NEW ROLLS NEED NEW PROCESSES

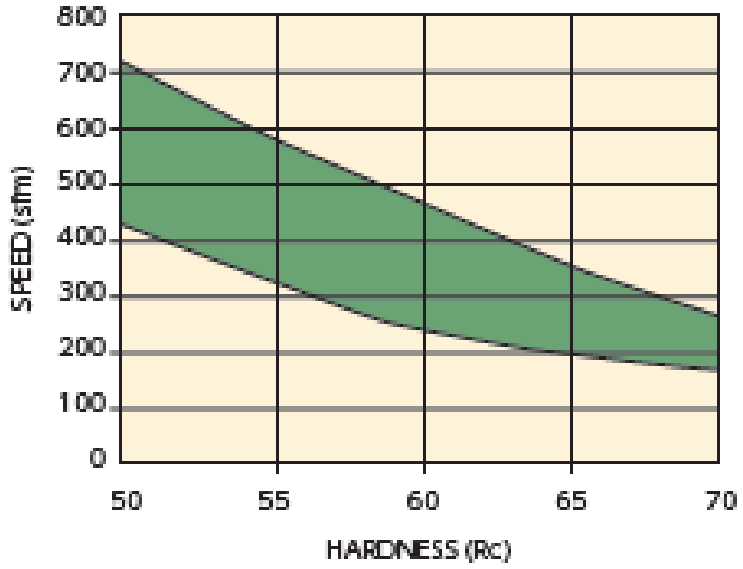
May, 2019

Cutting Tools are “NOT” a Commodity

- At NTK we feel we are a “Service Business” and not a “Supplier.
- You pay for our service by buying our products.
- If you are not demanding our service, or another supplier, you are spending your resources with out receiving full value.
- When you buy a new piece of equipment do you expect the company you bought it from to show you how to use it to it’s best ability?
- You should have tooling that works for you and how you like to do a job.

Many Grades for many reasons

Recommended Speed Chart



Insert Materials, Characteristics, and Applications

Ceramic Series

	Grade / Coating	Physical Properties: Density g/cm³	Hardness HRA	Bending Strength MPa	Young's Modulus GPa	Thermal Expansion Coefficient X10⁻⁶/K	Thermal Conductivity W/m·K	Applications
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 (62-70Rc)
SiAlON	SX9	3.3	93.5	1200	330	3.0	15	Semi finishing cast iron and ductile rolls
Whisker (Al2O3+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

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.

Grade Wheel

Solutions for Hard Material and Mill Roll Machining with Ceramics

Alumina + TiC Ceramics
- High-hot hardness and low plasticity
- Toughness & hardness

ZC7

Features
- TiN coating
- Excellent wear resistance
- Machining soft to hard turning applications (50-62RC)
- Semi-finish and finish cast irons and chilled irons

Work Materials
- Steels
- Cast iron rolls
- Chilled iron rolls

HC2

Features
- Balance of abrasion and fracture resistance
- Semi finishing and finishing cast iron and hardened steels

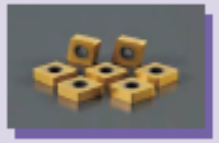
Work Materials
- Steels • Cast rolls • Ductile rolls

WA1

Features
- Flank wear resistance and notching resistance
- Machines through hard spots (even embedded insert pieces)
- Milling of hardened materials (45-65Rc)

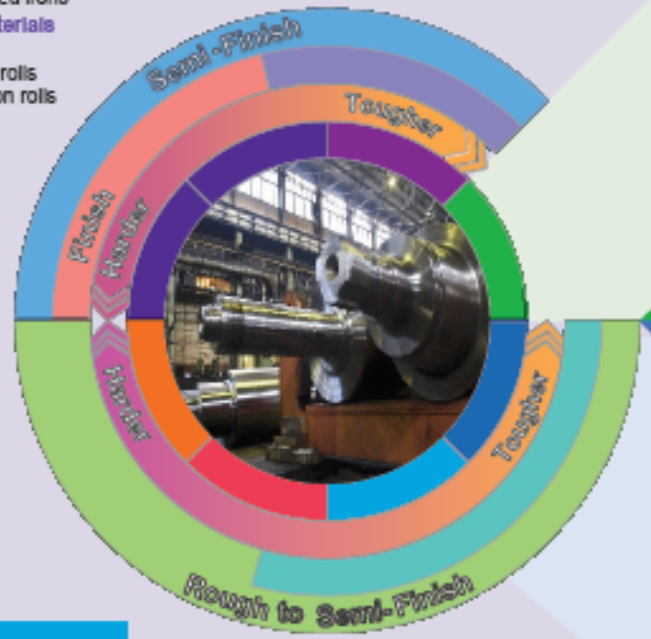
Work Materials
- Carbide rolls • Cast iron rolls
- Steels

ZC4



Features
- TiN coated premium finest grain ceramic
- Excellent wear resistance
- Best for hard turning applications from 50-70Rc
- Superior finish turning

Work Materials
- Steels • Gray cast iron rolls



Whisker - Versatile Player
- Productivity and reliability

SiAlON Ceramic
- Toughness and wear resistance

HC7

Features
- Excellent wear resistance
- Turning of hardened steels (35-62Rc)
- Wide range of machining even through interruptions
- Milling hardened steels (45-62Rc)

Work Materials
- Ductile iron rolls
- Chilled iron rolls
- Steels

HC5

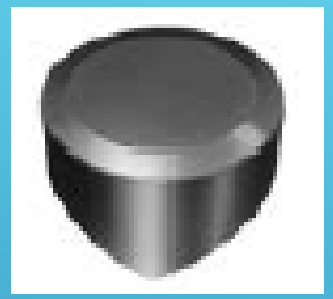
Features
- Excellent toughness and wear resistance
- Semi finishing of cast and hardened steels (35-62Rc)
- Machine through scale and interruptions

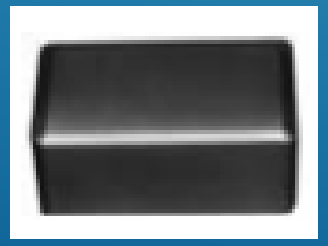
Work Materials
- Cast iron rolls • Steels
- CPM rolls (Hitachi rolls)

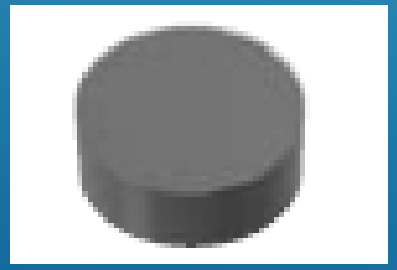
SX9

Features
- Excellent toughness and notch wear resistance
- Semi-finishing of cast and ductile rolls
- Turning and milling applications
- Machine hard materials (35-46Rc)

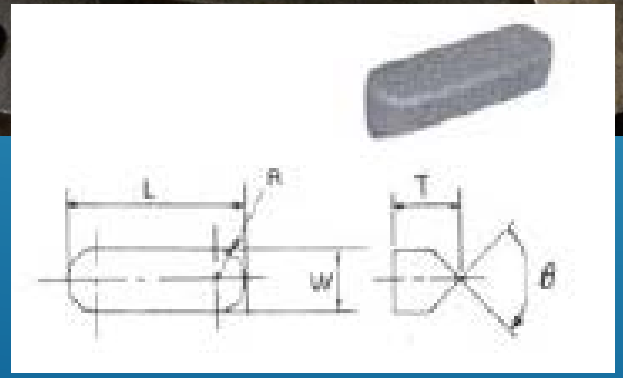
Work Materials
- Cast iron rolls
- Ductile iron rolls





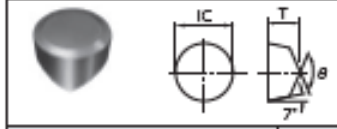



33


L
R
W
T
θ

Many options – Many reasons

RCGX



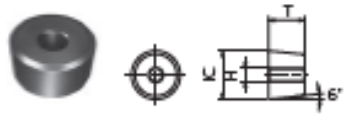
● : 1st Choice ● : 2nd choice

Steel	P
Stainless Steel	M
Cast Iron	K
Non-Ferrous Material	N
Heat Resistant Alloy	S
Hardened Material	H

Item Number	ISO Item Number	IC	T	θ	Ceramics						CBN
					Alumina - TiC				Whisker	SiAlON	
					HC2	HC5	HC7	ZC4	WA1	SX9	B30
RCGX 101 P2010		3/16	.240	90	●						
RCGX 102 P4815		1/4	.309	120	●	●	●				●
RCGX 102 T0225		1/4	.309	120						●	
RCGX 102 T0820		1/4	.309	120	●						
RCGX 103 P4815		3/8	.309	120	●	●	●				●
RCGX 103 P8015		3/8	.309	120		●	●				
RCGX 103 T0820		3/8	.309	120	●						
RCGX 103 T0825		3/8	.309	120				●			
RCGX 103 T1625		3/8	.309	120				●			
RCGX 104 P4815		1/2	.312	120							●
RCGX 104 P6015		1/2	.312	120	●	●	●				
RCGX 104 P8015		1/2	.312	120		●	●				
RCGX 104 T0820		1/2	.312	120	●						
RCGX 104 T1625		1/2	.312	120				●			
RCGX 45 E02	RCGX 120700 E004	1/2	5/16	120					●		
RCGX 45 T0220	RCGX 120700 T00520	1/2	5/16	120					●	●	
RCGX 45 T0320	RCGX 120700 T00820	1/2	5/16	120					●		
RCGX 45 T0420	RCGX 120700 T01020	1/2	5/16	120					●	●	
RCGX 45 Z0620	RCGX 120700 Z01520	1/2	5/16	120					●		
RCGX 45 Z0820	RCGX 120700 Z02020	1/2	5/16	120					●		
RCGX 105 P4815		5/8	.388	120	●	●					●
RCGX 105 P8015		5/8	.388	120		●	●				
RCGX 105 S8020		5/8	.388	120	●		●	●			
RCGX 106 P4815		3/4	.388	120	●						●
RCGX 106 P8015		3/4	.388	120	●	●	●				
RCGX 108 P8015		1	.461	140	●						

CDH.. Inserts

CDH

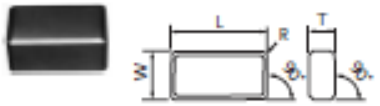


● : 1st Choice ● : 2nd choice

Steel	P
Stainless Steel	M
Cast Iron	K
Non-Ferrous Material	N
Heat Resistant Alloy	S
Hardened Material	H

Item Number	ISO Item Number	IC	T	H	Ceramics		
					Alumina - TiC		
					HC2	HC5	HC7
CDH 22 P2810	CDH 1207 P07010	1/2	1/4	.125	●	●	●
CDH 33 P6015	CDH 1909 P15015	3/4	3/8	.250	○		
CDH 33 Q6010	CDH 1909 Q15010	3/4	3/8	.250	●		
CDH 33 Q60108	CDH 1909 Q15010B	3/4	3/8	.250		●	●
CDH 42 P8015	CDH 2512 P20015	1	1/2	.266			●
CDH 42 P12010	CDH 2512 P30010G	1	1/2	.266	●	●	
CDH 43 P6010	CDH 2519 P15015	1	3/4	.266	●		
CDH 515 P71108	CDH 3209 P18010B	1-1/4	3/8	.391	●		
CDH 515 P7110	CDH 3209 P18010	1-1/4	3/8	.391	●		
CDH 515 P8015	CDH 3209 P20015	1-1/4	3/8	.391			●
CDH 515 Q7110	CDH 3209 Q18010	1-1/4	3/8	.391	●	●	●
CDH 53 P8015	CDH 3219 P20015	1-1/4	3/4	.391			●

LNJ / LNM



● : 1st Choice ● : 2nd choice

Steel	P
Stainless Steel	M
Cast Iron	K
Non-Ferrous Material	N
Heat Resistant Alloy	S
Hardened Material	H

Item Number	ISO Item Number	R	W	L	T	Ceramics				
						Whisker	Alumina - TiC			SiAlon
						WA1	HC2	HC5	HC7	SX9
LNJ 6688 P6015	LNJ 6688 P15015	.125	3/4	1-1/2	1/2		●			
LNJ 6688 Q8015	LNJ 6688 Q20015	.125	3/4	1-1/2	1/2			●	●	
LNM 6688 S6015	LNM 6688 SN2	.125	3/4	1-1/2	1/2	○				
LNM 6688 P6015	LNM 6688 PN	.125	3/4	1-1/2	1/2					●
LNM 6688 SNX2	LNM 6688 SNX2	.125	3/4	1-1/2	1/2		○			
LNM 6688 SNX6	LNM 6688 SNX6	.125	3/4	1-1/2	1/2				○	

ZT 1130

● : 1st Choice ● : 2nd choice

Steel	P
Stainless Steel	M
Cast Iron	K
Non-Ferrous Material	N
Heat Resistant Alloy	S
Hardened Material	H

Item Number	ISO Item Number	IC	T	R	Ceramics		
					Alumina - TiC		
					HC2	HC5	HC7
ZT 1130 PNX5		1-1/2	1/2	4-1/2	●	●	●

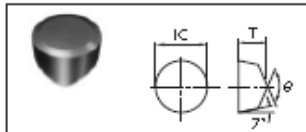
Rebar

Rebar Size Corresponds to I.C size

RCGX10

(inch)	IC	T	θ
RCGX 101	3/16	.240	90
RCGX 102	1/4	.309	120
RCGX 103	3/8	.309	120
RCGX 104	1/2	.312	120

(inch)	IC	T	θ
RCGX 105	5/8	.388	120
RCGX 106	3/4	.388	120
RCGX 108	1	.461	140



Steel	P	
Stainless Steel	M	
Cast Iron	K	* * * ● ● ● ● ● ● ● ● * * *
Non-Ferrous Material	N	
Heat Resistant Alloy	S	● ● ● ● ●
Hardened Material	H	* * ● ● ●

Item Number	ISO Item Number	IC	R	Cermet SX1	Ceramics SiAlON SX7	SX9	SX5	Whisker WA1	Silicon Nitride SX6	SP9	Alumina HC1	HW2	HC6	Alumina - TiC HC2	HC5	HC7	ZC7	ZC4
RCGX 101 P2010		3/16												●				
RCGX 102 P4815		1/4												●	●	●		
RCGX 102 T0225		1/4				●	●											
RCGX 102 T0820		1/4												●				
RCGX 103 P4815		3/8												●	●			
RCGX 103 P8015		3/8														●		
RCGX 103 T0820		3/8												●				
RCGX 103 T0825		3/8																●
RCGX 103 T1625		3/8																●
RCGX 104 P6015		1/2												●	●	●		
RCGX 104 P8015		1/2														●		
RCGX 104 T0820		1/2												●				
RCGX 104 T1625		1/2																●
RCGX 105 P4815		5/8												●	●			
RCGX 105 P8015		5/8														●		
RCGX 105 S8020		5/8												●		●		
RCGX 106 P4815		3/4												●				
RCGX 106 P8015		3/4												●	●	●		
RCGX 108 P8015		1												●				

Holders → F18 • F19

U.S. rebar size chart

Imperial bar size	Metric size	Linear Mass Density		Nominal diameter		Nominal area	
		lb/ft	(kg/m)	(in)	(mm)	(in²)	(mm²)
#2	#6	0.167	0.249	0.250 = 1/4	6.35	0.05	32
#3	#10	0.376	0.561	0.375 = 3/8	9.525	0.11	71
#4	#13	0.668	0.996	0.500 = 1/2	12.7	0.20	129
#5	#16	1.043	1.556	0.625 = 5/8	15.875	0.31	200
#6	#19	1.502	2.24	0.750 = 3/4	19.05	0.44	284
#7	#22	2.044	3.049	0.875 = 7/8	22.225	0.60	387
#8	#25	2.670	3.982	1.000	25.4	0.79	509
#9	#29	3.400	5.071	1.128	28.65	1.00	645
#10	#32	4.303	6.418	1.270	32.26	1.27	819
#11	#36	5.313	7.924	1.410	35.81	1.56	1006
#14	#43	7.650	11.41	1.693	43	2.25	1452
#18	#57	13.60	20.284	2.257	57.3	4.00	2581
#18J		14.60	21.775	2.337	59.4	4.29	2678

Tricks

ZT1130

1. Chips can be long and get tangled in chip flume. Increase feed and or depth of cut and it will make chips more brittle.
2. Typical cutting path is tail stock to chuck. You can utilize the other side of the insert if you reverse cutting path (from chuck to tail stock).
3. Slightly cocking insert will give you a large radius and will stabilize sloppy machines.

CDH

1. Using very large edge prep through scale (refurbished rolls) in HC5 in depths up to .100.
2. CDH515 can be upgraded to CDH53 in holder by switching shim seat.
3. The larger the radius the better tool life due to chip thinning.

RCGX

1. You can get 4 edges out of this insert by rotating the shim seat 90 deg.
2. If cutting while pulling away from centerline it is suggested to turn the shim seat 90 deg.
3. When contouring at the bottom of large groove reduce feed rate at transition to keep insert from breaking.

VGW

1. When doing rail rolls typical grooves have large radius on both sides of the groove. Most operators finish these with groovers. Use the largest radius possible on insert to limit breaking off the corners.
2. VGW is great replacement for VDB style groovers. Due to deep grooves the back side of VDBs must be ground off so they do not rub at bottom of the groove.

80 and 55 deg. Diamonds

1. Extremely weak tool for this industry. Tool path is extremely important.
2. Confirm roll material and hardness. These inserts operating parameters are very finite.

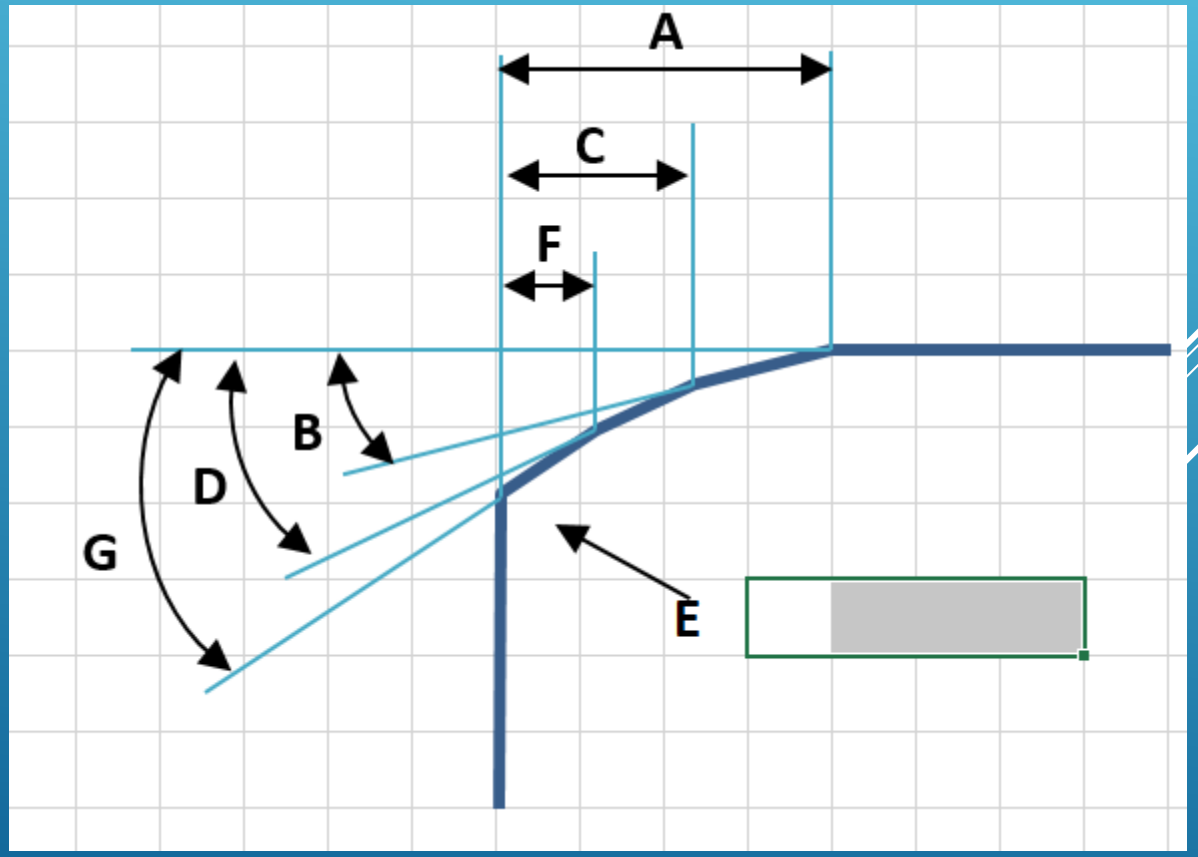
Operator

1. Since it is difficult to get exact tool life and performance the operators opinion is always the decision maker.

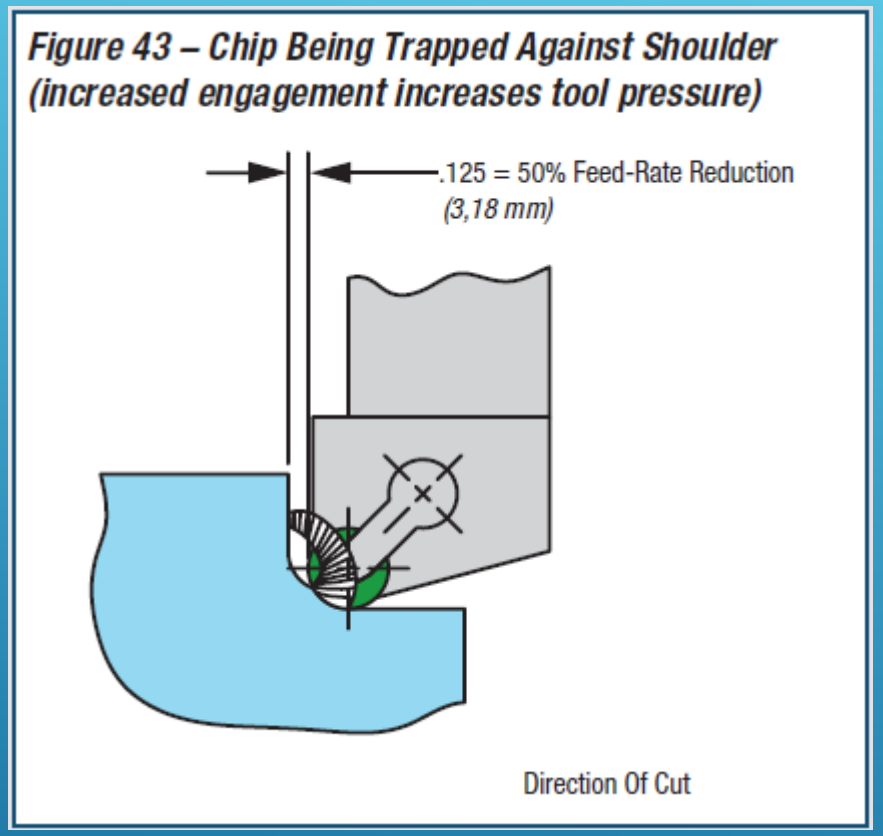
These 2 edge preps for the CDH515 In HC5 have been able to handle really heavy scale.

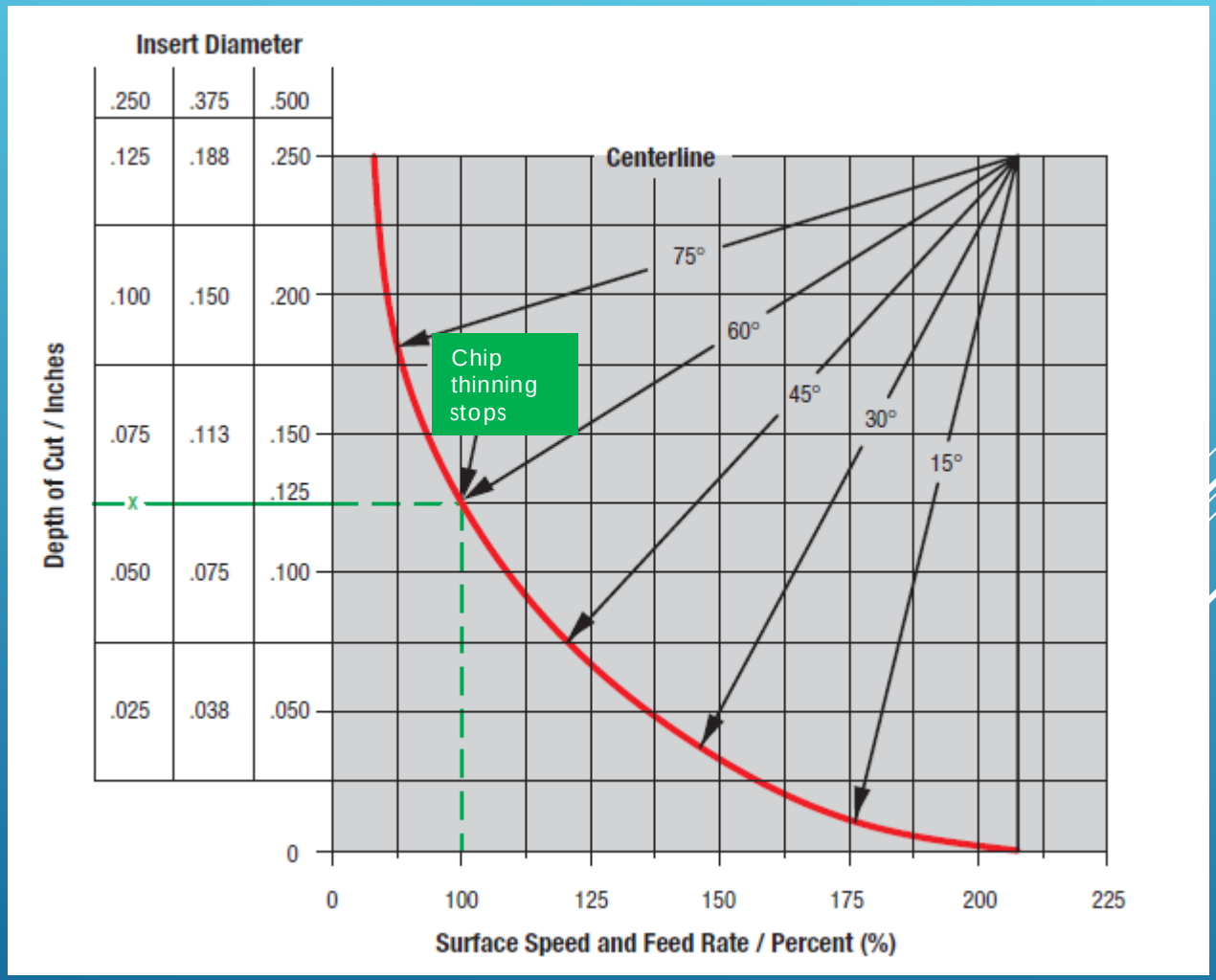
PNX5 = A = .0945 B = 15 deg. C = .008 D = 30 deg. E = .0015 hone

Q7110 = A = .0709 B = 10 deg. C= .008 D = 25 deg. F = .003 G = 40 deg.



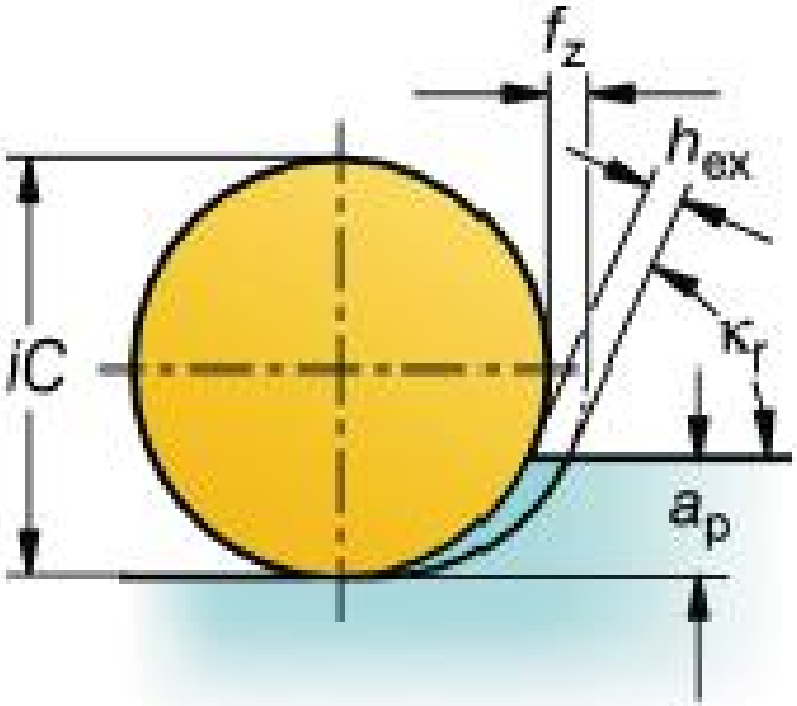
Chip Thinning





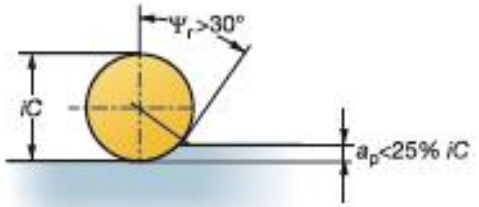
Insert Engagement

The Physics

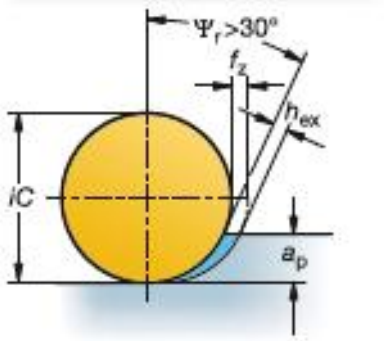


$$f_z = \frac{h_{ex} \times iC}{2 \times \sqrt{a_p \times iC - a_p^2}}$$

2. Round and radius insert cutters



$$\cos\kappa_r = \frac{(0.5\ iC - a_p)}{0.5\ iC}$$



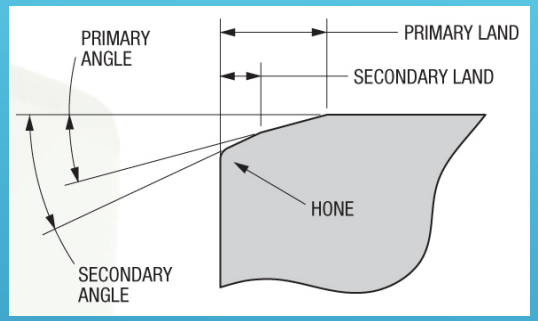
$$f_z = \frac{h_{ex} \times iC}{2 \times \sqrt{a_p \times iC - a_p^2}}$$

- Best performance is achieved when the lead angle, ψ_r, remains over 30° when using round insert cutters or ball nose end mills at limited depths of cut. This means that the depth of cut should not exceed 25% x insert diameter, *iC*.
- For larger depths of cut, it is better to use square inserts with a constant ψ_r of 45°.
- The chip thickness, h_{ex}, varies with round inserts, and depends on the lead angle. With low a_p/iC ratios, the feed can be increased considerably in order to raise the chip thickness to a desired level.
- Round inserts have a higher maximum chip thickness capability than straight edge solutions, due to the stronger insert shape and longer cutting length.

Insert Markings

Specialty edges

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

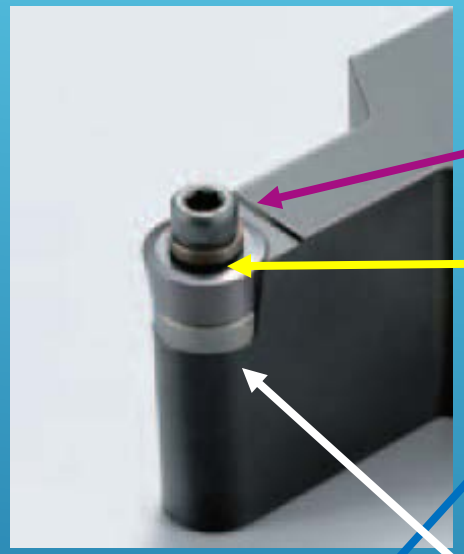


Primary Land Length & Angle	Inch	Metric
.028" X 15 deg.	2815	07015
.060" X 15 deg.	6015	15015
.079" X 15 deg.	7915	20015
.091" X 15 deg.	9115	23015

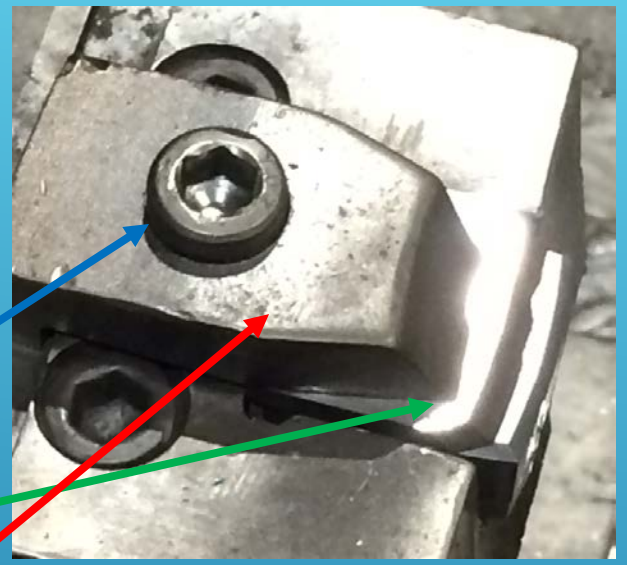
Example:

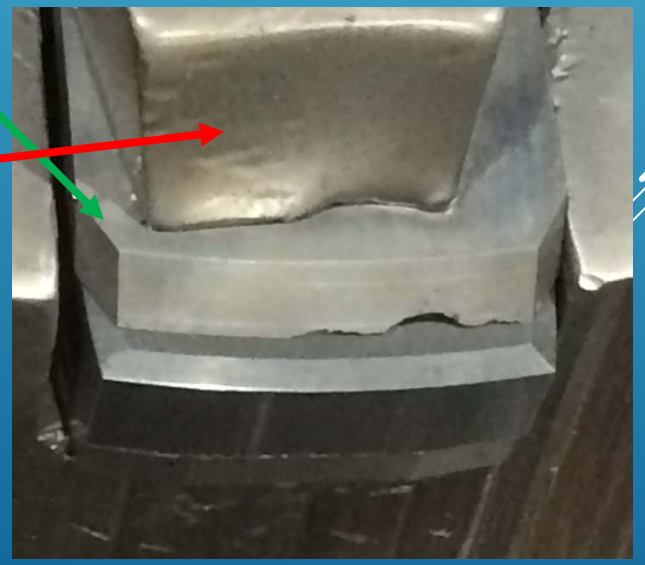
Old Designation	New Designation	
	Inch	Metric
CDH515C2.0X15SA HC7	P7915	P20015
LNJ6688C1.5X15SA HC7	P5915	P15015
RCGX105C2.0X20A HC2	S8020	K20020
ZT1130C2.3X20SA HC2	P7920	P7920

Factors: Tool holders



1. Insert Screw
2. Washer
3. Clamp screw
4. Insert Plate
5. Shim
6. Clamp





TOOL HOLDERS – DO'S & DON'TS

1. Use Proper tool and quality tool.
2. Never take a file to the holder or shim seat.
3. Hardware is cheap. Tool holders are expensive.
4. Send Damaged tool holders out for repair.
5. Clean the pocket thoroughly. (not just air blast)
6. Never over torque screws. Both shim seat screws and top clamps only requite 15 in/lbs to secure insert.

SECURE VS. CAUSING DAMAGE

1. Over torqueing will damage holder pocket.
2. Inserts and seats are 5X’s harder than the body.
3. The over torqueing will move and compress the pocket changing insert alignment for improper support.
4. Pocket Tolerance 0.004” Insert tolerance 0.004”
5. Remember Inserts have very high compressive strength and very little transferred ruptured strength.

- Pre-cooked Pasta or mechanical pencil lead!!!!

THANK YOU FOR YOUR INVITATION.