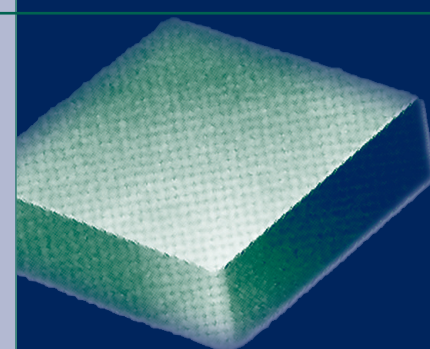
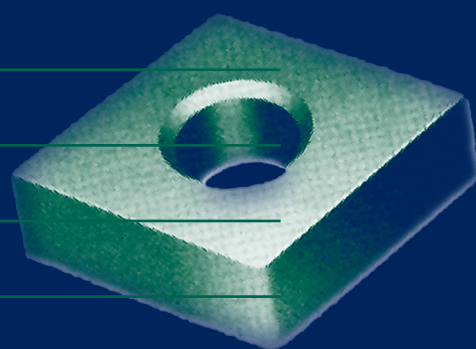
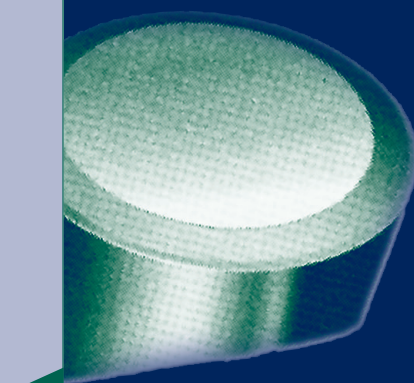
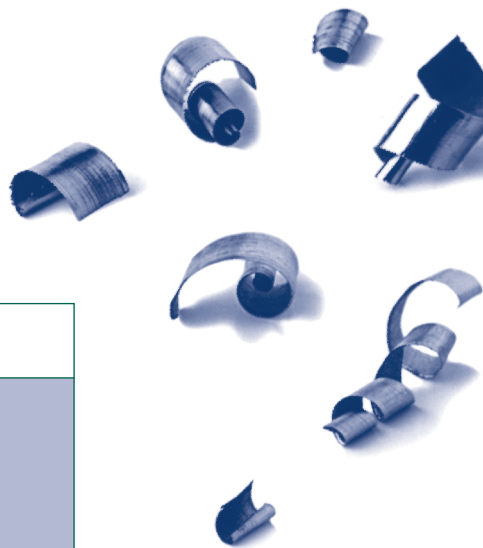
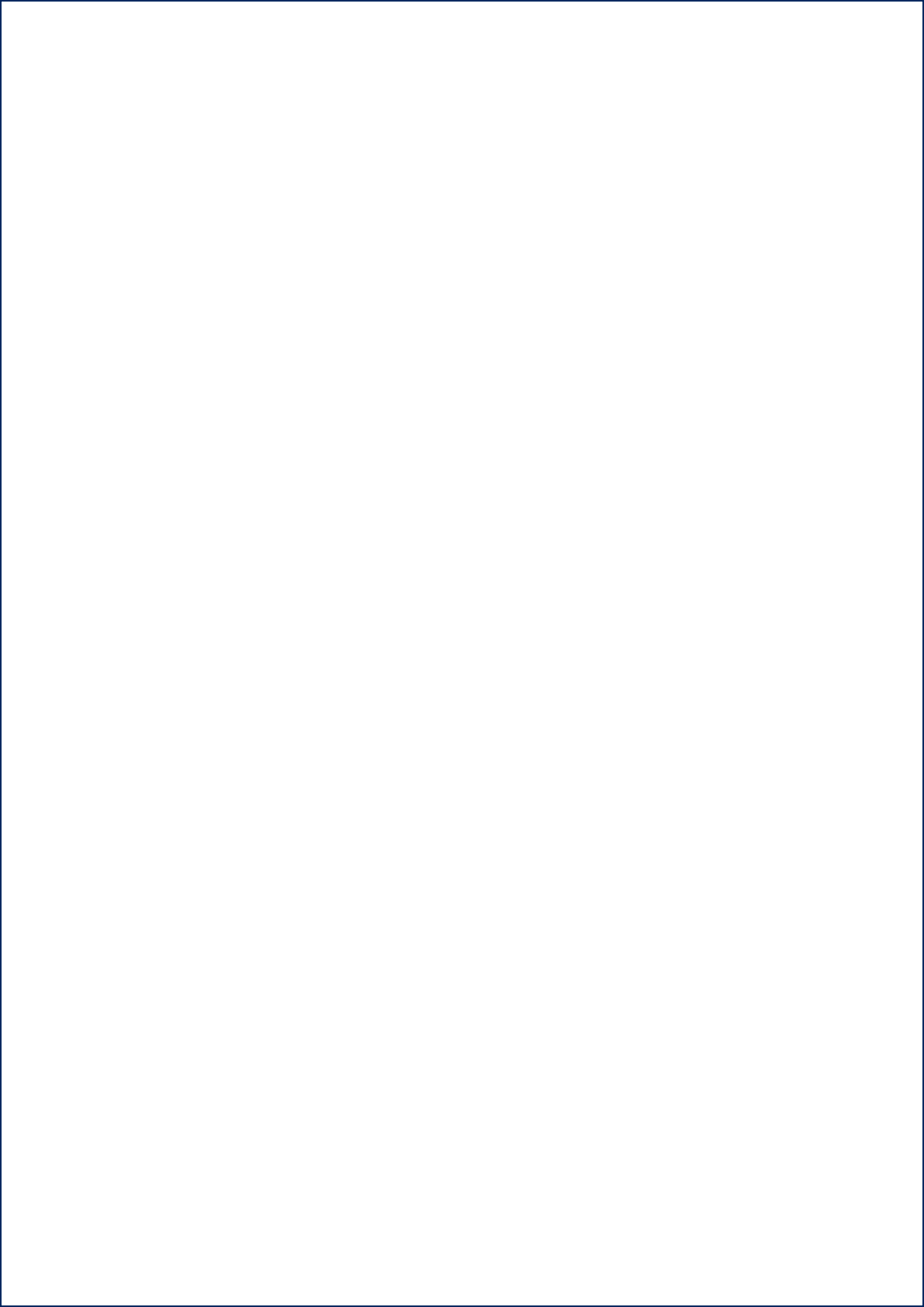


# Ceramic Inserts



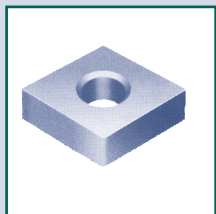
**COMBIDEX<sup>®</sup>**



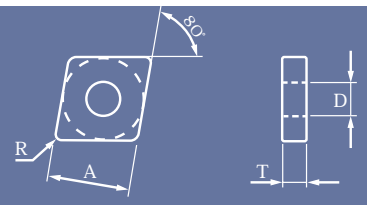
<b>CNGA</b>	- Insert		<b>4</b>
<b>CNGN</b>	- Insert		<b>4</b>
<b>DNGA</b>	- Insert		<b>5</b>
<b>DNGN</b>	- Insert		<b>5</b>
<b>ENGN</b>	- Insert		<b>5</b>
<b>RCGX</b>	- Insert		<b>6</b>
<b>RNGN</b>	- Insert		<b>6</b>
<b>SNGA</b>	- Insert		<b>6</b>
<b>SNGN</b>	- Insert		<b>7</b>
<b>SPGN</b>	- Insert		<b>7</b>
<b>TNGA</b>	- Insert		<b>8</b>
<b>TNGN</b>	- Insert		<b>8</b>
<b>TPGN</b>	- Insert		<b>8</b>
•	<b>Ceramic Grade System for Cutting</b>		<b>9</b>
•	<b>Ceramic Grade Comparision Table</b>		<b>9</b>
•	<b>Ceramic Recommended Grade for Workpiece</b>		<b>10</b>
•	<b>Ceramic Compound &amp; Physical Properties</b>		<b>10</b>
•	<b>Ceramic Recommended Cutting Conditions</b>		<b>11</b>



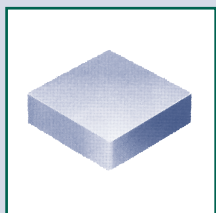
**CNGA**



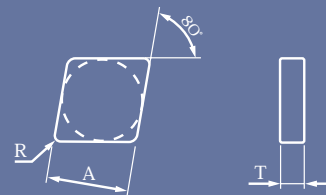
A	Size		R	D	Ordering code
	T				
12,700	4,76		0,4	5,2	CNGA 120404
↓	↓		0,8	↓	CNGA 120408
↓	↓		1,2	↓	CNGA 120412



**CNGN**



A	Size		R	Ordering code
	T			
12,700	4,76		0,4	CNGN 120404
↓	↓		0,8	CNGN 120408
↓	↓		1,2	CNGN 120412
↓	↓		1,6	CNGN 120416
12,700	7,94		0,8	CNGN 120708
↓	↓		1,2	CNGN 120712
↓	↓		1,6	CNGN 120716
15,875	7,94		0,8	CNGN 160708
↓	↓		1,2	CNGN 160712
↓	↓		1,6	CNGN 160716
25,400	9,52		2,4	CNGN 250924



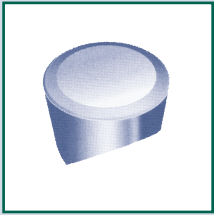
**Ceramic Inserts**

Geometrie	Ordering code	Size				DNGA
		A	T	R	D	
	DNGA 150604	12,700	6,35	0,4	5,2	
	DNGA 150608	↓	↓	0,8	↓	
	DNGA 150612	↓	↓	1,2	↓	

Geometrie	Ordering code	Size			DNGN
		A	T	R	
	DNGN 150604	12,700	6,35	0,4	
	DNGN 150608	↓	↓	0,8	
	DNGN 150704	12,700	7,94	0,4	
	DNGN 150708	↓	↓	0,8	

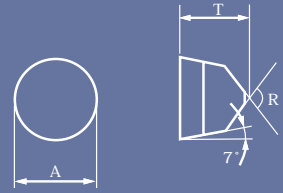
Geometrie	Ordering code	Size			ENGN
		A	T	R	
	ENGN 130708	12,700	7,94	0,8	
	ENGN 130712	↓	↓	1,2	
	ENGN 130716	↓	↓	1,6	

**RGCX**

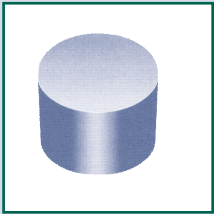


A	Size T	R	Ordering code
9,525	7,70	120°	RCGX 0907
12,700	↓	120°	RCGX 1207
15,875	9,77	120°	RCGX 1510
19,050	↓	120°	RCGX 1910
25,400	11,85	140°	RCGX 2512

**Geometrie**

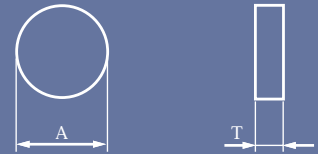


**RNGN**

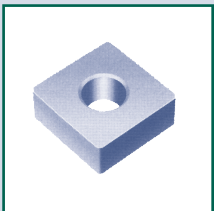


A	Size T	Ordering code
9,525	4,76	RNGN 090400
12,700	4,76	RNGN 120400
↓	7,94	RNGN 120700
15,875	7,94	RNGN 150700

**Geometrie**



**SNGA**



A	Size T	R	D	Ordering code
12,700	4,76	0,4	5,2	SNGA 120404
↓	↓	0,8	↓	SNGA 120408
↓	↓	1,2	↓	SNGA 120412
↓	↓	1,6	↓	SNGA 120416

**Geometrie**



**Geometrie**



**Ordering code**

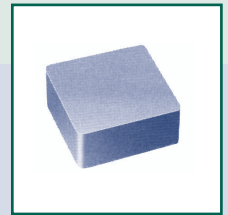
**A**

**Size T**

**R**

**SNGN**

SNGN 090304	9,525	3,18	0,4
SNGN 090308	↓	↓	0,8
SNGN 090312	↓	↓	1,2
SNGN 120404	12,700	4,76	0,4
SNGN 120408	↓	↓	0,8
SNGN 120412	↓	↓	1,2
SNGN 120416	↓	↓	1,6
SNGN 120420	↓	↓	2,0
SNGN 120424	↓	↓	2,4
SNGN 120708	12,700	7,94	0,8
SNGN 120712	↓	↓	1,2
SNGN 120716	↓	↓	1,6
SNGN 120720	↓	↓	2,0
SNGN 150420	15,875	4,76	2,0
SNGN 150424	↓	↓	2,4
SNGN 150708	15,875	7,94	0,8
SNGN 150712	↓	↓	1,2
SNGN 190708	19,050	7,94	0,8
SNGN 190712	↓	↓	1,2
SNGN 190716	↓	↓	1,6
SNGN 250924	25,400	9,52	2,4



**Geometrie**



**Ordering code**

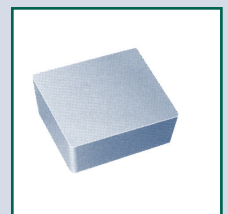
**A**

**Size T**

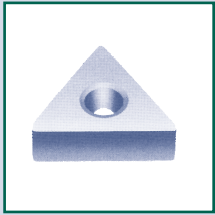
**R**

**SPGN**

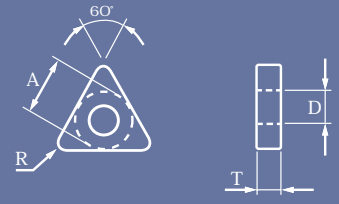
SPGN 090304	9,525	3,18	0,4
SPGN 090308	↓	↓	0,8
SPGN 090316	↓	↓	1,6
SPGN 120304	12,700	3,18	0,4
SPGN 120308	↓	↓	0,8
SPGN 120312	↓	↓	1,2
SPGN 120408	12,700	4,76	0,8
SPGN 120412	↓	↓	1,2
SPGN 120416	↓	↓	1,6



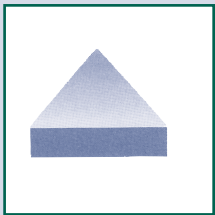
**TNGA**



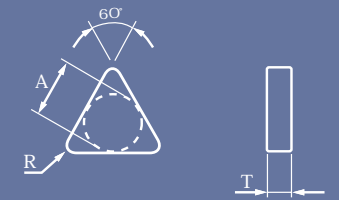
A	Size		R	D	Ordering code
	T				
9,525	4,76		0,4	4,0	TNGA 160404
↓	↓				
↓	↓		0,8		TNGA 160408



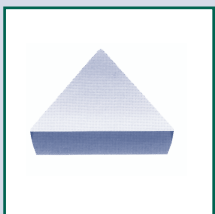
**TNGN**



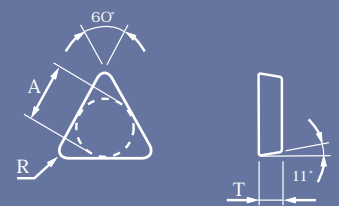
A	Size		R	Ordering code
	T			
9,525	4,76		0,4	TNGN 160404
↓	↓		0,8	TNGN 160408
↓	↓		1,2	TNGN 160412
↓	↓		1,6	TNGN 160416
9,525	7,94		0,8	TNGN 160708
↓	↓		1,2	TNGN 160712
12,700	4,76		0,8	TNGN 220408
↓	↓		1,2	TNGN 220412



**TPGN**



A	Size		R	Ordering code
	T			
6,350	3,18		0,2	TPGN 110302
↓	↓		0,4	TPGN 110304
9,525	3,18		0,2	TPGN 160302
↓	↓		0,4	TPGN 160304
↓	↓		0,8	TPGN 160308
↓	↓		1,2	TPGN 160312



## Ceramic Inserts

### CERAMIC GRADE SYTSTEM FOR CUTTING

Grade	Color	Composition	Application
CZ200	White	Al <sub>2</sub> O <sub>3</sub> + ZrO <sub>2</sub>	- Finishing and medium cutting of steel and cast irons.
CT100	Black	Al <sub>2</sub> O <sub>3</sub> + TiC	- Finishing and medium cutting of steels, cast irons, hardened steels and alloy steels. - Interrupted cutting of steels, cast irons.
CT300	Black	Al <sub>2</sub> O <sub>3</sub> + TiCN	- Finishing and medium cutting of steels, cast irons, especially hardened steels, alloy steels.
CT300C	Yelllow	Al <sub>2</sub> O <sub>3</sub> + TiCN ( TiN coated)	- Finishing and medium cutting of steels, cast irons, especially hardened steels, alloy steels.
CN26 / CN300	Gray	Si <sub>3</sub> N <sub>4</sub>	- Roughing and interrupted cutting of cast irons. - Cutting of Ni-base alloys.
CN700	Dark	Si <sub>3</sub> N <sub>4</sub> + TiN Gold	- Roughing and interrupted cutting of cast irons. - Cutting of high Ni-base alloys.

### CERAMIC GRADE COMPARISION TABLE

Combidx	NTK	Kyocera	CeramTec	Toshiba	Mitsubishi	Sumitomo	Sandvik	Kennametal
CZ200	HC1	SN60, SN80	SN60, SN80					
CT100	HC2 HC5	A65	SH20F	LX21	XD202	NB90S	CC650	K090
CT300	HC4	A66N	SH1	LX11	XD805			K090
CT300C	HC4	A66N	SH1	LX11	XD805			K090
CN26 / CN300	SX1		SL150 SL200			NS260		Kyon2000
CN700	SX8	KS7000	SL500	FX105	X520		CC690	Kyon3500

Material	CERAMIC GRADE FOR WORKPIECE			
	CZ200 CT300C	Grade CT100 CT300 CN300	CN26	CN700
Gray Cast Iron (FC)	++	++	++	++
Chilled Cast Iron	+	++	++	++
Ductile Cast Iron		+	+	+
Mild Steel	+			
Carbon Steel	+			
Alloy Steel	+	++		
Forged Steel		++		
Heat Treated Steel		++		
High Speed Steel		++		
High Manganese Steel		+	+	+
Stainless Steel				
Heat Resistent Steel		+	+	+
Ni-Base Alloys				++
Super Alloy Steel		+	+	+

++ : Excellent

+ : Good

**CERAMIC COMPOUND & PHYSICAL PROPERTIES**

Grade	ISO-class	Composit	Physical Properties	Characteristics
CZ200	P01~P10	Al <sub>2</sub> O <sub>3</sub> : 90%	Hardness = 1800 Hv	- Reinforced toughness by ZrO <sub>2</sub> .
	K01~K10	ZrO <sub>2</sub> : 10%	Density = 4.04 g/cm <sup>3</sup> Tough.(K <sub>Ic</sub> )=4.5 MN/m <sup>1.5</sup>	- High stability, resitance to mechanical impacts
CT100	P01~P10	Al <sub>2</sub> O <sub>3</sub> : 70%	Hardness = 2100 Hv	- Good mechanical properties
	K01~K10	TiC : 30%	Density = 4.28 g/cm <sup>3</sup> Tough.(K <sub>Ic</sub> )=4.8 MN/m <sup>1.5</sup>	
CT300/ CT300C	P01~P10	Al <sub>2</sub> O <sub>3</sub> : 60%	Hardness = 2300 Hv	- Good mechanical properties
	K01~K15	TiCN : 40%	Density = 4.46 g/cm <sup>3</sup> Tough.(K <sub>Ic</sub> )=5.0 MN/m <sup>1.5</sup>	
CN300	P01~P10	Si <sub>3</sub> N <sub>4</sub> : ~98%	Hardness = 1600 Hv	- High toughness and thermal shock resistance.
	K01~K15		Density = 3.2 g/cm <sup>3</sup> Tough.(K <sub>Ic</sub> )=6.0 MN/m <sup>1.5</sup>	- Machining with coolants
CN700	P01~P10	Si <sub>3</sub> N <sub>4</sub> : 80%	Hardness = 1600 Hv	- High toughness and thermal shock resistance.
	K01~K15	TiN : 20%	Density = 3.52 g/cm <sup>3</sup> Tough.(K <sub>Ic</sub> )=6.0 MN/m <sup>1.5</sup>	- Maching with coolants. - Poor reaction with Ni-base alloys.

## Ceramic Inserts

### CERAMIC RECOMMENDED CUTTING CONDITION

Grade	Workpiece	Cutting Conditions	Speed (m/min)	Feed (mm/rev)	Depth (mm)		
CZ200	- Gray Cast Iron (FC)	Roughing	200~500	0,2~0,4	2~5		
		Finishing	300~800	0,05~0,3	0,1~0,5		
	- Steel (HRc <45 )	Roughing	200~400	0,2~0,4	2~4		
		Finishing	300~800	0,05~0,3	0,1~0,5		
CT100	Gray	- Gray Cast Iron (FC)	Roughing	150~450	0,2~0,5	3~6	
		- Malleable (FCMB)	Finishing	200~600	0,3~0,5	0,1~0,5	
CT300	Cast	- Ductile Cast Iron (FCD)					
CT300C	Iron	- Chilled Cast Iron	Roughing	30~60	0,1~0,2	0,5~1,5	
			Finishing	50~100	0,05~0,15	0,1~0,5	
	Steel	- Carbon Steel	Roughing	150~400	0,2~0,5	2~5	
			Finishing	200~600	0,05~0,2	0,1~0,5	
			- Alloy Steel	Roughing	150~400	0,2~0,5	2~5
				Finishing	200~600	0,05~0,2	0,1~0,5
- Bearing Steel	Roughing	20~50	0,1~2,0	0,5~1,5			
	Finishing	40~150	0,05~0,5	0,1~0,5			
CN26	Gray	- Gray Cast Iron (FC)	Roughing	150~700	0,3~0,8	<5	
		- Malleable (FCMB)	Finishing	250~800	0,15~0,4	<1	
CN300	Cast	- Ductile Cast Iron (FCD)					
CN700	Iron	- Chilled Cast Iron	Roughing	20~80	1,0~2,0	<5	
			Finishing	60~160	0,5~1,0	<1	
		- Ni-base Alloy	Roughing	150~250	0,2~0,4	<5	
			Finishing	150~300	0,1~0,2	<1	
			- Non-Ferrous Metal	Finishing	150~300	0,1~0,2	<1



NL -3115 HE

