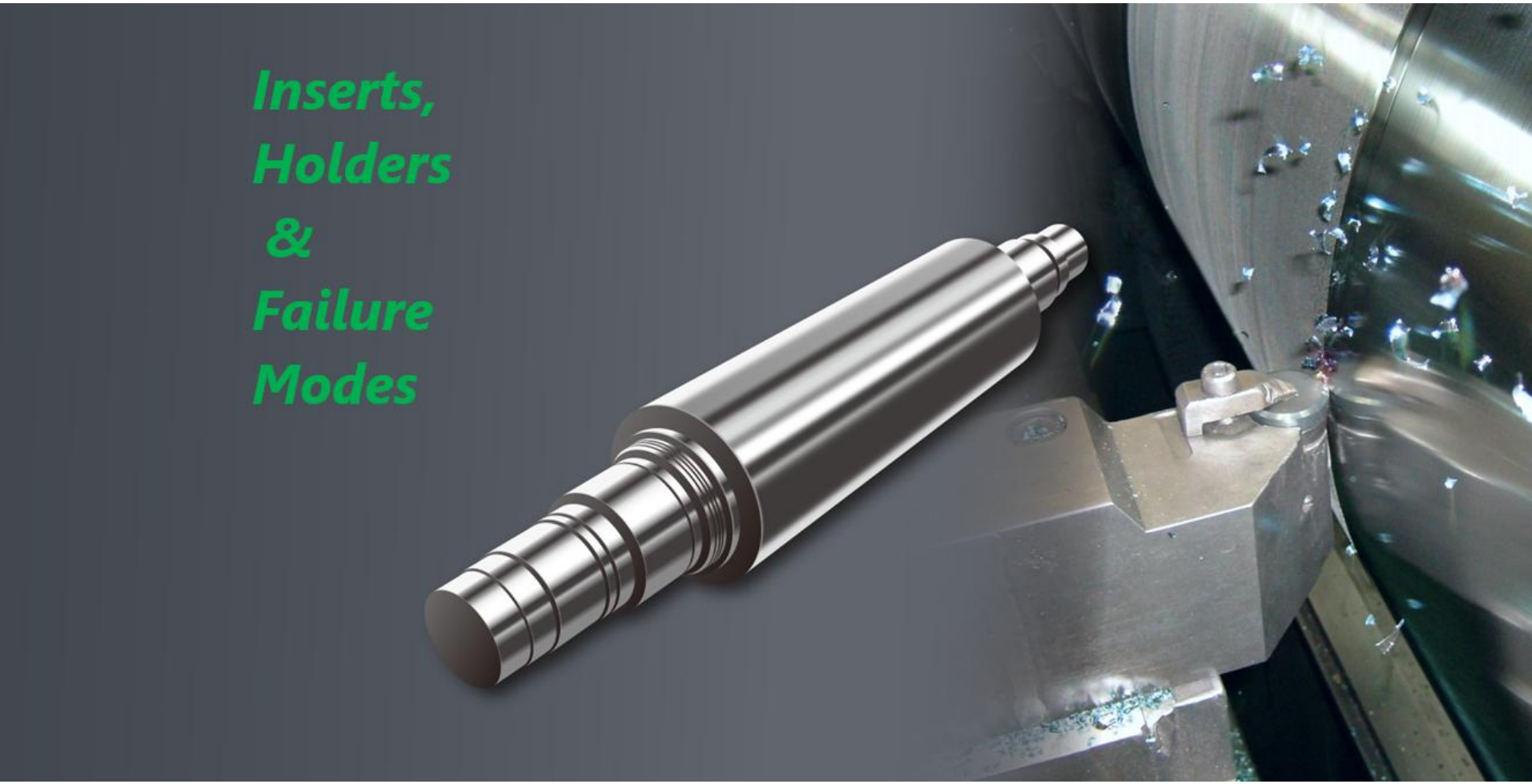
Institute of Roll Design

Leading in Innovation



Ed Hofheins
Product Manager - Ceramics

Member IMC Group Tungaloy INDUSTRY 4.0

Member IMC Group NTK CUTTING TOOLS

Leading in Innovation

Lathe Tooling: Failure Modes & Improved Grades

Inserts

- **Geometries**
- **Edge Preps**
- **Improved Grades**

Lathe Tooling

- **Styles**
- **Hardware**
- **Do's & Don'ts**

Failure Modes

Insert Markings

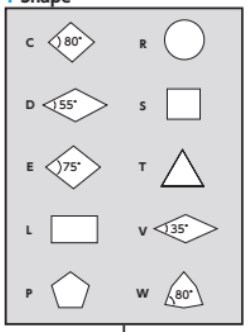
Insert Nomenclature and Edge Prep

Tool Materials / Selection Guide

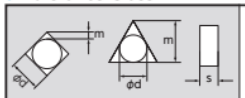
NTK

ANSI / ISO Insert Nomenclature

1 Shape



3 Tolerance Class



Symbol	d (inch)	m (inch)	s (inch)
A	±.0010	±.0002	±.0010
F	±.0050	±.0002	±.0010
C	±.0010	±.0005	±.0010
H	±.0050	±.0005	±.0010
E	±.0010	±.0010	±.0010
G	±.0010	±.0010	±.0050
J	±.0020	±.0020	±.0050
K	±.002~±.005	±.0005	±.0010
L	±.002~±.005	±.0010	±.0010
M	±.002~±.005	±.003~±.007	±.0050
N	±.002~±.005	±.003~±.007	±.0010
U	±.003~±.010	±.005~±.015	±.0050

C S T

Inscribed Circle	M tolerance d (inch)	M tolerance m (inch)
1/4"	±.002	±.003
3/8"	±.002	±.003
1/2"	±.003	±.005
5/8"	±.004	±.006
3/4"	±.004	±.006
1"	±.005	±.007

D K

Inscribed Circle	M tolerance d (inch)	M tolerance m (inch)
1/4"	±.002	±.004
3/8"	±.002	±.004
1/2"	±.003	±.006
5/8"	±.004	±.006
3/4"	±.004	±.007

5 Symbol for Insert Size

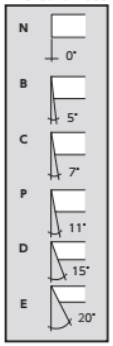
Inch Inscribed Circle	Inch	Metric C	Metric D	Metric R	Metric S	Metric T	Metric V	Metric W
1/4"	2	06	07	06	11	11	04	
3/8"	3	09	11	09	16	16	06	
1/2"	4	12	15	12	22	22	08	
5/8"	5	16	19	15	27	27	10	
3/4"	6	19	23	19	33	33	13	
1"	8	25	31	25	44	44	17	

7 Corner Radius

Corner Radius	Inch	Metric
1/64"	1	04
1/32"	2	08
3/64"	3	12
1/16"	4	16
5/64"	5	20
3/32"	6	24
1/8"	8	32

	1	2	3	4	5	6	7	8	9	10
Inch	S	N	G	A	4	3	3	T	04	20
Metric	S	N	G	A	12	04	12	T	010	20

2 Clearances



4 Type

Type	Symbol	Type	Symbol
	N (E)	70°–90°	H
	F		
	R	70°–90°	B
	A		
	G	40°–60°	T
	M		
Special design	X	40°–60°	W

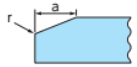
6 Thickness

Thickness S(inch)	Inch	Metric
3/32"	1.5	02
1/8"	2	03
5/32"	2.5	T3
3/16"	3	04
1/4"	4	06
5/16"	5	07
3/8"	6	09
1/2"	8	12

8 Edge Condition

Sharp	FNX08
Honed	E
Chamfered	T
Chamfered and Honed	Z
	S
	U
Double Chamfered	K
Double Chamfered and Honed	J
	P
	Q

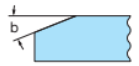
9 Negative Land Width



	Description inch	Description metric	a (inch)	r (inch)
E	01	002	–	.001
	02	004	–	.002
T	02	005	.002	–
	03	008	.003	–
	04	010	.004	–
	05	012	.005	–
	06	015	.006	–
	08	020	.008	–
Z	04	010	.004	.001
	08	020	.008	.001
S	04	010	.004	.002
	08	020	.008	.002
U	16	040	.016	.003
K	28	070	.028	–
J	60	150	.060	.001
P	71	180	.071	.002
Q	95	240	.095	.003

Note: K, J, P & Q show its primary land width

10 Negative Land Angle

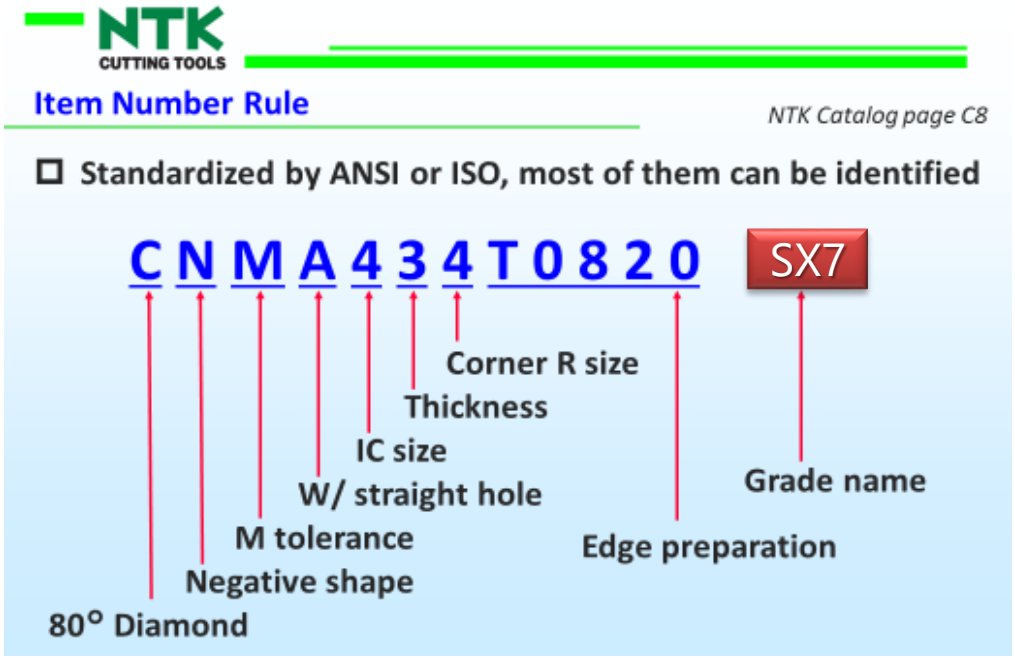


Description	b
10	10°
15	15°
20	20°
25	25°
30	30°

Note: K, J, P & Q show its primary land angle

Insert Nomenclature and Edge Prep

Leading in Innovation



Note** Some inserts used in Steel Mills or blueprint specials do not follow this designation.

Edge Preparation

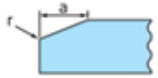
Leading in Innovation

T	04	20
8	9	10
T	010	20

8 Edge Condition

Sharp	FNX08
Honed	E
Chamfered	T
Chamfered and Honed	Z
	S
	U
Double Chamfered	K
Double Chamfered and Honed	J
	P
	Q

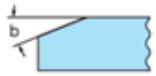
9 Negative Land Width



	Description inch	Description metric	a (inch)	r (inch)
E	01	002	–	.001
	02	004	–	.002
T	02	005	.002	–
	03	008	.003	–
	04	010	.004	–
	05	012	.005	–
	06	015	.006	–
	08	020	.008	–
Z	04	010	.004	.001
	08	020	.008	.001
S	04	010	.004	.002
	08	020	.008	.002
U	16	040	.016	.003
K	28	070	.028	–
J	60	150	.060	.001
P	71	180	.071	.002
Q	95	240	.095	.003

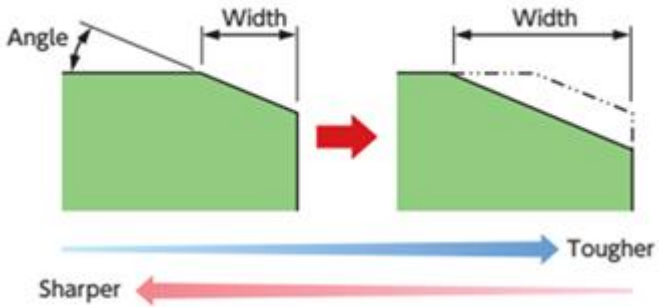
Note: K, J, P & Q show its primary land width

10 Negative Land Angle



Description	b
10	10°
15	15°
20	20°
25	25°
30	30°

Note: K, J, P & Q show its primary land angle

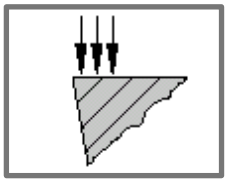
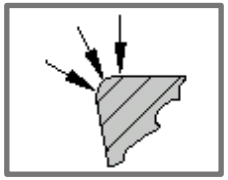
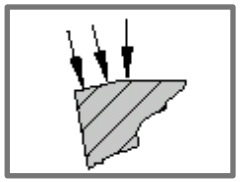


Larger T-land results in a tougher edge = More tool Pressure on part.
Smaller T-Land results in a fragile edge = Less tool Pressure on part

Greater Angle T-land results in a tougher edge = More tool pressure on part.
Less Angle T-land results in a fragile edge = Less tool pressure on part.

Edge Preparation

Dealing With High Tool Forces

- Sharp Edge
  - a) Lower Tool Pressure
  - b) Clean Cutting Action
- Honed Edge *for Carbides and Ceramics, Stronger than Sharp*
- T-Land Edge *for Ceramics, puts edge in compression, feed dependent*

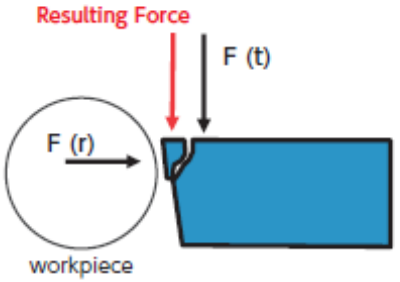
Edge Preparation

Leading in Innovation

Edge Prep and Directing of Cutting Forces

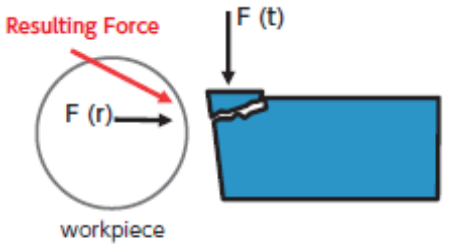
Importance of edge preparation

A combination of a high tangential force and a sharp insert edge can result in edge breakage. This is due to unbalanced radial and tangential forces. An example, at tool path entry or during interrupted cutting, all the pressure is directed into the top of the insert. This increases the risk of chipping.

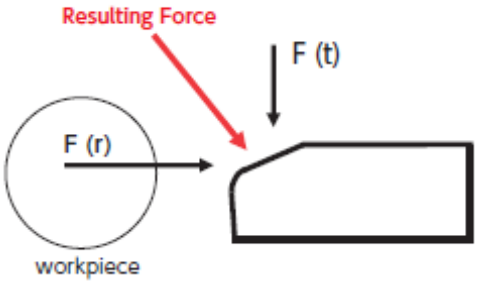


A combination of high radial forces and a sharp insert edge can result in edge flaking. An example, If the feed rate is too high, the force generated will overpower the insert and cause flaking to occur.

"Over center"



This insert is placed in compression with the addition of a chamfer on the edge reducing the chances of breaking or flaking. Radial and tangential forces are balanced to provide the best tool life. The resulting force is directed into the body of the insert ; and is achieved with a negative insert geometry with a chamfer and hone for the edge preparation.



Edge Preparation

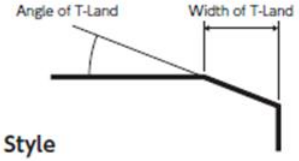
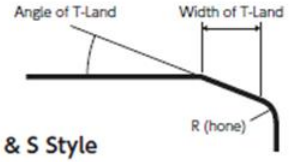
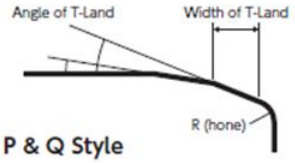
Leading in Innovation

Edge Conditions are a Key to Success

An important factor for achieving success when machining with ceramic inserts is to use the correct edge preparation. Ceramic is a hard material therefore the insert needs some edge work in order to withstand cutting forces and optimize the cutting tool performance. The edge preparation must correspond to the ceramic grade selected, the type of HRSA material being machined and the machining operation being performed. The majority of ceramic applications can be handled with NTK's standard edge preparations.
In unique circumstances that may arise, an edge preparation may need to be specialized to meet the conditions.

Description of Insert Edge Preparations

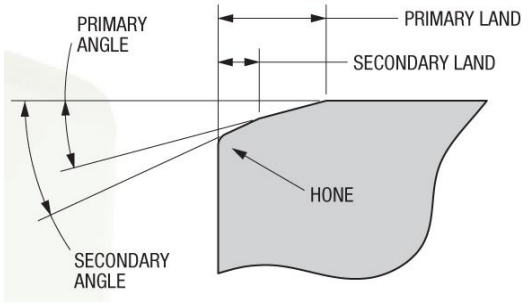
Edge Strength Increases

 FNX Style	Up sharp edges are not recommended for ceramics.
 E Style	Hones help protect the edge of ceramics from chipping or fracturing. Feed rates must be greater than the hone size to prevent a rubbing rather than a cutting action. Excessive honing reduces tool life.
 T Style	This geometry is typically the most common ceramic edge preparation. The cutting forces are distributed over a concentrated area of the ceramic edge.
 Z & S Style	A hone added to a T-land provides a stronger edge to prevent chipping. Usually this type of geometry works best on interrupted cuts or turning hardened steels.
 J, P & Q Style	Double T-lands and hones are generally used in heavy roughing cuts or hardened materials. This edge is extremely shock resistant but also generates large cutting forces.

Insert Markings
Specialty edges

Leading in Innovation

Style	Symbol
Double Chamfer with A hone	**P**
Double Chamfer with B hone	**Q**
Double Chamfer without hone	**K**



Primary Land Length & Angle	Inch	Metric
.028" X 15 deg.	2815	07015
.060" X 15 deg.	6015	15015
.079" X 15 deg.	7915	20015
.091" X 15 deg.	9115	23015

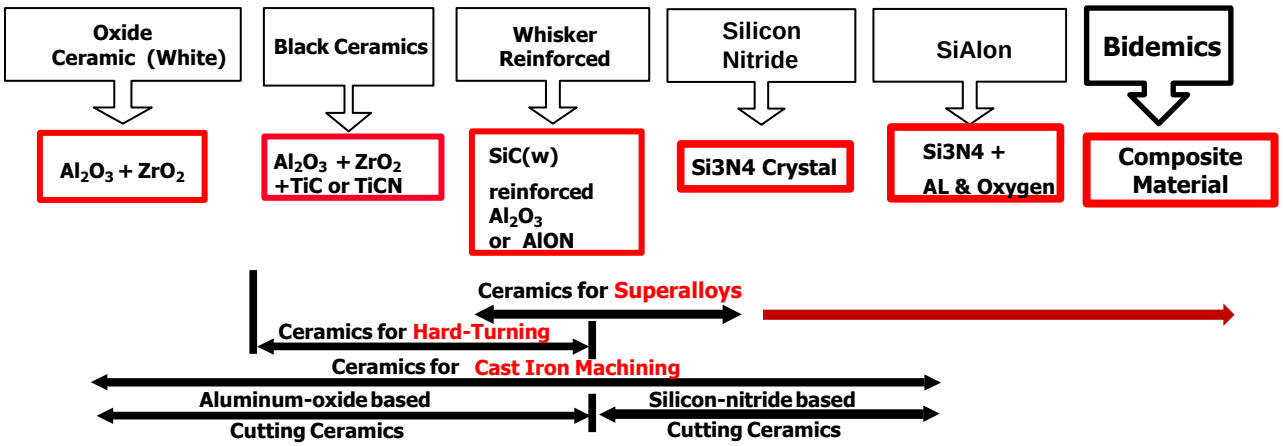
Example:

Current Designation	New Designation	
	Inch	Metric
CDH515C2.0X15SA HC7	P7915	P20015
LNJ6688C1.5X15SA HC7	P5915	P15015
RCGX105C2.0X20A HC2	S8020	K20020
ZT1130C2.3X20SA HC2	P7920	P7920

NTK Ceramic Grades

Classification of Cutting Ceramics

6 Main Classes



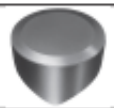
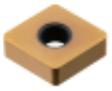
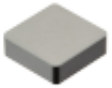
Member IMC Group Tungaloy INDUSTRY 4.0

Member IMC Group NTK CUTTING TOOLS

Ceramic Grades

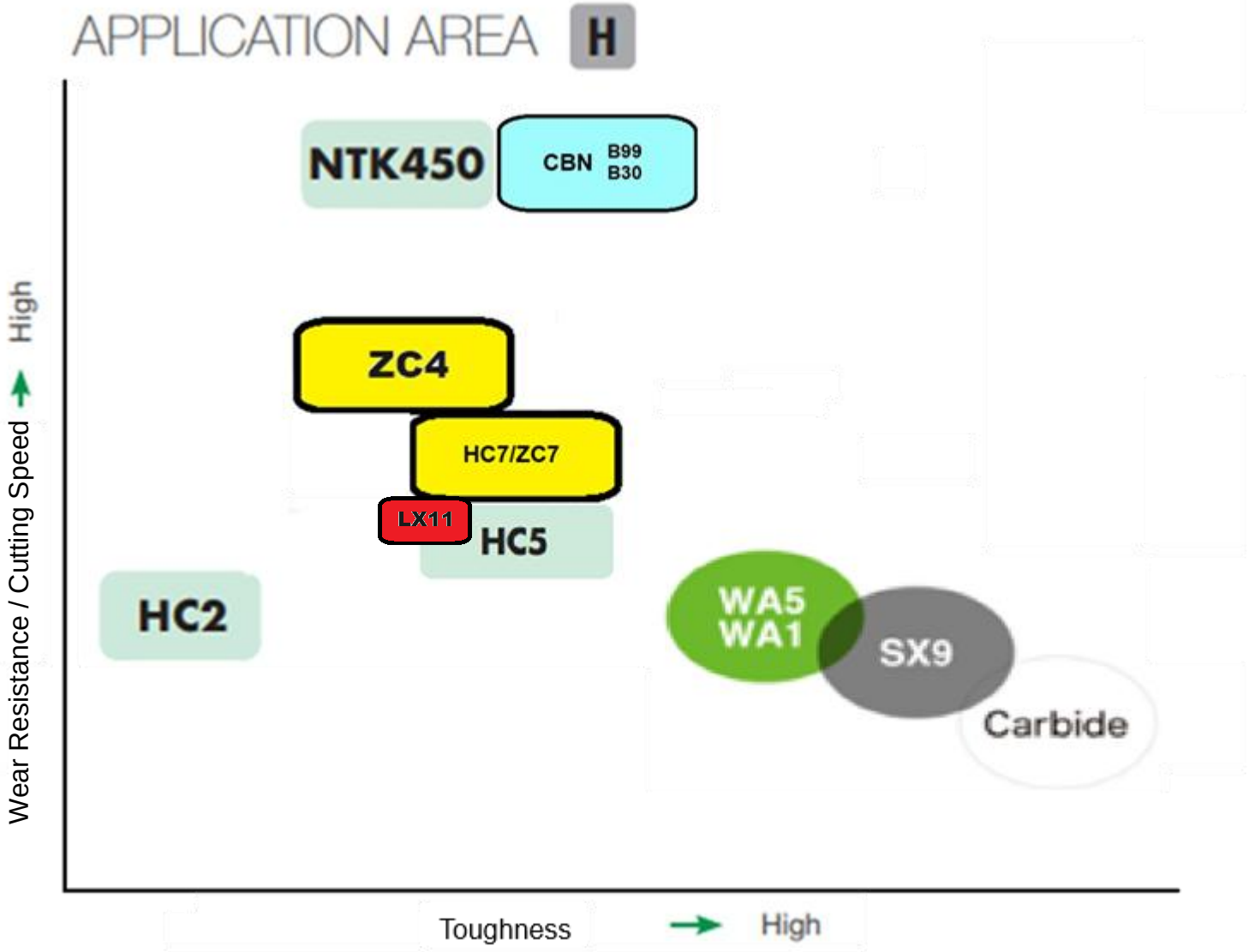
Leading in Innovation

Ceramic Series

	Grade / Coating	Physical Properties						Applications
		Density g/㎤	Hardness HRA	Bending Strength MPa	Young's Modulus GPa	Thermal Expansion Coefficient X10⁻⁶/K	Thermal Conductivity W/m・K	
Alumina + TiC based	HC2 	4.3	94.5	800	420	7.9	21	General purpose grade; cost effective Semi-finishing to finishing of cast iron mill rolls Machining of hardened materials
	HC5 	4.3	95.0	900	420	7.8	25	Roughing to finishing cast iron and steel mill rolls. Turning of hardened steels up to 62Rc.
	HC7 	4.6	95.0	1100	420	7.9	23	Turning of hardened steels in the 50-62Rc range. (demanding applications) Semi-finishing and finishing of cast iron
	ZC7  TiN	4.6	95.0	1100	420	7.9	23	Machining hardened materials even in soft to hard turning applications (50-62Rc) Semi-finishing and finishing cast iron; chilled iron
	ZC4  TiN	4.6	95.5	1000	420	7.8	25	Finish machining of hardened materials (60-70Rc)
SiAlON	SX9 	3.3	93.5	1200	330	3.0	15	Semi finishing cast iron and ductile rolls
Whisker (Al_2O_3+SiC)	WA1 	3.7	94.5	1200	400	7.0	35	Roughing to Semi-finishing of carbide mill rolls. Roughing of hardened rolls.(45-62Rc) Semi finishing to finishing of cast iron

Ceramic Grades

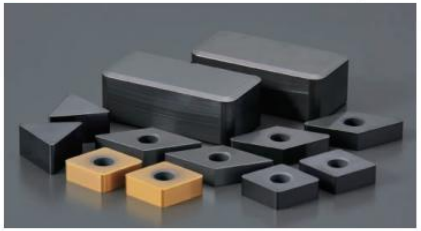
Leading in Innovation



Grey & Ductile Iron

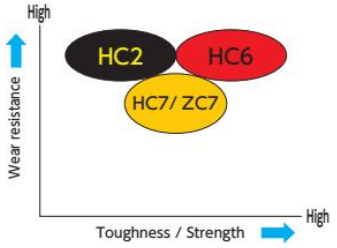
Leading in Innovation

Alumina TiC-based ceramics (Black ceramics)

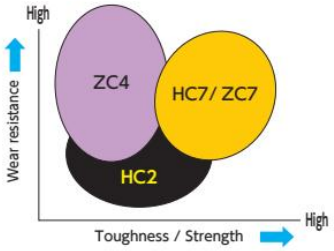


Alumina TiC-based ceramics are strengthened by adding hard carbide to highly pure alumina. This process results in ceramic materials that shows excellent performance in either wet or dry cutting conditions. As an added benefit, hardness and toughness has been improved which enables the machining of partially interrupted cuts. This ceramic material has both high-hot hardness and low plasticity needed to cut hardened materials.

【Gray cast iron, Finishing, WET, Black ceramic】



【Machining of hardened materials】



HC2

The standard grade for machining cast iron and hardened materials

Mill roll	
240 SFM	
.008 IPR	
.020" - .120" DOC	
DRY	
NTK : HC2	20 pcs
Competitor's black ceramic	10 pcs

Features

- *Well-balanced content of aluminum oxide and titanium carbide (Al_2O_3+TiC) sintered under pressure*
- *Stable performance under a wide range of machining conditions*
- *General purpose ceramic which works well in a wide range of cutting applications*

Grade	Work material	Application	Purpose	Cutting speed (SFM)	Feed (IPR)	Depth of cut (inch)	DRY	WET
HC2	Gray cast iron	Turning	Semi finish-Finish	1200-2100	.004-.016	.020-.060	●	●
	Mill rolls (Cast iron)	Turning	Semi finish-Finish	150-500	.003-.008	.020-.140	●	

Member IMC Group Tungaloy INDUSTRY 4.0

Member IMC Group NTK CUTTING TOOLS

Roll Specific Grade

Leading in Innovation

All-purpose grade for machining gray cast iron and hardened materials

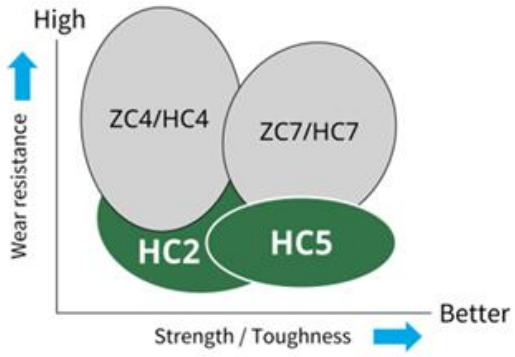
Well balanced grade between wear resistance and chipping resistance

Application

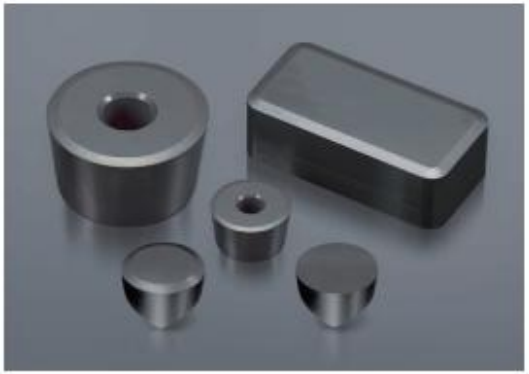
Gray cast iron / Semi to finishing with continuous machining

Hardened materials / Finishing

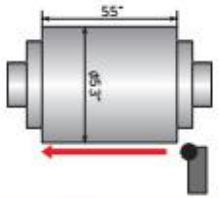
Hardened and cast iron mill rolls / Semi to finishing



HC5 — Developed for Mill Rolls



Mill roll	
Chilled cast iron	
230 SFM	
.016 IPR	
.394" DOC	
DRY	
NTK : HC5	4 pass
Competitor's black ceramic	2 pass



Features

- *Developed for use in hard turning applications for mill rolls*
- *Excellent toughness combined with wear resistance*

Grade	Work material	Application	Purpose	Cutting speed (SFM)	Feed (IPR)	Depth of cut (inch)	DRY	WET
HC5	Mill roll (Cast iron)	Turning	Rough-Finish	450-600	.004-.012	.025-.075	●	
	Mill roll (Steel)	Turning	Rough-Finish	450-600	.004-.012	.025-.075	●	

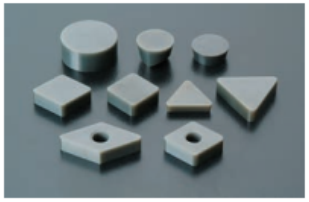
Grey & Ductile Iron

Leading in Innovation

- Semi Finishing
  - Cast Iron
  - Ductile Iron
- Very “Tough”

SX9

Best grade for roughing Inco 718 with scale



Features

- *Excellent notch wear resistance*
- *Better flank wear resistance compared to competitor's silicon nitride ceramics*
- *Superior toughness compared to Whisker-reinforced ceramics*
- *Best thermal shock resistance*
- *Best grade for roughing Inco 718 with scale*

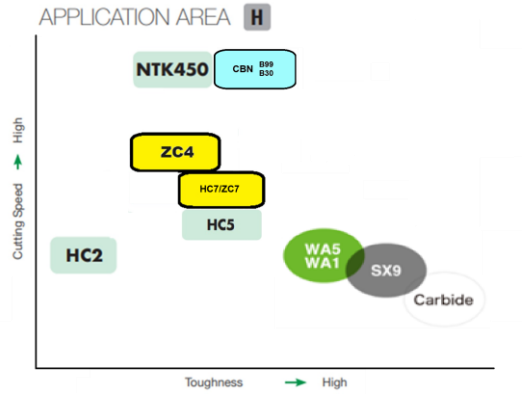
Housing (Inco 718 with scale)

	Comp. Whisker	SX9
Shape	RCGX45	←
Cutting speed (SFM)	600	←
Feed (IPR)	.005	.008
Depth of cut (inch)	.100	←
	WET	←

NTK : SX9 — • High productivity

Competitor's Whisker ceramic

Grade	Work material	Application	Purpose	Cutting speed (SFM)	Feed (IPR / IPT)	Depth of cut (inch)	DRY	WET
SX9	Heat resistant alloy	Turning	Rough scale	600-800	.008-.014	.040-.200		●
			Rough no scale	600-800	.008-.016	.040-.100		●
			Semi finish / profiling	600-800	.004-.012	.040-.080		●
		Milling	-	1500-3500	.004-.006	.040-.100	●	

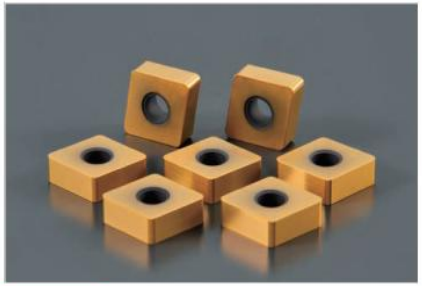


Hardened & Stainless Steels

Leading in Innovation

ZC4: Finishing of Hard Rolls (60-70Rc)

ZC4 — For machining hardened materials

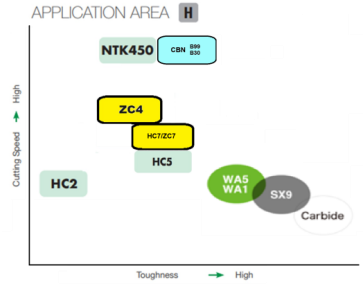


Side gear	
Case carburizing steel	
Hardness : HRC63	
400 SFM	
.004 IPR	
.006" DOC	
DRY	
NTK : ZC4	60 pcs
Competitor's black ceramic	30 pcs

Features

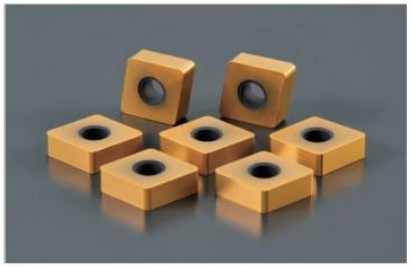
- *TiN-coated premium ceramic grade with the finest grain size of all the NTK ceramic grades*
- *Best for hard turning applications from (HRC 55 - 70)*
- *The gold coating makes edge wear easily detectable*

Grade	Work material	Application	Purpose	Cutting speed (SFM)	Feed (IPR)	Depth of cut (inch)	DRY	WET
ZC4	Hardened material (HRC55-70)	Turning	Finish	130-700	.003-.008	.005-.030	●	●



ZC7: Machining Hardened Rolls (50-62 Rc)

ZC7/ HC7 — For machining hardened parts with a wide range of hardness



Gear	
Carburized and hardened steel	
300 SFM	
.005 IPR	
.006" DOC	
WET	
	HRC58-62
NTK : ZC7	80 pcs
Competitor's CBN	80 pcs

Features

- *Excellent wear resistance in a wide range of applications such as machining carburized or induction hardened steels (HRC 30 - 62)*
- *High quality surface finishes with wiper facet inserts*
- *TiN coated ZC7 is available in various geometries as standard*

Grade	Work material	Application	Purpose	Cutting speed (SFM)	Feed (IPR)	Depth of cut (inch)	DRY	WET
ZC7 HC7	Hardened material (HRC30-62)	Turning	Finish	130-700	.003-.008	.005-.030	●	●
	Mill roll (Steel / Cast iron)	Turning	Rough - Finish	450-600	.004-.012	.025-.075	●	

- (HSS) High Speed Steel Rolls
- Titanium Carbide Rolls

Hardened & Stainless Steels

- Roughing to Semi-Finishing of Carbide Rolls

-Roughing of Hardened Rolls (45-62 Rc)

-Semi Finishing to Finishing of Cast Iron

- (HSS) High Speed Steel Rolls
- Titanium Carbide Rolls

WA1

High-speed machining of heat resistant alloys and cast iron

Housing	
Inco 625	Competitor's Whisker Ceramic / WA1
900 SFM	
.006 IPR	
.020"-.030" DOC	
WET	
NTK : WA1	1 pass
Competitor's whisker ceramic	1 pass

Features

- *Good flank wear resistance at high speed*
- *Best notch wear resistance compared to competitor's Whisker-reinforced ceramics*
- *Increased toughness compared to competitor's Whisker-reinforced ceramics*

Recommended applications

Grade	Work material	Application	Purpose	Cutting speed (SFM)	Feed (IPR)	Depth of cut (inch)	DRY	WET
WA1	Heat resistant alloy	Turning	Rough no scale	600–1000	.005–.010	.040–.100		●
			Semi finish Profiling	600–1100	.004–.010	.020–.080		●
			Grooving	600–1100	.002–.004	-		●
	Gray cast iron	Turning	Semi finish Finish	1200–2100	.004–.016	.020–.120	●	●
	Mill roll (Carbide)	Turning	Rough–Semi finish	150–500	.003–.008	.020–.140	●	
	Hardened Material (HRC 45–62)	Milling		550–850	.0025–.005	.030–.075	●	

Grade: NTK450

Leading in Innovation

NTK450

NTK CeramiX, a new material that maximizes the performance of ceramics, is born
Establishing an intermediate position between CBN and ceramics
Higher economic efficiency enables insert cost reduction

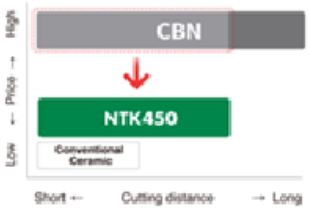
Performance

- Higher wear resistance performance with newly developed coating and dense, homogenized base material structure
- Ideal for small-lot production or single-part production when balancing tooling cost and performance

Application

Hardened materials
Continuous machining HRC55-65

Insert cost and cutting distance



NEW in 2025 !!

Currently only available CNGA,DNGA,TNGA,VNGA
(Other Geometries to come)

CBN Grades

Leading in Innovation

CBN

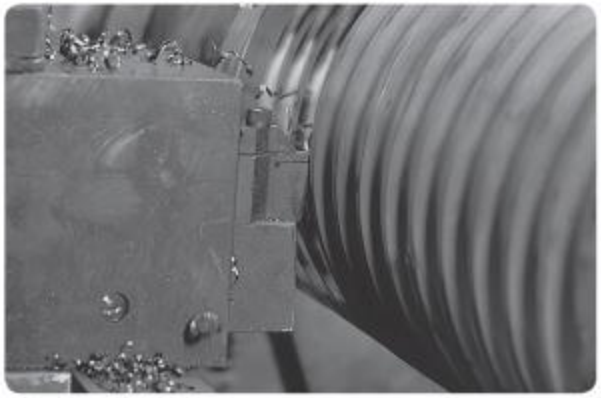
	Grade	Style	Main Binder	CBN Volume	Coating	Applications
CBN (Cubic Boron Nitride)	B99 	Solid	AlN	93%	–	High speed cast iron and mill roll machining
	B30 	Brazed	Ti	95%	–	Semi-finishing of carbide mill rolls. Semi-finishing to finishing of cast iron.

Machining Mill Rolls With NTK Grades

Leading in Innovation

Features

- *In addition to our general purpose ceramic HC2 grade, NTK offers HC5, and HC7 for higher productivity*
- *WA1's wear resistance is an advantage when roughing carbide and hardened rolls*
- *ZC7 covers a wide range of applications such as carburized or induction hardened steels.*
- *ZC4 performs the best in hardened material applications from 60-70 Hc*



Tool Holders

Holder Identification System

Leading in Innovation

(Industrial Standard Nomenclature)

① Clamping System

B, C, V	Clamp-on
W	Multi-clamp
P	Lever-lock
H	Bolt-clamp
S	Screw-on

② Insert Shape

C	D	R	S
80° Diamond	55° Diamond	Round	Square
T	**V**	**W**	
Triangluar	35° Diamond	Trigon	

③ Approach Angle

A	B	D	F	G
91°	75°	45°	91°	91°
H	**J**	**K**	**L**	**N**
107° 30'	93°	75°	95°	62° 30'
P	**R**	**S**	**V**	**X**
117° 30'	75°	45°	72° 30'	Special Design

①	②	③	④	⑤	⑥	⑦	⑧
C	C	L	N	R	16	5	D

④ Insert Relief Angle

N	0°
B	5°
C	7°
P	11°
D	15°
E	20°

⑤ Hand of Tool

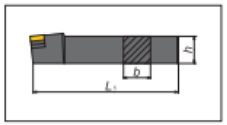
R

L

N

⑥ Shank Size [Height (h) and Width (b)] (inch)

	06	08	10	12	16	20	24	85
h	.375	.500	.625	.750	1.000	1.250	1.500	1.250
b	.375	.500	.625	.750	1.000	1.250	1.500	1.000



In case of $b = h$, the number will represent the number of sixteeths of b and h.

In case of $b \neq h$, the first digit represents the number of eighths of b, and the second digit represents the number of quarters of h.

⑦ Insert Size

IC (inch)	1/4	3/8	1/2	5/8	3/4	1
A	2	3	4	5	6	8
S, R	2	3	4	5	6	8
W	2	3	4	5	6	
80° C		3	4	5	6	8
55° D		3	4	5	6	8
35° V	2	3				

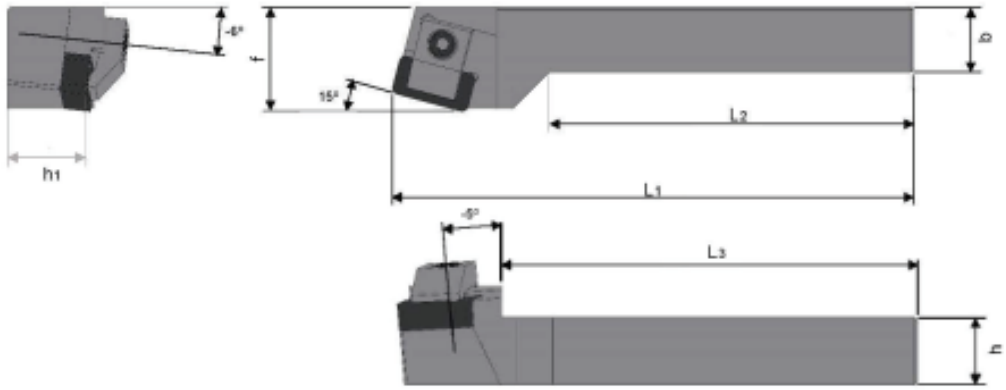
⑧ Length of toolholder (L_1) (inch)

B	C	D	E
4.500	5.000	6.000	7.000

Tool Holders

Examples

CLBN

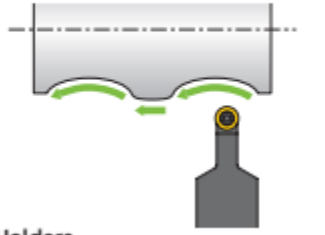


● **Toolholder Body (Made to order)**

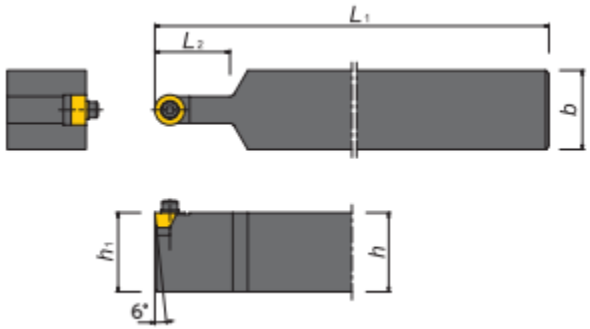
Holder Number	Stock		Dimensions										Spare Parts		Insert
			h		*b*		h_1		L_1		L_2		L_3		Clamp	Clamp Screw	
	R	L	(Inch)	(mm)	(Inch)	(mm)	(Inch)	(mm)	(Inch)	(mm)	(Inch)	(mm)	(Inch)	(mm)			
CLBN 5/8 20-6-L10			1.250	—	1.250	—	1.500	—	10.00	—	7.000	—	8.000	—			 LNM / LNJ 6688
CLBN 5/8 24-6-L10			1.500	—	1.500	—	1.500	—	10.00	—	7.000	—	8.000	—			
CLBN 5/8 32-6-L10			2.000	—	2.000	—	1.500	—	10.00	—	7.000	—	8.000	—			

Tool Holders

HRCD

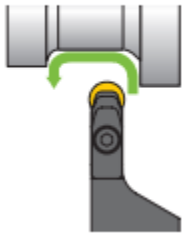


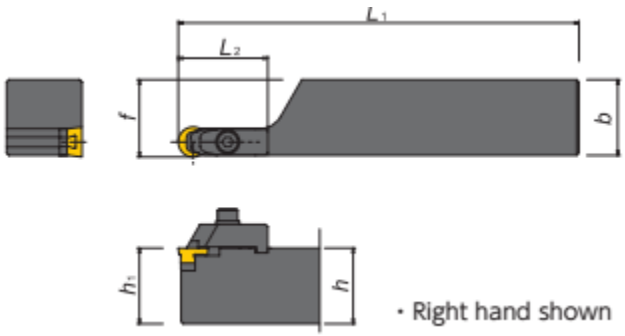
● Inch Holders



Uses CDN Inserts

VRAOR/L

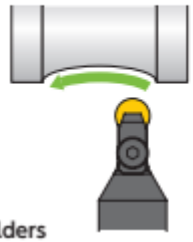




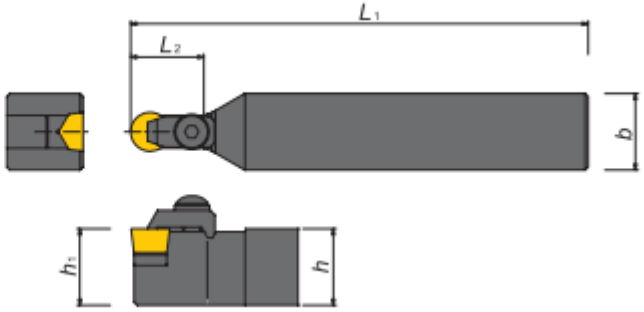
Uses RCGX Inserts

• Right hand shown

VRAON



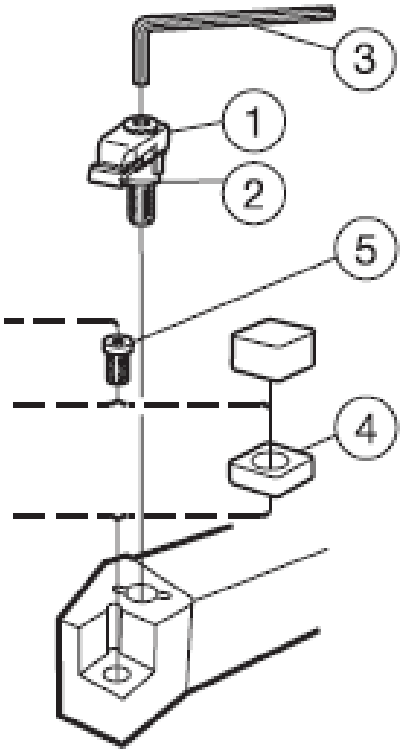
● Inch Holders



Uses RCGX Inserts

Factors: Tool holders

Ceramic clamping system



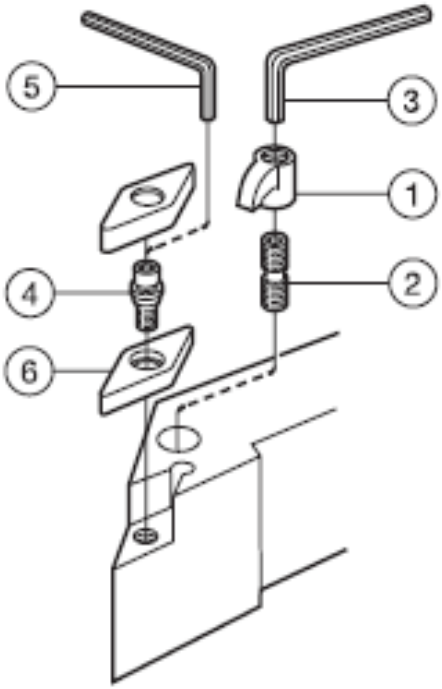
1. Top clamp
2. Clamp screw
3. Clamp wrench
4. Shim seat
5. Shim seat screw

Factors: Tool holders

Leading in Innovation

Hardware and holder importance.

A good holder and hardware affect the performance of inserts. A worn pocket could cause the insert to rock or shift in the middle of the cut causing the insert to break. The same is true of insert seats, clamps and lock pins. If inserts are chipping unexpectedly checking the holder and hardware is a must



1. top clamp
2. top clamp screw
3. wrench for top clamp
4. lock pin
5. lock pin wrench
6. shim seat

Tool Holder Problems

- Check holder for:
- Broken or chipped shims seats.
- Worn or bent clamps.
- Damaged holder (affects pocket support and alignment).
- Screws heads stripped or wrenches (replace immediately can cause problems to replace insert and tool alignment issues).

Tool holders
Do's & don'ts

Leading in Innovation

1. If the wrench or socket is replaced, replace the screw.
2. Never take a file to the holder or shim seat.
3. Replace the pin or shim seat screw when you replace shim seat.
4. Establish an area to put damaged holders to be sent out for repair.
5. Keep extra hardware for each holder at the workstation.
6. Clean the pocket thoroughly when indexing or changing the insert. This means don't just blow it off, use a rag and wipe pocket out also.
7. Never over torque screws. Both shim seat screws and top clamps only requite 15 in/lbs to secure insert.
8. Over torquing will damage holder pocket. Inserts and seats are harder than the body. The over torquing will move and compress the pocket changing insert alignment or improper support.

Insert Wear patterns & Failure Modes

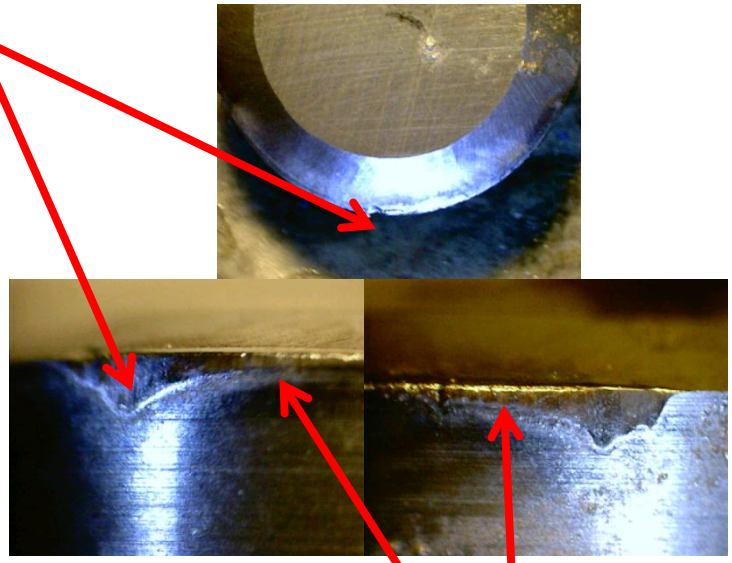
Causes of Failure

- It is important to understand why an insert failed. Knowing the mode of failure will make your job easier.

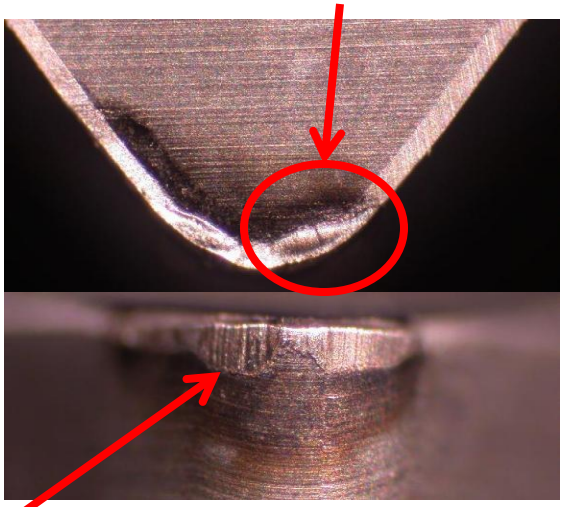
- To correctly judge failure, you need to look at all the factors involved in the machine, set-up, work holding, parts, tool holder, and finally the insert.

NORMAL wear

DOC notch



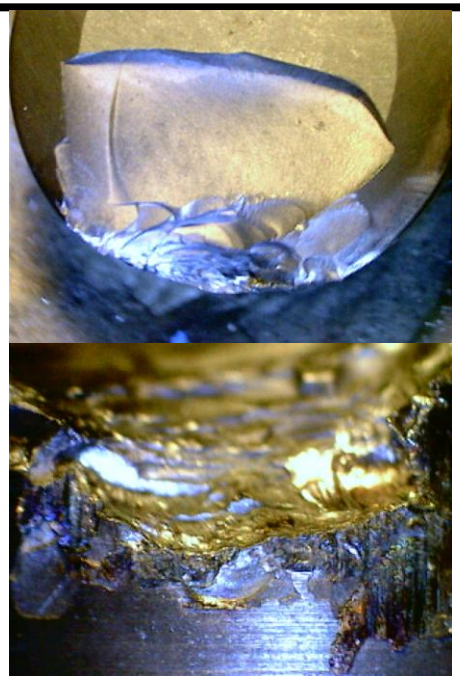
Chip wash pattern



Flank wear

Excessive wear

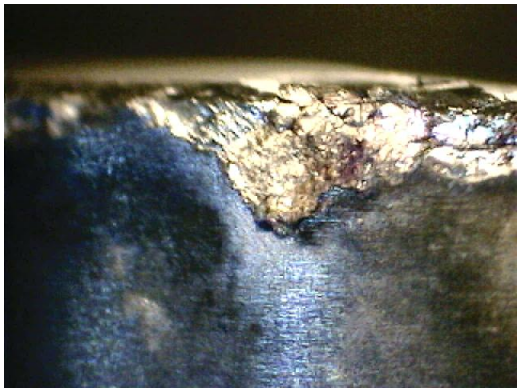
Leading in Innovation

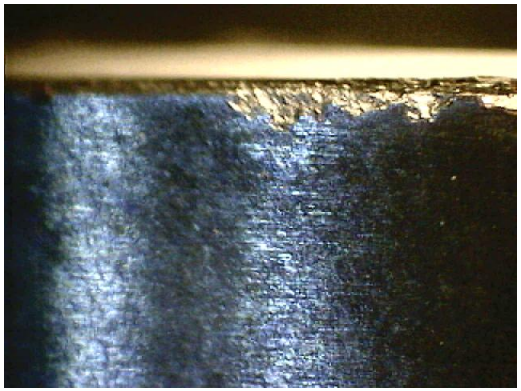


- **Problems**
- **Could scrap part**
- **Cause a following tool to fail if not caught**
- **More down time, due to possible holder damage and time to dial in size**

Insert wear patterns Chatter

Leading in Innovation





Noticed by multiple fracture points

Causes

Tool alignment

Too slow

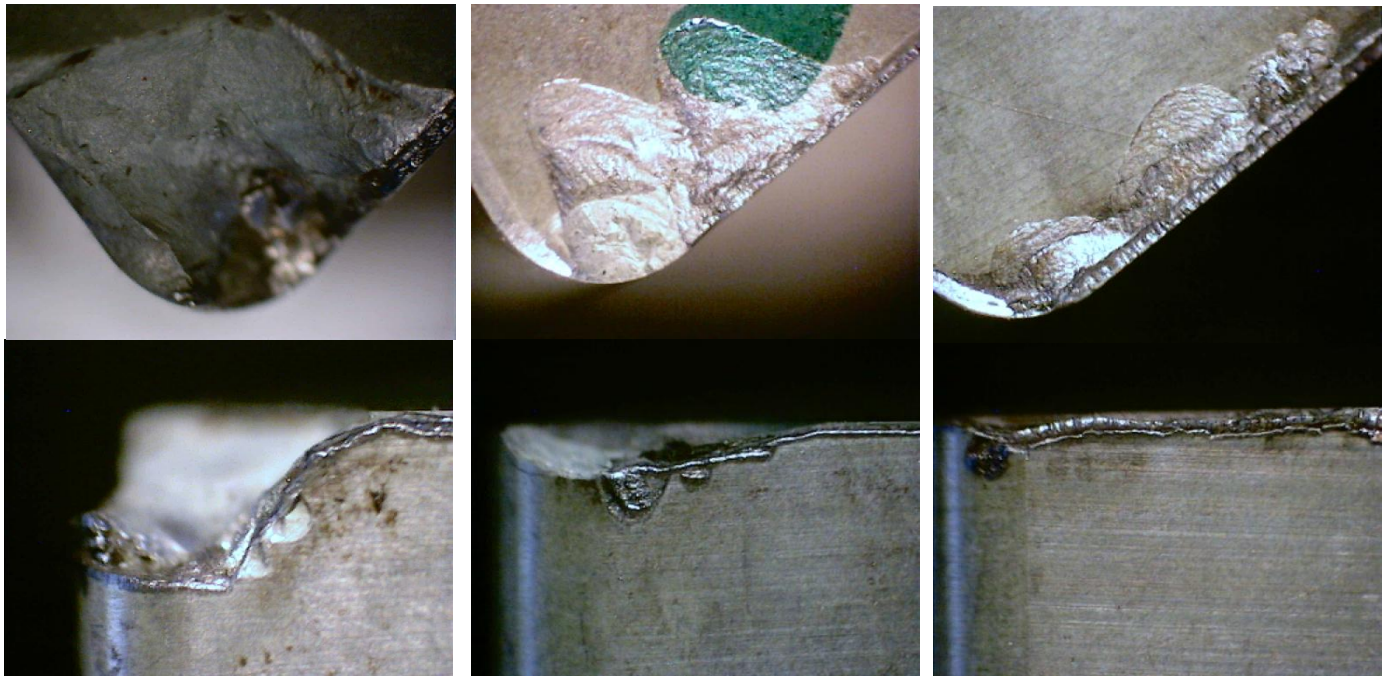
Too fast

DOC too light on thin wall parts

Boring with length to diameter ratios

Insert wear patterns Above center-line

Leading in Innovation



Insert shows breakage across the top of the inserts from the cutting point

Other signs - Chatter, smeared finish, fluctuating size

Above Center Failure

Leading in Innovation

Tool alignment causing above center-line condition.

- This can be caused from worn hardware
- Dirt or chip in pocket
- Pocket deformation from crashes and
- Broken tools and over torquing screws
- Stacking tolerance of holder, shim seat, and insert.
- Over torque on screws can change angle of how tool sets in the pocket.

REMEMBER CHANGE HARWARE & HOLDERS ON A REGULAR BASIS!

Insert wear patterns

Excessive doc notch

Notch wear

Nose of insert broken away

Leads to insert nose failure when run too long!

Remedies

1. More wear/abrasion resistant grade
2. Slow down SFM - Increase IPR
3. Increase SFM - Decrease IPR

NOTE: Only change 1 factor at a time!

Insert wear patterns

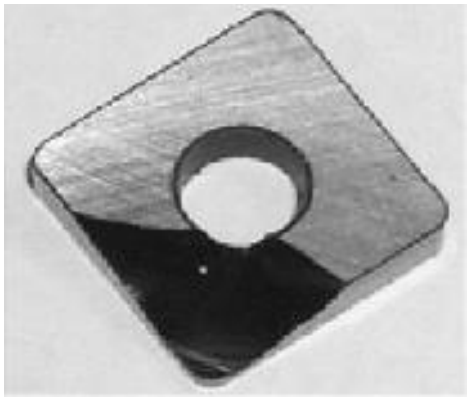
Inclusion fracture

If an insert hits an inclusion, gas pocket, injection spout, or different material in a casting it will fracture down the face of the tool.

Insert wear patters

Leading in Innovation

Excessive torquing on screws & Clamps

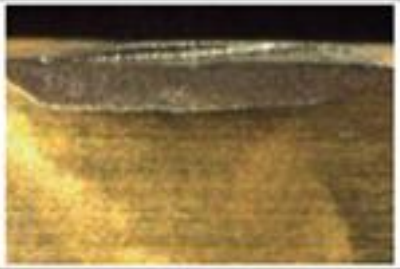


Fracture point comes from the lock pin area and moves forward. Typically, this fracture appears after the insert has cut the part because the insert crack normally won't break completely until tool is under pressure of cutting conditions.

*** 15 in/lbs to secure insert, Clamps & Shims.**

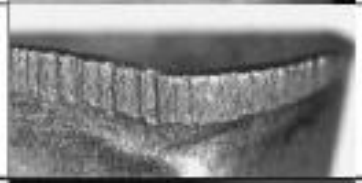
Troubleshooting

Leading in Innovation

Case		Cause	Measure
Flank wear		• Cutting Speed Too High • Feed Too Low • Insert Geometry Unsuitable • Part Material/insert Grade Incorrect	• Reduce Cutting Speed • Increase Feed • Increase Insert Corner Radius • Change Insert Grade
Crater Wear		• Unsuitable Cutting Conditions • Insert Geometry Unsuitable	• Smaller Cutting Edge Prep Angle • Reduce Cutting Speed
Flaking		• Insert Geometry Unsuitable • Insert cutting Over Center	• Lower Feed Rate • Smaller Cutting Edge Prep Angle • Eliminate Honing • Increase Feed • Lower Tool Holder in Post
Fracture/ Chipping		• Insert Geometry Unsuitable • Unsuitable Edge Treatment • Using Coolant	• Lower Feed • Larger Cutting-Edge Prep • Add Honing on Edge Prep • Turn Off Coolant

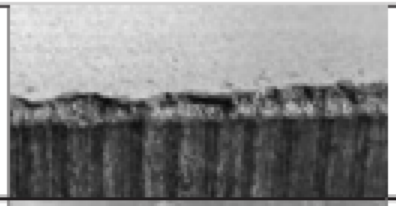
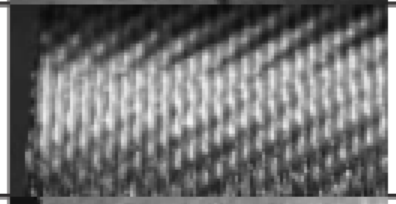
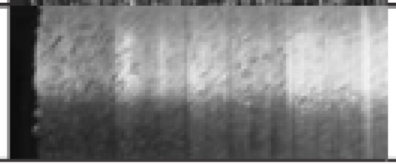
Troubleshooting

Leading in Innovation

Case/Symptom		Possible causes	Corrective measures
Wear on face		●High temperature causes chemical reactions between the insert material and chips	●Use a coated grade ●Decrease both of the cutting speed and feed rate ●Widen the rake angle
Notching wear		●The work surface is too hard ●Boundary area has been oxidized ●Burrs, caused by chips in the sheared form, have been cut	●Widen the side cutting edge angle ●Make the nose radius larger so that cutting is performed within the radius ●Use a round insert
Plastic deformation		●High cutting force and excessive heat is applied to the cutting edge	●Choose a material/grade highly resistant to wear ●Decrease both of the cutting speed and feed rate ●Make the nose radius larger ●Use coolant
Built-up edge		●This occurs because the cutting temperature is lower than the recrystallization temperature of the work material	●Increase the cutting speed ●Use coolant with excellent lubrication performance ●Change to a grade with less affinity to the work material
Deposition		●The deposition is caused to the face by a chemical reactions of the work material due to heat generation	●Increase the cutting speed ●Widen the relief angle ●Hone the face with a mirror-like-surface finish ●Change to a grade with less affinity to the work material
Clamping crack		●The insert was clamped under improper seating conditions	●Clean the clamping areas and install the insert in the recommended way ●Tighten to the specified torque

Troubleshooting

Leading in Innovation

Work Piece	Chipping		• Feed Rate is Too High • Unsuitable Insert Selected	• Decrease the Feed Rate • Use a Smaller Edge Prep • Change Insert to More Wear Resistant • Change the Cutting-Edge Angle of Holder
	Burring		• Feed Rate is Incorrect • Shape of Insert is not Suitable	• Decrease the Feed Rate • Use a Smaller Edge Prep
	Chatter Mark		• Cutting Edge Force is too great • Rigidity Of Work Piece • Rigidity of Cutting Tool is Insufficient • Insert Cutting Over Center	• Decrease the Feed Rate • Use a Smaller Edge Prep • Ensure Tool Overhang is Minimized • Change the Cutting-Edge Angle of the Hol • Lower Tool Holder in Post
	Gouging		• Vibration of the Cutting Edge • Due to Deposition/Built-up edge	• Increase the Cutting Speed • Change Insert Grade to a less Chemical similarities

Factors: order of checking

Leading in Innovation

1. Rolls/Parts – Slag, Inclusions, Gas Pockets, ETC.
   all cause additional shock and can cause insert failure.

2. Tool holder
   - Worn hard wear & Parts
   - Damage Pocket
   - Alignment

3. The machine and settings.
   - work holding (Chuck jaws)
   - program
   - offsets
   - speeds
   - feeds

Machining Mill Rolls With NTK Grades

Leading in Innovation

Key Points for Machining Mill Rolls

- *Hardness of the roll is an important factor. As the roll gets harder the SFM should be reduced.*
- *RCGX style inserts are the preferred insert for rigidity and cost savings.*
- *If making multiple passes with one edge, vary your DOC to move the wear on the insert edge and reduce notch wear.*
- *If you encounter chatter, increase your feed rate. Variable RPM controllers are helpful to reduce harmonics.*
- *Heavy chatter is often a sign of tooling being above centerline.*
- *Chilled and ductile iron rolls are typically softer and short chipping materials. Even after running in the mill, these rolls rarely exceed a 67 Shore hardness.*
- *Tool steel and CPM rolls run quite similar and are normally over 100 Shore hardness. These rolls have a higher Chrome and Cobalt content and are considered a longer chipping material. The combination of the material type and hardness require a slower speed to run successfully.*
- *RCGX 103 & 104 feed rate runs best at .006 IPR (0.15 mm/rev).*

NTK Support

Leading in Innovation

Ed Hofheins
Product Manager – Ceramic Division
(402) 250-3683
E-mail: ehofheins@Tungaloy-NTK.com

The link for the down loadable Catalogs & Fliers
https://www.ntkcuttingtools.com/us/

Ceramic and CBN for steel mill applications CUTTING TOOLS Co., Ltd.

millrolls.pdf

https://www.ntkcuttingtools.com/us/

https://tungaloy.com/us/

find us on: