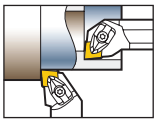


FINISHING OF STEEL

Low alloy steel, HB 180

ISO/ANSI **P** **F**

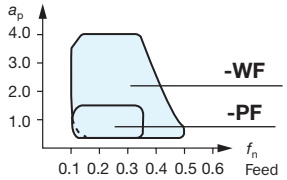
T-Max P

Double sided

CNMG 12 04 08-WF
a_p = 0.2 – 4.0 mm
f_n = 0.1 – 0.5 mm/r

CNMG 12 04 08-PF
a_p = 0.3 – 1,5 mm
f_n = 0.1 – 0.35 mm/r

Cutting depth



WF – for productive finish turning

Operations: longitudinal turning and facing

Components: rigid shafts, axles, hubs, gears etc.

Advantages: Double conventional feed rates with the same surface finish or halved surface finish values for the same feed.

-PF

Operations: longitudinal turning, facing, back-turning and profiling

Components: axles, gears where good surface finish is a priority

Advantages: light cutting geometry, low cutting forces suitable for slender shafts, thin walled and unstably clamped components.

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined or light forged skin.

HIGH FEED

-WF / GC1525

NORMAL FEED

-PF/ GC1525

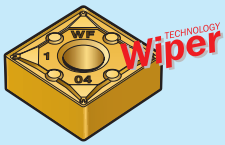
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

HIGH FEED



-WF / GC4015

NORMAL FEED

-PF / GC4015

DIFFICULT CONDITIONS

●

- Interrupted cuts.
- Heavy forging scale.

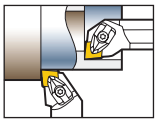
HIGH FEED

-WF / GC4025

NORMAL FEED

-PF / GC4225

SANDVIK Coromant



FINISHING OF STEEL

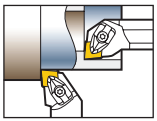
Negative basic-shape inserts

ISO/ANSI **P** **F**

ORDERING CODE					CUTTING DATA, CMC 02.1 / HB 180						
							Cutting speed v_c (m/min)				
Double sided		r_ε	GC1525	GC4015	GC4025	GC4225	Cutting depth a_p mm	Feed f_n mm/r	GC1525 [1]	GC4015	GC4025	GC4225
	**CNMG**	**09 03 04-WF**		★			**0.5** (0.3-1.5)	**0.15** (0.05-0.25)		**490**		
		09 03 08-WF		★	☆		**1** (0.3-2)	**0.3** (0.1-0.5)		**395**	**330**	
		12 04 04-WF	☆ [1]	★	☆		**0.4** (0.3-3)	**0.15** (0.05-0.25)	**280**	**490**	**405**	
		12 04 08-WF	☆ [1]	★	☆		**1** (0.3-4)	**0.3** (0.1-0.5)	**215**	**395**	**330**	
		12 04 12-WF		★	☆		**1.5** (0.4-4)	**0.5** (0.2-0.6)		**320**	**265**	
	**DNMX**	**11 04 04-WF**	☆ [1]	★	☆		**1** (0.2-1.5)	**0.2** (0.08-0.3)	**255**	**455**	**375**	
		11 04 08-WF	☆ [1]	★	☆		**1** (0.2-3)	**0.3** (0.1-0.4)	**215**	**395**	**330**	
		15 06 04-WF		★			**0.8** (0.2-3)	**0.2** (0.08-0.3)		**455**		
		15 06 08-WF	☆ [1]	★	☆		**1.5** (0.2-3)	**0.3** (0.1-0.4)	**215**	**395**	**330**	
		15 06 12-WF		★	☆		**1.5** (0.4-3.5)	**0.4** (0.15-0.55)		**355**	**290**	
	**TNMX**	**16 04 04-WF**	☆ [1]	★	☆		**1** (0.2-3)	**0.2** (0.08-0.3)	**255**	**455**	**375**	
		16 04 08-WF	☆ [1]	★	☆		**1.5** (0.2-3)	**0.3** (0.1-0.4)	**215**	**395**	**330**	
	**WNMG**	**06 04 04-WF**	☆ [1]	★	☆		**0.4** (0.3-2)	**0.15** (0.05-0.25)	**280**	**490**	**405**	
		06 04 08-WF	☆ [1]	★	☆		**1** (0.3-3)	**0.3** (0.1-0.5)	**215**	**395**	**330**	
		08 04 04-WF	☆ [1]	★	☆		**0.4** (0.3-3)	**0.15** (0.05-0.25)	**280**	**490**	**405**	
		08 04 08-WF	☆ [1]	★	☆		**1** (0.3-4)	**0.3** (0.1-0.5)	**215**	**395**	**330**	
		08 04 12-WF		★	☆		**1.5** (0.4-4)	**0.5** (0.2-0.6)		**320**	**265**	
	**CNMG**	**09 03 04-PF**	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.07-0.3)	**280**	**490**		**425**
		09 03 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.1-0.3)	**280**	**490**		**425**
		12 04 04-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.07-0.3)	**280**	**490**		**425**
		12 04 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
		12 04 12-PF	☆	★		☆	**0.8** (0.4-1.5)	**0.25** (0.15-0.35)	**235**	**425**		**365**
	**DNMG**	**11 04 04-PF**	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.07-0.3)	**280**	**490**		**425**
		11 04 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
		11 04 12-PF	☆	★		☆	**0.8** (0.4-1.5)	**0.25** (0.15-0.35)	**235**	**425**		**395**
		15 06 04-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.07-0.3)	**280**	**490**		**425**
		15 06 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
		15 06 12-PF	☆	★		☆	**0.8** (0.4-1.5)	**0.25** (0.15-0.35)	**235**	**425**		**365**
	**SNMG**	**12 04 08-PF**	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
		12 04 12-PF	☆	★		☆	**0.8** (0.4-1.5)	**0.25** (0.15-0.35)	**235**	**425**		**365**
	**TNMG**	**16 04 04-PF**	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.07-0.3)	**280**	**490**		**425**
		16 04 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
		16 04 12-PF	☆	★		☆	**0.8** (0.4-1.5)	**0.25** (0.15-0.35)	**235**	**425**		**365**
		22 04 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
		22 04 12-PF		★		☆	**0.8** (0.4-1.5)	**0.25** (0.15-0.5)		**425**		**365**
	**VNMG**	**16 04 04-PF**	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.07-0.3)	**280**	**490**		**425**
		16 04 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
	**WNMG**	**06 04 04-PF**	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.07-0.3)	**280**	**490**		**425**
		06 04 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
		06 04 12-PF		★			**0.8** (0.4-1.5)	**0.25** (0.15-0.5)		**425**		
		08 04 04-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.15** (0.07-0.3)	**280**	**490**		**425**
		08 04 08-PF	☆	★		☆	**0.4** (0.3-1.5)	**0.2** (0.1-0.35)	**255**	**455**		**395**
		08 04 12-PF		★		☆	**0.8** (0.4-1.5)	**0.25** (0.15-0.5)		**425**		**365**

Wiper Technology

[1] For a_p and f_n, check data on insert box.



MEDIUM MACHINING OF STEEL

Low alloy steel, HB 180

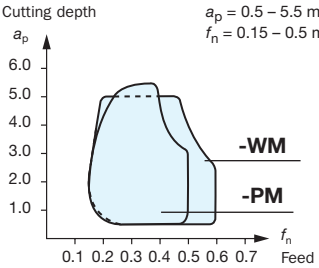
ISO/ANSI **P** **M**

T-Max P

Double sided

CNMG 12 04 08-WM
a_p = 0.5 – 5.0 mm
f_n = 0.15 – 0.6 mm/r

CNMG 12 04 08-PM
a_p = 0.5 – 5.5 mm
f_n = 0.15 – 0.5 mm/r



WM – for productive medium turning

Operations: longitudinal turning and facing

Components: rigid shafts, axles, hubs, gears etc

Advantages: Double conventional feed rates with the same surface finish or halved surface finish values for the same feed.shorter cutting edge engagement time.

-PM

Operations: longitudinal turning, facing and profiling

Components: axles, hubs, gears etc. in steel

Advantages: all-round, reliable giving problem-free machining

---

First choice

GOOD CONDITIONS

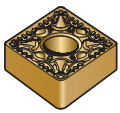
○

- Continuous cuts.
- Pre-machined or light forged skin.

HIGH FEED

-WM / GC1525

NORMAL FEED



-PM / GC4015

AVERAGE CONDITIONS

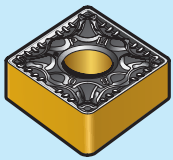
◑

General purpose operations.

HIGH FEED

-WM / GC4015

NORMAL FEED



-PM / GC4225

DIFFICULT CONDITIONS

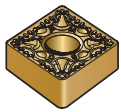
●

- **Interrupted cuts.**
- **Heavy forging scale.**

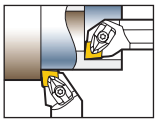
HIGH FEED

-WM / GC4225

NORMAL FEED



-PM / GC4035



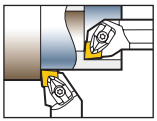
MEDIUM MACHINING OF STEEL

Negative basic-shape inserts

ISO/ANSI **P** **M**

ORDERING CODE										CUTTING DATA, CMC 02.1 / HB 180					
												Cutting speed v_c (m/min)			
Double sided			r_ε	GC1525	GC4015	GC4015	GC4225	GC4225	GC4035	Cutting depth a_p mm	Feed f_n mm/r	GC1525 [1]	GC4015	GC4225	GC4035
	CNMG	**12 04 08-WM**		☆[1]		★		☆		**3** (0.5-5)	**0.3** (0.15-0.6)	**215**	**395**	**345**	
		12 04 12-WM		☆[1]		★		☆		**3.5** (0.8-6)	**0.5** (0.2-0.9)	**200**	**320**	**275**	
		16 06 08-WM				★		☆		**3.5** (07-6.5)	**0.4** (0.2-0.7)		**355**	**305**	
		16 06 12-WM				★		☆		**3.5** (07-6.5)	**0.4** (0.2-0.7)		**355**	**305**	
	DNMX	**11 04 08-WM**		☆[1]		★		☆		**1.5** (0.5-3.5)	**0.35** (0.15-0.5)	**200**	**375**	**325**	
		11 04 12-WM		☆[1]		★		☆		**2** (0.5-4)	**0.45** (0.15-0.6)	**200**	**335**	**290**	
		15 06 08-WM		☆[1]		★		☆		**2** (0.5-4.5)	**0.35** (0.15-0.5)	**200**	**375**	**325**	
		15 06 12-WM		☆[1]		★		☆		**2.5** (0.5-5)	**0.45** (0.15-0.6)	**200**	**335**	**290**	
		15 06 16-WM				★		☆		**3.5** (0.5-6)	**0.6** (0.2-0.8)		**290**	**250**	
	TNMX	**16 04 08-WM**		☆[1]		★		☆		**2** (0.5-4.5)	**0.35** (0.15-0.5)	**200**	**375**	**325**	
		16 04 12-WM		☆[1]		★		☆		**2.5** (0.5-5)	**0.4** (0.15-0.6)	**200**	**355**	**305**	
	WNMG	**06 04 08-WM**		☆[1]		★		☆		**1.5** (0.5-3.5)	**0.3** (0.15-0.6)	**215**	**395**	**345**	
		06 04 12-WM		☆[1]		★		☆		**1.5** (0.8-3.5)	**0.5** (0.2-0.9	**200**	**320**	**275**	
		08 04 08-WM		☆[1]		★		☆		**3** (0.5-5)	**0.3** (0.15-0.6)	**215**	**395**	**345**	
		08 04 12-WM		☆[1]		★		☆		**3.5** (0.8-6)	**0.5** (0.2-0.9)	**200**	**320**	**275**	
	CNMG	**09 03 04-PM**			☆		★		☆	**2** (0.4-4)	**0.2** (0.1-0.3)		**455**	**395**	**230**
		09 03 08-PM			☆		★		☆	**2** (0.5-4)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		12 04 04-PM			☆		★		☆	**3** (0.4-5.5)	**0.2** (0.1-0.3)		**455**	**395**	**230**
		12 04 08-PM			☆		★		☆	**3** (0.5-5.5)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		12 04 12-PM			☆		★		☆	**3** (0.8-5.5)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		12 04 16-PM			☆		★		☆	**3** (1-5.5)	**0.4** (0.23-0.65)		**355**	**305**	**175**
		16 06 08-PM			☆		★		☆	**4** (0.5-7.2)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		16 06 12-PM			☆		★		☆	**4** (0.8-7.2)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		16 06 16-PM			☆		★		☆	**4** (1-7.2)	**0.4** (0.23-0.65)		**355**	**305**	**175**
	DNMG	**11 04 04-PM**			☆		★		☆	**2** (0.4-5)	**0.2** (0.1-0.3)		**455**	**395**	**230**
		11 04 08-PM			☆		★		☆	**2** (0.5-5)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		11 04 12-PM			☆		★		☆	**2** (0.8-5)	**0.35** (0.18-0.5)		**375**	**325**	**185**
		15 06 04-PM			☆		★		☆	**3** (0.4-6)	**0.2** (0.1-0.3)		**455**	**395**	**230**
		15 06 08-PM			☆		★		☆	**3** (0.5-6)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		15 06 12-PM			☆		★		☆	**3** (0.8-6)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		15 06 16-PM			☆		★		☆	**3** (1-6)	**0.4** (0.23-0.65)		**355**	**305**	**175**
	SNMG	**09 03 04-PM**			☆		★		☆	**2** (0.4-4.5)	**0.2** (0.1-0.3)		**455**	**395**	**230**
		09 03 08-PM			☆		★		☆	**2** (0.5-4.5)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		12 04 04-PM			☆		★		☆	**3** (0.4-6)	**0.2** (0.1-0.3)		**455**	**395**	**230**
		12 04 08-PM			☆		★		☆	**3** (0.5-6)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		12 04 12-PM			☆		★		☆	**3** (0.8-6)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		12 04 16-PM			☆		★		☆	**3** (1-6)	**0.4** (0.23-0.65)		**355**	**305**	**175**
		15 06 12-PM			☆		★		☆	**4** (0.8-7.5)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		15 06 16-PM			☆		★			**4** (1-7.5)	**0.4** (0.23-0.65)		**355**	**305**	
	TNMG	**16 04 04-PM**			☆		★		☆	**3** (0.4-5)	**0.2** (0.1-0.3)		**455**	**395**	**230**
		16 04 08-PM			☆		★		☆	**3** (0.5-5)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		16 04 12-PM			☆		★		☆	**3** (0.8-5)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		22 04 04-PM			☆		★		☆	**4** (0.4-6.6)	**0.2** (0.1-0.3)		**455**	**395**	**230**
		22 04 08-PM			☆		★		☆	**4** (0.5-6.6)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		22 04 12-PM			☆		★		☆	**4** (0.8-6.6)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		22 04 16-PM			☆		★		☆	**4** (1-6.6)	**0.4** (0.23-0.65)		**355**	**305**	**175**
	VNMG	**16 04 08-PM**			☆		★		☆	**2** (0.5-4)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		16 04 12-PM			☆		★		☆	**2** (0.8-4)	**0.35** (0.18-0.6)		**375**	**325**	**185**
	WNMG	**06 04 08-PM**			☆		★		☆	**2** (0.5-3)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		06 04 12-PM			☆		★		☆	**2** (0.8-3)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		08 04 08-PM			☆		★		☆	**2.5** (0.5-4)	**0.3** (0.15-0.5)		**395**	**345**	**200**
		08 04 12-PM			☆		★		☆	**2.5** (0.8-4)	**0.35** (0.18-0.6)		**375**	**325**	**185**
		08 04 16-PM			☆		★			**3** (1-4)	**0.4** (0.23-0.65)		**355**	**305**	

[1] For a_p and f_n, check data on insert box.



ROUGHING OF STEEL

Low alloy steel, HB 180

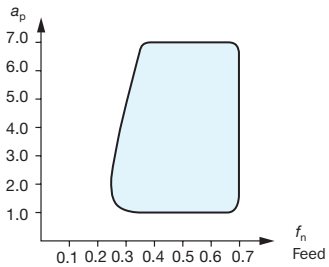
ISO/ ANSI **P** **R**

T-Max P

Double sided

CNMG 12 04 12-PR
a_p = 1.0 – 7.0 mm
f_n = 0.25 – 0.7 mm/r

Cutting depth



-PR

Operations: longitudinal turning, facing and profiling

Components: axles, hubs, gears etc. in steel

Advantages: universal capability, double-sided insert geometry with high roughing capability contributing towards good machining economy

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined or light forged skin.

NORMAL FEED

-PR / GC4015

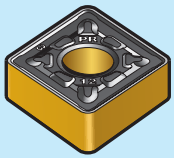
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

NORMAL FEED



-PR / GC4225

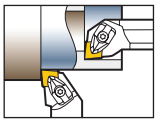
DIFFICULT CONDITIONS

●

- Interrupted cuts.
- Heavy forging scale.

NORMAL FEED

-PR / GC4035

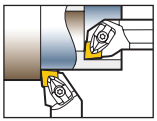


ROUGHING OF STEEL

Negative basic-shape inserts

ISO/ANSI **P** **R**

ORDERING CODE						CUTTING DATA, CMC 02.1 / HB 180					
								Cutting speed v_c (m/min)			
Double sided		r_ε	○ GC4015	◑ GC4225	● GC4035	Cutting depth a_p mm	Feed f_n mm/r	GC4015	GC4225	GC4035
	**CNMG**	**12 04 08-PR**	☆	★	☆	**4** (0.7-7)	**0.35** (0.2-0.5)	**375**	**325**	**185**
		12 04 12-PR	☆	★	☆	**4** (1-7)	**0.4** (0.25-0.7)	**355**	**305**	**175**
		12 04 16-PR	☆	★	☆	**4** (1.5-7)	**0.5** (0.32-0.75)	**320**	**275**	**160**
		16 06 08-PR	☆	★	☆	**5** (0.7-8)	**0.35** (0.2-0.5)	**375**	**325**	**185**
		16 06 12-PR	☆	★	☆	**5** (1-8)	**0.4** (0.25-0.7)	**355**	**305**	**175**
		16 06 16-PR	☆	★	☆	**5** (1.5-8)	**0.5** (0.3-0.8)	**320**	**275**	**160**
		16 06 24-PR	☆	★	☆	**5** (2-8)	**0.5** (0.32-0.9)	**320**	**275**	**160**
		19 06 08-PR	☆	★	☆	**5** (0.7-10)	**0.35** (0.2-0.5)	**375**	**325**	**185**
		19 06 12-PR	☆	★	☆	**5** (1-10)	**0.4** (0.25-0.7)	**355**	**305**	**175**
		19 06 16-PR	☆	★	☆	**5** (1.5-10)	**0.5** (0.5-0.8)	**320**	**275**	**160**
		19 06 24-PR	☆	★	☆	**5** (2-10)	**0.5** (0.32-0.9)	**320**	**275**	**160**
	**DNMG**	**15 06 08-PR**	☆	★	☆	**4** (0.7-6)	**0.35** (0.2-0.5)	**375**	**325**	**185**
		15 06 12-PR	☆	★	☆	**4** (1-6)	**0.4** (0.25-0.7)	**355**	**305**	**175**
		15 06 16-PR	☆	★	☆	**4** (1.5-6)	**0.5** (0.32-0.75)	**320**	**275**	**160**
	**SNMG**	**12 04 08-PR**	☆	★	☆	**4** (0.7-7)	**0.35** (0.2-0.5)	**375**	**325**	**185**
		12 04 12-PR	☆	★	☆	**4** (1-7)	**0.4**(0.25-0.7)	**355**	**305**	**175**
		12 04 16-PR	☆	★	☆	**4** (1.5-7)	**0.5** (0.32-0.75)	**320**	**275**	**160**
		15 06 08-PR	☆	★	☆	**5** (1.5-8)	**0.35** (0.2-0.5)	**375**	**325**	**185**
		15 06 12-PR	☆	★	☆	**5** (1-8)	**0.4** (0.25-0.7)	**355**	**305**	**175**
		15 06 16-PR	☆	★	☆	**5** (1.5-8)	**0.5** (0.3-0.8)	**320**	**275**	**160**
		15 06 24-PR	☆	★	☆	**5** (2-8)	**0.5** (0.32-0.9)	**320**	**275**	**160**
		19 06 12-PR	☆	★	☆	**5** (1-10)	**0.4** (0.25-0.7)	**355**	**305**	**175**
		19 06 16-PR	☆	★	☆	**5** (1.5-10)	**0.5** (0.3-0.8)	**320**	**275**	**160**
		19 06 24-PR	☆	★	☆	**5** (2-10)	**0.5** (0.32-0.9)	**320**	**275**	**160**
	**TNMG**	**16 04 08-PR**	☆	★	☆	**3** (0.7-6)	**0.35** (0.2-0.55)	**375**	**325**	**185**
		16 04 12-PR	☆	★	☆	**3** (1-6)	**0.4** (0.25-0.65)	**355**	**305**	**175**
		22 04 08-PR	☆	★	☆	**4** (0.7-7)	**0.35** (0.2-0.55)	**375**	**325**	**185**
		22 04 12-PR	☆	★	☆	**4** (1-7)	**0.4** (0.25-0.65)	**355**	**305**	**175**
		22 04 16-PR	☆	★	☆	**4** (1.5-7)	**0.5** (0.32-0.75)	**320**	**275**	**160**
	**WNMG**	**06 04 08-PR**	☆	★	☆	**3** (0.7-3.5)	**0.3** (0.2-0.45)	**395**	**345**	**200**
		06 04 12-PR	☆	★		**3** (0.8-3.5)	**0.35**(0.25-0.55)	**375**	**325**	
		08 04 08-PR	☆	★	☆	**4** (0.7-5)	**0.35** (0.2-0.55)	**375**	**325**	**185**
		08 04 12-PR	☆	★	☆	**4** (1-5)	**0.4** (0.25-0.7)	**355**	**305**	**175**
		08 04 16-PR	☆	★	☆	**4** (1.5-5)	**0.5** (0.32-0.75)	**320**	**275**	**160**



ROUGHING OF STEEL

Low alloy steel, HB 180

ISO/ ANSI **P** **R**

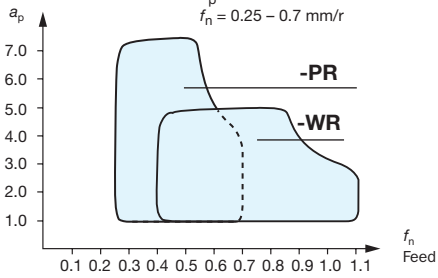
T-Max P

Single sided

CNMM 12 04 12-WR
a_p = 1.0 – 5.0 mm
f_n = 0.4– 1.1 mm/r

CNMM 12 04 12-PR
a_p = 1.0 – 7.5 mm
f_n = 0.25 – 0.7 mm/r

Cutting depth



WR – for productive rough turning

Operations: longitudinal turning and facing

Components: shafts, axles, gears etc

Advantages: strong single-sided insert geometry for high removal rate with high insert stability in seat.

-PR

Operations: longitudinal turning, facing and profiling

Components: shafts, axles, hubs, gears etc.

Advantages: positive roughing geometry generating small cutting forces, broad application range, high single-sided insert stability

Possible optimization: geometries QR, HR and double-sided PR

First choice

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined or light forged skin.

HIGH FEED

-WR / GC4005

NORMAL FEED

-PR / GC4015

AVERAGE CONDITIONS

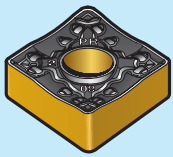
◑

General purpose operations.

HIGH FEED

-WR / GC4015

NORMAL FEED



-PR / GC4225

DIFFICULT CONDITIONS

●

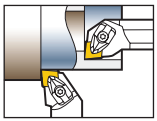
- **Interrupted cuts.**
- **Heavy forging scale.**

HIGH FEED

-WR / GC4025

NORMAL FEED

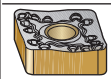
-PR / GC4035

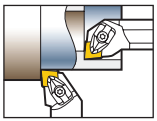


ROUGHING OF STEEL

Negative basic-shape inserts

ISO/ANSI **P** **R**

ORDERING CODE									CUTTING DATA, CMC 02.1 / HB 180						
											Cutting speed v_c (m/min)				
Single sided		r_ε	GC4005	GC4015	GC4015	GC4225	GC4025	GC4035	Cutting depth a_p mm	Feed f_n mm/r	GC4005	GC4015	GC4025	GC4225	GC4035
	**CNMM 12 04 08-WR**		☆		★		☆		**2.5** (0.8-5)	**0.6** (0.3-0.8)	**320**	**290**	**240**		
	12 04 12-WR		☆		★		☆		**2.5** (1-5)	**0.8** (0.4-1.1)	**270**	**245**	**205**		
	12 04 16-WR		☆		★		☆		**2.5** (1.2-5)	**0.8** (0.44-1.2)	**270**	**245**	**205**		
	16 06 12-WR		☆		★		☆		**3** (1.2-6)	**0.8** (0.42-1.2)	**270**	**245**	**205**		
	16 06 16-WR		☆		★		☆		**3** (1.4-6)	**0.9** (0.46-1.2)	**250**	**230**	**190**		
	**TNMX 22 04 12-WR**		☆		★		☆		**2.5** (1-5)	**0.8** (0.4-1.1)	**270**	**245**	**205**		
	22 04 16-WR		☆		★		☆		**2.5** (1.2-5)	**0.9** (0.44-1.2)	**250**	**230**	**190**		
	**CNMM 12 04 08-PR**			☆		★		☆	**5** (0.7-7.5)	**0.4** (0.2-0.55)		**355**		**305**	**175**
	12 04 12-PR			☆		★		☆	**5** (1-7.5)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	12 04 16-PR			☆		★			**5** (1.5-7.5)	**0.55** (0.32-0.9)		**305**		**265**	
	16 06 08-PR			☆		★		☆	**6** (0.7-9.5)	**0.4** (0.2-0.55)		**355**		**305**	**175**
	16 06 12-PR			☆		★		☆	**6** (1-9.5)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	16 06 16-PR			☆		★		☆	**6** (1.5-9.5)	**0.55** (0.32-0.9)		**305**		**265**	**155**
	19 06 12-PR			☆		★		☆	**6** (1-12)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	19 06 16-PR			☆		★		☆	**6** (1.5-12)	**0.55** (0.32-0.9)		**305**		**265**	**155**
	19 06 24-PR			☆		★		☆	**6** (2-12)	**0.55** (0.35-1.2)		**305**		**265**	**155**
	**DNMM 15 06 08-PR**			☆		★		☆	**5** (0.7-6)	**0.4** (0.2-0.55)		**355**		**305**	**175**
	15 06 12-PR			☆		★		☆	**5** (1-6)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	15 06 16-PR			☆		★		☆	**5** (1.5-6)	**0.55** (0.32-0.9)		**305**		**265**	**155**
	**SNMM 12 04 08-PR**			☆		★		☆	**5** (0.7-7.5)	**0.4** (0.2-0.55)		**355**		**305**	**175**
	12 04 12-PR			☆		★		☆	**5** (1-7.5)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	15 06 12-PR			☆		★		☆	**6** (1-9)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	15 06 16-PR			☆		★		☆	**6** (1.5-9)	**0.55** (0.32-0.9)		**305**		**265**	**155**
	19 06 12-PR			☆		★		☆	**6** (1-12)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	19 06 16-PR			☆		★		☆	**6** (1.5-12)	**0.55** (0.32-0.9)		**305**		**265**	**155**
	19 06 24-PR			☆		★		☆	**6** (2-12)	**0.55** (0.35-1.2)		**305**		**265**	**155**
	**TNMM 16 04 08-PR**			☆		★		☆	**4** (0.7-6)	**0.4** (0.2-0.55)		**355**		**305**	**175**
	16 04 12-PR			☆		★		☆	**4** (1-6)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	22 04 08-PR			☆		★		☆	**5** (0.7-8)	**0.4** (0.2-0.55)		**355**		**305**	**175**
	22 04 12-PR			☆		★		☆	**5** (1-8)	**0.5** (0.25-0.7)		**320**		**275**	**160**
	22 04 16-PR			☆		★		☆	**5** (1.5-8)	**0.55** (0.32-0.9)		**305**		**265**	**155**



FINISHING OF STAINLESS STEEL

Stainless steel, austenitic, HB 180

ISO/ANSI **M** **F**

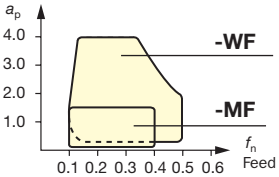
T-Max P

Double sided

CNMG 12 04 08-WF
a_p = 0.3 – 4.0 mm
f_n = 0.1 – 0.5 mm/r

CNMG 12 04 08-MF
a_p = 0.1– 1.5 mm
f_n = 0.1 – 0.4 mm/r

Cutting depth



WF – for productive finish turning

Operations: longitudinal turning and facing

Components: rigid shafts, axles, hubs, gears etc.

Advantages: Double conventional feed rates with the same surface finish or halved surface finish values for the same feed.

-MF

Operations: finishing operations generally

Components: stainless steel components in general

Advantages: light cutting geometry with low cutting forces, good alternative for slender shafts, thin-walled and unstably clamped components.

First choice

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined or light cast/forged skin.

HIGH FEED

-WF / GC1025

NORMAL FEED

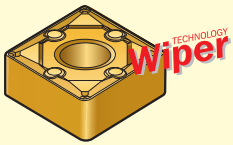
-MF / GC1025

AVERAGE CONDITIONS

◑

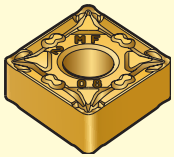
General purpose operations.

HIGH FEED



-WF / GC2015

NORMAL FEED



-MF / GC2015

DIFFICULT CONDITIONS

●

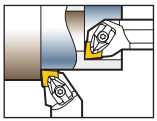
- Interrupted cuts.
- Heavy cast skin or forging scale.

HIGH FEED

-WF / GC2015

NORMAL FEED

-MF / GC2025

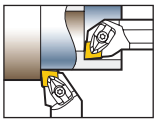


FINISHING OF STAINLESS STEEL

Negative basic-shape inserts

ISO/ANSI **M** **F**

ORDERING CODE							CUTTING DATA, CMC 05.21 / HB 180				
									Cutting speed v_c (m/min)		
Double sided		r_ε	GC1025	GC2015	GC2015	GC2025	Cutting depth a_p mm	Feed f_n mm/r	GC1025	GC2015	GC2025
	**CNMG**	**09 03 04-WF**	★				**0.5** (0.3-1.5)	**0.15** (0.05-0.25)	**245**		
		09 03 08-WF	★				**1** (0.3-2)	**0.3** (0.1-0.5)	**170**		
		12 04 04-WF	☆	★	☆		**0.4** (0.3-3)	**0.15** (0.05-0.25)	**245**	**290**	
		12 04 08-WF	☆	★	☆		**1** (0.3-4)	**0.3** (0.1-0.5)	**170**	**220**	
		12 04 12-WF	★				**1.5** (0.4-4)	**0.5** (0.2-0.5)	**105**		
	**DNMX**	**11 04 04-WF**	☆	★	☆		**1** (0.2-1.5)	**0.2** (0.08-0.3)	**220**	**290**	
		11 04 08-WF	☆	★	☆		**1** (0.2-3)	**0.3** (0.1-0.4)	**170**	**270**	
Wiper TECHNOLOGY		**15 06 08-WF**	☆	★	☆		**1.5** (0.2-3)	**0.3** (0.1-0.4)	**170**	**270**	
	**TNMX**	**16 04 04-WF**	☆	★	☆		**1** (0.2-3)	**0.2** (0.08-0.3)	**220**	**290**	
		16 04 08-WF	☆	★	☆		**1.5** (0.2-3)	**0.3** (0.1-0.4)	**170**	**270**	
	**WNMG**	**06 04 04-WF**	☆	★	☆		**0.4** (0.3-2)	**0.15** (0.05-0.25)	**245**	**290**	
		06 04 08-WF	☆	★	☆		**1** (0.3-3)	**0.3** (0.1-0.5)	**170**	**270**	
		08 04 04-WF	☆	★	☆		**0.4** (0.3-3)	**0.15** (0.05-0.25)	**245**	**290**	
		08 04 08-WF	☆	★	☆		**1** (0.3-4)	**0.3** (0.1-0.5)	**170**	**270**	
	**CNMG**	**12 04 04-MF**	☆	★		☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**265**	**290**	**265**
		12 04 08-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.2** (0.1-0.4)	**220**	**290**	**240**
	**DNMG**	**11 04 04-MF**	☆	★		☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**265**	**290**	**265**
		11 04 08-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.2** (0.1-0.4)	**220**	**290**	**240**
		15 06 04-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**265**	**290**	**265**
		15 06 08-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.2** (0.1-0.4)	**220**	**290**	**240**
	**SNMG**	**12 04 04-MF**	☆	★		☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**265**	**290**	**265**
		12 04 08-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.2** (0.1-0.4)	**220**	**290**	**240**
	**TNMG**	**16 04 04-MF**	☆	★		☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**265**	**290**	**265**
		16 04 08-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.2** (0.1-0.4)	**220**	**290**	**240**
	**VNMG**	**16 04 04-MF**	☆	★		☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**265**	**290**	**265**
	**WNMG**	**06 04 04-MF**	☆	★		☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**265**	**290**	**265**
		06 04 08-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.2** (0.1-0.4)	**220**	**290**	**240**
		08 04 04-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**265**	**290**	**265**
		08 04 08-MF	☆	★		☆	**0.4** (0.1-1.5)	**0.2** (0.1-0.4)	**220**	**290**	**240**



MEDIUM MACHINING OF STAINLESS STEEL

Stainless steel, austenitic, HB 180

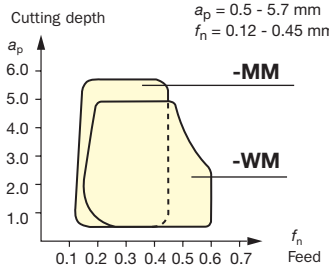
ISO/ANSI **M** **M**

T-Max P

Double sided

CNMG 12 04 08-WM
a_p = 0.5 – 5.0 mm
f_n = 0.15 – 0.6 mm/r

CNMG 12 04 08-MM
a_p = 0.5 - 5.7 mm
f_n = 0.12 - 0.45 mm/r



-WM – for productive medium turning

Operations: longitudinal turning and facing

Components: rigid shafts, axles, hubs, gears etc

Advantages: Double conventional feed rates with the same surface finish or halved surface finish values for the same feed.

-MM

Operations: longitudinal turning, facing and profiling

Components: stainless steel components in general

Advantages: reliable allowing problem-free machining

First choice

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined or light cast/forged skin.

HIGH FEED

-WM / GC1025

NORMAL FEED

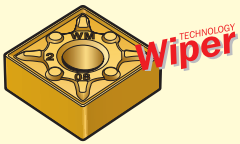
-MM / GC2015

AVERAGE CONDITIONS

◑

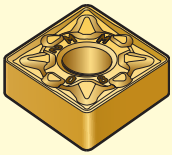
General purpose operations.

HIGH FEED



-WM / GC2015

NORMAL FEED



-MM / GC2025

DIFFICULT CONDITIONS

●

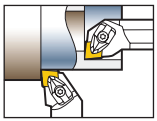
- Interrupted cuts.
- Heavy cast skin or forging scale.

HIGH FEED

-WM / GC2015

NORMAL FEED

-MM / GC2035

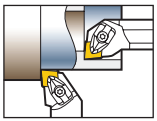


MEDIUM MACHINING OF STAINLESS STEEL

Negative basic-shape inserts

ISO/ANSI **M** **M**

ORDERING CODE				CUTTING DATA, CMC 05.21 / HB 180							
						Cutting speed v_c (m/min)					
Double sided		r_ε	GC1025	GC2015	GC2015	GC2025	GC2015	GC2035	Cutting depth a_p mm	Feed f_n mm/r	GC1025	GC2015	GC2025	GC2035
	**CNMG 12 04 08-WM**		☆		★		☆		**3** (0.5-5)	**0.3** (0.15-0.5)	**170**	**270**		
	12 04 12-WM		☆		★		☆		**3.5** (0.8-6)	**0.5** (0.2-0.5)	**105**	**215**		
	**DNMX 11 04 08-WM**				★		☆		**1.5** (0.5-3.5)	**0.35** (0.15-0.5)		**255**		
	11 04 12-WM		★						**2** (0.5-4)	**0.45** (0.15-0.5)	**120**			
Wiper TECHNOLOGY	**15 06 08-WM**		☆		★		☆		**2** (0.5-4.5)	**0.35** (0.15-0.5)	**150**	**255**		
	15 06 12-WM		☆		★		☆		**2.5** (0.5-5)	**0.45** (0.15-0.5)	**120**	**225**		
	**TNMX 16 04 08-WM**				★		☆		**2** (0.5-4.5)	**0.35** (0.15-0.5)		**255**		
	16 04 12-WM		☆		★		☆		**2.5** (0.5-5)	**0.4** (0.15-0.6)	**130**	**240**		
	**WNMG 06 04 08-WM**		☆		★		☆		**1.5** (0.5-3.5)	**0.3** (0.15-0.5)	**170**	**270**		
	06 04 12-WM		☆		★		☆		**1.5** (0.8-3.5)	**0.5** (0.2-0.5)	**105**	**215**		
	08 04 08-WM		☆		★		☆		**3** (0.5-5)	**0.3** (0.15-0.5)	**170**	**270**		
	08 04 12-WM		☆		★		☆		**3.5** (0.8-6)	**0.5** (0.2-0.5)	**105**	**215**		
	**CNMG 12 04 08-MM**			☆		★		☆	**3** (0.5-5.7)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	12 04 12-MM			☆		★		☆	**3** (0.5-5.7)	**0.3** (0.15-0.6)		**270**	**205**	**160**
	12 04 16-MM			☆		★		☆	**3** (0.5-5.7)	**0.37** (0.18-0.65)		**250**	**185**	**150**
	16 06 08-MM			☆		★		☆	**4** (0.5-7.2)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	16 06 12-MM			☆		★		☆	**4** (0.5-7.2)	**0.3** (0.15-0.6)		**270**	**205**	**160**
	16 06 16-MM					★		☆	**4** (0.5-7.2)	**0.37** (0.18-0.65)			**185**	**150**
	**DNMG 11 04 08-MM**			☆		★		☆	**2** (0.5-4.4)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	11 04 12-MM			☆		★			**2** (0.5-4.4)	**0.3** (0.15-0.6)		**270**	**205**	
	15 06 08-MM			☆		★		☆	**3** (0.5-6.4)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	15 06 12-MM			☆		★		☆	**3** (0.5-6.4)	**0.3** (0.15-0.6)		**270**	**205**	**160**
	**SNMG 12 04 08-MM**			☆		★		☆	**3** (0.5-6.4)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	12 04 12-MM			☆		★		☆	**3** (0.5-6.4)	**0.3** (0.15-0.6)		**270**	**205**	**160**
	12 04 16-MM			☆		★		☆	**3** (0.5-6.4)	**0.37** (0.18-0.65)		**250**	**185**	**150**
	15 06 12-MM					★		☆	**4** (0.5-8)	**0.3** (0.15-0.6)			**205**	**160**
	15 06 16-MM					★			**4** (0.5-8)	**0.37** (0.18-0.65)			**185**	
	**TNMG 16 04 08-MM**			☆		★		☆	**3** (0.5-4.8)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	16 04 12-MM			☆		★		☆	**3** (0.5-4.8)	**0.3** (0.15-0.6)		**270**	**205**	**160**
	22 04 08-MM			☆		★		☆	**4** (0.5-6.6)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	22 04 12-MM			☆		★		☆	**4** (0.5-6.6)	**0.3** (0.15-0.6)		**270**	**205**	**160**
	22 04 16-MM			☆		★			**4** (0.5-6.6)	**0.37** (0.18-0.65)		**250**	**185**	
	**VNMG 16 04 08-MM**			☆		★		☆	**2** (0.5-4)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	**WNMG 06 04 08-MM**			☆		★		☆	**2** (0.5-3)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	06 04 12-MM			☆		★			**2** (0.5-3)	**0.3** (0.15-0.6)		**270**	**205**	
	08 04 08-MM			☆		★		☆	**2.5** (0.5-4)	**0.25** (0.12-0.45)		**280**	**225**	**165**
	08 04 12-MM			☆		★		☆	**2.5** (0.5-4)	**0.3** (0.15-0.6)		**270**	**205**	**160**



ROUGHING OF STAINLESS STEEL

Stainless steel, austenitic, HB 180

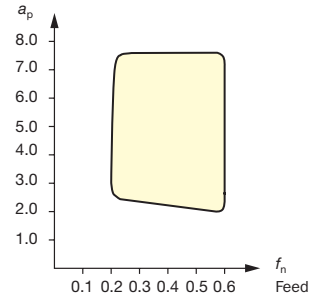
ISO/ANSI **M** **R**

T-Max P

Double sided

CNMG 12 04 12-MR
a_p = 2.0 – 7.6 mm
f_n = 0.2 – 0.6 mm/r

Cutting depth



-MR

Operations: longitudinal turning, facing and profiling

Components: stainless steel components in general

Advantages: broad roughing capability, double-sided alternative for high capable roughing contributing towards good machining economy

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined or light cast/forged skin.

NORMAL FEED

-MR / GC2015

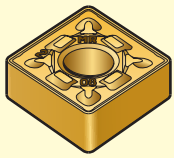
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

NORMAL FEED



-MR / GC2025

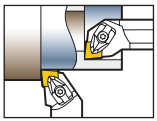
DIFFICULT CONDITIONS

●

- Interrupted cuts.
- Heavy cast skin or forging scale.

NORMAL FEED

-MR / GC2035

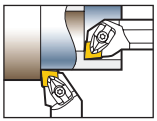


ROUGHING OF STAINLESS STEEL

Negative basic-shape inserts

ISO/ANSI **M** **R**

ORDERING CODE					CUTTING DATA, CMC 05.21 / HB 180				
							Cutting speed v_c (m/min)		
Double sided		GC2015	GC2025	GC2035	Cutting depth a_p mm	Feed f_n mm/r	GC2015	GC2025	GC2035
	**CNMG 12 04 08-MR**	☆	★	☆	**3** (2-7.6)	**0.3** (0.15-0.55)	**270**	**205**	**160**
	12 04 12-MR	☆	★	☆	**3** (2-7.6)	**0.35** (0.2-0.6)	**255**	**190**	**155**
	12 04 16-MR	☆	★	☆	**3** (2-7.6)	**0.4** (0.25-0.7)	**240**	**175**	**145**
	16 06 12-MR	☆	★	☆	**4** (2-10)	**0.35** (0.2-0.6)	**255**	**190**	**155**
	16 06 16-MR	☆	★	☆	**4** (2-10)	**0.4** (0.25-0.7)	**240**	**175**	**145**
	**DNMG 15 06 08-MR**	☆	★	☆	**3** (2-6)	**0.3** (0.15-0.55)	**270**	**205**	**160**
	15 06 12-MR	☆	★	☆	**3** (2-6)	**0.35** (0.2-0.6)	**255**	**190**	**155**
	**SNMG 12 04 08-MR**	☆	★	☆	**3** (2-7.6)	**0.3** (0.15-0.55)	**270**	**205**	**160**
	12 04 12-MR	☆	★	☆	**3** (2-7.6)	**0.35** (0.2-0.6)	**255**	**190**	**155**
	15 06 12-MR	☆	★	☆	**4** (2-9.6)	**0.35** (0.2-0.6)	**255**	**190**	**155**
	15 06 16-MR	☆	★	☆	**4** (2-9.6)	**0.4** (0.25-0.7)	**240**	**175**	**145**
	**TNMG 16 04 08-MR**	☆	★	☆	**3** (2-5.6)	**0.3** (0.15-0.55)	**270**	**205**	**160**
	16 04 12-MR	☆	★	☆	**3** (2-5.6)	**0.35** (0.2-0.6)	**255**	**190**	**155**
	22 04 08-MR	☆	★	☆	**4** (2-7.7)	**0.3** (0.15-0.55)	**270**	**205**	**160**
	22 04 12-MR	☆	★	☆	**4** (2-7.7)	**0.35** (0.2-0.6)	**255**	**190**	**155**
	**WNMG 06 04 08-MR**	☆	★	☆	**2** (1.5-3)	**0.3** (0.15-0.55)	**270**	**205**	**160**
	06 04 12-MR		★	☆	**2** (1.5-3)	**0.35** (0.2-0.6)		**190**	**155**
	08 04 08-MR	☆	★	☆	**2.5** (2-4)	**0.3** (0.15-0.55)	**270**	**205**	**160**
	08 04 12-MR	☆	★	☆	**2.5** (2-4)	**0.35** (0.2-0.6)	**255**	**190**	**155**



ROUGHING OF STAINLESS STEEL

Stainless steel, austenitic, HB 180

ISO/ ANSI **M** **R**

T-Max P

Single sided

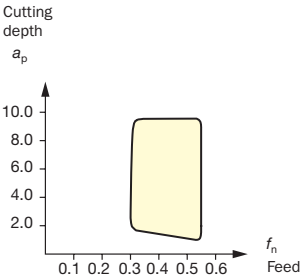
CNMM 16 06 08-MR
a_p = 1.0 – 9.5 mm
f_n = 0.3 – 0.55 mm/r

-MR

Operations: longitudinal turning, facing and profiling

Components: rolls, shafts, axles etc

Advantages: strong cutting edge for roughing, broad application area, high single-sided insert stability.



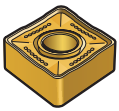
First choice

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined or light cast/forged skin.

NORMAL FEED



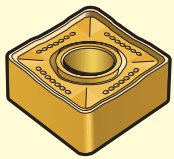
-MR / GC2025

AVERAGE CONDITIONS

◑

General purpose operations.

NORMAL FEED



-MR / GC2025

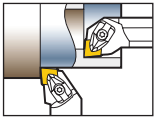
DIFFICULT CONDITIONS

●

- Interrupted cuts.
- Heavy cast skin or forging scale.

NORMAL FEED

-MR / GC2025 / GC2035

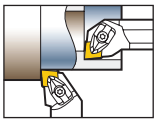


ROUGHING OF STAINLESS STEEL

Negative basic-shape inserts

ISO/ ANSI **M** **R**

ORDERING CODE							CUTTING DATA, CMC 05.21 / HB 180			
									Cutting speed v_c (m/min)	
Single sided		r_ε	○ GC2025	◑ GC2025	● GC2025	● GC2035	Cutting depth a_p mm	Feed f_n mm/r	GC2025	GC2035
	**CNMM**	**12 04 08-MR**	☆	★		☆	**3** (0.7-7.5)	**0.35** (0.2-0.55)	**190**	**155**
		12 04 12-MR	☆	★	☆		**3** (1-7.5)	**0.4** (0.25-0.7)	**175**	
		12 04 16-MR	☆	★	☆		**3** (1.5-7.5)	**0.5** (0.32-0.9)	**150**	
		16 06 08-MR	☆	★	☆		**6** (1-9.5)	**0.4** (0.3-0.55)	**175**	
		16 06 12-MR	☆	★	☆		**6** (1.2-9.5)	**0.45** (0.32-0.65)	**165**	
		16 06 16-MR	☆	★	☆		**6** (1.5-9.5)	**0.5** (0.35-0.8)	**150**	
	**DNMM**	**15 06 08-MR**	☆	★	☆		**3** (0.7-6)	**0.35** (0.2-0.55)	**190**	
		15 06 12-MR	☆	★	☆		**3** (1-6)	**0.4** (0.25-0.7)	**175**	
		15 06 16-MR	☆	★	☆		**3** (1.5-6)	**0.5** (0.32-0.9)	**150**	
	**SNMM**	**12 04 08-MR**	☆	★		☆	**3** (0.7-7.5)	**0.35** (0.2-0.55)	**190**	**155**
		12 04 12-MR	☆	★		☆	**3** (1-7.5)	**0.4** (0.25-0.7)	**175**	**145**
		12 04 16-MR	☆	★		☆	**3** (1.5-7.5)	**0.5** (0.32-0.9)	**150**	**130**
		15 06 12-MR	☆	★	☆		**4** (1-9)	**0.4** (0.25-0.7)	**175**	
		15 06 16-MR	☆	★	☆		**4** (1.5-9)	**0.5** (0.32-0.9)	**150**	
	**TNMM**	**16 04 08-MR**	☆	★		☆	**3** (0.7-7.5)	**0.35** (0.2-0.55)	**190**	**155**
		16 04 12-MR	☆	★		☆	**5** (1-7.5)	**0.4** (0.25-0.7)	**175**	**145**
		22 04 08-MR	☆	★	☆		**3** (0.7-8)	**0.35** (0.2-0.55)	**190**	
		22 04 12-MR	☆	★	☆		**3** (1-8)	**0.4** (0.25-0.7)	**175**	
		22 04 16-MR	☆	★	☆		**3** (1.5-8)	**0.5** (0.32-0.9)	**150**	
	**WNMM**	**08 04 08-MR**	☆	★		☆	(0.7-6)	**0.35** (0.2-0.55)	**190**	**155**
		08 04 12-MR	☆	★		☆	**3** (1-6)	**0.4** (0.25-0.7)	**175**	**145**
		08 04 16-MR	☆	★	☆		**3** (1.5-6)	**0.5** (0.32-0.9)	**150**	



FINISHING OF GREY CAST IRON AND NODULAR CAST IRON

High tensile, HB 220 / HB 250

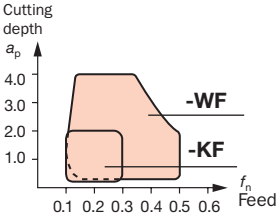
ISO/ANSI **K** **F**

T-Max P

Double sided

CNMG 12 04 08-WF
a_p = 0.3 – 4.0 mm
f_n = 0.1 – 0.5 mm/r

CNMG 12 04 08-KF
a_p = 0.2 – 2.0 mm
f_n = 0.1 – 0.3 mm/r



WF – for productive finish turning

Operations: longitudinal turning and facing

Components: rigid shafts, axles, hubs, gears etc.

Advantages: Double conventional feed rates with the same surface finish or halved surface finish values for the same feed. Ideal when good surface finish is a priority.

-KF

Operations: longitudinal turning, facing and profiling

Components: cast-iron components in general

Advantages: light-cutting geometry with low cutting forces, advantageous for vibration-sensitive components and unstably clamped components.

GOOD CONDITIONS

○

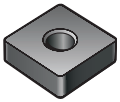
Continuous cuts.

Pre-machined or light cast skin.

HIGH FEED

-WF / GC3215

NORMAL FEED



-NGA / CC650

For best performance with ceramics use specially designed toolholders. See main catalogue.

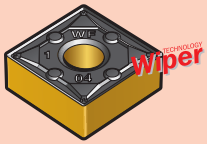
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

HIGH FEED



-WF / GC3215

NORMAL FEED

-KF / GC3215

DIFFICULT CONDITIONS

●

Interrupted cuts.

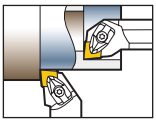
Heavy cast skin.

HIGH FEED

-WF / GC3215

NORMAL FEED

-KF / GC3215

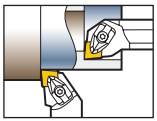


FINISHING OF GREY CAST IRON AND NODULAR CAST IRON

Negative basic-shape inserts

ISO/ANSI **K** **F**

ORDERING CODE						CUTTING DATA, CMC 08.2 / HB 220			
								Cutting speed v_c (m/min)	
Double sided		r_ε	CC650	GC3215	GC3215	GC3215	Cutting depth a_p mm	Feed f_n mm/r	CC650	GC3215
	CNMG	09 03 08-WF		☆	★	☆	**1** (0.3-2)	**0.3** (0.1-0.5)		**190**
		12 04 04-WF		☆	★	☆	**0.4** (0.3-3)	**0.15** (0.05-0.25)		**225**
		12 04 08-WF		☆	★	☆	**1** (0.3-4)	**0.3** (0.1-0.5)		**190**
		12 04 12-WF		☆	★	☆	**1.5** (0.4-4)	**0.5** (0.2-0.6)		**160**
	DNMX	11 04 04-WF		☆	★	☆	**1** (0.2-1.5)	**0.2** (0.08-0.3)		**215**
Wiper		11 04 08-WF		☆	★	☆	**1** (0.2-3)	**0.3** (0.1-0.4)		**190**
		15 06 08-WF		☆	★	☆	**1.5** (0.2-3)	**0.3** (0.1-0.4)		**190**
		15 06 12-WF		☆	★	☆	**1.5** (0.4-3.5)	**0.4** (0.15-0.55)		**175**
	TNMX	16 04 04-WF		☆	★	☆	**1** (0.2-3)	**0.2** (0.08-0.3)		**215**
		16 04 08-WF		☆	★	☆	**1.5** (0.2-3)	**0.4** (0.1-0.4)		**190**
	WNMG	06 04 04-WF		☆	★	☆	**0.4** (0.3-2)	**0.15** (0.05-0.25)		**225**
		06 04 08-WF		☆	★	☆	**1** (0.3-3)	**0.3** (0.1-0.5)		**190**
		08 04 04-WF		☆	★	☆	**0.4** (0.3-3)	**0.15** (0.05-0.25)		**225**
		08 04 08-WF		☆	★	☆	**1** (0.3-4)	**0.3** (0.1-0.5)		**190**
		08 04 12-WF		☆	★	☆	**1.5** (0.4-4)	**0.5** (0.2-0.6)		**160**
	CNMG	12 04 04-KF			★	☆	**0.5** (0.2-2)	**0.15** (0.08-0.25)		**225**
		12 04 08-KF			★	☆	**0.5** (0.2-2)	**0.2** (0.1-0.3)		**215**
		12 04 12-KF			★	☆	**1** (0.2-2.5)	**0.25** (0.1-0.35)		**200**
	CNGA	12 04 08 T01020	★				**3.6** (0.1-6)	**0.2** (0.05-0.36)	**610**	
		12 04 12 T01020	★				**3.6** (0.1-6)	**0.3** (0.05-0.54)	**540**	
		16 06 08 T01020	★				**4.8** (0.1-8)	**0.2** (0.05-0.36)	**610**	
		16 06 12 T01020	★				**4.8** (0.1-8)	**0.3** (0.05-0.54)	**540**	
	DNMG	11 04 04-KF			★	☆	**0.5** (0.2-2)	**0.15** (0.08-0.25)		**225**
		11 04 08-KF			★	☆	**0.5** (0.2-2)	**0.2** (0.1-0.3)		**215**
		15 06 04-KF			★	☆	**0.5** (0.2-2)	**0.15** (0.08-0.25)		**225**
		15 06 08-KF			★	☆	**0.5** (0.2-2)	**0.2** (0.1-0.3)		**215**
	SNGA	12 04 08 T01020	★				**3.6** (0.1-6)	**0.2** (0.05-0.36)	**610**	
		12 04 12 T01020	★				**3.6** (0.1-6)	**0.3** (0.05-0.54)	**540**	
	TNMG	16 04 04-KF			★	☆	**0.5** (0.2-2)	**0.15** (0.08-0.25)		**225**
		16 04 08-KF			★	☆	**0.5** (0.2-2)	**0.2** (0.1-0.3)		**215**
	TNGA	16 04 08 T01020	★				**4.8** (0.1-8)	**0.2** (0.05-0.36)	**610**	
		16 04 12 T01020	★				**4.8** (0.1-8)	**0.3** (0.05-0.54)	**540**	
	WNMG	06 04 04-KF			★	☆	**0.5** (0.2-2)	**0.15** (0.08-0.25)		**225**
		08 04 04-KF			★	☆	**0.5** (0.2-2)	**0.15** (0.08-0.25)		**225**
		08 04 08-KF			★	☆	**0.5** (0.2-2)	**0.2** (0.1-0.3)		**215**
		08 04 12-KF			★	☆	**1** (0.2-2.5)	**0.25** (0.1-0.35)		**200**



MEDIUM MACHINING OF GREY CAST IRON

High tensile, HB 220

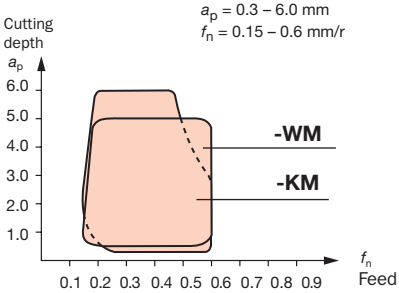
ISO/ ANSI **K** **M**

T-Max P

Double sided

CNMG 12 04 08-WM
a_p = 0.5 – 5.0 mm
f_n = 0.15 – 0.6 mm/r

CNMG 12 04 12-KM
a_p = 0.3 – 6.0 mm
f_n = 0.15 – 0.6 mm/r



WM – for productive medium turning

Operations: longitudinal turning and facing

Components: rigid shafts, axles, hubs, gears etc

Advantages: Double conventional feed rates with the same surface finish or halved surface finish values for the same feed. Ideal when good surface finish is a priority.

-KM

Operations: longitudinal turning, facing and profiling

Components: cast-iron components in general

Advantages: reliable giving problem-free machining, finishing to light roughing

Inserts for nodular cast iron, see page 42.

First choice

GOOD CONDITIONS

○

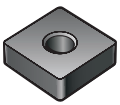
Continuous cuts.

Pre-machined or light cast skin.

HIGH FEED

-WM / GC3215

NORMAL FEED



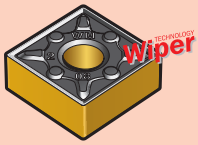
-NGA / CC6090

AVERAGE CONDITIONS

◑

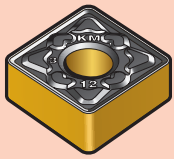
General purpose operations.

HIGH FEED



-WM / GC3215

NORMAL FEED



-KM / GC3205

DIFFICULT CONDITIONS

●

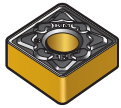
Interrupted cuts.

Heavy cast skin.

HIGH FEED

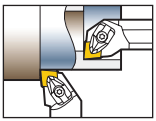
-WM / GC3215

NORMAL FEED



-KM / GC3215

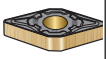
For best performance with ceramics use specially designed toolholders. See main catalogue.



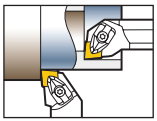
MEDIUM MACHINING OF GREY CAST IRON

Negative basic-shape inserts

ISO/ANSI **K** **M**

ORDERING CODE							CUTTING DATA, CMC 08.2 / HB 220					
									Cutting speed v_c (m/min)			
Double sided		r_ε	CC6090	GC3215	GC3205	GC3215	GC3215	Cutting depth a_p mm	Feed f_n mm/r	CC6090	GC3205	GC3215
	**CNMG**	**12 04 08-WM**		☆		★	☆	**3** (0.5-5)	**0.3** (0.15-0.6)			**190**
		12 04 12-WM		☆		★	☆	**3.5** (0.8-6)	**0.5** (0.2-0.9)			**160**
		16 06 08-WM		☆		★	☆	**3.5** (0.7-6.5)	**0.4** (0.2-0.7)			**175**
		16 06 12-WM		☆		★	☆	**3.5** (0.7-6.5)	**0.4** (0.2-0.7)			**175**
	**DNMX**	**15 06 08-WM**		☆		★	☆	**2** (0.5-4.5)	**0.35** (0.15-0.5)			**185**
		15 06 12-WM		☆		★	☆	**2.5** (0.5-5)	**0.45** (0.15-0.6)			**170**
		15 06 16-WM		☆		★	☆	**3.5** (0.5-6)	**0.6** (0.2-0.8)			**150**
	**TNMX**	**16 04 08-WM**		☆		★	☆	**2** (0.5-4.5)	**0.35** (0.15-0.5)			**185**
		16 04 12-WM		☆		★	☆	**2.5** (0.5-5)	**0.4** (0.15-0.6)			**175**
	**WNMG**	**06 04 08-WM**		☆		★	☆	**1.5** (0.5-3.5)	**0.3** (0.15-0.6)			**190**
		06 04 12-WM		☆		★	☆	**1.5** (0.8-3.5)	**0.5** (0.2-0.9)			**160**
		08 04 08-WM		☆		★	☆	**3** (0.5-5)	**0.3** (0.15-0.6)			**190**
		08 04 12-WM		☆		★	☆	**3.5** (0.8-6)	**0.5** (0.2-0.9)			**160**
	**CNMG**	**12 04 08-KM**			★		☆	**3** (0.2-6)	**0.35** (0.15-0.5)		**325**	**185**
		12 04 12-KM			★		☆	**3** (0.3-6)	**0.4** (0.15-0.6)		**310**	**175**
		12 04 16-KM			★		☆	**3** (0.3-6)	**0.45** (0.2-0.7)		**295**	**170**
		16 06 08-KM			★		☆	**4** (0.2-8)	**0.35** (0.15-0.5)		**325**	**185**
		16 06 12-KM			★		☆	**4** (0.3-8)	**0.4** (0.15-0.6)		**310**	**175**
		16 06 16-KM			★		☆	**4** (0.3-8)	**0.45** (0.2-0.7)		**295**	**170**
	**CNGA**	**12 04 08T02520**	★					**3.6** (0.1-6)	**0.2** (0.15-0.36)	**610**		
		12 04 12T02520	★					**3.6** (0.1-6)	**0.3** (0.15-0.54)	**540**		
		12 04 16T02520	★					**3.6** (0.1-6)	**0.4** (0.15-0.6)	**475**		
		16 06 12T02520	★					**4.8** (0.1-8)	**0.4** (0.15-0.6)	**475**		
		16 06 16T02520	★					**4.8** (0.1-8)	**0.4** (0.15-0.6)	**475**		
	**DNMG**	**11 04 08-KM**					☆	**2** (0.2-3.5)	**0.35** (0.15-0.5)			**185**
		11 04 12-KM					☆	**2** (0.3-3.5)	**0.4** (0.15-0.6)			**175**
		15 06 08-KM			★		☆	**2.5** (0.2-5)	**0.35** (0.15-0.5)		**325**	**185**
		15 06 12-KM			★		☆	**2.5** (0.3-5)	**0.4** (0.15-0.6)		**310**	**175**
	**SNMG**	**09 03 08-KM**					☆	**2.5** (0.2-4.5)	**0.35** (0.15-0.5)			**185**
		12 04 08-KM			★		☆	**3** (0.2-6)	**0.35** (0.15-0.5)		**325**	**185**
		12 04 12-KM			★		☆	**3** (0.3-6)	**0.4** (0.15-0.6)		**310**	**175**
		12 04 16-KM			★		☆	**3** (0.3-6)	**0.45** (0.2-0.7)		**295**	**170**
		15 06 12-KM			★		☆	**4** (0.3-8)	**0.4** (0.15-0.6)		**310**	**175**
		15 06 16-KM			★		☆	**4** (0.3-8)	**0.45** (0.2-0.7)		**295**	**170**
	**SNGA**	**12 04 08 T02520**	★					**3.6** (0.1-6)	**0.2** (0.15-0.36)	**610**		
		12 04 12 T02520	★					**3.6** (0.1-6)	**0.3** (0.15-0.54)	**540**		
		12 04 16 T02520	★					**3.6** (0.1-6)	**0.4** (0.15-0.6)	**475**		
	**TNMG**	**16 04 08-KM**			★		☆	**3** (0.2-5.5)	**0.35** (0.15-0.5)		**325**	**185**
		16 04 12-KM			★		☆	**3** (0.3-5.5)	**0.4** (0.15-0.6)		**310**	**175**
		22 04 08-KM			★		☆	**4** (0.2-8)	**0.35** (0.15-0.5)		**325**	**185**
		22 04 12-KM			★		☆	**4** (0.3-8)	**0.4** (0.15-0.6)		**310**	**175**
		22 04 16-KM			★		☆	**4** (0.3-8)	**0.45** (0.2-0.7)		**295**	**170**
	**TNGA**	**16 04 08 T02520**	★					**4.8** (0.1-8)	**0.2** (0.15-0.36)	**610**		
		16 04 12 T02520	★					**4.8** (0.1-8)	**0.3** (0.15-0.54)	**540**		
		16 04 16 T02520	★					**4.8** (0.1-8)	**0.4** (0.15-0.6)	**475**		
	**VNMG**	**16 04 08-KM**			★		☆	**2** (0.2-3.5)	**0.3** (0.15-0.4)		**340**	**190**
		16 04 12-KM			★		☆	**2** (0.3-3.5)	**0.35** (0.15-0.5)		**325**	**185**
	**WNMG**	**06 04 08-KM**					☆	**2** (0.2-4)	**0.35** (0.15-0.5)			**185**
		06 04 12-KM					☆	**2** (0.3-4)	**0.4** (0.15-0.6)			**175**
		08 04 08-KM			★		☆	**2.5** (0.2-5)	**0.35** (0.15-0.5)		**325**	**185**
		08 04 12-KM			★		☆	**2.5** (0.3-5)	**0.4** (0.15-0.6)		**310**	**175**
		08 04 16-KM			★		☆	**2.5** (0.3-5)	**0.45** (0.2-0.7)		**295**	**170**
	**WNGA**	**08 04 08T02520**	★					**3** (0.1-5)	**0.2** (0.15-0.36)	**610**		
		08 04 12T02520	★					**3** (0.1-5)	**0.3** (0.15-0.54)	**540**		
		08 04 16T02520	★					**3** (0.1-5)	**0.4** (0.15-0.6)	**475**		

Wiper



MEDIUM MACHINING OF NODULAR CAST IRON

High tensile, HB 250

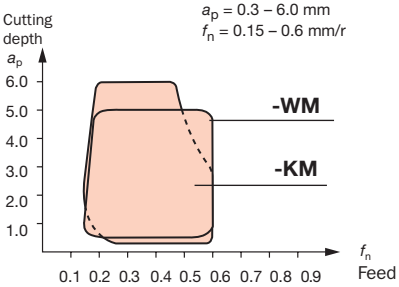
ISO/ANSI **K** **M**

T-Max P

Double sided

CNMG 12 04 08-WM
a_p = 0.5 – 5.0 mm
f_n = 0.15 – 0.6 mm/r

CNMG 12 04 12-KM
a_p = 0.3 – 6.0 mm
f_n = 0.15 – 0.6 mm/r



WM – for productive medium turning

Operations: longitudinal turning and facing

Components: rigid shafts, axles, hubs, gears etc

Advantages: Double conventional feed rates with the same surface finish or halved surface finish values for the same feed. Ideal when good surface finish is a priority.

-KM

Operations: longitudinal turning, facing and profiling

Components: cast-iron components in general

Advantages: reliable giving problem-free machining, finishing to light roughing

Inserts for grey cast iron, see page 40.

First choice

GOOD CONDITIONS

○

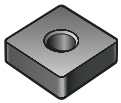
Continuous cuts.

Pre-machined or light cast skin.

HIGH FEED

-WM / GC3210

NORMAL FEED



-NGA / CC6090

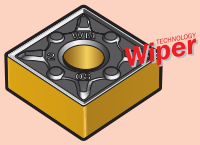
For best performance with ceramics use specially designed toolholders. See main catalogue.

AVERAGE CONDITIONS

◑

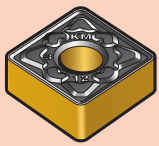
General purpose operations.

HIGH FEED



-WM / GC3210

NORMAL FEED



-KM / GC3210

DIFFICULT CONDITIONS

●

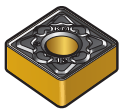
Interrupted cuts.

Heavy cast skin.

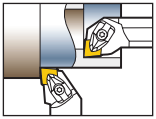
HIGH FEED

-WM / GC3215

NORMAL FEED



-KM / GC3215



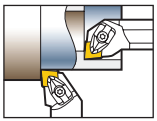
MEDIUM MACHINING OF NODULAR CAST IRON

Negative basic-shape inserts

ISO/ANSI **K** **M**

ORDERING CODE							CUTTING DATA, CMC 09.2 / HB 250					
									Cutting speed v_c (m/min)			
Double sided		r_ε	CC6090	GC3210	GC3210	GC3215	Cutting depth a_p mm	Feed f_n mm/r	CC6090	GC3210	GC3215	
	CNMG	**12 04 08-WM**		☆	★	☆	**3** (0.5-5)	**0.3** (0.15-0.6)		**285**	**190**	
		12 04 12-WM		☆	★	☆	**3.5** (0.8-6)	**0.5** (0.2-0.9)		**235**	**160**	
		16 06 08-WM		☆	★	☆	**3.5** (0.7-6.5)	**0.4** (0.2-0.7)		**255**	**175**	
		16 06 12-WM		☆	★	☆	**3.5** (0.7-6.5)	**0.4** (0.2-0.7)		**255**	**175**	
	DNMX	**15 06 08-WM**		☆	★	☆	**2** (0.5-4.5)	**0.35** (0.15-0.5)		**270**	**185**	
		15 06 12-WM		☆	★	☆	**2.5** (0.5-5)	**0.45** (0.15-0.6)		**245**	**170**	
		15 06 16-WM		☆	★	☆	**3.5** (0.5-6)	**0.6** (0.2-0.8)		**215**	**150**	
	TNMX	**16 04 08-WM**		☆	★	☆	**2** (0.5-4.5)	**0.35** (0.15-0.5)		**270**	**185**	
		16 04 12-WM		☆	★	☆	**2.5** (0.5-5)	**0.4** (0.15-0.6)		**255**	**175**	
	WNMG	**06 04 08-WM**		☆	★	☆	**1.5** (0.5-3.5)	**0.3** (0.15-0.6)		**285**	**190**	
		06 04 12-WM		☆	★	☆	**1.5** (0.8-3.5)	**0.5** (0.2-0.9)		**235**	**160**	
		08 04 08-WM		☆	★	☆	**3** (0.5-5)	**0.3** (0.15-0.6)		**285**	**190**	
		08 04 12-WM		☆	★	☆	**3.5** (0.8-6)	**0.5** (0.2-0.9)		**235**	**160**	
	CNMG	**12 04 08-KM**			★	☆	**3** (0.2-6)	**0.35** (0.15-0.5)		**270**	**185**	
		12 04 12-KM			★	☆	**3** (0.3-6)	**0.4** (0.15-0.6)		**255**	**175**	
		12 04 16-KM			★	☆	**3** (0.3-6)	**0.45** (0.2-0.7)		**245**	**170**	
		16 06 08-KM			★	☆	**4** (0.2-8)	**0.35** (0.15-0.5)		**270**	**185**	
		16 06 12-KM			★	☆	**4** (0.3-8)	**0.4** (0.15-0.6)		**255**	**175**	
		16 06 16-KM			★	☆	**4** (0.3-8)	**0.45** (0.2-0.7)		**245**	**170**	
	CNGA	**12 04 08T02520**	★				**3.6** (0.1-6)	**0.2** (0.15-0.36)	**610**			
		12 04 12T02520	★				**3.6** (0.1-6)	**0.3** (0.15-0.54)	**540**			
		12 04 16T02520	★				**3.6** (0.1-6)	**0.4** (0.15-0.6)	**475**			
		16 06 12T02520	★				**4.8** (0.1-8)	**0.3** (0.15-0.54)	**540**			
		16 06 16T02520	★				**4.8** (0.1-8)	**0.4** (0.15-0.6)	**475**			
	DNMG	**11 04 08-KM**			★	☆	**2** (0.2-3.5)	**0.35** (0.15-0.5)		**270**	**185**	
		11 04 12-KM			★	☆	**2** (0.3-3.5)	**0.4** (0.15-0.6)		**255**	**175**	
		15 06 08-KM			★	☆	**2.5** (0.2-5)	**0.35** (0.15-0.5)		**270**	**185**	
		15 06 12-KM			★	☆	**2.5** (0.3-5)	**0.4** (0.15-0.6)		**255**	**175**	
	SNMG	**09 03 08-KM**			★	☆	**2.5** (0.2-4.5)	**0.35** (0.15-0.5)		**270**	**185**	
		12 04 08-KM			★	☆	**3** (0.2-6)	**0.35** (0.15-0.5)		**270**	**185**	
		12 04 12-KM			★	☆	**3** (0.3-6)	**0.4** (0.15-0.6)		**255**	**175**	
		12 04 16-KM			★	☆	**3** (0.3-6)	**0.45** (0.2-0.7)		**245**	**170**	
		15 06 12-KM			★	☆	**4** (0.3-8)	**0.4** (0.15-0.6)		**255**	**175**	
		15 06 16-KM			★	☆	**4** (0.3-8)	**0.45** (0.2-0.7)		**245**	**170**	
	SNGA	**12 04 08T02520**	★				**3.6** (0.1-6)	**0.2** (0.15-0.36)	**610**			
		12 04 12T02520	★				**3.6** (0.1-6)	**0.3** (0.15-0.54)	**540**			
		12 04 16T02520	★				**3.6** (0.1-6)	**0.4** (0.15-0.6)	**475**			
	TNMG	**16 04 08-KM**			★	☆	**3** (0.2-5.5)	**0.35** (0.15-0.5)		**270**	**185**	
		16 04 12-KM			★	☆	**3** (0.3-5.5)	**0.4** (0.15-0.6)		**255**	**175**	
		22 04 08-KM			★	☆	**4** (0.2-8)	**0.35** (0.15-0.5)		**270**	**185**	
		22 04 12-KM			★	☆	**4** (0.3-8)	**0.4** (0.15-0.6)		**255**	**175**	
		22 04 16-KM			★	☆	**4** (0.3-8)	**0.45** (0.2-0.7)		**245**	**170**	
	TNGA	**16 04 08T02520**	★				**4.8** (0.1-8)	**0.2** (0.15-0.36)	**610**			
		16 04 12T02520	★				**4.8** (0.1-8)	**0.3** (0.15-0.54)	**540**			
		16 04 16T02520	★				**4.8** (0.1-8)	**0.4** (0.15-0.6)	**475**			
	VNMG	**16 04 08-KM**			★	☆	**2** (0.2-3.5)	**0.3** (0.15-0.4)		**285**	**190**	
		16 04 12-KM			★	☆	**2** (0.3-3.5)	**0.35** (0.15-0.5)		**270**	**185**	
	WNMG	**06 04 08-KM**			★	☆	**2** (0.2-4)	**0.35** (0.15-0.5)		**270**	**185**	
		06 04 12-KM			★	☆	**2** (0.3-4)	**0.4** (0.15-0.6)		**255**	**175**	
		08 04 08-KM			★	☆	**2.5** (0.2-5)	**0.35** (0.15-0.5)		**270**	**185**	
		08 04 12-KM			★	☆	**2.5** (0.3-5)	**0.4** (0.15-0.6)		**255**	**175**	
		08 04 16-KM			★	☆	**2.5** (0.3-5)	**0.45** (0.2-0.7)		**245**	**170**	
	WNGA	**08 04 08T02520**	★				**3** (0.1-5)	**0.2** (0.15-0.36)	**610**			
		08 04 12T02520	★				**3** (0.1-5)	**0.3** (0.15-0.54)	**540**			
		08 04 16T02520	★				**3** (0.1-5)	**0.4** (0.15-0.6)	**475**			

Wiper TECHNOLOGY



ROUGHING OF GREY CAST IRON

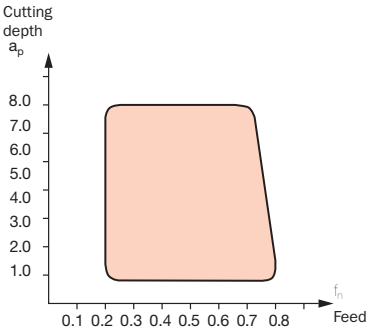
High tensile, HB 220

ISO/ ANSI **K** **R**

T-Max P

Double sided

CNMA 12 04 12-KR
a_p = 0.3 – 8.0 mm
f_n = 0.2 – 0.8 mm/r



.NMA-KR

Operations: longitudinal turning, facing and to some extent profiling

Components: cast-iron components in general

Advantages: broad application range for roughing

Inserts for nodular cast iron, see page 46.

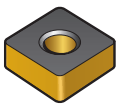
GOOD CONDITIONS

○

Continuous cuts.

Pre-machined or light cast skin.

NORMAL FEED



-KR / GC3205

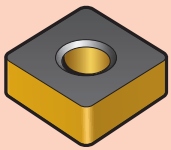
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

NORMAL FEED



-KR / GC3205

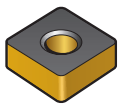
DIFFICULT CONDITIONS

●

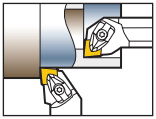
Interrupted cuts.

Heavy cast skin.

NORMAL FEED



-KR / GC3215

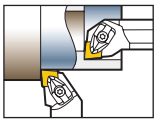


ROUGHING OF GREY CAST IRON

Negative basic-shape inserts

ISO/ANSI **K** **R**

ORDERING CODE						CUTTING DATA, CMC 08.2 / HB 220			
								Cutting speed v_c (m/min)	
Double sided		r_ε	GC3205	GC3205	GC3215	Cutting depth a_p mm	Feed f_n mm/r	GC3205	GC3215
	**CNMA**	**12 04 04-KR**	☆	★	☆	**2.5** (0.2-5)	**0.2** (0.1-0.3)	**375**	**215**
		12 04 08-KR	☆	★	☆	**4** (0.2-8)	**0.35** (0.15-0.6)	**325**	**185**
		12 04 12-KR	☆	★	☆	**4** (0.3-8)	**0.45** (0.2-0.8)	**295**	**170**
		12 04 16-KR	☆	★	☆	**4** (0.3-8)	**0.55** (0.2-1)	**275**	**155**
		16 06 12-KR	☆	★	☆	**5** (0.3-10)	**0.45** (0.2-0.8)	**295**	**170**
		16 06 16-KR	☆	★	☆	**5** (0.3-10)	**0.55** (0.2-1)	**275**	**155**
		19 06 08-KR	☆	★	☆	**6** (0.2-12)	**0.35** (0.15-0.6)	**325**	**185**
		19 06 12-KR	☆	★	☆	**6** (0.3-12)	**0.45** (0.2-0.8)	**295**	**170**
		19 06 16-KR	☆	★	☆	**6** (0.3-12)	**0.55** (0.2-1)	**275**	**155**
		19 06 24-KR	☆	★	☆	**6** (0.4-12)	**0.6** (0.2-1.19)	**265**	**185**
	**DNMA**	**15 06 08-KR**	☆	★	☆	**3** (0.2-6)	**0.35** (0.15-0.6)	**325**	**185**
		15 06 12-KR	☆	★	☆	**3** (0.3-6)	**0.45** (0.2-0.8)	**295**	**170**
		15 06 16-KR	☆		★	**3** (0.3-6)	**0.55** (0.2-1)	**275**	**155**
	**SNMA**	**09 03 08-KR**	☆		★	**2.5** (0.4-4.5)	**0.38** (0.19-0.53)	**315**	**180**
		12 04 08-KR	☆	★	☆	**4** (0.2-8)	**0.35** (0.15-0.6)	**325**	**185**
		12 04 12-KR	☆	★	☆	**4** (0.3-8)	**0.45** (0.2-0.8)	**295**	**170**
		12 04 16-KR	☆	★	☆	**4** (0.3-8)	**0.55** (0.2-1)	**275**	**155**
		15 06 12-KR	☆	★	☆	**5** (0.3-10)	**0.45** (0.2-0.8)	**295**	**170**
		15 06 16-KR	☆	★	☆	**5** (0.3-10)	**0.55** (0.2-1)	**275**	**155**
		19 06 08-KR		★	☆	**6** (0.2-12)	**0.35** (0.15-0.6)		**185**
		19 06 12-KR	☆	★	☆	**6** (0.3-12)	**0.45** (0.2-0.8)	**295**	**170**
		19 06 16-KR	☆	★	☆	**6** (0.3-12)	**0.55** (0.2-1)	**275**	**155**
	**TNMA**	**16 04 04-KR**	☆	★	☆	**2.5** (0.2-5)	**0.2** (0.1-0.3)	**375**	**215**
		16 04 08-KR	☆	★	☆	**3.5** (0.2-7)	**0.35** (0.15-0.6)	**325**	**185**
		16 04 12-KR	☆	★	☆	**3.5** (0.3-7)	**0.45** (0.2-0.8)	**295**	**170**
		16 04 16-KR	☆	★	☆	**3.5** (0.3-7)	**0.55** (0.2-1)	**275**	**155**
		22 04 04-KR	☆		★	**2.5** (0.2-10)	**0.2** (0.1-0.3)	**375**	**215**
		22 04 08-KR	☆	★	☆	**5** (0.2-10)	**0.35** (0.15-0.6)	**325**	**185**
		22 04 12-KR	☆	★	☆	**5** (0.3-10)	**0.45** (0.2-0.8)	**295**	**170**
		22 04 16-KR	☆	★	☆	**5** (0.3-10)	**0.55** (0.2-1)	**275**	**155**
	**WNMA**	**06 04 08-KR**	☆	★	☆	**2.5** (0.2-4)	**0.35** (0.15-0.6)	**325**	**185**
		06 04 12-KR	☆	★	☆	**2.5** (0.3-4)	**0.45** (0.2-0.8)	**295**	**170**
		08 04 08-KR	☆	★	☆	**3** (0.2-5)	**0.35** (0.15-0.6)	**325**	**185**
		08 04 12-KR	☆	★	☆	**3** (0.3-5)	**0.45** (0.2-0.8)	**295**	**170**
		08 04 16-KR	☆	★	☆	**3** (0.3-5)	**0.55** (0.2-1)	**275**	**155**



ROUGHING OF NODULAR CAST IRON

High tensile, HB 250

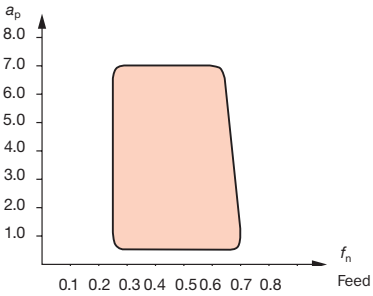
ISO/ANSI **K** **R**

T-Max P

Double sided

CNMG 12 04 12-KR
a_p = 0.5– 7.0 mm
f_n = 0.25 – 0.7 mm/r

Cutting depth



.NMG-KR

Operations: longitudinal turning, facing and to some extent profiling

Components: cast-iron components in general

Advantages: broad application range for roughing, double-sided alternative for highly capable roughing, contributing towards good machining economy

Inserts for grey cast iron, see page 44.

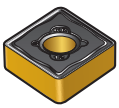
GOOD CONDITIONS

○

Continuous cuts.

Pre-machined or light cast skin.

NORMAL FEED



-KR / GC3210

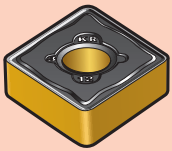
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

NORMAL FEED



-KR / GC3210

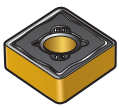
DIFFICULT CONDITIONS

●

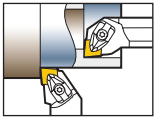
Interrupted cuts.

Heavy cast skin.

NORMAL FEED



-KR / GC3215

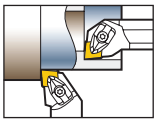


ROUGHING OF NODULAR CAST IRON

Negative basic-shape inserts

ISO/ANSI **K** **R**

ORDERING CODE					CUTTING DATA, CMC 09.2/HB 250			
							Cutting speed v_c (m/min)	
Double sided	r_ε	○ GC3210	◑ GC3210	● GC3215	Cutting depth a_p mm	Feed f_n mm/r	GC3210	GC3215
	**CNMG 12 04 08-KR**	☆	★	☆	**3.5** (0.4-7)	**0.38** (0.19-0.53)	**260**	**180**
	12 04 12-KR	☆	★	☆	**3.5** (0.5-7)	**0.5** (0.25-0.7)	**235**	**160**
	12 04 16-KR	☆	★	☆	**3.5** (0.8-7)	**0.61** (0.28-0.85)	**215**	**150**
	16 06 12-KR	☆	★	☆	**4.7** (0.8-9.3)	**0.55** (0.28-0.77)	**225**	**155**
	16 06 16-KR	☆	★	☆	**4.7** (1-9.3)	**0.61** (0.3-0.85)	**215**	**150**
	19 06 12-KR	☆	★	☆	**7** (1-14)	**0.55** (0.28-0.77)	**225**	**155**
	19 06 16-KR	☆	★	☆	**7** (1.5-14)	**0.61** (0.3-0.85)	**215**	**150**
	**DNMG 15 06 08-KR**	☆	★	☆	**3.5** (0.4-7)	**0.34** (0.17-0.47)	**270**	**185**
	15 06 12-KR	☆	★	☆	**3.5** (0.5-7)	**0.45** (0.23-0.63)	**245**	**170**
	15 06 16-KR	☆	★	☆	**3.5** (0.8-7)	**0.5** (0.25-0.69)	**235**	**160**
	**SNMG 12 04 08-KR**	☆	★	☆	**3.5** (0.4-7)	**0.38** (0.19-0.53)	**260**	**180**
	12 04 12-KR	☆	★	☆	**3.5** (0.5-7)	**0.5** (0.28-0.7)	**235**	**160**
	12 04 16-KR	☆	★	☆	**3.5** (0.8-7)	**0.55** (0.28-0.77)	**225**	**155**
	15 06 12-KR	☆	★	☆	**4.4** (0.6-8.8)	**0.55** (0.28-0.77)	**225**	**155**
	15 06 16-KR	☆	★	☆	**4.4** (0.9-8.8)	**0.61** (0.3-0.85)	**215**	**150**
	19 06 16-KR	☆	★	☆	**6.1** (1.3-12.3)	**0.61** (0.3-0.85)	**215**	**150**
	**TNMG 16 04 08-KR**	☆	★	☆	**3.2** (0.3-6.2)	**0.3** (0.17-0.42)	**285**	**190**
	16 04 12-KR	☆	★	☆	**3.2** (0.5-6.3)	**0.4** (0.2-0.56)	**255**	**175**
	16 04 16-KR	☆	★	☆	**3.2** (0.7-6.2)	**0.44** (0.22-0.62)	**245**	**170**
	22 04 08-KR	☆	★	☆	**3.5** (0.4-7)	**0.38** (0.19-0.53)	**260**	**180**
	22 04 12-KR	☆	★	☆	**3.5** (0.5-7)	**0.5** (0.25-0.7)	**235**	**160**
	22 04 16-KR	☆	★	☆	**3.5** (0.8-7)	**0.55** (0.28-0.77)	**225**	**155**
	**WNMG 06 04 08-KR**	☆	★	☆	**2.2** (0.2-4.5)	**0.3** (0.17-0.42)	**285**	**190**
	06 04 12-KR	☆	★	☆	**2.2** (0.3-4.5)	**0.4** (0.2-0.56)	**255**	**175**
	08 04 08-KR	☆	★	☆	**2.7** (0.3-5.5)	**0.34** (0.17-0.47)	**270**	**185**
	08 04 12-KR	☆	★	☆	**2.7** (0.4-5.5)	**0.45** (0.23-0.63)	**245**	**170**



FINISHING OF SUPER ALLOYS

HB 350

ISO/ ANSI **S** **F**

T-Max P

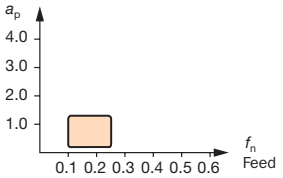
Double sided

CNGP 12 04 08
a_p = 0.2– 1.3 mm
f_n = 0.1 – 0.25 mm/r

.NGP
Operations: finishing operations generally
Components: HRSA components in general

Advantages: light cutting geometry with low cutting forces, good alternative for slender shafts, thin-walled and unstably clamped components. The positive geometry minimizes tendencies for built up edge, leading to good surface finish capability and long tool-life.

Cutting depth



GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined surface

NORMAL FEED

.NGP / S05F

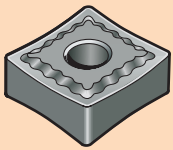
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

NORMAL FEED



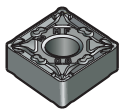
.NGP / GC1105

DIFFICULT CONDITIONS

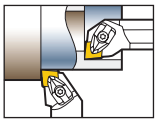
●

- Interrupted cuts.
- Hard/aged conditions, forging scale

NORMAL FEED



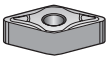
MF / GC1105

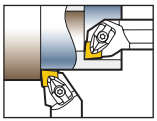


FINISHING OF SUPER ALLOYS

Negative basic-shape inserts

ISO/ANSI **S** **F**

ORDERING CODE					CUTTING DATA, CMC 20.22/HB 350			
							Cutting speed v_c (m/min)	
Double sided	r_ε	○ S05F	◑ GC1105	● GC1105	Cutting depth a_p mm	Feed f_n mm/r	S05F	GC1105
	**CNMG 12 04 04-MF**	☆	★	☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**90**	**80**
	12 04 08-MF	☆	★	☆	**0.4** (0.1-1.5)	**0.15** (0.1-0.3)	**85**	**80**
	**CNGP 12 04 04**	☆	★	☆	**0.6** (0.1-1.3)	**0.11** (0.06-0.15)	**90**	**80**
	12 04 08	☆	★	☆	**0.6** (0.2-1.3)	**0.17** (0.1-0.25)	**80**	**75**
	**DNMG 15 06 04-MF**	☆	★	☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**90**	**80**
	15 06 08-MF	☆	★	☆	**0.4** (0.1-1.5)	**0.15** (0.1-0.3)	**85**	**80**
	**DNGP 15 06 04**	☆	★	☆	**0.2** (0.1-0.3)	**0.1** (0.05-0.15)	**90**	**80**
	15 06 08	☆	★	☆	**0.3** (0.2-0.5)	**0.17** (0.1-0.25)	**80**	**75**
	**VNMG 16 04 04-MF**	☆	★	☆	**0.4** (0.1-1.5)	**0.1** (0.05-0.2)	**90**	**80**
	**VNGP 16 04 04**	☆	★	☆	**0.2** (0.1-0.3)	**0.1** (0.05-0.15)	**90**	**80**
	16 04 08	☆	★	☆	**0.3** (0.2-0.5)	**0.17** (0.1-0.25)	**80**	**75**
	**WNGP 08 04 04**		☆	★	**0.6** (0.1-1.3)	**0.11** (0.06-0.15)		**80**
	08 04 08		☆	★	**0.6** (0.2-1.3)	**0.17** (0.1-0.25)		**75**



MEDIUM MACHINING OF SUPER ALLOYS

HB 350

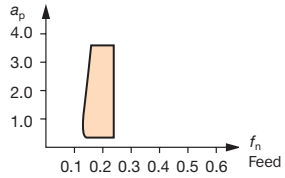
ISO/ ANSI **S** **M**

T-Max P

Double sided

CNMG 12 04 08-23
a_p = 0.4 – 3.6 mm
f_n = 0.13 – 0.24 mm/r

Cutting depth



-23 – for fine- to medium turning

Operations: longitudinal turning, facing and profiling

Components: generally semi-finishing and finishing of components in stainless steel and HRSA

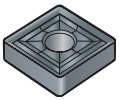
Advantages: Sharp, light cutting geometry to give low cutting forces. Provides possibility to machine slender shafts, thin-walled and unstably clamped components. Positive geometry minimizes tendency for BUE, resulting in good surface finish and long tool-life

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined surface

NORMAL FEED



-23 / GC1105

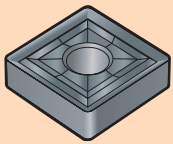
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

NORMAL FEED



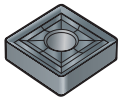
-23 / GC1105

DIFFICULT CONDITIONS

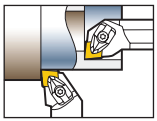
●

- Interrupted cuts.
- Hard/aged conditions, forging scale

NORMAL FEED



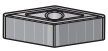
-23 / H13A

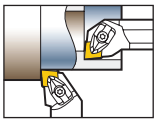


MEDIUM MACHINING OF SUPER ALLOYS

Negative basic-shape inserts

ISO/ANSI **S** **M**

ORDERING CODE					CUTTING DATA, CMC 20.22/HB 350			
							Cutting speed v_c (m/min)	
Double sided	r_ε	GC1105	GC1105	H13A	Cutting depth a_p mm	Feed f_n mm/r	GC1105	H13A
	**CNMG 12 04 04-23**	☆	★	☆	**1.5** (0.2-3.6)	**0.14** (0.1-0.18)	**80**	**40**
	12 04 08-23	☆	★	☆	**2.4** (0.4-3.6)	**0.18** (0.13-0.24)	**75**	**40**
	12 04 12-23	☆	★	☆	**2.4** (0.4-3.6)	**0.22** (0.16-0.29)	**65**	**35**
	**DNMG 15 06 04-23**	☆	★	☆	**1.5** (0.2-3.6)	**0.14** (0.1-0.18)	**80**	**40**
	15 06 08-23	☆	★	☆	**2.4** (0.4-3.6)	**0.18** (0.13-0.5)	**75**	**40**
	15 06 12-23	☆	★	☆	**2.4** (0.4-3.6)	**0.22** (0.16-0.29)	**65**	**35**
	**SNMG 12 04 04-23**			★	**1.5** (0.2-3.6)	**0.14** (0.1-0.18)		**40**
	12 04 08-23	☆	★	☆	**2.4** (0.4-3.6)	**0.18** (0.13-0.24)	**75**	**40**
	12 04 12-23	☆	★	☆	**2.4** (0.4-3.6)	**0.22** (0.16-0.29)	**65**	**35**
	**TNMG 16 04 04-23**	☆	★	☆	**2** (0.2-3)	**0.11** (0.08-0.15)	**80**	**40**
	16 04 08-23	☆	★	☆	**2** (0.3-3)	**0.15** (0.11-0.2)	**80**	**40**
	16 04 12-23	☆	★	☆	**2** (0.4-3)	**0.18** (0.13-0.24)	**75**	**40**
	22 04 08-23	☆	★	☆	**2.4** (0.4-3.6)	**0.18** (0.13-0.24)	**75**	**40**
	22 04 12-23	☆	★		**2.4** (0.4-3.6)	**0.22** (0.16-0.29)	**65**	
	**VNMG 16 04 04-23**	☆	★	☆	**2** (0.4-4)	**0.15** (0.1-0.2)	**80**	**40**
	16 04 08-23	☆	★	☆	**2.5** (0.5-4)	**0.2** (0.15-0.25)	**70**	**35**
	**WNMG 06 04 04-23**	☆	★	☆	**2** (0.5-3)	**0.15** (0.1-0.3)	**80**	**40**
	06 04 08-23	☆	★	☆	**2.5** (0.7-4)	**0.25** (0.2-0.35)	**60**	**35**
	08 04 04-23	☆	★	☆	**2.5** (0.5-4)	**0.15** (0.1-0.3)	**80**	**40**
	08 04 08-23	☆	★	☆	**2.5** (0.7-4)	**0.25** (0.2-0.35)	**60**	**35**



ROUGHING OF SUPER ALLOYS

HB 350

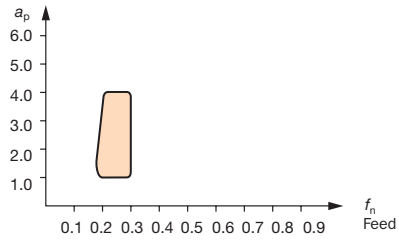
ISO/ ANSI **S** **R**

T-Max P

Double sided

CNMG 12 04 08-QM
a_p = 1.0 – 4.0 mm
f_n = 0.18 – 0.3 mm/r

Cutting depth



-QM

Operations: longitudinal turning, facing and profiling

Components: generally within mixed machining in stainless steel and HRSA

Advantages: large application area for semi-finishing to light roughing in different materials, available in many grades

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined surface

NORMAL FEED

-QM / S05F

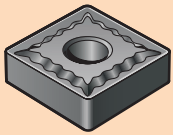
First choice

AVERAGE CONDITIONS

◑

General purpose operations.

NORMAL FEED



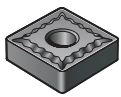
-QM / GC1105

DIFFICULT CONDITIONS

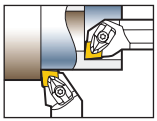
●

- Interrupted cuts.
- Hard/aged conditions, forging scale

NORMAL FEED



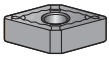
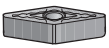
-QM / H13A

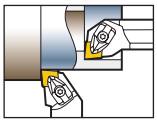


ROUGHING OF SUPER ALLOYS

Negative basic-shape inserts

ISO/ANSI **S** **R**

ORDERING CODE						CUTTING DATA, CMC 20.22/HB 350				
								Cutting speed v_c (m/min)		
Double sided		r_ε	S05F	GC1105	H13A	Cutting depth a_p mm	Feed f_n mm/r	S05F	GC1105	H13A
	**CNMG**	**12 04 04-QM**		★	☆	**1.5** (0.5-4)	**0.18** (0.14-0.23)		**75**	**40**
		12 04 08-QM	☆	★	☆	**2.4** (1-4)	**0.22** (0.18-0.3)	**70**	**65**	**35**
		12 04 12-QM	☆	★	☆	**2.4** (1.2-4)	**0.25** (0.2-0.34)	**70**	**60**	**35**
		12 04 16-QM		★	☆	**2.4** (1.3-4)	**0.28** (0.23-0.38)		**55**	**30**
		16 06 08-QM			☆	**3** (1-6)	**0.25** (0.2-0.35)			**25**
		16 06 12-QM		★	☆	**3** (1-6)	**0.3** (0.25-0.4)		**50**	**30**
	**DNMG**	**15 06 04-QM**			☆	**2.4** (1-4)	**0.2** (0.18-0.3)			**35**
		15 06 08-QM	☆	★	☆	**2.4** (1-4)	**0.22** (0.18-0.3)	**70**	**65**	**35**
		15 06 12-QM	☆	★	☆	**2.4** (1.2-4)	**0.25** (0.2-0.34)	**70**	**60**	**35**
	**SNMG**	**09 03 08-QM**			☆	**2.5** (1-3)	**0.25** (0.2-0.3)			**35**
		12 04 08-QM	☆	★	☆	**2.4** (1-4)	**0.22** (0.18-0.3)	**70**	**65**	**35**
		12 04 12-QM		★	☆	**2.4** (1.2-4)	**0.24** (0.19-0.32)		**65**	**35**
		12 04 16-QM		★	☆	**2.4** (1.2-4)	**0.35** (0.3-0.4)		**45**	**25**
	**TNMG**	**16 04 04-QM**			☆	**2** (1-3.5)	**0.2** (0.18-0.23)			**35**
		16 04 08-QM		★	☆	**2** (1-3.5)	**0.18** (0.15-0.25)		**75**	**40**
		16 04 12-QM		★		**2** (1-3.5)	**0.21** (0.17-0.28)		**70**	
		22 04 04-QM			☆	**3** (1-5)	**0.2** (0.18-0.25)			**35**
		22 04 08-QM			☆	**3** (1-5)	**0.25** (0.2-0.3)			**35**
		22 04 12-QM			☆	**3** (1-5)	**0.3** (0.25-0.35)			**30**
		22 04 16-QM		★		**3** (1.3-5)	**0.28** (0.23-0.38)		**55**	
	**VNMG**	**16 04 04-QM**			★	**0.9** (0.4-2)	**0.13** (0.1-0.17)			**40**
		16 04 08-QM		★	☆	**1.1** (0.8-2)	**0.18** (0.15-0.22)		**75**	**40**
	**WNMG**	**08 04 04-QM**		★	☆	**2.1** (0.8-3.5)	**0.18** (0.15-0.23)		**75**	**40**
		08 04 08-QM		★	☆	**2.1** (0.8-3.5)	**0.2** (0.16-0.3)		**70**	**35**
		08 04 12-QM		★	☆	**2.1** (1-3.5)	**0.25** (0.18-0.34)		**60**	**35**



FINISHING OF HARDENED STEEL

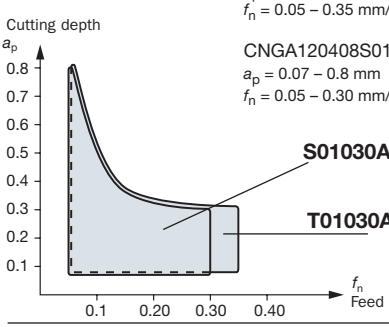
HRC 60

ISO/ANSI **H** **F**

T-Max P

CNGA120408T01030AWH
a_p = 0.07 – 0.8 mm
f_n = 0.05 – 0.35 mm/r

CNGA120408S01030A
a_p = 0.07 – 0.8 mm
f_n = 0.05 – 0.30 mm/r



.NGA

Operations: longitudinal turning, facing and profiling.

Components: hardened gear box and other drive train components.

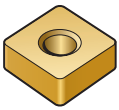
Advantages: excellent finish on hardened materials. Savings compared to grinding.

Possible optimization: Wiper geometry WH.

GOOD CONDITIONS

○

- Continuous cuts.
- Pre-machined surface.



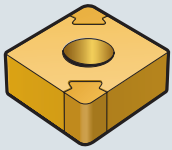
.NGA / GC6050

First choice

AVERAGE CONDITIONS

◑

- Continous to light interrupted cuts.
- High quality surfaces.

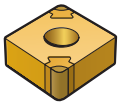


.NGA / CB7015

DIFFICULT CONDITIONS

●

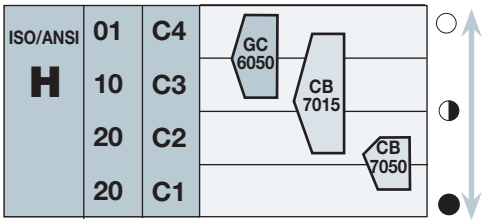
- Interrupted cuts.



.NGA / CB7050

Insert grades

Wear resistance



Toughness

GC6050 - Coated ceramic

CB7015 - Cubic boron nitride tipped, coated

CB7050 - Cubic boron nitride tipped, coated

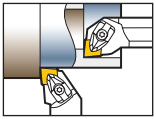
Chamfer configurations

S-type

Chamfer with light honing

T-type

Chamfer with no honing



FINISHING OF HARDENED STEEL

Negative basic-shape inserts

ISO/ANSI **H** **F**

ORDERING CODE						CUTTING DATA, CMC 04.1 / HRC 60				
								Cutting speed v_c (m/min)		
Double sided		r_ε	GC6050	CB7015	CB7050	Cutting depth a_p mm	Feed f_n mm/r	GC6050	CB7015	CB7050
	**CNGA 12 04 04 T01030AWH**			★		**0.1**(0.07-0.4)	**0.18**(0.05-0.25)		**180**	
	12 04 08 T01030AWH			★		**0.1**(0.07-0.8)	**0.28**(0.05-0.35)		**155**	
	12 04 12 T01030AWH			★		**0.2**(0.07-1.2)	**0.32**(0.05-0.4)		**145**	
	**WNGA 08 04 04 T01030AWH**			★		**0.1**(0.07-0.4)	**0.18**(0.05-0-25)		**180**	
	08 04 08 T01030AWH			★		**0.1**(0.07-0.8)	**0.28**(0.05-0-35)		**155**	
	08 04 12 T01030AWH			★		**0.2**(0.07-1.2)	**0.32**(0.05-0.4)		**145**	
	**CNGA 12 04 04 S01525**		★			**0.1** (0.1-0.5)	**0.1** (0.05-0.2)	**160**		
	12 04 08 S01525		★			**0.2** (0.1-1)	**0.1** (0.05-0.3)	**160**		
	12 04 12 S01525		★			**0.3** (0.1-1.5)	**0.15** (0.05-0.35)	**140**		
	**CNGA 12 04 04 S01030A**			★		**0.1**(0.07-0.4)	**0.1**(0.05-0.2)		**215**	
	12 04 08 S01030A			★		**0.2**(0.07-0.8)	**0.15**(0.05-0.3)		**190**	
	12 04 12 S01030A			★		**0.2**(0.07-1.2)	**0.2**(0.05-0.3		**175**	
	**CNGA 12 04 04 T01020A**				★	**0.1** (0.07-0.4)	**0.1** (0.05-0.2)			**145**
	12 04 08 T01020A				★	**0.2** (0.07-0.8)	**0.15** (0.05-0.3)			**140**
	12 04 12 T01020A				★	**0.2** (0.07-1.2)	**0.2** (0.05-0.4)			**130**
	**DNGA 15 06 04 S01525**		★			**0.1** (0.1-0.5)	**0.1** (0.05-0.2)	**160**		
	15 06 08 S01525		★			**0.2** (0.1-1)	**0.1** (0.05-0.3)	**160**		
	15 06 12 S01525		★			**0.3** (0.1-1.5)	**0.15** (0.05-0.35)	**140**		
	**DNGA 15 04 04 S01030A**			★		**0.1**(0.07-0.4)	**0.1**(0.05-0-2)		**215**	
	15 04 08 S01030A			★		**0.2**(0.07-0.8)	**0.15**(0.05-0-3)		**190**	
	15 04 12 S01030A			★		**0.2**(0.07-1.2)	**0.2**(0.05-0.3)		**175**	
	**SNGA 12 04 08 S01525**		★			**0.2** (0.1-1)	**0.1** (0.05-0.3)	**160**		
	12 04 12 S01525		★			**0.3** (0.1-1.5)	**0.15** (0.05-0.35)	**140**		
	**SNGA 12 04 08 S01030A**			★		**0.2**(0.07-0.8)	**0.15**(0.05-0.3)		**190**	
	12 04 12 S01030A			★		**0.2**(0.07-1.2)	**0.2**(0.05-0.3)		**175**	
	**SNGA 12 04 08 T01020A**				★	**0.2** (0.07-0.8)	**0.15** (0.05-0.3)			**140**
	12 04 12 T01020A				★	**0.2** (0.07-1.2)	**0.2** (0.05-0.4)			**130**
	**TNGA 16 04 04 S01525**		★			**0.1** (0.1-0.5)	**0.1** (0.05-0.2)	**160**		
	16 04 08 S01525		★			**0.2** (0.1-1)	**0.1** (0.05-0.2)	**160**		
	16 04 12 S01525		★			**0.3** (0.1-1.5)	**0.15** (0.05-0.35)	**140**		
	**TNGA 16 04 04 S01030A**			★		**0.1**(0.07-0.4)	**0.1**(0.05-0-2)		**215**	
	16 04 08 S01030A			★		**0.2**(0.07-0.8)	**0.15**(0.05-0-3)		**190**	
	16 04 12 S01030A			★		**0.2**(0.07-1.2)	**0.2**(0.05-0.3)		**145**	
	**TNGA 16 04 04 T01020A**				★	**0.1** (0.07-0.4)	**0.1** (0.05-0.2)			**145**
	16 04 08 T01020A				★	**0.2** (0.07-0.8)	**0.15** (0.05-0.3)			**140**
	16 04 12 T01020A				★	**0.2** (0.07-0.6)	**0.2** (0.05-0.4)			**130**
	**VNGA 16 04 04 S01525**		★			**0.1** (0.1-0.5)	**0.1** (0.05-0.2)	**160**		
	16 04 08 S01525		★			**0.2** (0.1-1)	**0.1** (0.05-0.3)	**160**		
	16 04 12 S01525		★			**0.3** (0.1-1.5)	**0.15** (0.05-0.35)	**140**		
	**WNGA 08 04 04 S01525**		★			**0.1** (0.1-0.5)	**0.1** (0.05-0.2)	**160**		
	08 04 08 S01525		★			**0.2** (0.1-1)	**0.1** (0.05-0.3)	**160**		
	**WNGA 08 04 04 S01030A**			★		**0.1**(0.07-0.4)	**0.1**(0.05-0-2)		**215**	
	08 04 08 S01030A			★		**0.2**(0.07-0.8)	**0.15**(0.05-0-3)		**190**	
	08 04 12 S01030A			★		**0.2**(0.07-1.2)	**0.2**(0.05-0-3)		**175**	
	**WNGA 08 04 04 T01020A**				★	**0.1** (0.07-0.4)	**0.1** (0.05-0.2)			**145**
	08 04 08 T01020A				★	**0.2** (0.07-0.8)	**0.15** (0.05-0.3)			**140**
	08 04 12 T01020A				★	**0.2** (0.07-1.2)	**0.2** (0.05-0.4)			**130**