

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

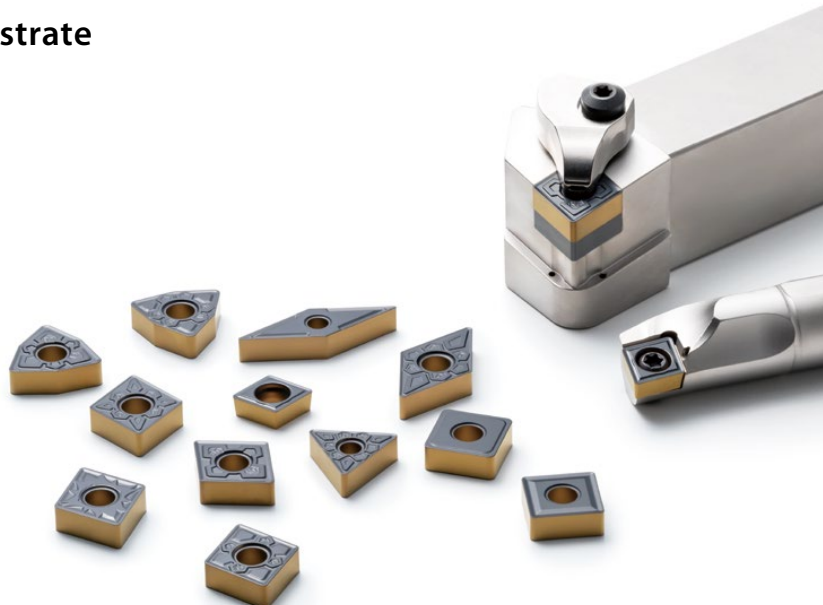
Designed for wear resistance

CA415K

1st recommendation :

Interrupted/heavily interrupted machining

Designed for stability



CVD Coated Carbide for Cast Iron

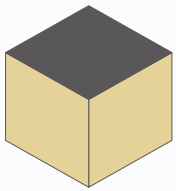
CA410K/CA415K



Machining video

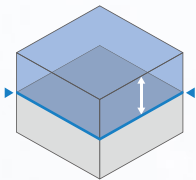
Newly developed coating and carbide substrate drastically extend tool life
Large lineup for a wide range of machining applications

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



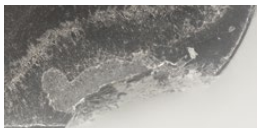
Thick layer and strong adhesion

Durability required for cast iron machining
More resistant to delamination and wear for stable machining



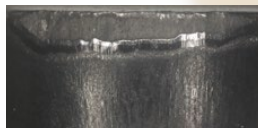
Problem

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

T E C H N O L O G Y

For steel **P**

CA115P/CA125P



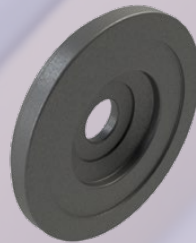
For cast iron **K**

CA410K/CA415K



Support various machining applications

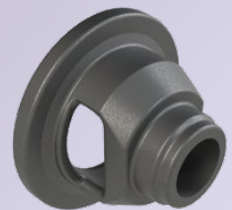
Flywheel



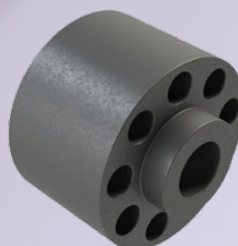
Camshaft



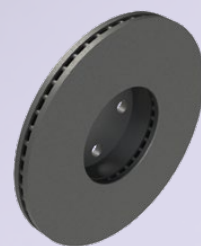
Differential gear case



Cylinder

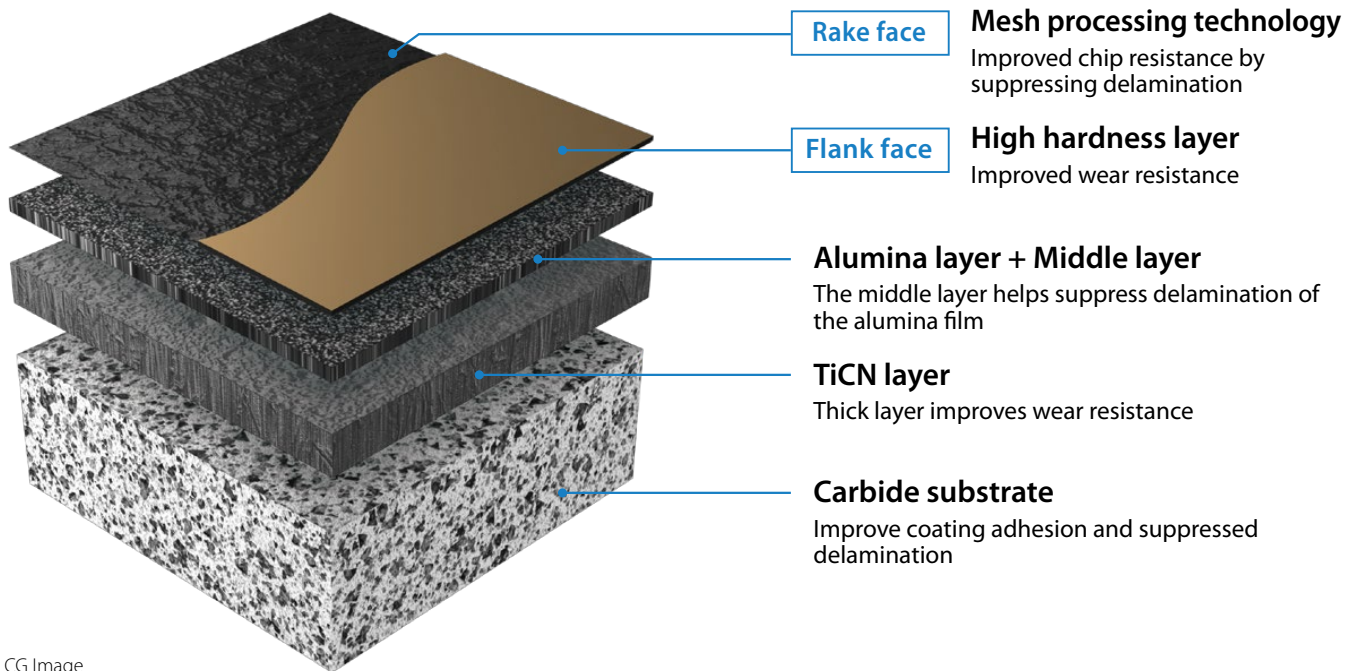


Brake disc



1

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



CG Image

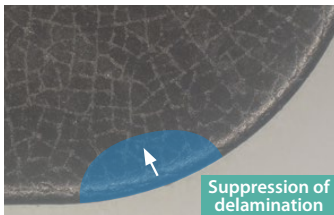
Rake face

Mesh processing technology Unique Technology

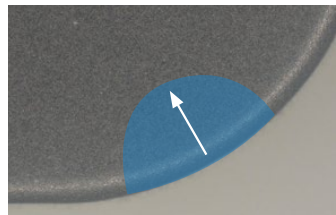
Special surface treatment technology reduces residual stress in coatings
The mesh pattern suppresses the progression of delamination and maintains excellent chipping resistance

Example of delamination ■ Area of delamination

Meshed

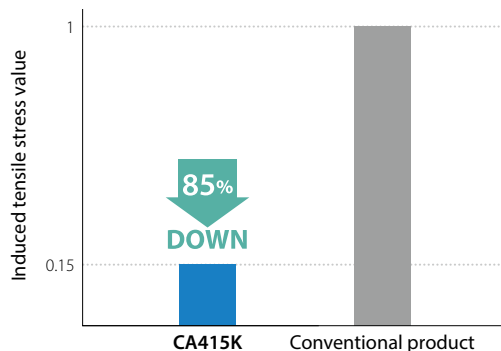


No mesh



Induced stress comparison (Internal evaluation)

Conventional product as 1

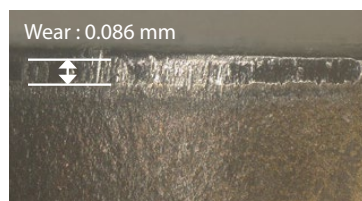


Flank face

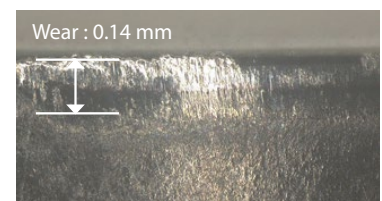
High hardness layer

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



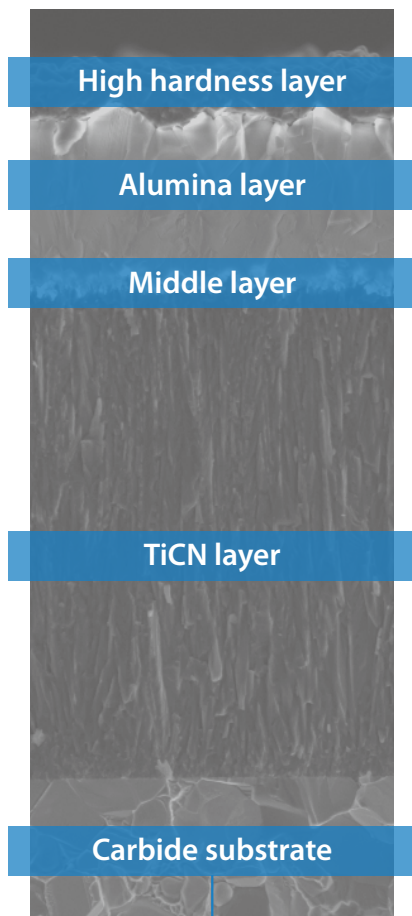
$V_c = 210 \text{ m/min}$, $a_p = 1.5 \text{ mm}$, $f = 0.4 \text{ mm/rev}$ Wet FCD600 CNMA120412 (Internal evaluation)

2

Thick layer and strong adhesion

Stable machining through suppressed wear and delamination

CA415K Coating cross-section

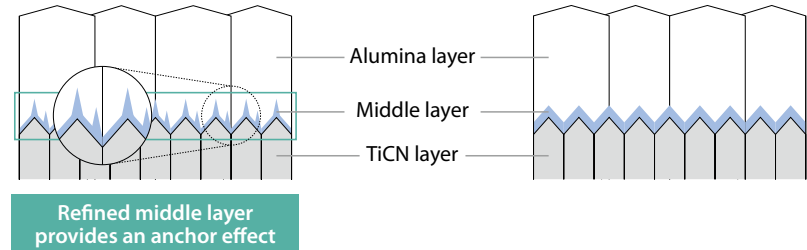


Middle layer

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

CA410K/CA415K

Conventional product

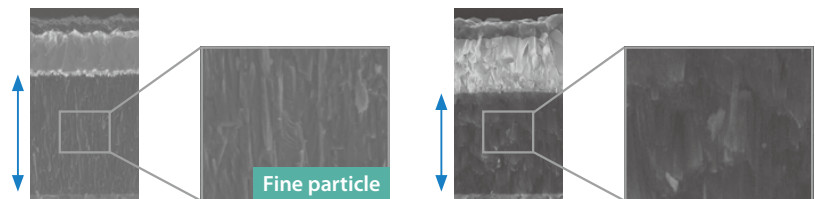


TiCN layer

Thick layer improves wear resistance

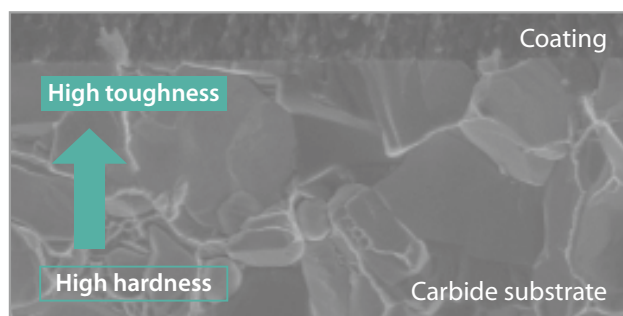
CA415K

Conventional product (K15)

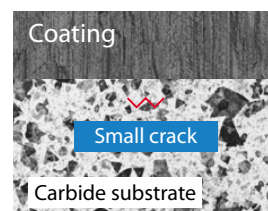


Surface-hardened technology Unique Technology

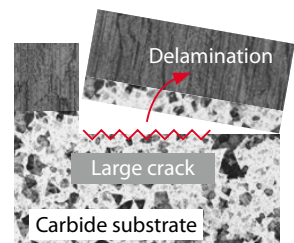
Improved carbide toughness. Crack resistance near coating suppresses delamination



Example of delamination

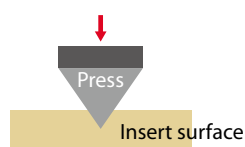


New carbide substrate

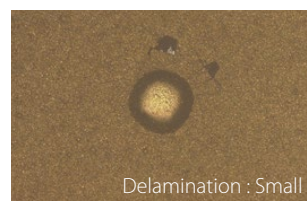


Conventional carbide substrate

Adhesion comparison (Internal evaluation)



New carbide substrate



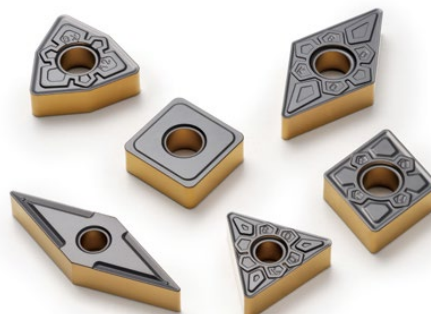
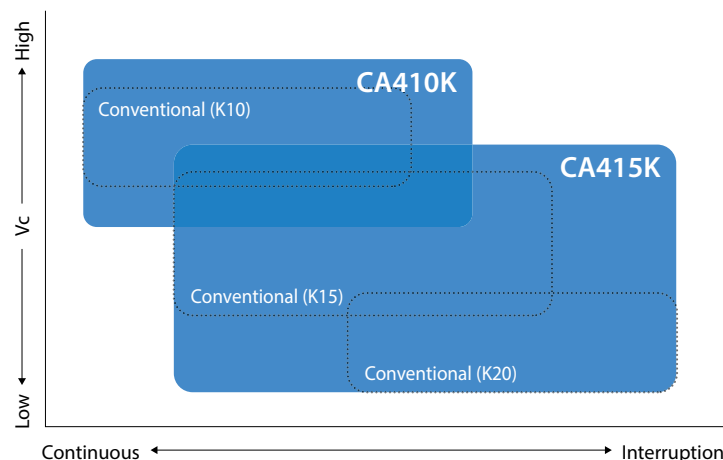
Conventional carbide substrate



3

Grades CA410K for high-speed machining and CA415K for stability

Application map

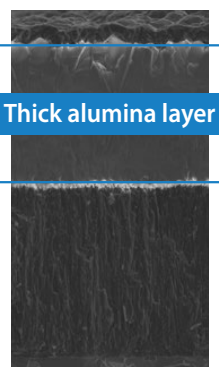


CA410K

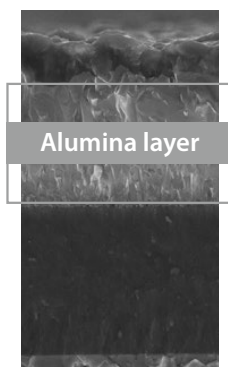
1st recommendation : Continuous machining

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

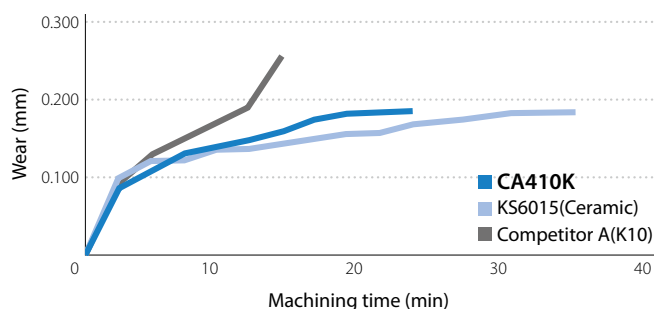
CA410K



Conventional product (K10)



Wear resistance comparison (Internal evaluation)



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

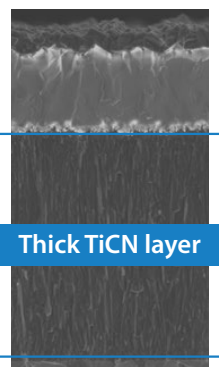
CA410K achieves high wear resistance close to ceramics

CA415K

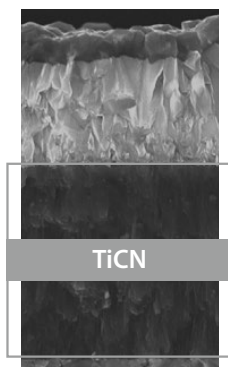
1st recommendation : Interrupted/heavy interrupted machining

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

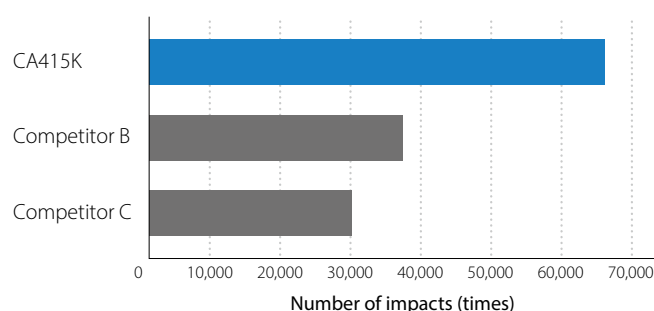
CA415K



Conventional product (K15)



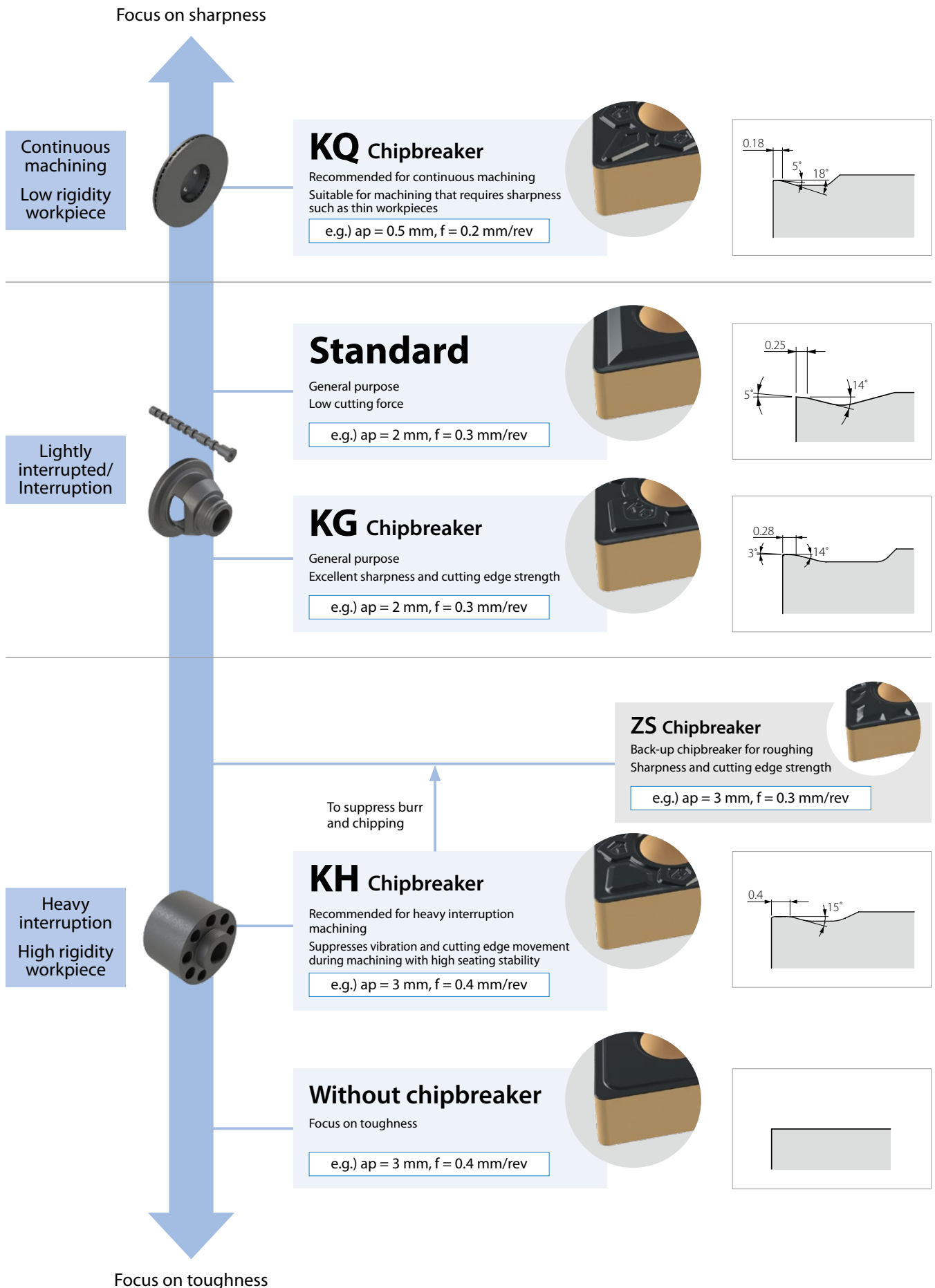
Chipping resistance comparison (Internal evaluation)



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

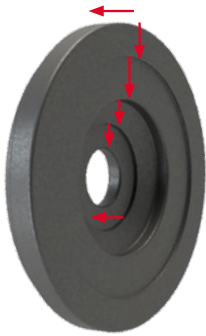
4

Extensive Chipbreaker lineup for a wide range of machining operations



Case study

Flywheel FCD600



1) External turning / facing (roughing)

$V_c = 130$ m/min, $a_p = 1.5$ mm, $f = 0.25$ mm/rev Wet
CNMG120412KQ (CA415K)

Number of parts

CA415K 10 pcs/corner

Tool life

2x

Competitor D 5 pcs/corner

2) Internal turning

$V_c = 130$ m/min, $a_p = 1.5$ mm, $f = 0.25$ mm/rev Wet
CNMG120412KQ (CA415K)

Number of parts

CA415K 10 pcs/corner

Tool life

2x

Competitor D 5 pcs/corner

3) External turning / facing (finishing)

$V_c = 180$ m/min, $a_p = 3$ mm, $f = 0.1 \sim 0.15$ mm/rev Wet
CNMG120408KQ (CA415K)

Number of parts

CA415K 14 pcs/corner

Tool life

1.4x

Competitor D 10 pcs/corner

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



$V_c = 140$ m/min
 $a_p = 1$ mm
 $f = 0.22$ mm/rev
Wet
TNMG160408KQ (CA410K)

Number of parts

CA410K 75 pcs/corner

Tool life

1.8x

Competitor A 40 pcs/corner

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

(User evaluation)

Differential gear case FCD450



$V_c = 230$ m/min
(Interrupted area 140 m/min)
 $a_p = 1 \sim 3$ mm
 $f = 0.3$ mm/rev
Wet
WNMG080412KH (CA415K)

Number of parts

CA415K 200 pcs/corner

Tool life

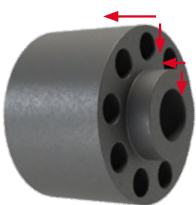
2x

Competitor C 100 pcs/corner

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



$V_c = 120$ m/min
 $a_p = 3$ mm
 $f = 0.35$ mm/rev
Wet
CNMA120408 (CA415K)

Number of parts

CA415K 150 pcs/corner (Stable)

Tool life

1.5x

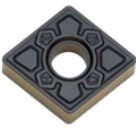
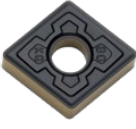

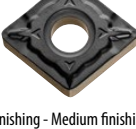
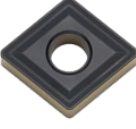
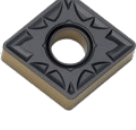
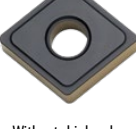
Competitor E (K05) 100 pcs/corner (Unstable)

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.



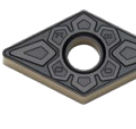
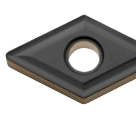
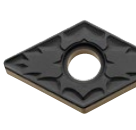
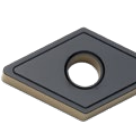
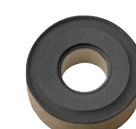
(User evaluation)



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) | | | | CA410K | CA415K |
|---|---|----------------|-----------|---------------|---------------|--------|--------|
| | | IC | Thickness | Hole diameter | Corner R (RE) | | |
|  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 | ● | ● |
| | | | | | | | |
|  Medium roughing - Roughing | 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) | | | | CA410K | CA415K |
|---|---|----------------|-----------|---------------|---------------|--------|--------|
| | | IC | Thickness | Hole diameter | Corner R (RE) | | |
|  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 | ● | ● |
|  Medium roughing - Roughing | 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 | ● | ● |

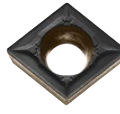
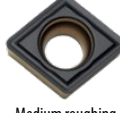

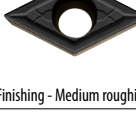



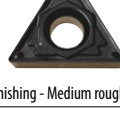
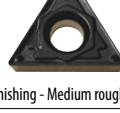


● : Available

Stock items (Negative)

| Shape | Description | Dimensions(mm) | | | | CA410K | CA415K |
|---|---------------------------------------|----------------|-----------|---------------|-------------------|--------|--------|
| | | IC | Thickness | Hole diameter | Corner R (RE) | | |
|  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) | | | | | CA410K | CA415K |
|--|---------------------------------|----------------|-----------|---------------|-------------------|--------------|--------|--------|
| | | IC | Thickness | Hole diameter | Corner R (RE) | Relief Angle | | |
|  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

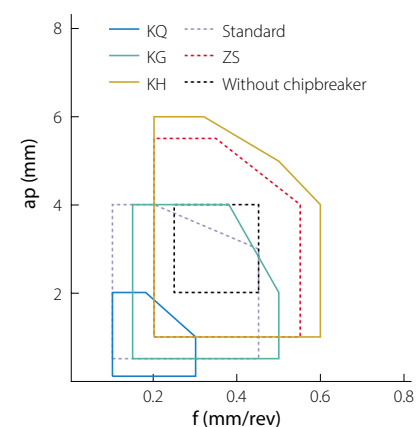
CA410K 1st recommendation : Continuous machining

| | |
|--------|--|
| 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

| | | | | | |
|---------------------------|--|--|--|--|--|
| Overhang with chipbreaker | | | | | View A ← |
| Clamp condition (View A) | | | | | Chipbreaker Insert Not recommended |

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