Romay Corporation
3795 Doering Drive • Jackson, MI 49201-9525
Phone (517) 769-6662 • Fax (517) 769-6787
E-mail: ceramics@romaycorp.com
Website: www.romaycorp.com

Your Authorized Distributor Is:

Romay Inserts and the *SC* Coating

"Setting new standards in productivity"

General Catalog 2010

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Romay Inserts & Coatings

"Setting New Standards in Productivity"

Allow us to introduce ourselves. Romay Corporation has been in the cutting tool business since 1977. It was started by Robert Maynard when he retired after 36 years with Ford Motor Company. He was part of Ford's Central Staff, the Manufacturing and Development Division, in the Research Department. His specialty was cutting tool inserts, specifically Ceramics.

I am his son, Dave, and started with Romay in January of 1981, taking over the day-to-day operations in August of 1996. Over the years, we have developed a full line of Ceramic, Carbide, Silicon Nitride and Whiskered cutting tool inserts.
While we have not done any advertising, except word-of-mouth, our competition knows us quite well.
Our quality is second-to-none, and our PRICES are EXTREMEMLY COMPETITIVE.
We are available for technical phone support 9 to 5pm-Eastern Standard Time, Monday through Friday.

Historically, our strength has been in the black and white Ceramics; currently we are actively increasing our supply of Carbide and especially our Silicon Nitride. At present we have over 150,000 inserts in stock. For very large-volume orders, special consideration will be taken.

Romay is committed to providing top-quality inserts, knowledgeable tech support, and competitive pricing. If this sounds good, and we can be of further help, kindly advise us.

Some important information:

- Payment Terms are Net 30 Days
- Blanket Order Policy – Blanket orders are accepted for up to one year. The price is determined by the blanket order quantity. Releases can be scheduled on a regular basis, or as needed.
- Special inserts are not subject to cancellation or change in specifications.

Sincerely,
David S. Maynard, President
Romay Corporation

Revolutionizing the industry... *again!*

>>> *Introducing our latest innovation at ROMAY* <<<

The SC coating

Coat *anything*
All tools (Inserts, Drills, Taps, Reamers, Wear Parts, etc.)
Easily coats over other coatings!

Cut *anything*
Steels, Irons, Aerospace Metals, Aluminum, etc.

Upgrade *from 'gold' coatings*
50% - 400% more tool life!

Operation:	Drilling and Boring Pistons	
Material:	4140 Steel & 3500 Cast Iron	
Insert:	**P27477-1** **Walter WAP-1 (a 'gold-coated' insert)**	**P27477-1** **Walter WAP-1 + SC Coating**
Tool Life 4140 Steel:	20pcs	85pcs
Tool Life 3500 Cast Iron:	20pcs	78pcs
Results:	**Romay's SC coating increased the tool life of this coated carbide grade by 400% in both Steel and Iron.**	

JOIN THE REVOLUTION with ROMAY and SC

SC NEWSLETTER

The results keep coming in…
the SC coating is, simply, the best coating on the market today. While it's enough for some customers to have it significantly increase their tool's life, others want to know why it works so well.

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Two patented processes allow an extra hard, lubricious, pore-free, vacuum deposited coating at temperatures far below all known coating temperatures:

Coating Process	*Temperature*
CVD	**1200º-1500º F**
PVD	**about 700º F**
***SC* - PVD**	**below 200º F**

****

Because of this ultra-low coating temperature, there is no change of material hardness or toughness and sharp edges can be coated easily.

With our patented Nano-Structure, we can deposit multiple layers of Boron and Boron Carbide for hardness, or Molybdenum Disulfide for lubricity, as well as several other elements for additional properties. All these layers add up to no more than 3 microns thick! The revolutionary technology behind these patents is why we see superior abrasion resistance and high lubricity.

****

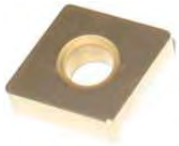
Some hard data on *SC*:

Type of coating…	**Nano-Structured, multi-layered, very low temp PVD**
Thickness of coating…	***1 – 3 microns***
Hardness of coating…	**3000 – 4500 Knoops**
Coefficient of sliding friction…	***less than 0.1***

****

At minimal cost, you can significantly increase your customer's tool life AND significantly decrease his tooling costs! Yes, we can even put the SC coating over a coated tool!
Win back the business that you lost due to a competitor's lower price or superior performance.
Show your customer you're on the cutting edge of innovation / technology by introducing them to the SC coating!

Operation:	Milling - Roughing	
Material:	Nodular Cast Iron	
Insert:	**3212796-T3-D2 Carbide** (a 'gold-coated' insert)	**3212796-T3-D2 Carbide + SC Coating**
Parts Machined:	2,100pcs	4,200pcs
Results:	**Romay's SC coating increased the tool life of this carbide grade by 100% in rough milling of Nodular Cast Iron.**	



Romay Inserts

"Setting New Standards in Productivity"

Table of Contents:

Page	Information
1	'Insert-in-a-flash' quick-finder index *(see next page)*
2	Grade Descriptions
3	Ceramic Comparison Chart
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6	Ceramic and Silicon Nitride Machining Recommendations
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37	Whisker Ceramic Machining Recommendations

‘Insert-in-a-flash’ quick-finder insert index…

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Ceramic and Silicon Nitride Inserts:

Style	Page	Style	Page	Style	Page
CDH	24	DNGA	15	SNGA	17
CNGN	12, 13	DNGX	16	SNGX	19
CNGA	12	RCGX	24	SNMA	19
CNGX	14	RCMA	24	TNGN	21
CNMA	13	RNGN	17	TNGA	20
CNVX	14	RNGA	16	TPGN	22
DNGN	15	SNGN	18	WNGA	23
				VNGA	23

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Coated Carbide Inserts:

Style	Page	Style	Page
CNMG	25	SCMT	32
DNMG	26	SCGX	32
SNMG	27	TCMT	33
TNMG	28	TCGX	33
WNMG	29		
CCMT	30		
CCGX	30		
DCMT	31		
DCGX	31		

Whisker Ceramic Inserts:

Style	Page
CNGN	34
CPGN	34
DNGN	35
RCGN V	35
RNGN	35
SNGN	36

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Ceramic Grades

CC-10	Our white alumina ceramic grade mainly applicable for roughing and finishing cast iron and steel in higher surface speed operations. Available with hole for pinlock.
CC-20	Our standard black ceramic grade is a composite with Alumina Matrix containing Titanium Carbide with excellent wear, crater and strength characteristics. Available with hole for pinlock.
CC-30	Our black ceramic grade for cutting high hardness metals with Rc 55 and above, chilled cast iron and powdered metals. This insert has replaced some grinding operations in hardened steel (Rc 60-62). Available with hole for pinlock.

Silicon Nitride Grades

CC-510	A high speed, low cost silicon nitride grade with excellent wear resistance.
CC-513	Our toughest silicon nitride grade. Great for high-speed iron cutting with very heavy interruptions in milling, turning, boring facing.
CC-514	Our medium silicon nitride grade. Great for general purpose machining of irons.
CC-515	Our silicon nitride grade for all irons, especially ductile and nodular irons. An extremely hard, wear-resistant silicon nitride for roughing and finishing at elevated speeds. Works in continuous and interrupted cuts.
CC-516	Our best overall grade with very good wear resistance & excellent shock resistance. Excellent for hard materials & interrupted cuts at high speeds.
CC-5477	Our silicon nitride grade for cutting exotic aerospace metals such as Inconel, Waspaloy, Hastelloy, Renee, etc. For roughing and finishing. A cost-effective alternative to the “whiskered” ceramic.

Coated Carbide Grades

R-100	Thick CVD (TiCN with Al_2O_3) coating. Ideal for finishing steel, cast steel, and stainless steel at high speeds in dry machining. Excellent wear resistance. Can also be used in abrasive irons like ductile iron.
R-200	Thick CVD (TiCN with Al_2O_3) coating. This is the grade with the widest application area. Great for finishing, semi-finishing, and light roughing of steel, cast steel, stainless steel, and abrasive irons.
R-300	Thin PVD (AlTiN) coating and ultra-fine carbide substrate. Great for finishing to semi-finishing of stainless steels, heat resistant alloys, hi-temp alloys and titanium alloys. Good for milling of stainless steel.
R-400	Thick CVD (TiCN with AL_2O_3) on top of a very hard substrate to produce the best balance between wear and flanking resistance when machining irons, especially nodular, at high speeds.
R-500	TiAlN coating over an ultra-fine carbide substrate of high strength and toughness. Suitable for milling and boring all kinds of materials, as well as rough turning of high-temperature alloys.
R-600	Uncoated, high-polish carbide grade with fine size grain. Good for fine and semi-finish machining of cast iron and nonferrous metal, particularly of Aluminum.

Whisker Ceramic Grade

CC-600	A ceramic whisker material comparable to Greenleaf’s WG-300. Excellent for rough and finish machining of aerospace metals(Inconel, Titanium, Udumet, Hastelloy, etc..), some stainless steels, hardened steels and nodular and chilled irons.

Comparison Chart for all CERAMIC Grades

Romay	CC-10	CC-20	CC-30	CC-30-SC
Greenleaf	GEM & 9	GEM 2 & 3	GEM 2 & 3	
Kennametal	K-060	K-090	K-090	Kyon 4400
Kyocera (Ceratip)	SN-56 SN-60 & 80	A-65 CER II	A-65 CER II	A66N
NTK	CX-3 HC-1	HC-2 HC-6	HC-5	ZC-4
SPK	SN-60 SN-80	SH-20-F	SH-1	
Sandvik	CC-620	CC-650	CC-650	
Sumitomo	W-80	NB-90-S	NB-90-S	
Toshiba	LX-A	LX-21	LX-21	LX-11
Valenite	Q-44	Q-32	Q-32	

Silicon Nitride Comparison Chart		
Competitor Grades:	Romay Grades 1st Choice	2nd Choice
Kyon 1540	CC-5477	
Kyon 3500	CC-516	CC-514
Sandvik cc690	CC-516	CC-514
Sandvik cc1690	CC-516-SC	CC-514-SC
Sandvik cc6090	CC-510	CC-515
NTK Sx5, Sx9	CC-5477	
NTK Sx8, Sx6	CC-516	CC-514
NTK SP1, SP2	CC-516-SC	CC-514-SC
Toshiba FX105	CC-510	CC-516, CC-514
Indexable MW-43	CC-510	CC-515
Ceratip KS-6000	CC-516	CC-513
Ceratip KS-500	CC-514	CC-510
Valenite Q6	CC-516	CC-514
Valenite Q65	CC-510	
SPK SL-500	CC-510	CC-515
SPK SL-250-C	CC-516-SC	CC-514-SC
Whisker Ceramic Comparison Chart		
Competitor Grades:	Romay Grades 1st Choice	2nd Choice
Greenleaf WG-300	CC-600	
NTK WA1	CC-600	
Sandvik cc670	CC-600	

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Where can you run Ceramic and Silicon Nitride?

Silicon Nitride (SiN)….. in almost all iron applications, such as cast, ductile, nodular, etc., you can do ROUGHING and FINISHING in turning, boring, facing and milling. The SiN will last longer, run faster, and give you a better finish than coated tungsten carbide. Our SiN generally out-performs any other competitor's SiN, especially our CC-516 and CC-514 grades.

Our CC-5477 SiN grade works well in ROUGHING and FINISHING of aerospace metals, such as Iconel, Waspaloy, Hastelloy, etc.

Our CC-516, CC-515, and CC-510 SiN grades can also ROUGH in hardened steel above Rc58.

Black/White Ceramics (B/WC)….. in almost all iron and steel applications, you can use either ceramic to do FINISHING operations. The B/WC can be run at faster speeds, will last longer, and give a better surface finish than coated carbides.

Where B/WC can work for FINISHING in irons, they will, generally, work better than even the SiN and be less expensive.

In steels, most customers are FINISHING in coated carbides, but B/WC can be run faster, last longer, and give a much better surface finish than the coated carbides. In many applications, the B/WC have REPLACED GRINDING operations.

In steels above Rc58, you can ROUGH with SiN and FINISH with the black ceramic, or the gold-coated black ceramic. In many cases, you can REPLACE GRINDING operations.

In many powdered metal operations, you can use the B/WC for FINISHING.

For specific examples of our test reports, please visit our website… www.romaycorp.com

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Machining Recommendations

R = Roughing F = Finishing
SR = Semi-Roughing SF = Semi-Finishing

Turning and Boring:

Material	Operation	Recommended Grade	Speed(SFM)	Feed(IPR)	DOC (max)
Low-Carbon Steels <Rc56	R, SR	CC-10, CC-20 (thicker inserts)	300 - 2,300	.008 - .020	.060
	F, SF	CC-10, CC-20	600 - 4,000	.003 - .030	.020
Alloy Steels <Rc56	R, SR	CC-10, CC-20 (thicker inserts)	200 - 2,200	.008 - .020	.060
	F, SF	CC-10, CC-20	600 - 4,000	.003 - .030	.020
Hardened Steels; Chilled Cast Iron >Rc56	F, SF	CC-30	200 - 700	.003 - .010	.020
	F, SF	CC-30-SC	200 - 700	.003 - .010	.040
Cast Iron	R, SR	CC-5XX	500 - 5,000	.010 - .025	.250
	F, SF	CC-20, CC-5XX	800 - 5,000	.003 - .025	.050
Ductile & Nodular Iron	R, SR	CC-5XX	500 - 2,000+	.010 - .025	.150
	F, SF	CC-20, CC-5XX	500 - 2,500	.003 - .025	.040
Ni-based alloys; Non-ferrous metals	R, SR	CC-5477	500 - 850	.008 - .016	.150
	F, SF	CC-5477, CC-20	500 - 1,500	.004 - .008	.040

Milling:

Material	Operation	Recommended Grade	Speed(SFM)	Feed(IPR)
Cast Iron	R, SR	CC-5XX	300 - 4,000	.004 - .008
	F, SF	CC-20, CC-5XX	500 - 5,000	.002 - .004
Ductile & Nodular Iron	R, SR	CC-5XX	300 - 2,500	.002 - .006
	F, SF	CC-5XX	650 - 5,000	.002 - .004

General recommended starting conditions:

In irons: 40% faster than the coated carbide on the first corner. Keep increasing the speed by 25% per corner after that.

In steels: 25% faster than the coated carbide on the first corner. Keep increasing the speed by 20% per corner after that.

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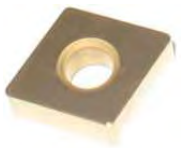

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Trouble-shooting Ceramic Tools:

Some of the more common problems faced by those not familiar with the use of ceramic toolbits are:

Chipping
Probable causes
- lack of rigidity
- not enough chamfer on cutting edge
- chipbreaker too narrow
- chatter
- scale or inclusions
- improper grinding
- too much relief
- defective or burred toolholder or shim seat

Cratering
Probable causes
- chipbreaker set too tight
- nose radius too large
- side cutting edge angle too great

Cracking or Breaking
Probable causes
- insert surfaces not flat
- insert not seated solidly
- stopping workpiece while tool is engaged
- worn or chipped cutting edges
- feed to heavy
- improperly applied coolant
- too much rake or relief
- too much overhang or tool too small
- lack of rigidity in setup
- speed too slow
- too much variation in depth of cut
- chatter
- grinding cracks
- defective or burred toolholder or shim seat

continued on next page:

Trouble-shooting Ceramic Tools:

Some of the more common problems faced by those not familiar with the use of ceramic toolbits are:

continued from preceding page:

Chatter

Probable causes

- tool not on center
- insufficient relief and/or clearance
- too much rake
- too much overhang or tool too small
- nose radius too large
- feed to heavy
- lack of rigidity
- insufficient power, or slipping clutch

Torn Finish

Probable causes

- lack of rigidity
- dull tool
- speed too slow
- chipbreaker too narrow or too deep
- improper grinding

Excess Wear

Probable causes

- speed too high or feed too light
- speed too low
- nose radius too large
- improper grinding

Questions???

Technical phone-support is available

Ask for Tim Maynard or Dave Maynard @ 517-769-6662

9 to 5pm-Eastern Standard Time, Monday through Friday

Carbide Grade Comparison Chart

ISO	Romay	Mitsubishi	Sandvik	Seco	Sumitomo	Toshiba	Kennametal	Iscar	Valenite	Walter
P01	R-100 R-200	UE6005 F7010	GC4015 GC4215	TX110	AC1000	T7005 TD905 T715X	KC9010 KC910		SV515 SV305	WQM15 WTA21
P10	R-100 R-200	UE6010 UC6010 UE6020	GC4015 **GC1025** **GC1020**	TP15 TP100	AC1000 AC2000	TD905 T715X TD915	KC9110 KC935 **KC730** **KC635M KC610M**	IC520M IC8048	SV310	WTL41 WTA33 WAP10 **WXK10 WXH15** WTN33
P20	R-200 **R-300**	UC6010 UE6020 UC6025 F620 F7030 **UP20M** **AP20M**	GC4020 GC4025 GC4225 GC4030 GC3040	TP200 T250M T25M **CP20** **F25M**	AC230 AC2000 AC3000	TD915 T7020	**KC725M** KC9125 **KC9040** KC625M KC850 CM4 KC9025 **KC631M**	IC9015 IC635	SV410 SV325	WTA31 **WXH15** WQM25 WTL82 WAP20 WTN43 WAP25 WTA43 **WXM15** WTA41 **WXP20** WTP20
P30	R-200	UC6025 UE6035 F7030 **AP20M** **AP15TF**	GC4025 **GC4125** GC4035 GC4030 GC4040	T250M T25M CP30 TP200 F30M	AC3000 AC304 AC230 **AC325** **ACZ330** **ACZ350**	T725 TD930 T325 **GH330** **AH330 AH120**	**KC792M** KC9045 CD4 **KC7020 KC7025 KC7215** **KC7225** KC7935 **KC633M** KC8050	IC9025 **IC950**	SV230 SV330 **SV935**	**WXM25** WTP25 **WXP25** WTA61 WTL71 WTL14 WAP30 WTL41 WAP35 WTL74 WTP35 WTA51
M10	**R-300**	F7010 US7020	**GC1005** GC2015 **GC1025**	TP100	AC1000 AC2000	TD915 T715X	**KC7310(KC5010)** KC9215 KC9010 **KC510M KC635M**		VC929	**WXN10 WXK10** WAM10 WAP10 WTA31 WTA33
M20	**R-300**	US7020 F620 F7030 **AP20M** **UP20M**	**GC1020** GC2025 GC2030 **GC4125** GC3040	TP200 **CP50** T250M T25M **F25M**	AC2000 AC3000 **AC325 ACZ330** AC304	T6020 T725X **GH330 AH330**	**KC5025 KC792M** KC9225 **KC7020** KC9025 **KC730** KC9225 **KC625M KC705M** **KC7215**	IC9025 IC950	VC901 SV415 SV235	**WXM15** WTP25 WAM20 WTA43 WQM25 WTA41 WAP20 **WXM20 WQM35** WTA61
M30	**R-300**	US735 F620 F730 **AP15TF**	**GC1020 GC1120** **GC2035** GC2135 GC2040	T25M TP300 **CP50 F30M**	AC3000 **AC325** **ACZ330**	T6030 T335S T325 **AH740** **AH120**	**CS5(KC7015)** KC9240 **KC7025** KC9040 **KC720** KC8050 CD4 KC7935	**IC328** **IC3028**		WAP25 **WXM25** WAM30 WTP35 WTA51 **WXM35** **WXK35 WXP40**
K01	R-400	**GP10H** UC5005 UE6005 UC5015	GC3005 GC3205 GC3015	TP05 T10M	AC300G	T5010 **AH110**	KC9315 KC9010 **KC5410**		V01 SV405	**WXN10**
K10	R-400	UC5015 UC6010 F5010 **AP10H**	GC3005 GC3015 GC3115 GC3210	TX150 T10M T15M TP100	AC300G AC500G AC700G AC211 **EH10Z EH510Z**	T5020 T1020 **GH110**	**KC510M(KC705M) KC730** **KC7210 KC7310(KC5010)** **KC625M KC631M KC635M** **KC620M** KC9120 KC915M	IC9015 IC4050	VN8 SV510 SV305	WTA13 WTA33 WTA11 WAK10 WAK15 **WXN15** **WXK15** WTA31 WTP20
K20	**R-300** R-400	UP10H UC6010 AP15TF	**GC1020 GC1120** GC3025 GC3020 GC4025	TX150 T15M T25M T250M TP200	AC500G **EH20Z**	T1015 T5020 **AH120** J740	KC992M **KC7215** KC9315 **KC7225** KC9025 CM4 **KC520M KC525M** KC920M KC925M **KC709M KC7020**	IC910	SV415 SV525	WAK20 WTA43 WTA33 WTA41 WTA21 WTL82 **WXK15 WXH15** WQK25 **WXM15**

Grade name which is in **bold-face** means PVD-Coated grade.

Grade name with underline means this grade is for milling or could be used in milling.

General Machining Conditions for Romay Carbide Grades

P *Material*		R-100			R-200		
	Brinnell Hardness	.004"IPR	.016"IPR	.032"IPR	.004"IPR	.016"IPR	.032"IPR
		Surface Feet Per Minute			Surface Feet Per Minute		
Carbon Steel	125	1700	1200	900	1600	1100	800
	150	1600	1100	850	1450	1000	700
	170	1500	1100	800	1300	900	650
Low Alloy Steel	180	1700	1170	800	1500	1000	715
	210	1500	1000	715	1300	900	620
	275	950	850	500	900	620	500
	350	750	520	400	700	500	400
High Alloy Steel	200	1250	850	600	975	700	500
	325	600	400	300	450	325	250
Cast Steel	180	900	700	525	780	600	400
	200	800	600	450	700	450	325
	225	650	600	325	650	425	300

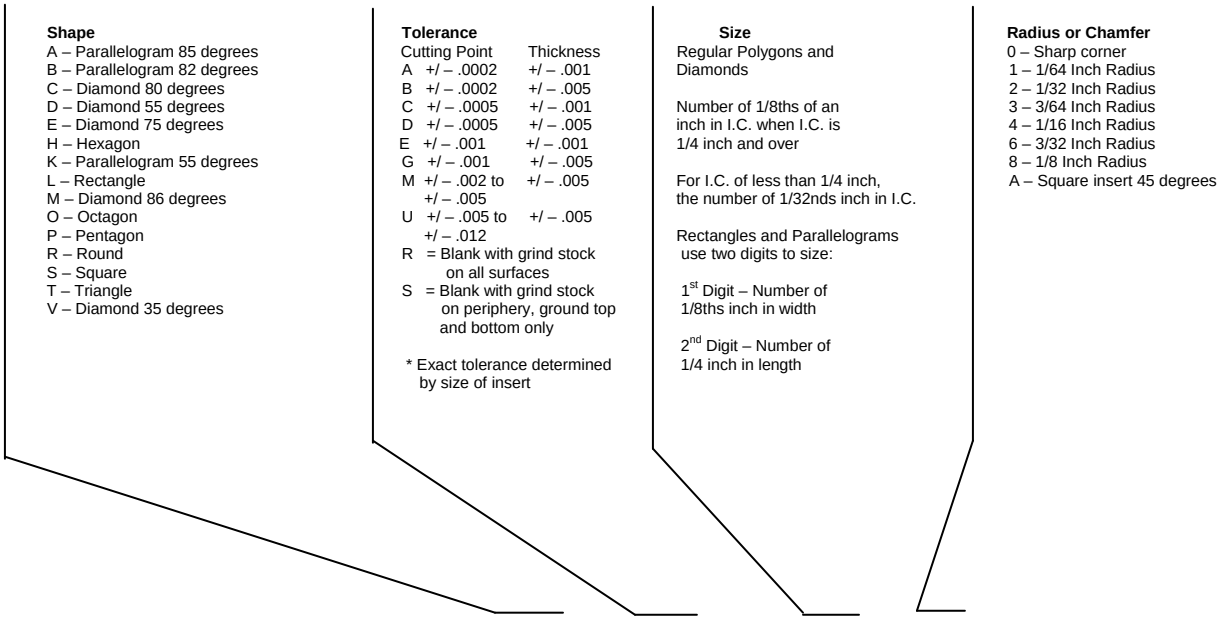
M *Material*		R-300 & R-500		
		.004"IPR	.008"IPR	.012"IPR
		Surface Feet Per Minute		
Stainless Steel		900	750	585

S *Material*	Brinnell Hardness	R-300 & R-500		
		.004"IPR	.008"IPR	.012"IPR
Heat Resistant & High Temp Alloy		Surface Feet Per Minute		
Iron Based	200	250	200	180
	280	180	160	150
Ni or Co Based	250	150	130	100
	350	110	100	80

K *Material*	Brinnell Hardness	R-400 & R-100		
		.004"IPR	.012"IPR	.024"IPR
Irons		Surface Feet Per Minute		
Malleable Cast Iron	130	1200	1000	800
	230	900	700	500
Cast Iron	180	1700	1100	800
	260	800	700	500
Graphite Cast Iron	160	1100	800	600
	250	800	600	450

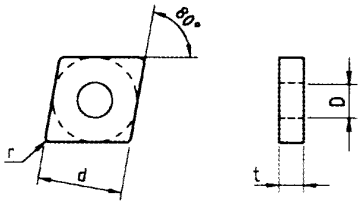
Romay *Silicon Nitride* can be run on all irons at significantly increased speeds

A.N.S.I. Insert Identification System



CNGA ceramic

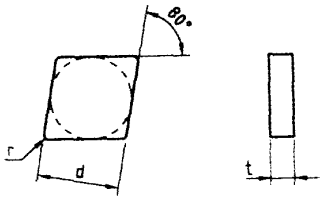
80 degree diamond negative rake inserts



ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
CNGA 120404	CNGA 431	1/2	3/16	1/64	.203	+	+	+	+		+	+	+	+	
CNGA 120408	CNGA 432			1/32		+	+	+	+	+	+	+	+	+	+
CNGA 120412	CNGA 433			3/64		+	+	+	+	+	+	+	+	+	+
CNGA 120416	CNGA 434			1/16		+	+	+	+	+	+	+	+	+	+
CNGA 160404	CNGA 541	5/8	1/4	1/64	.250	+	+	+	+						
CNGA 160408	CNGA 542			1/32		+	+	+	+	+	+	+	+	+	+
CNGA 160412	CNGA 543			3/64		+	+	+	+	+	+	+	+	+	+
CNGA 160416	CNGA 544			1/16		+	+	+	+	+	+	+	+	+	+
CNGA 190604	CNGA 641	3/4	1/4	1/64	.312	+	+	+	+						
CNGA 190608	CNGA 642			1/32		+	+	+	+		+	+	+	+	+
CNGA 190612	CNGA 643			3/64		+	+	+	+		+	+	+	+	+
CNGA 190616	CNGA 644			1/16		+	+	+	+						

CNGN ceramic

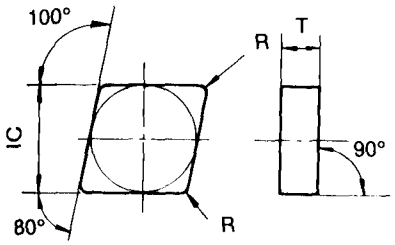
80 degree diamond negative rake inserts



ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
CNGN 120404	CNGN 431	1/2	3/16	1/64	—	+	+	+	+						
CNGN 120408	CNGN 432			1/32		+	+	+	+	+	+	+	+	+	+
CNGN 120412	CNGN 433			3/64		+	+	+	+	+	+	+	+	+	+
CNGN 120416	CNGN 434			1/16		+	+	+	+	+	+	+	+	+	+
CNGN 120704	CNGN 451	1/2	5/16	1/64	—	+	+	+	+						
CNGN 120708	CNGN 452			1/32		+	+	+	+	+	+	+	+	+	+
CNGN 120712	CNGN 453			3/64		+	+	+	+	+	+	+	+	+	+
CNGN 120716	CNGN 454			1/16		+	+	+	+	+	+	+	+	+	+
CNGN 160604	CNGN 541	5/8	1/4	1/64	—	+	+	+	+		+	+	+	+	+
CNGN 160608	CNGN 542			1/32		+	+	+	+		+	+	+	+	+
CNGN 160612	CNGN 543			3/64		+	+	+	+	+	+	+	+	+	+
CNGN 160616	CNGN 544			1/16		+	+	+	+	+	+	+	+	+	+

CNGN ceramic

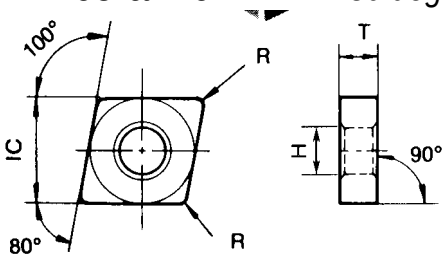
80 degree diamond negative rake inserts



ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
CNGN 190604	CNGN 641	3/4	1/4	1/64	—	+	+	+	+						
CNGN 190608	CNGN 642			1/32		+	+	+	+						
CNGN 190612	CNGN 643			3/64		+	+	+	+	+	+	+	+	+	
CNGN 190616	CNGN 644			1/16		+	+	+	+	+	+	+	+	+	
CNGN 190704	CNGN 651	3/4	5/16	1/64	—	+	+	+	+						
CNGN 190708	CNGN 652			1/32		+	+	+	+						
CNGN 190712	CNGN 653			3/64		+	+	+	+						
CNGN 190716	CNGN 654			1/16		+	+	+	+						

CNMA ceramic

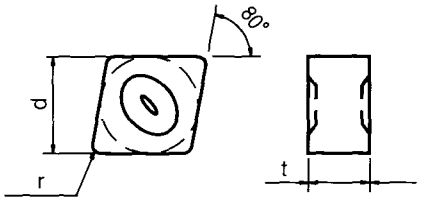
80 degree diamond negative rake inserts



ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
CNMA 120408	CNMA 432	1/2	3/16	1/32	.203					+	+		+		
CNMA 120412	CNMA 433			3/64						+	+	+	+		
CNMA 120416	CNMA 434			1/16						+	+	+	+		
CNMA 160616	CNMA 544	5/8	1/4	1/16	.250					+	+	+	+		

CNGX ceramic

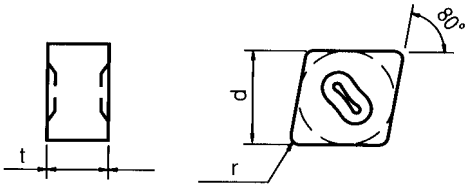
80 degree diamond, dimpled negative rake inserts



ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE		SILICON NITRIDE					
		IC	T	R	H	CC-10 CC-20 CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
CNGX 120708	CNGX 452	1/2	5/16	1/32	—	+ +	+	+	+	+	+	+	
CNGX 120712	CNGX 453			3/64		+ +	+	+	+	+	+	+	
CNGX 120716	CNGX 454			1/16		+ +	+	+	+	+	+	+	
CNGX 160708	CNGX 552	5/8	5/16	1/32	—			+	+	+	+		
CNGX 160712	CNGX 553			3/64				+	+	+	+		
CNGX 160716	CNGX 554			1/16				+	+	+	+		

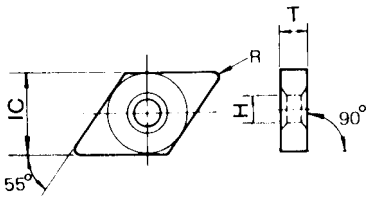
CNVX ceramic

80 degree diamond, dimpled negative rake inserts



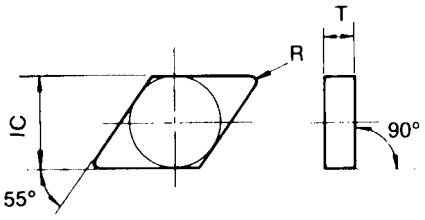
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE		SILICON NITRIDE					
		IC	T	R	H	CC-10 CC-20 CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
CNVX 150404	CNVX 452	1/2	5/16	1/32	—	+ +	+	+	+	+	+	+	
CNVX 150408	CNVX 453			3/64		+ +	+	+	+	+	+	+	
CNVX 150412	CNVX 454			1/16				+	+	+	+	+	

DNGA ceramic *55 degree diamond negative rake inserts*



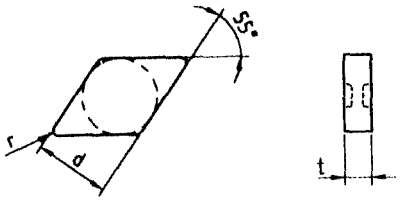
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
DNGA 150404	DNGA 431			1/64		+	+	+	+		+	+	+	+	+
DNGA 150408	DNGA 432	1/2	3/16	1/32	.203	+	+	+	+		+	+	+	+	+
DNGA 150412	DNGA 433			3/64		+	+	+	+		+	+	+	+	+
DNGA 150416	DNGA 434			1/16		+	+	+	+		+	+	+	+	+
DNGA 190604	DNGA 541			1/64		+	+	+	+						
DNGA 190608	DNGA 542	5/8	1/4	1/32	.250	+	+	+	+		+	+	+	+	+
DNGA 190612	DNGA 543			3/64		+	+	+	+		+	+	+	+	+
DNGA 190616	DNGA 544			1/16		+	+	+	+		+	+	+	+	+

DNGN ceramic *55 degree diamond negative rake inserts*



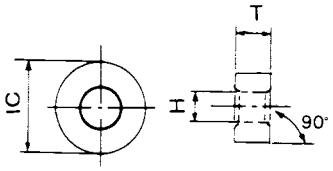
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
DNGN 150404	DNGN 431			1/64		+	+	+	+						
DNGN 150408	DNGN 432	1/2	3/16	1/32	—	+	+	+	+		+	+	+	+	+
DNGN 150412	DNGN 433			3/64		+	+	+	+		+	+	+	+	+
DNGN 150416	DNGN 434			1/16		+	+	+	+		+	+	+	+	+
DNGN 190604	DNGN 541			1/64		+	+	+	+						
DNGN 190608	DNGN 542	5/8	1/4	1/32	—	+	+	+	+						
DNGN 190612	DNGN 543			3/64		+	+	+	+						
DNGN 190616	DNGN 544			1/16		+	+	+	+						

DNGX ceramic *55 degree diamond, dimpled negative rake inserts*



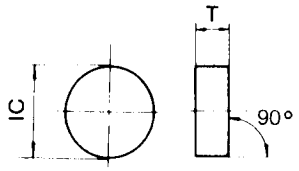
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE		SILICON NITRIDE					
		IC	T	R	H	CC-10 CC-20 CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
DNGX 120708	DNGX 352	3/8	5/16	1/32	—			+	+	+	+	+	
DNGX 120712	DNGX 353			3/64				+	+	+	+	+	
DNGX 120716	DNGX 354			1/16				+	+	+	+	+	
DNGX 150708	DNGX 452	1/2	5/16	1/32	—								+
DNGX 150712	DNGX 453			3/64				+	+	+	+	+	+
DNGX 150716	DNGX 454			1/16				+	+	+	+	+	+

RNGA ceramic *round negative rake inserts*



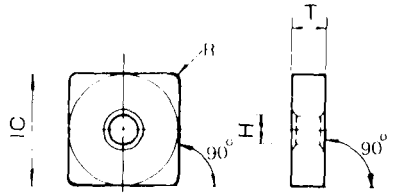
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE		SILICON NITRIDE					
		IC	T	R	H	CC-10 CC-20 CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
RNGA 090300	RNGA 32	3/8	1/8	—	.150	+ + +	+						
RNGA 120400	RNGA 43	1/2	3/16	—	.203	+ + +	+						

RNG ceramic *round negative rake inserts*



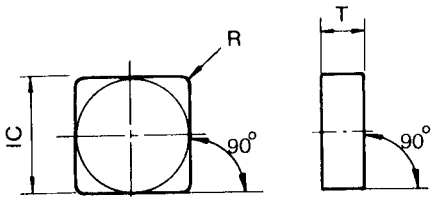
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE		SILICON NITRIDE					
		IC	T	R	H	CC-10 CC-20 CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
RNGN 090300	RNGN 32	3/8	1/8	—	—	+ + +	+		+	+	+	+	
RNGN 090400	RNGN 33	3/8	3/16	—	—	+ + +	+	+	+	+	+	+	+
RNGN 120400	RNGN 43	1/2	3/16	—	—	+ + +	+	+	+	+	+	+	+
RNGN 120700	RNGN 45	1/2	5/16	—	—	+ + +	+	+	+	+	+	+	+
RNGN 190600	RNGN 64	3/4	1/4	—	—	+ + +	+						+
RNGN 250700	RNGN 86	1	3/8	—	—	+ + +	+						+

SNGA ceramic *square negative rake inserts*



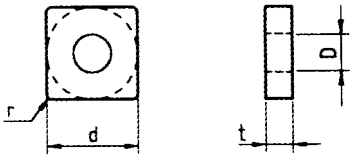
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE		SILICON NITRIDE					
		IC	T	R	H	CC-10 CC-20 CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
SNGA 090304	SNGA 321			1/64		+ + +	+						
SNGA 090308	SNGA 322	3/8	1/8	1/32	.150	+ + +	+						
SNGA 090312	SNGA 323			3/64		+ + +	+						
SNGA 090316	SNGA 324			1/16		+ + +	+						
SNGA 120404	SNGA 431			1/64		+ + +	+	+					
SNGA 120408	SNGA 432	1/2	3/16	1/32	.203	+ + +	+	+	+	+	+	+	
SNGA 120412	SNGA 433			3/64		+ + +	+	+	+	+	+	+	
SNGA 120416	SNGA 434			1/16		+ + +	+	+	+	+	+	+	
SNGA 190604	SNGA 641			1/64		+ + +	+						+
SNGA 190608	SNGA 642	3/4	1/4	1/32	.312	+ + +	+						+
SNGA 190612	SNGA 643			3/64		+ + +	+		+	+	+	+	+
SNGA 190616	SNGA 644			1/16		+ + +	+		+	+	+	+	+

SNGN ceramic *square negative rake inserts*



ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE		SILICON NITRIDE					
		IC	T	R	H	CC-10 CC-20 CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
SNGN 090304	SNGN 321	3/8	1/8	1/64	—	+ + +	+						+
SNGN 090308	SNGN 322			1/32		+ + +	+	+					+
SNGN 090312	SNGN 323			3/64		+ + +	+	+					+
SNGN 090316	SNGN 324			1/16		+ + +	+						
SNGN 090304	SNGN 331	3/8	3/16	1/64	—	+ + +	+						
SNGN 090308	SNGN 332			1/32		+ + +	+	+	+	+	+	+	
SNGN 090312	SNGN 333			3/64		+ + +	+	+	+	+	+	+	
SNGN 090316	SNGN 334			1/16		+ + +	+						
SNGN 120404	SNGN 431	1/2	3/16	1/64	—	+ + +	+						+
SNGN 120408	SNGN 432			1/32		+ + +	+	+	+	+	+	+	+
SNGN 120412	SNGN 433			3/64		+ + +	+	+	+	+	+	+	+
SNGN 120416	SNGN 434			1/16		+ + +	+	+	+	+	+	+	+
SNGN 120424	SNGN 436			3/32		+ + +	+						
SNGN 120432	SNGN 438			1/8		+ + +	+						
SNGN 120704	SNGN 451	1/2	5/16	1/64	—	+ + +	+	+	+	+	+	+	+
SNGN 120708	SNGN 452			1/32		+ + +	+	+	+	+	+	+	+
SNGN 120712	SNGN 453			3/64		+ + +	+	+	+	+	+	+	+
SNGN 120716	SNGN 454			1/16		+ + +	+	+	+	+	+	+	+
SNGN 150604	SNGN 541	5/8	1/4	1/64	—	+ + +	+						
SNGN 150608	SNGN 542			1/32		+ + +	+						
SNGN 150612	SNGN 543			3/64		+ + +	+						
SNGN 150616	SNGN 544			1/16		+ + +	+						
SNGN 190404	SNGN 631	3/4	3/16	1/64	—	+ + +	+						
SNGN 190408	SNGN 632			1/32		+ + +	+						
SNGN 190412	SNGN 633			3/64		+ + +	+						
SNGN 190416	SNGN 634			1/16		+ + +	+						
SNGN 190604	SNGN 641	3/4	1/4	1/64	—	+ + +	+						+
SNGN 190608	SNGN 642			1/32		+ + +	+						+
SNGN 190612	SNGN 643			3/64		+ + +	+		+	+	+	+	+
SNGN 190616	SNGN 644			1/16		+ + +	+						+

SNMA ceramic *square negative rake inserts*

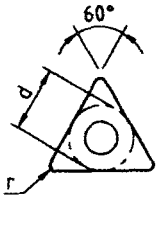


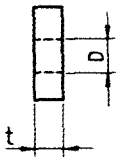
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
SNMA 120708	SNMA 433	1/2	3/16	3/64	—					+	+	+	+		
SNMA 120712	SNMA 434	1/2	3/16	1/16						+	+	+	+		
SNMA 150616	SNMA 544	5/8	1/4	1/16	—					+	+	+	+		

SNGX ceramic *square, dimpled negative rake inserts*

ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
SNGX 120708	SNGX 452	1/2	5/16	1/32	—	+	+	+	+	+	+	+	+	+	+
SNGX 120712	SNGX 453			3/64		+	+	+	+	+	+	+	+	+	+
SNGX 120716	SNGX 454			1/16		+	+	+	+	+	+	+	+	+	+
SNGX 150708	SNGX 552	5/8	5/16	1/32	—	+	+	+	+		+	+	+	+	+
SNGX 150712	SNGX 553			3/64		+	+	+	+		+	+	+	+	+
SNGX 150716	SNGX 554			1/16		+	+	+	+		+	+	+	+	+

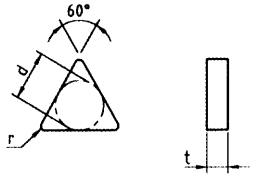
TNGA ceramic *triangle negative rake inserts*





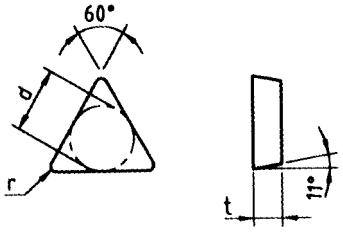
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE		SILICON NITRIDE					
		IC	T	R	H	CC-10 CC-20 CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
TNGA 160304	TNGA 321			1/64		+ + +	+						
TNGA 160308	TNGA 322	3/8	1/8	1/32	.150	+ + +	+						
TNGA 160312	TNGA 323			3/64		+ + +	+						
TNGA 160316	TNGA 324			1/16		+ + +	+						
TNGA 160404	TNGA 331			1/64		+ + +	+	+	+	+	+	+	
TNGA 160408	TNGA 332	3/8	3/16	1/32	.150	+ + +	+	+	+	+	+	+	
TNGA 160412	TNGA 333			3/64		+ + +	+	+	+	+	+	+	
TNGA 160416	TNGA 334			1/16		+ + +	+		+	+	+	+	
TNGA 220404	TNGA 431			1/64		+ + +	+						+
TNGA 220408	TNGA 432	1/2	3/16	1/32	.203	+ + +	+	+	+	+	+	+	+
TNGA 220412	TNGA 433			3/64		+ + +	+	+	+	+	+	+	+
TNGA 220416	TNGA 434			1/16		+ + +	+	+	+	+	+	+	+
TNGA 270604	TNGA 541			1/64		+ + +	+						
TNGA 270608	TNGA 542	5/8	1/4	1/32	.250	+ + +	+						
TNGA 270612	TNGA 543			3/64		+ + +	+						
TNGA 270616	TNGA 544			1/16		+ + +	+						

TNGN ceramic *triangle negative rake inserts*



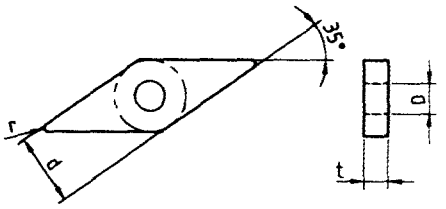
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
TNGN 110304	TNGN 221	1/4	1/8	1/64	—	+	+	+	+						
TNGN 110308	TNGN 222			1/32		+	+	+	+						
TNGN 110312	TNGN 223			3/64		+	+	+	+						
TNGN 110316	TNGN 224			1/16		+	+	+	+						
TNGN 160304	TNGN 321	3/8	1/8	1/64	—	+	+	+	+						
TNGN 160308	TNGN 322			1/32		+	+	+	+						
TNGN 160312	TNGN 323			3/64		+	+	+	+						
TNGN 160316	TNGN 324			1/16		+	+	+	+						
TNGN 160404	TNGN 331	3/8	3/16	1/64	—	+	+	+	+	+					+
TNGN 160408	TNGN 332			1/32		+	+	+	+	+	+	+	+	+	+
TNGN 160412	TNGN 333			3/64		+	+	+	+	+	+	+	+	+	+
TNGN 160416	TNGN 334			1/16		+	+	+	+		+	+	+	+	+
TNGN 220404	TNGN 431	1/2	3/16	1/64	—	+	+	+	+						+
TNGN 220408	TNGN 432			1/32		+	+	+	+	+	+	+	+	+	+
TNGN 220412	TNGN 433			3/64		+	+	+	+	+	+	+	+	+	+
TNGN 220416	TNGN 434			1/16		+	+	+	+	+	+	+	+	+	+
TNGN 270604	TNGN 541	5/8	1/4	1/64	—	+	+	+	+						
TNGN 270608	TNGN 542			1/32		+	+	+	+						
TNGN 270612	TNGN 543			3/64		+	+	+	+						
TNGN 270616	TNGN 544			1/16		+	+	+	+						

TPGN ceramic *triangle positive rake inserts*



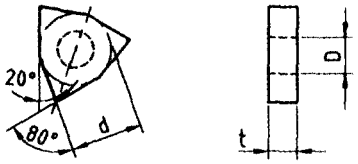
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
TPGN 110304	TPGN 221			1/64		+	+	+	+		+	+	+	+	
TPGN 110308	TPGN 222	1/4	1/8	1/32	—	+	+	+	+		+	+	+	+	
TPGN 110312	TPGN 223			3/64		+	+	+	+						
TPGN 110316	TPGN 224			1/16		+	+	+	+						
TPGN 160304	TPGN 321			1/64		+	+	+	+		+	+	+	+	+
TPGN 160308	TPGN 322	3/8	1/8	1/32	—	+	+	+	+		+	+	+	+	+
TPGN 160312	TPGN 323			3/64		+	+	+	+		+	+	+	+	+
TPGN 160316	TPGN 324			1/16		+	+	+	+						
TPGN 220404	TPGN 431			1/64		+	+	+	+		+	+	+	+	+
TPGN 220408	TPGN 432	1/2	3/16	1/32	—	+	+	+	+		+	+	+	+	+
TPGN 220412	TPGN 433			3/64		+	+	+	+		+	+	+	+	+
TPGN 220416	TPGN 434			1/16		+	+	+	+						

VNGA ceramic *35 degree diamond negative rake inserts*



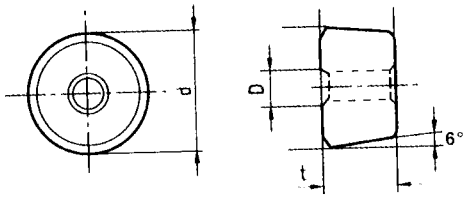
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
VNGA 160404	VNGA 331	3/8	3/16	1/64	.150	+	+	+	+						+
VNGA 160408	VNGA 332			1/32		+	+	+	+	+	+	+	+	+	+
VNGA 160412	VNGA 333			3/64		+	+	+	+	+	+	+	+	+	+
VNGA 160416	VNGA 334			1/16		+	+	+	+						
VNGA 220404	VNGA 431	1/2	3/16	1/64	.203	+	+	+	+						
VNGA 220408	VNGA 432			1/32		+	+	+	+	+	+	+	+		
VNGA 220412	VNGA 433			3/64		+	+	+	+	+	+	+	+		
VNGA 220416	VNGA 434			1/16		+	+	+	+						

WNGA ceramic *trigon negative rake inserts*



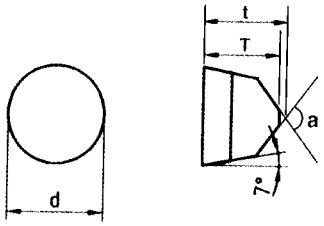
ISO DESIGNATION	INSERT STYLE	DIMENSIONS				BLACK / WHITE				SILICON NITRIDE					
		IC	T	R	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-510	CC-513	CC-514	CC-515	CC-516	CC-5477
WNGA 080404	WNGA 431	1/2	3/16	1/64	.203	+	+	+	+						
WNGA 080408	WNGA 432			1/32		+	+	+	+	+	+	+	+	+	
WNGA 080412	WNGA 433			3/64		+	+	+	+	+	+	+	+	+	

CDH / RCMA ceramic *round positive rake button insert*



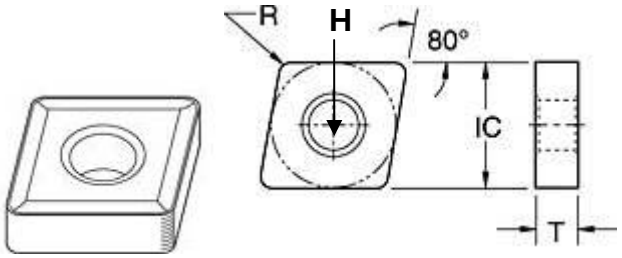
DESIGNATION	INSERT STYLE	DIMENSIONS			BLACK / WHITE				SILICON NITRIDE
		IC	T	H	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-5477
RCMA 41	CDH 22	1/2	1/4	.125	+	+	+		
RCMA 63	CDH 315	3/4	3/16	.125	+	+	+		
RCMA 66	CDH 33	3/4	3/8	.250	+	+	+		
RCMA 68	CDH 34	3/4	1/2	.250	+	+	+		
RCMA 88	CDH 42	1	1/2	.266	+	+	+		+
RCMA 812	CDH 43	1	3/4	.266	+	+	+		
RCMA 106	CDH 515	1-1/4	3/8	.390	+	+	+		+
RCMA 1012	CDH 53	1-1/4	3/4	.390	+	+	+		

RCGX ceramic *round positive rake V-bottom inserts*



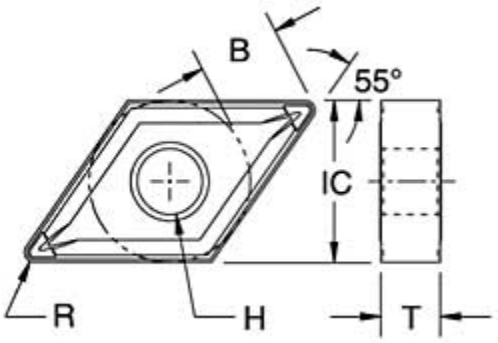
ISO DESIGNATION	INSERT STYLE	DIMENSIONS			BLACK / WHITE				SILICON NITRIDE
		IC	T	ANGLE	CC-10	CC-20	CC-30	CC-30-SC (COATED)	CC-5477
RCGX 060400	RCGX 102	1/4	3/16	120 degrees	+	+	+		
RCGX 060600	RCGX 102	1/4	1/4	120 degrees	+	+	+		
RCGX 060700	RCGX 102	1/4	5/16	120 degrees	+	+	+		
RCGX 090700	RCGX 103	3/8	.313	120 degrees	+	+	+		+
RCGX 120700	RCGX 104	1/2	.313	120 degrees	+	+	+		+
RCGX 151000	RCGX 105	5/8	.394	120 degrees	+	+	+		+
RCGX 191000	RCGX 106	3/4	.394	120 degrees	+	+	+		
RCGX 251200	RCGX 108	1	.473	140 degrees	+	+	+		

CNMG carbide



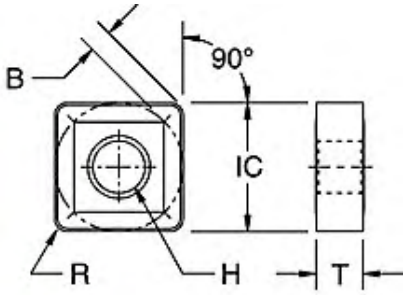
ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
CNMG 090304	CNMG 321	.375	.125	.016	.150	●	●	●	●	●	●
CNMG 090308	CNMG 322	.375	.125	.031	.150	●	●	●	●	●	●
CNMG 120404	CNMG 431	.500	.187	.016	.203	●	●	●	●	●	●
CNMG 120408	CNMG 432	.500	.187	.031	.203	●	●	●	●	●	●
CNMG 120412	CNMG 433	.500	.187	.047	.203	●	●	●	●	●	●
CNMG 120416	CNMG 434	.500	.187	.063	.203		●		●		
CNMG 160608	CNMG 542	.625	.250	.031	.250	●	●	●	●	●	
CNMG 160612	CNMG 543	.625	.250	.047	.250		●	●	●	●	
CNMG 160616	CNMG 544	.625	.250	.063	.250		●	●	●	●	
CNMG 190408	CNMG 642	.750	.250	.031	.313	●	●		●		
CNMG 190412	CNMG 643	.750	.250	.047	.313	●	●		●		
CNMG 190416	CNMG 644	.750	.250	.063	.313		●		●		
CNMG 190424	CNMG 646	.750	.250	.094	.313		●				
CNMG 250924	CNMG 866	1.00	.375	.094	.359		●	●		●	

DNMG carbide



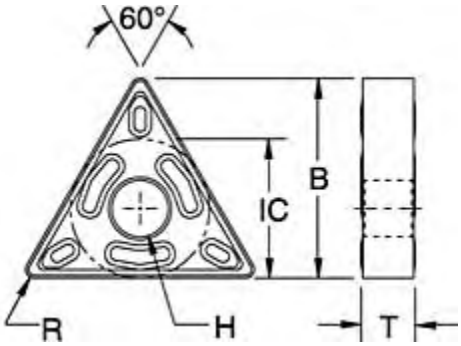
ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
DNMG 110404	DNMG 331	.375	.187	.016	.150	●	●	●	●	●	
DNMG 110408	DNMG 332	.375	.187	.031	.150	●	●	●	●	●	
DNMG 110412	DNMG 333	.375	.187	.047	.150	●	●	●	●	●	
DNMG 150404	DNMG 431	.500	.187	.016	.203	●	●	●	●	●	
DNMG 150408	DNMG 432	.500	.187	.031	.203	●	●	●	●	●	
DNMG 150412	DNMG 433	.500	.187	.047	.203	●	●	●	●	●	●
DNMG 150416	DNMG 434	.500	.187	.063	.203		●		●		
DNMG 150604	DNMG 441	.500	.250	.016	.203	●	●	●	●	●	
DNMG 150608	DNMG 442	.500	.250	.031	.203	●	●	●	●	●	●
DNMG 150612	DNMG 443	.500	.250	.047	.203	●	●	●	●	●	●
DNMG 150616	DNMG 444	.500	.250	.063	.203		●		●		
DNEG 150404	DNEG 431	.500	.187	.016	.203						●
DNEG 150408	DNEG 432	.500	.187	.031	.203						●
DNEG 150412	DNEG 433	.500	.187	.047	.203						●
DNEG 150604	DNEG 441	.500	.250	.016	.203						●
DNEG 150608	DNEG 442	.500	.250	.031	.203						●

SNMG carbide



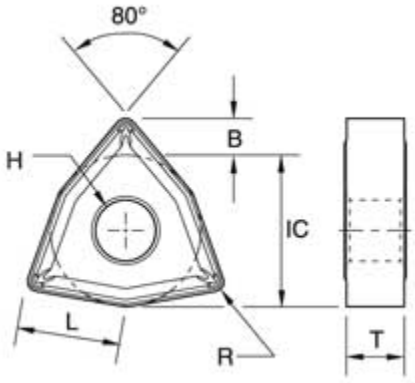
ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
SNMG 090304	SNMG 321	.375	.125	.016	.150	●	●	●	●	●	
SNMG 090308	SNMG 322	.375	.125	.031	.150	●	●	●	●	●	
SNMG 090312	SNMG 323	.375	.125	.047	.150		●	●	●	●	
SNMG 120404	SNMG 431	.500	.187	.016	.203	●	●	●	●	●	
SNMG 120408	SNMG 432	.500	.187	.031	.203	●	●	●	●	●	●
SNMG 120412	SNMG 433	.500	.187	.047	.203	●	●	●	●	●	
SNMG 120416	SNMG 434	.500	.187	.063	.203		●	●	●	●	
SNMG 150608	SNMG 542	.625	.250	.031	.250	●	●				
SNMG 150612	SNMG 543	.625	.250	.047	.250	●	●	●	●	●	
SNMG 150616	SNMG 544	.625	.250	.063	.250		●	●		●	
SNMG 150624	SNMG 546	.625	.250	.094	.250		●				
SNMG 190612	SNMG 643	.750	.250	.047	.313		●				
SNMG 190616	SNMG 644	.750	.250	.063	.313		●		●		
SNMG 190624	SNMG 646	.750	.250	.094	.313		●				

TNMG carbide



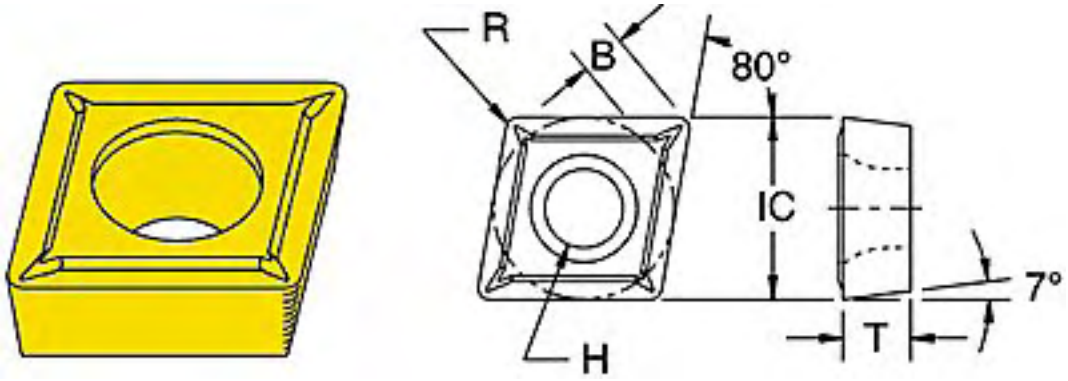
ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
TNMG 110304	TNMG 221	.250	.125	.016	.089	●	●	●	●	●	
TNMG 110308	TNMG 222	.250	.125	.031	.089	●	●	●	●	●	
TNMG 160404	TNMG 331	.375	.187	.016	.150	●	●	●	●	●	
TNMG 160408	TNMG 332	.375	.187	.031	.150	●	●	●	●	●	
TNMG 160412	TNMG 333	.375	.187	.047	.150	●	●	●	●	●	
TNMG 220404	TNMG 431	.500	.187	.016	.203	●	●	●		●	
TNMG 220408	TNMG 432	.500	.187	.031	.203	●	●	●	●	●	
TNMG 220412	TNMG 433	.500	.187	.047	.203	●	●	●	●	●	
TNMG 220416	TNMG 434	.500	.187	.063	.203		●	●	●	●	
TNMG 270608	TNMG 542	.625	.250	.031	.250	●	●				
TNMG 270612	TNMG 543	.625	.250	.047	.250		●				
TNMG 270616	TNMG 544	.625	.250	.063	.250		●				
TNMG 330916	TNMG 664	.750	.375	.063	.313		●				
TNMG 330924	TNMG 666	.750	.375	.094	.313		●				

WNMG carbide



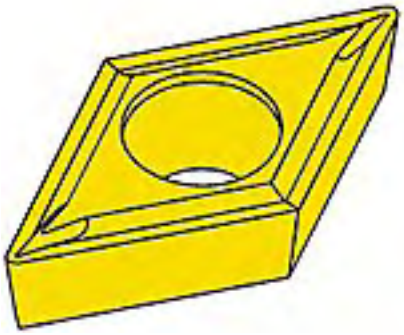
ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
WNMG 06T304	WNMG 3(2.5)1	.375	.156	.016	.150	●	●	●		●	
WNMG 06T308	WNMG 3(2.5)2	.375	.156	.031	.150	●	●	●		●	
WNMG 06T312	WNMG 3(2.5)3	.375	.156	.047	.150	●	●	●		●	
WNMG 060404	WNMG 331	.375	.187	.016	.150	●		●		●	
WNMG 060408	WNMG 332	.375	.187	.031	.150	●	●	●	●	●	
WNMG 060412	WNMG 333	.375	.187	.047	.150	●	●		●		
WNMG 080404	WNMG 431	.500	.187	.016	.203	●	●	●	●	●	●
WNMG 080408	WNMG 432	.500	.187	.031	.203	●	●	●	●	●	●
WNMG 080412	WNMG 433	.500	.187	.047	.203	●	●	●	●	●	●
WNMG 080416	WNMG 434	.500	.187	.063	.203		●		●		
WNMG 080608	WNMG 442	.500	.250	.031	.203	●	●		●		

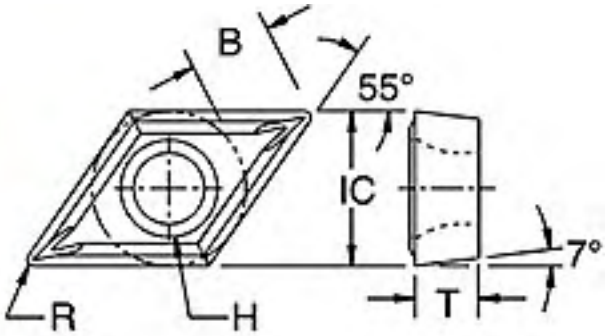
CCMT / CCGX carbide



ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
CCMT 060202	CCMT 21.50	.250	.094	.008	.110	●	●	●		●	
CCMT 060204	CCMT 21.51	.250	.094	.016	.110	●	●	●		●	
CCMT 060208	CCMT 21.52	.250	.094	.031	.110	●	●	●		●	
CCMT 09T302	CCMT 32.50	.375	.156	.008	.173	●	●	●		●	
CCMT 09T304	CCMT 32.51	.375	.156	.016	.173	●	●	●		●	
CCMT 09T308	CCMT 32.52	.375	.156	.031	.173	●	●	●		●	
CCMT 120404	CCMT 431	.500	.187	.016	.219	●	●	●		●	
CCMT 120408	CCMT 432	.500	.187	.031	.219	●	●	●		●	
CCMT 120412	CCMT 433	.500	.187	.047	.219		●	●		●	
CCGX 060202	CCGX 21.50	.250	.094	.008	.110						●
CCGX 060204	CCGX 21.51	.250	.094	.016	.110						●
CCGX 060208	CCGX 21.52	.250	.094	.031	.110						●
CCGX 09T302	CCGX 32.50	.375	.156	.008	.173						●
CCGX 09T304	CCGX 32.51	.375	.156	.016	.173						●
CCGX 09T308	CCGX 32.52	.375	.156	.031	.173						●
CCGX 120402	CCGX 430	.500	.187	.008	.219						●
CCGX 120404	CCGX 431	.500	.187	.016	.219						●
CCGX 120408	CCGX 432	.500	.187	.031	.219						●

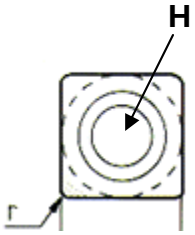
DCMT / DCGX carbide

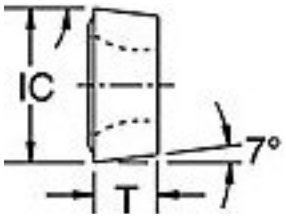




ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
DCMT 060202	DCMT 21.50	.250	.094	.008	.110	●		●		●	
DCMT 060204	DCMT 21.51	.250	.094	.016	.110	●	●	●		●	
DCMT 060208	DCMT 21.52	.250	.094	.031	.110	●	●	●		●	
DCMT 09T302	DCMT 32.50	.375	.156	.008	.173	●	●	●		●	
DCMT 09T304	DCMT 32.51	.375	.156	.016	.173	●	●	●		●	
DCMT 09T308	DCMT 32.52	.375	.156	.031	.173	●	●	●		●	
DCMT 09T312	DCMT 32.53	.375	.156	.047	.173		●	●		●	
DCGX 060202	DCGX 21.50	.250	.094	.008	.110						●
DCGX 060204	DCGX 21.51	.250	.094	.016	.110						●
DCGX 09T302	DCGX 32.50	.375	.156	.008	.173						●
DCGX 09T304	DXGX 32.51	.375	.156	.016	.173						●
DCGX 09T308	DCGX 32.52	.375	.156	.031	.173						●

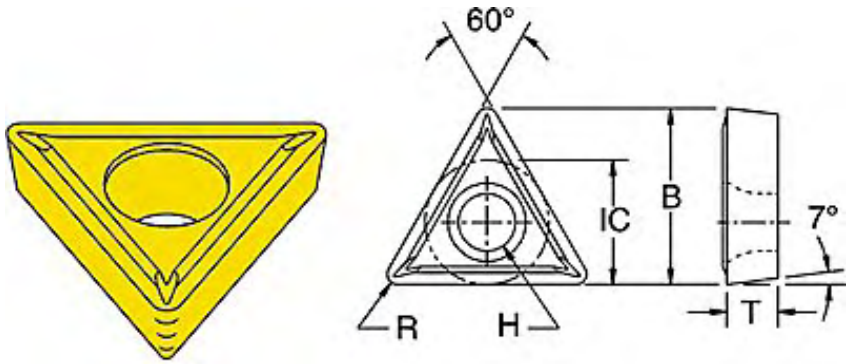
SCMT / SCGX carbide





ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
SCMT 09T302	SCMT 32.50	.375	.156	.008	.173	●		●		●	
SCMT 09T304	SCMT 32.51	.375	.156	.016	.173	●	●	●		●	
SCMT 09T308	SCMT 32.52	.375	.156	.031	.173	●	●	●		●	
SCMT 120404	SCMT 431	.500	.187	.016	.219	●	●	●		●	
SCMT 120408	SCMT 432	.500	.187	.031	.219	●	●	●		●	
SCMT 120412	SCMT 433	.500	.187	.047	.219		●	●		●	
SCGX 09T302	SCGX 32.50	.375	.156	.008	.173						●
SCGX 09T304	SCGX 32.51	.375	.156	.016	.173						●
SCGX 09T308	SCGX 32.52	.375	.156	.031	.173						●
SCGX 120404	SCGX 431-LH	.500	.187	.016	.219						●
SCGX 120408	SCGX 432-LH	.500	.187	.031	.219						●

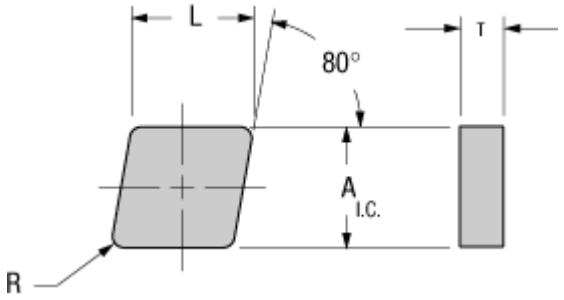
TCMT / TCGX carbide



ISO DESIGNATION	ANSI DESIGNATION	DIMENSIONS				GRADES					
		IC	T	R	H	R-100	R-200	R-300	R-400	R-500	R-600
TCMT 060102	TCMT 1.21.20	.156	.078	.008	.087	●		●		●	
TCMT 060104	TCMT 1.21.21	.156	.078	.016	.087	●	●	●		●	
TCMT 060108	TCMT 1.21.22	.156	.078	.031	.087	●	●	●		●	
TCMT 080202	TCMT 1.81.50	.219	.094	.008	.098	●	●	●		●	
TCMT 080204	TCMT 1.81.51	.219	.094	.016	.098	●	●	●		●	
TCMT 080208	TCMT 1.81.52	.219	.094	.031	.098	●	●	●		●	
TCMT 110202	TCMT 21.50	.250	.094	.008	.110	●		●		●	
TCMT 110204	TCMT 21.51	.250	.094	.016	.110	●	●	●		●	
TCMT 110208	TCMT 21.52	.250	.094	.031	.110	●	●	●		●	
TCMT 16T302	TCMT 32.50	.375	.156	.008	.173	●					
TCMT 16T304	TCMT 32.51	.375	.156	.016	.173	●	●	●		●	
TCMT 16T308	TCMT 32.52	.375	.156	.031	.173	●	●	●		●	
TCMT 16T312	TCMT 32.53	.375	.156	.047	.173		●	●		●	
TCMT 220408	TCMT 432	.500	.187	.031	.217	●	●	●		●	
TCGX 080202	TCGX 1.81.50	.219	.094	.008	.098						●
TCGX 080204	TCGX 1.81.51	.219	.094	.016	.098						●
TCGX 110202	TCGX 21.50	.250	.094	.008	.110						●
TCGX 110204	TCGX 21.51	.250	.094	.016	.110						●
TCGX 110208	TCGX 21.52	.250	.094	.031	.110						●
TCGX 16T302	TCGX 32.50	.375	.156	.008	.173						●
TCGX 16T304	TCGX 32.51	.375	.156	.016	.173						●
TCGX 16T308	TCGX 32.52	.375	.156	.031	.173						●

CNGN whisker ceramic

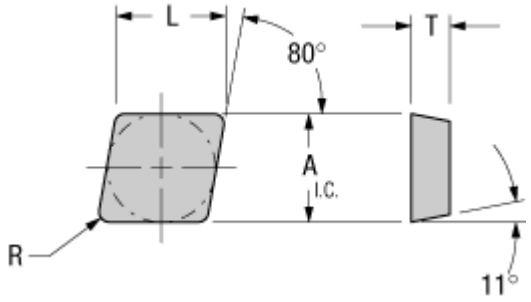
80 degree diamond negative rake inserts



ISO DESIGNATION	INSERT STYLE	DIMENSIONS			WHISKER CERAMIC
		IC(A)	T	R	CC-600
CNGN 120408	CNGN 432	1/2	3/16	1/32	+
CNGN 120412	CNGN 433			3/64	+
CNGN 120416	CNGN 434			1/16	+
CNGN 120708	CNGN 452	1/2	5/16	1/32	+
CNGN 120712	CNGN 453			3/64	+
CNGN 120716	CNGN 454			1/16	+

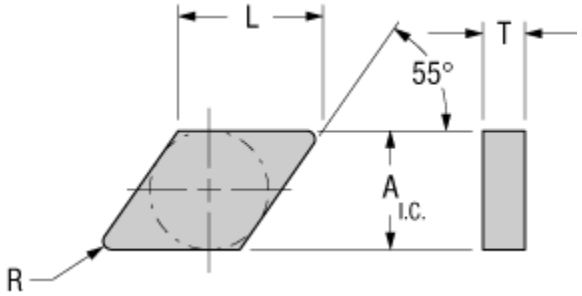
CPGN whisker ceramic

80 degree diamond positive rake insert



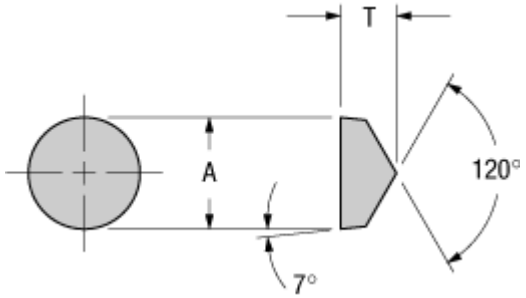
ISO DESIGNATION	INSERT STYLE	DIMENSIONS			WHISKER CERAMIC
		IC(A)	T	R	CC-600
CPGN 120408	CPGN 432	1/2	3/16	1/32	+
CPGN 120412	CPGN 433			3/64	+
CPGN 120416	CPGN 434			1/16	+

DNGN whisker ceramic *55 degree diamond negative rake inserts*



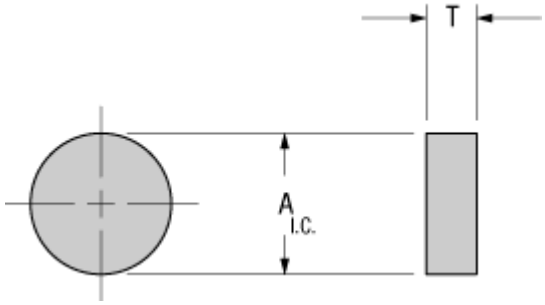
ISO DESIGNATION	INSERT STYLE	DIMENSIONS			WHISKER CERAMIC
		IC(A)	T	R	CC-600
DNGN 120408	DNGN 432	1/2	3/16	1/32	+
DNGN 120412	DNGN 433			3/64	+
DNGN 120416	DNGN 434			1/16	+

RCGN V whisker ceramic *round V-bottom*



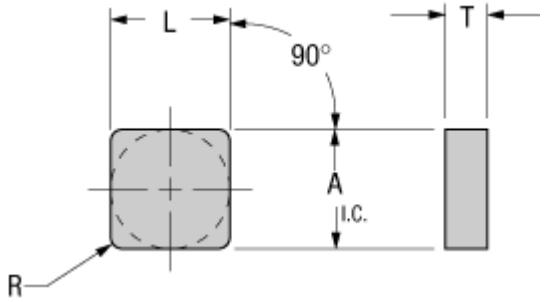
ISO DESIGNATION	INSERT STYLE	DIMENSIONS			WHISKER CERAMIC
		IC(A)	T		CC-600
RCGN 060400	RCGN 2V	.250	.187		+
RCGN 090700	RCGN 3V	.375	.312		+
RCGN 120700	RCGN 4V	.500	.312		+

RNGN whisker ceramic *round negative rake insert*



ISO DESIGNATION	INSERT STYLE	DIMENSIONS			WHISKER CERAMIC
		IC(A)	T		CC-600
RNGN 120400	RNGN 43	.500	.187		+
RNGN 120700	RNGN 45	.500	.312		+

SNGN whisker ceramic *square negative rake inserts*



ISO DESIGNATION	INSERT STYLE	DIMENSIONS			WHISKER CERAMIC
		IC(A)	T	R	CC-600
SNGN 120408	SNGN 432	1/2	3/16	1/32	+
SNGN 120412	SNGN 433			3/64	+
SNGN 120416	SNGN 434			1/16	+
SNGN 190708	SNGN 652	3/4	5/16	1/32	+
SNGN 190712	SNGN 653			3/64	+
SNGN 190716	SNGN 654			1/16	+

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Machining Recommendations

Whisker Ceramic

CC-600

Material	Hardness Rc	Speed(SFM)	Feed(IPR)	DOC
Inconel 718	36 – 46	900 – 2,500	.004 - .012	.600(max)
Rene 95	45 – 50	300 – 900	.004 - .012	.500(max)
Waspaloy	45 – 50	800 – 900	.004 - .008	.100
Hastelloy	30 – 40	900 – 2,000	.006 - .015	.150(max)
Stellite	35 – 45	500 – 1,200	.004 - .012	.060
400 Stainless Steel	45 – 55	500 – 900	.006 - .015	.200(max)
D2 Tool Steel	60	150 – 450	.004 - .015	.015
H13 Tool Steel	35	1400	.030	.060
52 100	62	450 – 650	.003 - .008	.060 - .015
Nodular Iron	25	1,000 – 1,200	.007 - .020	.300(max)