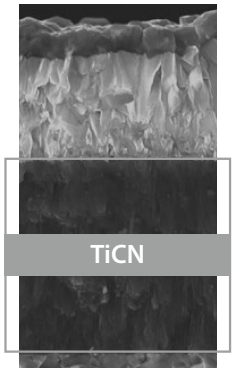
1st recommendation : Interrupted/heavy interrupted machining

Thick, micro TiCN layer. Stable machining with high wear and chipping resistance

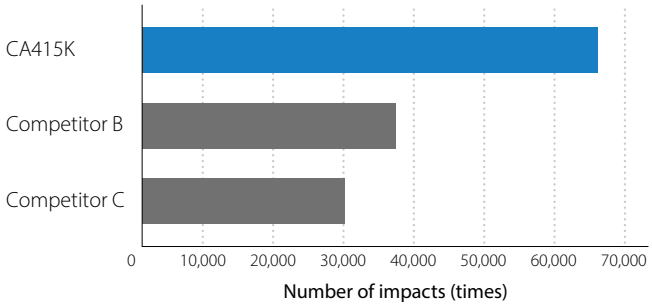
CA415K



Conventional product (K15)



Chipping resistance comparison (Internal evaluation)

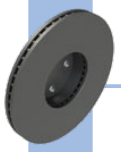


Vc = 180 m/min, ap = 1.5 mm, f = 0.4 mm/rev FCD600 Wet CNMG120412KH

4 Extensive Chipbreaker lineup for a wide range of machining operations

Focus on sharpness

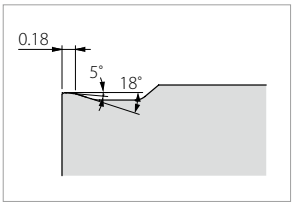
Continuous machining
Low rigidity workpiece



KQ Chipbreaker

Recommended for continuous machining
Suitable for machining that requires sharpness such as thin workpieces

e.g.) ap = 0.5 mm, f = 0.2 mm/rev

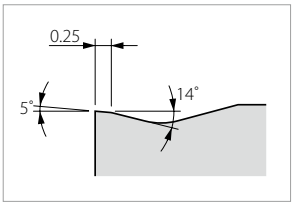


Lightly interrupted/ Interruption

Standard

General purpose
Low cutting force

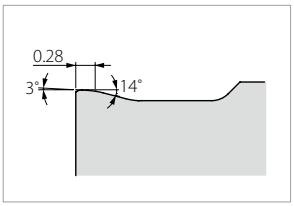
e.g.) ap = 2 mm, f = 0.3 mm/rev



KG Chipbreaker

General purpose
Excellent sharpness and cutting edge strength

e.g.) ap = 2 mm, f = 0.3 mm/rev



ZS Chipbreaker

Back-up chipbreaker for roughing
Sharpness and cutting edge strength

e.g.) ap = 3 mm, f = 0.3 mm/rev

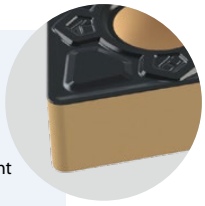
To suppress burr and chipping

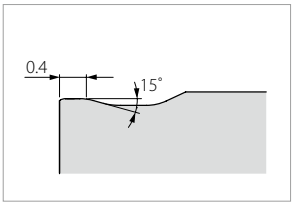
Heavy interruption
High rigidity workpiece

KH Chipbreaker

Recommended for heavy interruption machining
Suppresses vibration and cutting edge movement during machining with high seating stability

e.g.) ap = 3 mm, f = 0.4 mm/rev

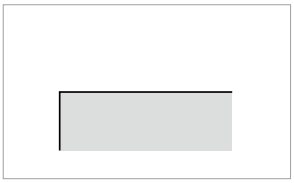




Without chipbreaker

Focus on toughness

e.g.) ap = 3 mm, f = 0.4 mm/rev



Focus on toughness

Case study

Flywheel FCD600

1) External turning / facing (roughing)
Vc = 130 m/min, ap = 1.5 mm, f = 0.25 mm/rev Wet
CNMG120412KQ (CA415K)

Number of parts
CA415K **10 pcs/corner**
Competitor D **5 pcs/corner**
Tool life **2x**

2) Internal turning
Vc = 130 m/min, ap = 1.5 mm, f = 0.25 mm/rev Wet
CNMG120412KQ (CA415K)

Number of parts
CA415K **10 pcs/corner**
Competitor D **5 pcs/corner**
Tool life **2x**

3) External turning / facing (finishing)
Vc = 180 m/min, ap = 3 mm, f = 0.1 ~ 0.15 mm/rev Wet
CNMG120408KQ (CA415K)

Number of parts
CA415K **14 pcs/corner**
Competitor D **10 pcs/corner**
Tool life **1.4x**

Achieved extended tool life in both roughing and finishing processes. 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 FCD700

Vc = 140 m/min
ap = 1 mm
f = 0.22 mm/rev
Wet
TNMG160408KQ (CA410K)

Number of parts
CA410K **75 pcs/corner**
Competitor A **40 pcs/corner**
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 FCD450

Vc = 230 m/min
(Interrupted area 140 m/min)
ap = 1 ~ 3 mm
f = 0.3 mm/rev
Wet
WNMG080412KH (CA415K)

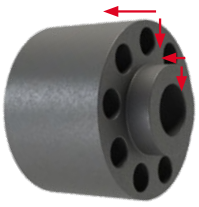
Number of parts
CA415K **200 pcs/corner**

Competitor C **100 pcs/corner**

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 intermittent cutting sections. (User evaluation)

Cylinder FCD600



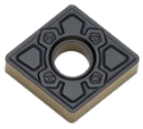
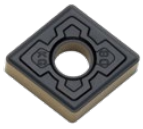
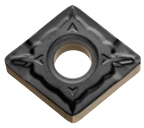
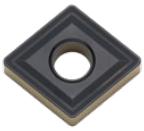
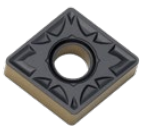
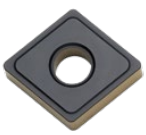
Vc = 120 m/min
ap = 3 mm
f = 0.35 mm/rev
Wet
CNMA120408 (CA415K)

Number of parts
CA415K **150 pcs/corner** (Stable)
Competitor E (K05) **100 pcs/corner** (Unstable)
Tool life **1.5x**

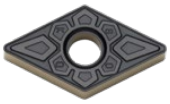
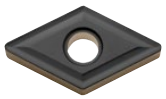
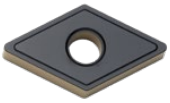
Variations in tool life during intermittent machining were a challenge, but with CA415K (w/o chipbreaker), stable machining was achieved. Even after machining longer than the set lifespan of competitor products, the cutting edge remained in good condition.

(User evaluation)

Stock items (Negative)

Shape	Description	Dimensions(mm)				CA410K	CA415K
		IC	Thickness	Hole diameter	Corner R (RE)		
 Roughing	CNMG 120408KH 120412KH 120416KH	12.7	4.76	5.16	0.8 1.2 1.6	● ● ●	● ● ●
 Medium roughing - Roughing	CNMG 120404KG 120408KG 120412KG	12.7	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●
 Finishing	CNMG 120404KQ 120408KQ 120412KQ	12.7	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●
 Finishing - Medium finishing With wiper edge	CNMG 120408WQ 120412WQ	12.7	4.76	5.16	0.8 1.2	● ●	● ●
 Medium roughing - Roughing	CNMG 120404 120408 120412 120416	12.7	4.76	5.16	0.4 0.8 1.2 1.6	● ● ● ●	● ● ● ●
	CNMG 160612 160616	15.875	6.35	6.35	1.2 1.6	● ●	● ●
	CNMG 190608 190612 190616	19.05	6.35	7.94	0.8 1.2 1.6	● ● ●	● ● ●
 Roughing	CNMG 120408ZS 120412ZS	12.7	4.76	5.16	0.8 1.2	● ●	● ●
 Without chipbreaker	CNMA 120404 120408 120412 120416	12.7	4.76	5.16	0.4 0.8 1.2 1.6	● ● ● ●	● ● ● ●

● : Available

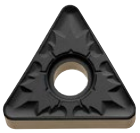
Shape	Description	Dimensions(mm)				CA410K	CA415K
		IC	Thickness	Hole diameter	Corner R (RE)		
 Roughing	DNMG 150408KH 150412KH	12.7	4.76	5.16	0.8 1.2	● ●	● ●
	DNMG 150608KH 150612KH	12.7	6.35	5.16	0.8 1.2	● ●	● ●
 Medium roughing - Roughing	DNMG 150404KG 150408KG 150412KG	12.7	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●
	DNMG 150604KG 150608KG 150612KG	12.7	6.35	5.16	0.4 0.8 1.2	● ● ●	● ● ●
 Finishing	DNMG 150404KQ 150408KQ	12.7	4.76	5.16	0.4 0.8	● ●	● ●
	DNMG 150604KQ 150608KQ	12.7	6.35	5.16	0.4 0.8	● ●	● ●
 Medium roughing - Roughing	DNMG 150404 150408 150412	12.7	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●
	DNMG 150604 150608 150612	12.7	6.35	5.16	0.4 0.8 1.2	● ● ●	● ● ●
 Roughing	DNMG 150408ZS 150412ZS	12.7	4.76	5.16	0.8 1.2	● ●	● ●
	DNMG 150608ZS 150612ZS	12.7	6.35	5.16	0.8 1.2	● ●	● ●
 Without chipbreaker	DNMA 150404 150408	12.7	4.76	5.16	0.4 0.8	● ●	● ●
	DNMA 150604 150608	12.7	6.35	5.16	0.4 0.8	● ●	● ●
 Medium roughing - Roughing	RNMG 120400	12.7	4.76	5.16	–	●	●
	RNMG 150600	15.875	6.35	6.35	–	●	●

● : Available

Stock items (Negative)

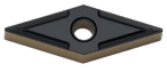
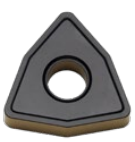
Shape	Description	Dimensions(mm) IC	Thickness	Hole diameter	Corner R (RE)	CA410K	CA415K
 Roughing	SNMG 120408KH 120412KH 120416KH	12.7	4.76	5.16	0.8 1.2 1.6	● ● ●	● ● ●
 Medium roughing - Roughing	SNMG 120408KG 120412KG	12.7	4.76	5.16	0.8 1.2	● ●	● ●
 Medium roughing - Roughing	SNMG 090308	9.525	3.18	3.81	0.8	●	●
	SNMG 120404 120408 120412 120416 120420	12.7	4.76	5.16	0.4 0.8 1.2 1.6 2.0	● ● ● ● ●	● ● ● ● ●
 Roughing	SNMG 120408ZS 120412ZS	12.7	4.76	5.16	0.8 1.2	● ●	● ●
 Without chipbreaker	SNMA 120404 120408 120412 120416 120420	12.7	4.76	5.16	0.4 0.8 1.2 1.6 2.0	● ● ● ● ●	● ● ● ● ●
 Without chipbreaker	SNMN 120408 120412	12.7	4.76	–	0.8 1.2	● ●	● ●

● : Available

Shape	Description	Dimensions(mm) IC	Thickness	Hole diameter	Corner R (RE)	CA410K	CA415K
 Roughing	TNMG 160408KH 160412KH 160416KH	9.525	4.76	3.81	0.8 1.2 1.6	● ● ●	● ● ●
 Medium roughing - Roughing	TNMG 160404KG 160408KG 160412KG	9.525	4.76	3.81	0.4 0.8 1.2	● ● ●	● ● ●
 Finishing	TNMG 160404KQ 160408KQ	9.525	4.76	3.81	0.4 0.8	● ●	● ●
 Medium roughing - Roughing	TNMG 160404 160408 160412 160416 160420	9.525	4.76	3.81	0.4 0.8 1.2 1.6 2.0	● ● ● ● ●	● ● ● ● ●
	TNMG 220404 220408 220412	12.7	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●
 Roughing	TNMG 160408ZS 160412ZS	9.525	4.76	3.81	0.8 1.2	● ●	● ●
 Without chipbreaker	TNMA 160404 160408 160412 160416 160420	9.525	4.76	3.81	0.4 0.8 1.2 1.6 2.0	● ● ● ● ●	● ● ● ● ●

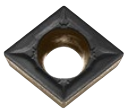
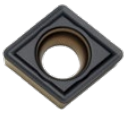
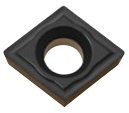
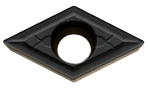
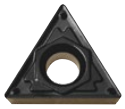
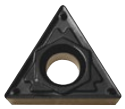
● : Available

Stock items (Negative)

Shape	Description	Dimensions(mm) IC	Thickness	Hole diameter	Corner R (RE)	CA410K	CA415K
 Roughing	VNMG 160408KH 160412KH	9.525	4.76	3.81	0.8 1.2	● ●	● ●
 Medium roughing - Roughing	VNMG 160408KG 160412KG	9.525	4.76	3.81	0.8 1.2	● ●	● ●
 Medium roughing - Roughing	VNMG 160404 160408	9.525	4.76	3.81	0.4 0.8	● ●	● ●
 Roughing	WNMG 080408KH 080412KH 080416KH	12.7	4.76	5.16	0.8 1.2 1.6	● ● ●	● ● ●
 Medium roughing - Roughing	WNMG 080404KG 080408KG 080412KG	12.7	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●
 Finishing	WNMG 080404KQ 080408KQ 080412KQ	12.7	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●
 Medium roughing - Roughing	WNMG 080404 080408 080412	12.7	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●
 Roughing	WNMG 080408ZS 080412ZS	12.7	4.76	5.16	0.8 1.2	● ●	● ●
 Without chipbreaker	WNMA 080408 080412	12.7	4.76	5.16	0.8 1.2	● ●	● ●

● : Available

Stock items (Positive)

Shape	Description	Dimensions(mm) IC	Thickness	Hole diameter	Corner R (RE)	Relief Angle	CA410K	CA415K
 Finishing - Medium roughing	CCMT 060204GK	6.35	2.38	2.8	0.4	7°	●	●
	CCMT 09T304GK	9.525	3.97	4.4	0.4	7°	●	●
	CCMT 120404GK 120408GK	12.7	4.76	5.5	0.4 0.8	7°	● ●	● ●
 Medium roughing	CCMT 09T308	9.525	3.97	4.4	0.8	7°	●	●
 Medium roughing	CPMH 080204 080208	7.94	2.38	3.5	0.4 0.8	11°	● ●	● ●
	CPMH 090304 090308	9.525	3.18	4.5	0.4 0.8	11°	● ●	● ●
 Finishing - Medium roughing	DCMT 070204GK 070208GK	6.35	2.38	2.8	0.4 0.8	7°	● ●	● ●
	DCMT 11T304GK 11T308GK	9.525	3.97	4.4	0.4 0.8	7°	● ●	● ●
 Medium roughing	DCMT 11T308	9.525	3.97	4.4	0.8	7°	●	●
 Medium roughing	RCMX 1204M0	12.0	4.76	4.2	–	7°	●	●
 Without chipbreaker	SPMN 120304 120308	12.7	3.18	–	0.4 0.8	11°	● ●	● ●
	SPMN 120408 120412	12.7	4.76	–	0.8 1.2	11°	● ●	● ●
 Finishing - Medium roughing	TCMT 110204HQ 110208HQ	6.35	2.38	2.8	0.4 0.8	7°	● ●	● ●
	TCMT 16T308HQ 16T312HQ	9.525	3.97	4.4	0.8 1.2	7°	● ●	● ●
 Finishing - Medium roughing	TPMT 110304HQ 110308HQ	6.35	3.18	3.3	0.4 0.8	11°	● ●	● ●
	TPMT 160304HQ 160308HQ	9.525	3.18	4.7	0.4 0.8	11°	● ●	● ●
 Medium roughing	TPMR 110304 110308	6.35	3.18	–	0.4 0.8	11°	● ●	● ●
	TPMR 160304 160308	9.525	3.18	–	0.4 0.8	11°	● ●	● ●
 Without chipbreaker	TPMN 110304 110308	6.35	3.18	–	0.4 0.8	11°	● ●	● ●
	TPMN 160304 160308 160312	9.525	3.18	–	0.4 0.8 1.2	11°	● ● ●	● ● ●

● : Available

Recommended cutting conditions

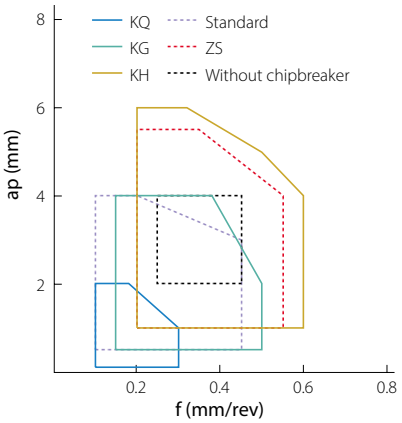
CA410K 1st recommendation : Continuous machining

CA415K 1st recommendation : Interrupted/heavy interrupted machining

Workpiece material	Application	Vc (m/min)	
		CA410K	CA415K
Gray cast iron (FC)	Continuous	200 - **400** - 700	180 - **300** - 450
	Lightly interrupted ~ Interruption		
	Heavily interrupted		
Ductile cast iron (FCD)	Continuous	200 - **350** - 500	150 - **250** - 350
	Lightly interrupted ~ Interruption		
	Heavily interrupted	-	
Ductile cast iron (FCD)	Continuous	160 - **250** - 400	120 - **180** - 250
	Lightly interrupted ~ Interruption	-	
	Heavily interrupted		

Applicable chipbreaker range

CNM□120408 Type



Precautions

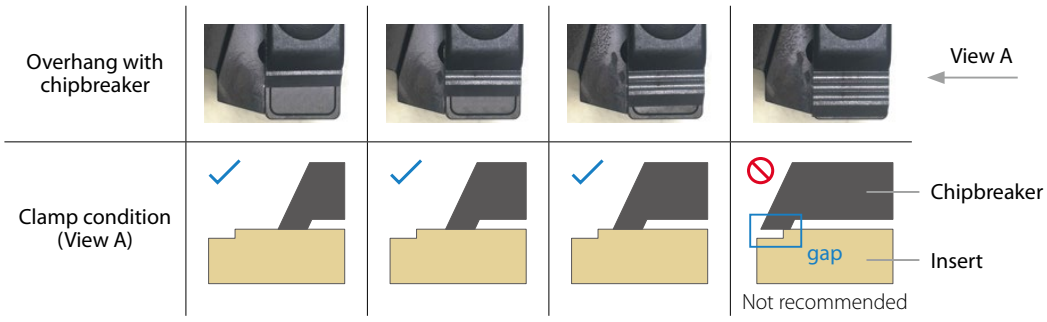
Installing SNMN Insert into toolholder

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 : SNMN1204... (CA410K/CA415K)

Holders : CS□N R/L 2020K-12, CS□N R/L 2525M-12, CSRN R/L 3225P-12, CS-N R/L 2525M-12

Overhang of the chipbreaker and the clamp condition



SNMN1204… (CA310/CA315/CA320) can be installed.

CP500 CAT/38T2504JPS