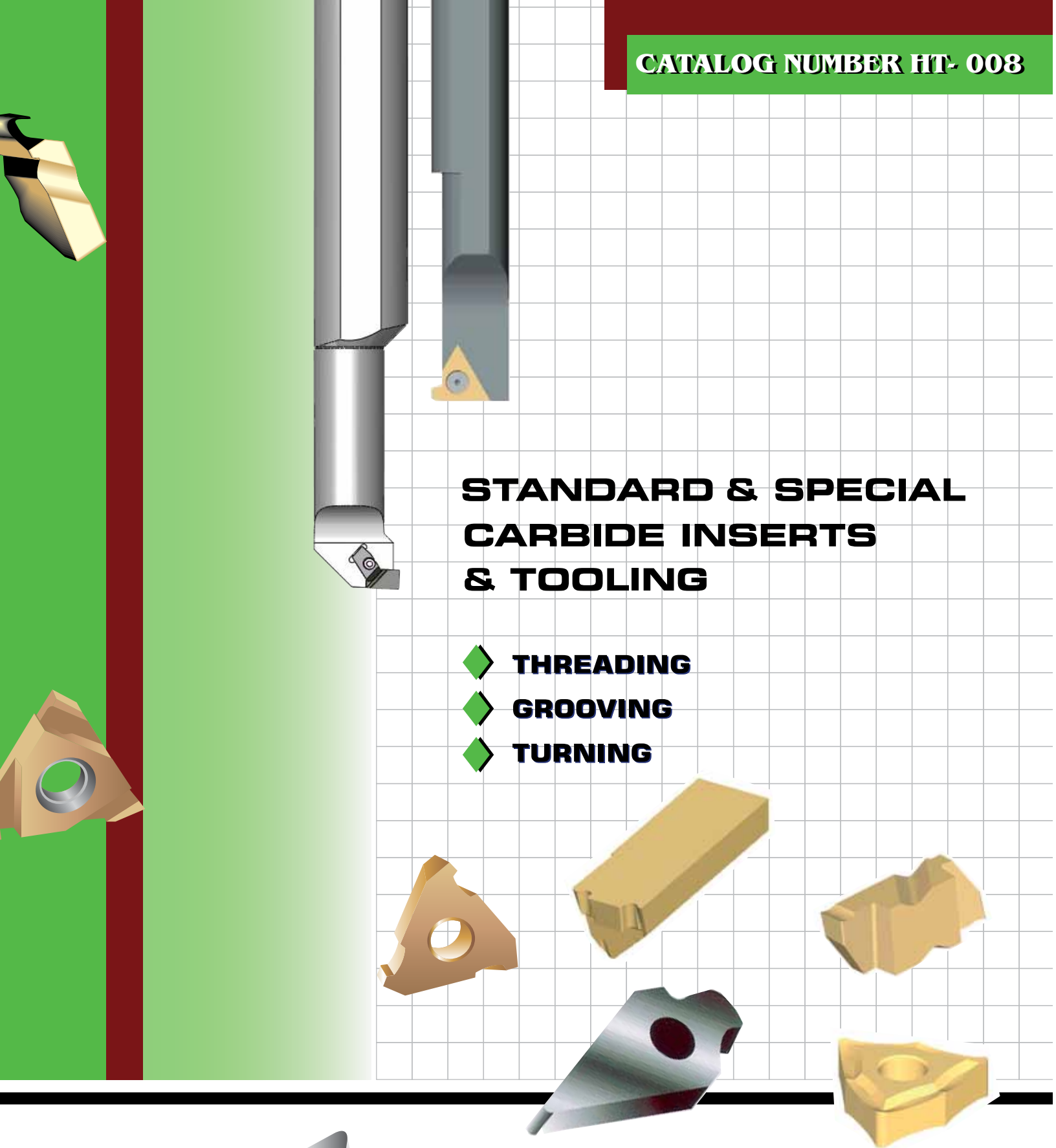


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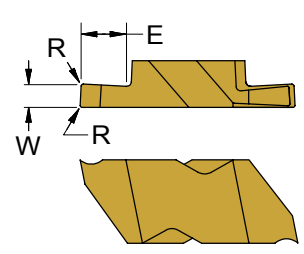
## FEATURED PRODUCTS FROM HORIZON

### RK-LK Chip Curler Inserts

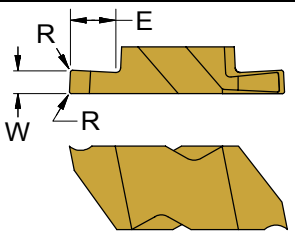


Precision ground (not molded!) for the finest chip flow in the industry. Horizon's RK-LK Chip Curler Inserts are designed to lower cutting forces while reducing edge build-up in stainless, titanium and Inconel. They also work well at lighter feeds in any gummy material and can be used at high feeds in aluminum, copper and plastics. Precision Ground cutting edges mean better finishes and longer tool life in most applications! See pages 2, 3, 4, 7, 11, and 13 for product offering and page 36 for additional information.

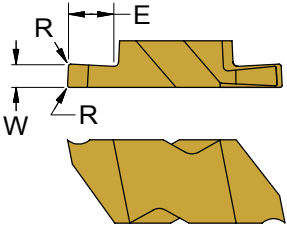
**Stocked Items Indicated. Call for Availability in Other Grades, Modifications, or Full Specials**

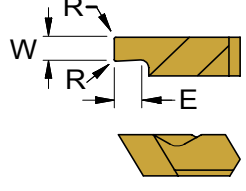
Style:	Insert Description		Dimensions			Grades					
	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>Ground-in Chip Curlers With 15° - 18° Positive Rake.</p> <p>Lower Cutting Pressures and Reduced Edge Build-up.</p> <p>Use Lighter Feeds on Tough Materials - .0005 - .003 / Rev.</p> <p>Run Aluminum, Copper and Plastics at Higher Feed Rates.</p>		HG 2031RK	.031	.0035	.055		●		●	●	●
		HG 2031LK		± .0015			●		●	●	●
		HG 2039RK	.039	.0035	.055		●		●	●	●
		HG 2039LK		± .0015			●		●	●	●
		HG 2041RK	.041	.0035	.080		●		●	●	●
		HG 2041LK		± .0015			●		●	●	●
		HG 2047RK	.047	.0035	.080		●		●	●	●
		HG 2047LK		± .0015			●		●	●	●
		HG 2055RK	.055	.0035	.080		●		●	●	●
		HG 2055LK		± .0015			●		●	●	●
		HG 2058RK	.058	.0075	.055		●		●	●	●
		HG 2058LK		± .0025			●		●	●	●
		HG 2062RK	.062	.0075	.115		●		●	●	●
		HG 2062LK		± .0025			●		●	●	●
		HG 2070RK	.070	.0075	.115		●		●	●	●
		HG 2070LK		± .0025			●		●	●	●
		HG 2079RK	.079	.0075	.115		●		●	●	●
		HG 2079LK		± .0025			●		●	●	●
		HG 2094RK	.094	.0075	.115		●		●	●	●
		HG 2094LK		± .0025			●		●	●	●
	HG 2118RK	.118	.0075	.115		●		●	●	●	
	HG 2118LK		± .0025			●		●	●	●	
	HG 2125RK	.125	.0075	.115		●		●	●	●	
	HG 2125LK		± .0025			●		●	●	●	
	HG 2140RK	.140	.0075	.115		●		●	●	●	
	HG 2140LK		± .0025			●		●	●	●	

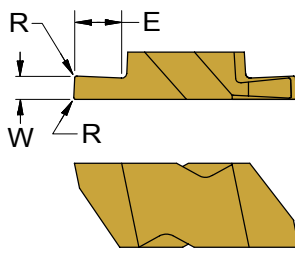
# GROOVING INSERTS

Style:	Insert Description		Dimensions			Grades					
	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>Ground-in Chip Curlers With 15° - 18° Positive Rake.</p> <p>Lower Cutting Pressures and Reduced Edge Build-up.</p> <p>Use Lighter Feeds on Tough Materials - .0005 - .003 / Rev.</p> <p>Run Aluminum, Copper and Plastics at Higher Feed Rates.</p>		<b>HG 3020RK</b>	.020	.0035	.055		●		●	●	●
		<b>HG 3020LK</b>		± .0015			●		●	●	●
		<b>HG 3031RK</b>	.031	.0035	.055		●		●	●	●
		<b>HG 3031LK</b>		± .0015			●		●	●	●
		<b>HG 3039RK</b>	.039	.0035	.055		●		●	●	●
		<b>HG 3039LK</b>		± .0015			●		●	●	●
		<b>HG 3047RK</b>	.047	.0035	.080		●		●	●	●
		<b>HG 3047LK</b>		± .0015			●		●	●	●
		<b>HG 3062RK</b>	.062	.0075	.125		●		●	●	●
		<b>HG 3062LK</b>		± .0025			●		●	●	●
		<b>HG 3072RK</b>	.072	.0075	.125		●		●	●	●
		<b>HG 3072LK</b>		± .0025			●		●	●	●
		<b>HG 3078RK</b>	.078	.0075	.125		●		●	●	●
		<b>HG 3078LK</b>		± .0025			●		●	●	●
		<b>HG 3081RK</b>	.081	.0075	.125		●		●	●	●
		<b>HG 3081LK</b>		± .0025			●		●	●	●
		<b>HG 3082RK</b>	.082	.0075	.125		●		●	●	●
		<b>HG 3082LK</b>		± .0025			●		●	●	●
		<b>HG 3088RK</b>	.088	.0075	.125		●		●	●	●
		<b>HG 3088LK</b>		± .0025			●		●	●	●
		<b>HG 3094RK</b>	.094	.0075	.192		●		●	●	●
		<b>HG 3094LK</b>		± .0025			●		●	●	●
		<b>HG 3097RK</b>	.097	.0075	.192		●		●	●	●
		<b>HG 3097LK</b>		± .0025			●		●	●	●
		<b>HG 3105RK</b>	.105	.0075	.192		●		●	●	●
		<b>HG 3105LK</b>		± .0025			●		●	●	●
		<b>HG 3110RK</b>	.110	.0075	.192		●		●	●	●
		<b>HG 3110LK</b>		± .0025			●		●	●	●
		<b>HG 3118RK</b>	.118	.0075	.192		●		●	●	●
		<b>HG 3118LK</b>		± .0025			●		●	●	●
		<b>HG 3125RK</b>	.125	.0075	.205		●		●	●	●
		<b>HG 3125LK</b>		± .0025			●		●	●	●
	<b>HG 3140RK</b>	.140	.0075	.205		●		●	●	●	
	<b>HG 3140LK</b>		± .0025			●		●	●	●	
	<b>HG 3142RK</b>	.142	.0125	.205		●		●	●	●	
	<b>HG 3142LK</b>		± .0025			●		●	●	●	
	<b>HG 3156RK</b>	.156	.0125	.205		●		●	●	●	
	<b>HG 3156LK</b>		± .0025			●		●	●	●	
	<b>HG 3158RK</b>	.158	.0125	.205		●		●	●	●	
	<b>HG 3158LK</b>		± .0025			●		●	●	●	

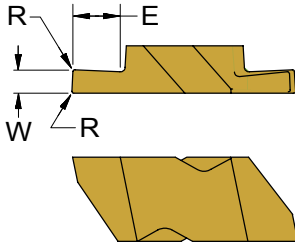
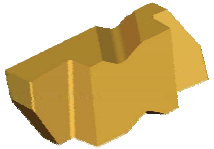
# GROOVING INSERTS

Style:	Insert Description		Dimensions			Grades					
HG-RK/LK Chip Curler	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>Ground-in Chip Curlers With 15° - 18° Positive Rake.</p> <p>Lower Cutting Pressures and Reduced Edge Build-up.</p> <p>Use Lighter Feeds on Tough Materials - .0005 - .003 / Rev.</p> <p>Run Aluminum, Copper and Plastics at Higher Feed Rates.</p>		HG 3178RK	.178	.0225	.205		•		•	•	•
		HG 3178LK		± .0025			•		•	•	•
		HG 3185RK	.185	.0225	.205		•		•	•	•
		HG 3185LK		± .0025			•		•	•	•
		HG 3189RK	.189	.0225	.205		•		•	•	•
		HG 3189LK		± .0025			•		•	•	•
		HG 4093RK	.093	.0075	.255		•		•	•	•
		HG 4093LK		± .0025			•		•	•	•
		HG 4125RK	.125	.0075	.255		•		•	•	•
		HG 4125LK		± .0025			•		•	•	•
		HG 4189RK	.189	.0225	.255		•		•	•	•
		HG 4189LK		± .0025			•		•	•	•
		HG 4213RK	.213	.0225	.255		•		•	•	•
	HG 4213LK		± .0025			•		•	•	•	
	HG 4219RK	.219	.0225	.255		•		•	•	•	
	HG 4219LK		± .0025			•		•	•	•	
	HG 4250RK	.250	.0225	.255		•		•	•	•	
	HG 4250LK		± .0025			•		•	•	•	

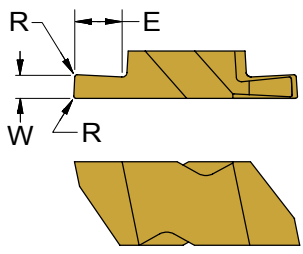
Style:	Insert Description		Dimensions			Grades						
HG Size 1 ID Grooving	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG	
 <p>Left Hand Shown</p>		NA	.031	.0035	.050							
		HG 1031L		± .0015		•			•			
		HG 1047L	NA	.047	.0035	.075				•		
		HG 1062L	NA	.062	.0035	.075				•		
		HG 1094L	NA	.094	.0035	.075				•		
		HG 1094L		± .0015			•			•		

Style:	Insert Description		Dimensions			Grades					
HG Size 2	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>E Dimension is Maximum Depth of Cut</p>		HG 2031R	.031	.0035	.055		•		•	•	•
		HG 2031L		± .0015			•		•	•	•
		HG 2039R	.039	.0035	.055		•		•	•	•
		HG 2039L		± .0015			•		•	•	•
		HG 2041R	.041	.0035	.055		•		•	•	•
		HG 2041L		± .0015			•		•	•	•
		HG 2047R	.047	.0035	.080		•		•	•	•
	HG 2047L		± .0015			•		•	•	•	

# GROOVING INSERTS

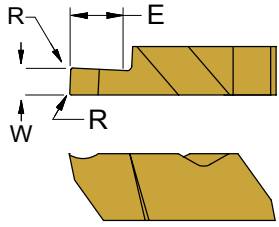
Style:	Insert Description		Dimensions			Grades					
	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
<b>HG Size 2 &amp; 3</b>    Right Hand Shown  E Dimension is Maximum Depth of Cut  Use RH Inserts with RH External Tool Holders  Use LH Inserts with RH Internal Boring Bars  For Tool Holder Information See Pages 26-28  Metric Sizes & Full Special Inserts Available on Request    Left Hand Shown		HG 2055R	.055	.0035	.080		•		•	•	•
	HG 2055L			± .0015			•		•	•	•
		HG 2058R	.058	.0075	.080		•		•	•	•
	HG 2058L			± .0025			•		•	•	•
		HG 2062R	.062	.0075	.115		•		•	•	•
	HG 2062L			± .0025			•		•	•	•
		HG 2070R	.070	.0075	.115		•		•	•	•
	HG 2070L			± .0025			•		•	•	•
		HG 2079R	.079	.0075	.115		•		•	•	•
	HG 2079L			± .0025			•		•	•	•
		HG 2094R	.094	.0075	.115		•		•	•	•
	HG 2094L			± .0025			•		•	•	•
		HG 2118R	.118	.0075	.115		•		•	•	•
	HG 2118L			± .0025			•		•	•	•
		HG 2125R	.125	.0075	.115		•		•	•	•
	HG 2125L			± .0025			•		•	•	•
		HG 2140R	.140	.0075	.115		•		•	•	•
	HG 2140L			± .0025			•		•	•	•
		HG 3020R	.020	.0035	.055		•		•	•	•
	HG 3020L			± .0015			•		•	•	•
		HG 3031R	.031	.0035	.055		•		•	•	•
	HG 3031L			± .0015			•		•	•	•
		HG 3039R	.039	.0035	.055		•		•	•	•
	HG 3039L			± .0015			•		•	•	•
		HG 3047R	.047	.0035	.080		•		•	•	•
	HG 3047L			± .0015			•		•	•	•
		HG 3062R	.062	.0075	.125		•		•	•	•
	HG 3062L			± .0025			•		•	•	•
		HG 3072R	.072	.0075	.125		•		•	•	•
	HG 3072L			± .0025			•		•	•	•
		HG 3078R	.078	.0075	.125		•		•	•	•
	HG 3078L			± .0025			•		•	•	•
	HG 3081R	.081	.0075	.125		•		•	•	•	
HG 3081L			± .0025			•		•	•	•	
	HG 3082R	.082	.0075	.125		•		•	•	•	
HG 3082L			± .0025			•		•	•	•	
	HG 3088R	.088	.0075	.125		•		•	•	•	
HG 3088L			± .0025			•		•	•	•	
	HG 3094R	.094	.0075	.192		•		•	•	•	
HG 3094L			± .0025			•		•	•	•	

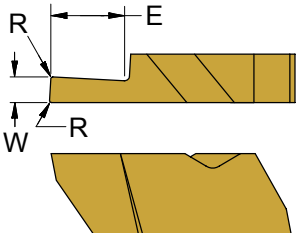

# GROOVING INSERTS

Style:	Insert Description		Dimensions			Grades					
HG Size 3 & 4	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>E Dimension is Maximum Depth of Cut</p> <p>For Tool Holder Information See Pages 26-28</p>		HG 3097R	.097	.0075	.192		•		•	•	•
	HG 3097L			± .0025			•		•	•	•
		HG 3105R	.105	.0075	.192		•		•	•	•
	HG 3105L			± .0025			•		•	•	•
		HG 3110R	.110	.0075	.192		•		•	•	•
	HG 3110L			± .0025			•		•	•	•
		HG 3118R	.118	.0075	.192		•		•	•	•
	HG 3118L			± .0025			•		•	•	•
		HG 3122R					•		•	•	•
	HG 3122L						•		•	•	•
		HG 3125R	.125	.0075	.205		•		•	•	•
	HG 3125L			± .0025			•		•	•	•
		HG 3140R	.140	.0075	.205		•		•	•	•
	HG 3140L			± .0025			•		•	•	•
		HG 3142R	.142	.0125	.205		•		•	•	•
	HG 3142L			± .0025			•		•	•	•
		HG 3156R	.156	.0125	.205		•		•	•	•
	HG 3156L			± .0025			•		•	•	•
		HG 3158R	.158	.0125	.205		•		•	•	•
	HG 3158L			± .0025			•		•	•	•
		HG 4213R					•		•	•	•
	HG 4213L						•		•	•	•
		HG 3178R	.178	.0225	.205		•		•	•	•
	HG 3178L			± .0025			•		•	•	•
		HG 3185R	.185	.0225	.205		•		•	•	•
	HG 3185L			± .0025			•		•	•	•
		HG 3189R	.189	.0225	.205		•		•	•	•
	HG 3189L			± .0025			•		•	•	•
		HG 4093R	.093	.0075	.255		•		•	•	•
	HG 4093L			± .0025			•		•	•	•
	HG 4125R	.125	.0075	.255		•		•	•	•	
HG 4125L			± .0025			•		•	•	•	
	HG 4189R	.189	.0225	.255		•		•	•	•	
HG 4189L			± .0025			•		•	•	•	
	HG 4219R	.219	.0225	.255		•		•	•	•	
HG 4219L			± .0025			•		•	•	•	
	HG 4250R	.250	.0225	.255		•		•	•	•	
HG 4250L			± .0025			•		•	•	•	

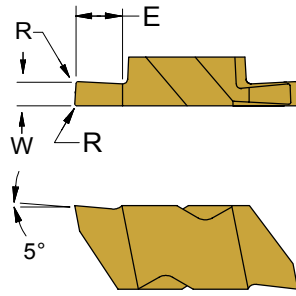
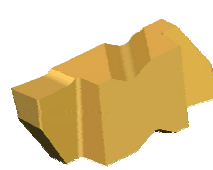


# GROOVING INSERTS

Style:	Insert Description		Dimensions			Grades					
HGD-RK/LK Size 2, 3, 4 Deep Chip Curler	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>*Double Ended Inserts With 2 Cutting Edges</p>		HGD 2047RK	.047	.004	.185		•		•	•	•
		HGD 2047LK		± .001			•		•	•	•
		HGD 2062RK	.062	.004	.200		•		•	•	•
		HGD 2062LK		± .001			•		•	•	•
		HGD 2094RK	.094	.004	.200		•		•	•	•
		HGD 2094LK		± .001			•		•	•	•
		HGD 2125RK	.125	.004	.200		•		•	•	•
		HGD 2125LK		± .001			•		•	•	•
		HGD 3062RK*	.062	.0075	.192		•		•	•	•
		HGD 3062LK*		± .0025			•		•	•	•
		HGD 3094RK	.094	.0075	.255		•		•	•	•
		HGD 3094LK		± .0025			•		•	•	•
		HGD 3125RK	.125	.0075	.255		•		•	•	•
		HGD 3125LK		± .0025			•		•	•	•
		HGD 4125RK*	.125	.0075	.300		•		•	•	•
	HGD 4125LK*		± .0025			•		•	•	•	
	HGD 4250RK	.250	.0225	.505		•		•	•	•	
	HGD 4250LK		± .0025			•		•	•	•	

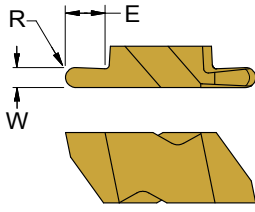
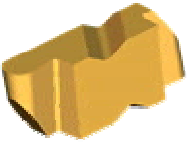
Style:	Insert Description		Dimensions			Grades					
HGD Size 2, 3 & 4 Deep Grooving	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>SE = Single Ended Inserts DE = Double Ended Inserts with 2 cutting edges</p>  <p>Double Ended Groovers Maintain Overall Length as Standard Size 3 and 4 Inserts</p>		HGD 2047R	.047	.004	.185		•		•	•	•
		HGD 2047L		± .001			•		•	•	•
		HGD 2062R	.062	.004	.200		•		•	•	•
		HGD 2062L		± .001			•		•	•	•
		HGD 2094R	.094	.004	.200		•		•	•	•
		HGD 2094L		± .001			•		•	•	•
		HGD 2125R	.125	.004	.200		•		•	•	•
		HGD 2125L		± .001			•		•	•	•
		HGD 3062R DE	.062	.0075	.192		•		•	•	•
		HGD 3062L DE		± .0025			•		•	•	•
		HGD 3094R SE	.094	.0075	.255		•		•	•	•
		HGD 3094L SE		± .0025			•		•	•	•
		HGD 3125R SE	.125	.0075	.255		•		•	•	•
		HGD 3125L SE		± .0025			•		•	•	•
		HGD 3189R SE	.189	.0225	.255		•		•	•	•
		HGD 3189L SE		± .0025			•		•	•	•
		HGD 4125R DE	.125	.0075	.300		•		•	•	•
		HGD 4125L DE		± .0025			•		•	•	•
		HGD 4189R SE	.189	.0225	.505		•		•	•	•
		HGD 4189L SE		± .0025			•		•	•	•
	HGD 4250R SE	.250	.0225	.505		•		•	•	•	
	HGD 4250L SE		± .0025			•		•	•	•	

# GROOVING INSERTS

Style:	Insert Description		Dimensions			Grades					
	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>E Dimension is Maximum Depth of Cut</p> <p>Use RH Inserts with RH External Tool Holders</p> <p>Use LH Inserts with RH Internal Boring Bars</p> <p>For Tool Holder Information See Pages 26-28</p>  <p>Left Hand Shown</p>		HGP 2031R	.031	.0035	.055		●		●	●	●
	HGP 2031L			± .0015			●		●	●	●
		HGP 2041R	.041	.0035	.055		●		●	●	●
	HGP 2041L			± .0015			●		●	●	●
		HGP 2047R	.047	.0035	.080		●		●	●	●
	HGP 2047L			± .0015			●		●	●	●
		HGP 2062R	.062	.0075	.115		●		●	●	●
	HGP 2062L			± .0025			●		●	●	●
		HGP 2094R	.094	.0075	.115		●		●	●	●
	HGP 2094L			± .0025			●		●	●	●
		HGP 2125R	.125	.0075	.115		●		●	●	●
	HGP 2125L			± .0025			●		●	●	●
		HGP 3031R	.031	.0035	.055		●		●	●	●
	HGP 3031L			± .0015			●		●	●	●
		HGP 3047R	.047	.0035	.080		●		●	●	●
	HGP 3047L			± .0015			●		●	●	●
		HGP 3062R	.062	.0075	.125		●		●	●	●
	HGP 3062L			± .0025			●		●	●	●
		HGP 3088R	.088	.0075	.125		●		●	●	●
	HGP 3088L			± .0025			●		●	●	●
		HGP 3092R	.092	.0075	.192		●		●	●	●
	HGP 3092L			± .0025			●		●	●	●
		HGP 3094R	.094	.0075	.192		●		●	●	●
	HGP 3094L			± .0025			●		●	●	●
		HGP 3125R	.125	.0075	.205		●		●	●	●
	HGP 3125L			± .0025			●		●	●	●
		HGP 3156R	.156	.0075	.205		●		●	●	●
	HGP 3156L			± .0025			●		●	●	●
	HGP 3189R	.189	.0225	.205		●		●	●	●	
HGP 3189L			± .0025			●		●	●	●	
	HGP 4189R	.189	.0225	.255		●		●	●	●	
HGP 4189L			± .0025			●		●	●	●	
	HGP 4250R	.250	.0225	.255		●		●	●	●	
HGP 4250L			± .0025			●		●	●	●	

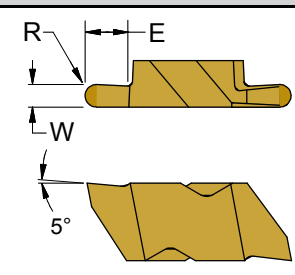
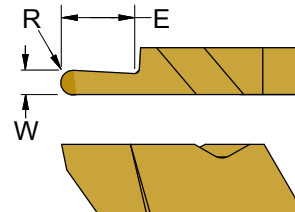
Additional 5° Positive Rake Sizes are Available upon Request - Please Call for Availability

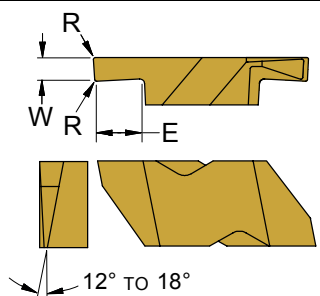

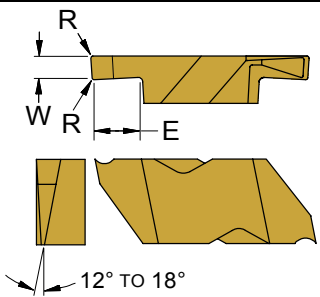
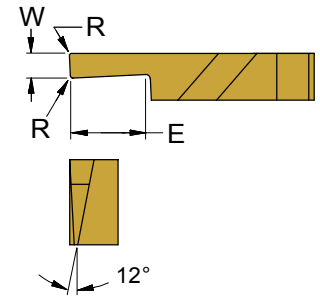
# GROOVING INSERTS

Style:	Insert Description		Dimensions			Grades						
	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG	
<p><b>HR - Full Nose Radius</b></p>  <p>Right Hand Shown</p> <p>E Dimension is Maximum Depth of Cut</p> <p>Use RH Inserts with RH External Tool Holders</p> <p>Use LH Inserts with RH Internal Boring Bars</p> <p>For Tool Holder Information See Pages 26-28</p>  <p>Left Hand Shown</p>		HR 2015R	.030	.015	.055		•		•		•	
		HR 2015L						•		•		•
		HR 2031R	.062	.031	.115		•		•	•		•
		HR 2031L						•		•		•
		HR 2047R	.094	.047	.115		•		•	•		•
		HR 2047L						•		•		•
		HR 2062R	.125	.062	.115		•		•	•		•
		HR 2062L						•		•		•
		HR 3010R	.020	.010	.055		•		•	•		•
		HR 3010L						•		•		•
		HR 3015R	.030	.015	.055		•		•	•		•
		HR 3015L						•		•		•
		HR 3020R	.040	.020	.055		•		•	•		•
		HR 3020L						•		•		•
		HR 3026R	.052	.026	.055		•		•	•		•
		HR 3026L						•		•		•
		HR 3031R	.062	.031	.130		•		•	•		•
		HR 3031L						•		•		•
		HR 3039R	.078	.039	.130		•		•	•		•
		HR 3039L						•		•		•
		HR 3047R	.094	.047	.185		•		•	•		•
		HR 3047L						•		•		•
		HR 3062R	.125	.062	.185		•		•	•		•
		HR 3062L						•		•		•
		HR 3078R	.156	.078	.185		•		•	•		•
		HR 3078L						•		•		•
		HR 3094R	.188	.094	.185		•		•	•		•
		HR 3094L						•		•		•
		HR 3125R	.250	.125	.192		•		•	•		•
		HR 3125L						•		•		•
		HR 4062R	.125	.062	.255		•		•	•		•
		HR 4062L						•		•		•
	HR 4094R	.188	.094	.255		•		•	•		•	
	HR 4094L						•		•		•	
	HR 4125R	.250	.125	.255		•		•	•		•	
	HR 4125L						•		•		•	

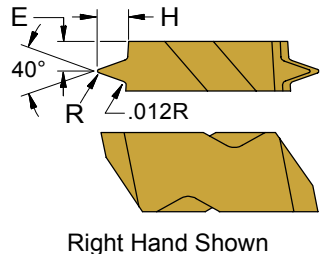
Additional Full Nose Radius Sizes are Available upon Request - Please Call for Availability

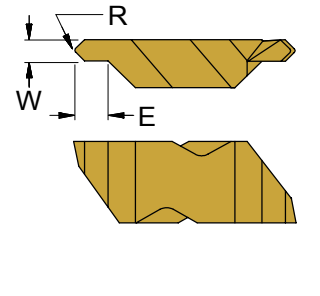
## GROOVING INSERTS

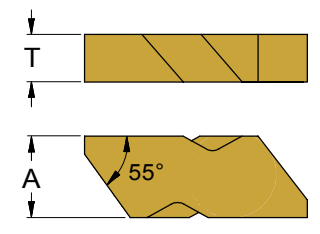
Style:	Insert Description		Dimensions			Grades					
	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
<b>HRP - 5° Positive Rake Full Nose Radius</b>    Right Hand Shown  E Dimension is Maximum Depth of Cut  Use RH Inserts with RH External Tool Holders  Use LH Inserts with RH Internal Boring Bars  For Tool Holder Information See Pages 26-28		HRP 2031R	.062	.031	.115		•		•		•
	HRP 2031L						•		•		•
		HRP 3031R	.062	.031	.130		•		•		•
	HRP 3031L						•		•		•
		HRP 3047R	.094	.047	.185		•		•		•
	HRP 3047L						•		•		•
		HRP 3062R	.125	.062	.185		•		•		•
	HRP 3062L						•		•		•
		HRP 3078R	.156	.078	.185		•		•		•
	HRP 3078L						•		•		•
		HRP 3094R	.188	.094	.185		•		•		•
	HRP 3094L						•		•		•
		HRP 4062R	.125	.062	.255		•		•		•
	HRP 4062L						•		•		•
		HRP 4094R	.188	.094	.255		•		•		•
	HRP 4094L						•		•		•
	HRP 4125R	.250	.125	.255		•		•		•	
HRP 4125L						•		•		•	
Additional Full Nose Radius Sizes Available upon Request											
<b>Style:</b>	<b>Insert Description</b>		<b>Dimensions</b>			<b>Grades</b>					
<b>HRD - Full Nose Radius Deep Grooving</b>	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
  Right Hand Shown  E Dimension is Maximum Depth of Cut  *HRD 3031R/L HRD 4062R/L Double End Deep Groover Maintains Overall Length as Standard Size 3 and 4 Inserts		HRD 3031R*	.062	.031	.192		•		•		•
	HRD 3031L*						•		•		•
		HRD 3047R	.094	.047	.255		•		•		•
	HRD 3047L						•		•		•
		HRD 3062R	.125	.062	.255		•		•		•
	HRD 3062L						•		•		•
		HRD 3094R	.188	.094	.255		•		•		•
	HRD 3094L						•		•		•
		HRD 4062R*	.125	.062	.300		•		•		•
	HRD 4062L*						•		•		•
		HRD 4094R	.188	.094	.505		•		•		•
HRD 4094L						•		•		•	
	HRD 4125R	.250	.125	.505		•		•		•	
HRD 4125L						•		•		•	
Additional Full Nose Radius Sizes Available upon Request											

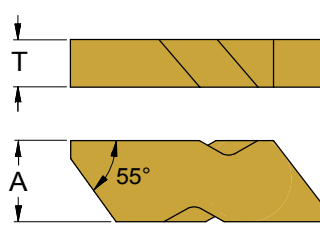
Style:	Insert Description		Dimensions			Grades						
<b>HF - Face Grooving</b>  12° TO 18° Left Hand Shown  Special Clearance Angles can be modified by request  *Use Left Hand Inserts For Counter-Clockwise Rotation    See Page 36 For Additional Face Grooving Information	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG	
		HF 3062R	.062	.0075	.125		●			●		●
		HF 3062L*		± .0025			●			●		●
		HF 3072R	.072	.0075	.125		●			●		●
		HF 3072L*		± .0025			●			●		●
		HF 3094R	.094	.0075	.185		●			●		●
		HF 3094L*		± .0025			●			●		●
		HF 3098R	.098	.0075	.185		●			●		●
		HF 3098L*		± .0025			●			●		●
		HF 3110R	.110	.0075	.185		●			●		●
		HF 3110L*		± .0025			●			●		●
		HF 3125R	.125	.0075	.185		●			●		●
		HF 3125L*		± .0025			●			●		●
		HF 3156R	.156	.0075	.185		●			●		●
		HF 3156L*		± .0025			●			●		●
	HF 3188R	.188	.0225	.185		●			●		●	
	HF 3188L*		± .0025			●			●		●	
	HF 3189R	.189	.0225	.185		●			●		●	
	HF 3189L*		± .0025			●			●		●	
	HF 4250R	.250	.0225	.255		●			●		●	
	HF 4250L*		± .0025			●			●		●	
<b>HF - RK- LK Chip Curler Face Grooving</b>  12° TO 18° Left Hand Shown	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG	
		HF 3094RK	.094	.0075	.185		●			●		●
		HF 3094LK*		± .0025			●			●		●
		HF 3125RK	.125	.0075	.185		●			●		●
		HF 3125LK*		± .0025			●			●		●
		HF 3156RK	.156	.0075	.185		●			●		●
	HF 3156LK*		± .0025			●			●		●	
*Use Left Hand Inserts For Counter-Clockwise Rotation See Page 39 For Additional Face Grooving Information												
<b>HFD - Deep Face Grooving</b>  12° Left Hand Shown	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG	
		HFD 3125R	.125	.0075	.255		●			●		●
		HFD 3125L*		± .0025			●			●		●
		HFD 4189R	.189	.0225	.505		●			●		●
		HFD 4189L*		± .0025			●			●		●
		HFD 4250R	.250	.0225	.505		●			●		●
	HFD 4250L*		± .0025			●			●		●	
*Use Left Hand Inserts For Counter-Clockwise Rotation See Page 39 For Additional Face Grooving Information												

# GROOVING INSERTS

Style:	Insert Description		Dimensions			Grades					
<b>Poly-V Grooving</b>	Left Hand	Right Hand	H	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p>		HV 3RJ	.087	.0125	.125		•				•
		HV 3LJ					•				•
		HV 4RL	.201	.0125	.118		•				•
		HV 4LL					•				•

Style:	Insert Description		Dimensions			Grades					
<b>Undercutting</b>	Left Hand	Right Hand	W	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Left Hand Shown</p>		HU 3094R	.094	.020	.125		•				•
		HU 3094L					•				•
		HU 3125R	.125	.047	.188		•				•
		HU 3125L					•				•
		HU 3156R	.156	.047	.188		•				•
	HU 3156L					•				•	

Style:	Insert Description		Dimensions			Grades						
<b>Precision Ground Blanks</b>	Left Hand	Right Hand	A	T		C10	C23	C56				
 <p>Right Hand Shown</p>		HB 2R	.219	.150		•	•	•				
		HB 2L					•	•	•			
		HB 3R	.344	.195			•	•	•			
		HB 3L					•	•	•			
		HB 4R	.453	.255			•	•	•			
		HB 4L					•	•	•			
		HB 5R	.688	.380			•	•	•			
		HB 5L					•	•	•			
	HB 6R	.453	.380			•	•	•				
	HB L6					•	•	•				

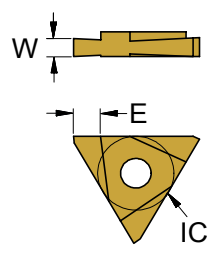
Style:	Insert Description		Dimensions			Grades						
<b>Precision Ground Deep Grooving Blanks</b>	Left Hand	Right Hand	A	T		C10	C23	C56				
 <p>Right Hand Shown</p>		HBD 2R	.219	.150		•	•	•				
		HBD 2L					•	•	•			
		HBD 3R	.344	.195			•	•	•			
		HBD 3L					•	•	•			
		HBD 4R	.453	.255			•	•	•			
	HBD 4L					•	•	•				

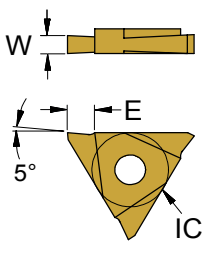
Style:	Insert	Dimensions			Grades					
V - Dogbone	Description	W	H	S	C10	C23	C23J	310F	323F	323FG
	VDB 125 A015	.125	.250	.106		•				•
	VDB 156 A015	.156	.250	.106		•				•
	VDB 188 A015	.188	.250	.144		•				•
	VDB 218 A015	.218	.250	.144		•				•
	VDB 250 A015	.250	.250	.144		•				•
	VDB 250 B015	.250	.337	.144		•				•

Style:	Insert	Dimensions			Grades					
V - Dogbone With Chip Curler	Description	W	H	S	C10	C23	C23J	310F	323F	323FG
	VDB 125 A015C	.125	.250	.106		•				•
	VDB 156 A015C	.156	.250	.106		•				•
	VDB 188 A015C	.188	.250	.144		•				•
	VDB 250 A015C	.250	.250	.144		•				•
	VDB 250 B015C	.250	.337	.144		•				•
	VDB 281 B015	.281	.337	.202		•				•
	VDB 312 B015	.312	.337	.202		•				•
	VDB 344 B015	.344	.337	.276		•				•
	VDB 375 B015	.375	.337	.276		•				•

Style:	Insert	Dimensions			Grades					
V - Dogbone Full Nose Radius	Description	R	W	H	C10	C23	C23J	310F	323F	323FG
	VDB 125 RA	.062	.125	.250		•				•
	VDB 156 RA	.078	.156	.250		•				•
	VDB 188 RA	.094	.188	.250		•				•
	VDB 218 RA	.109	.218	.250		•				•
	VDB 250 RA	.125	.250	.250		•				•
	VDB 250 RB	.125	.250	.337		•				•
	VDB 281 RB	.140	.281	.337		•				•
	VDB 312 RB	.156	.312	.337		•				•
	VDB 344 RB	.172	.344	.337		•				•
VDB 375 RB	.187	.375	.337		•				•	

# GROOVING INSERTS

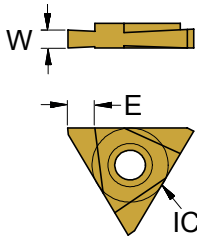
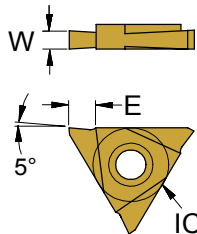
Style:	Insert	Dimensions			Grades					
TNMA On Edge Grooving	Description	W	E	IC	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>NGR = Right Hand NGL = Left Hand NGC = Center</p> <p>Sharp Corners - No Radius</p> <p>TNMA Inserts for use in Carboloy® Tool Holders Only</p>	TNMA 32NGR 062	.062	.156	.375		●				●
	TNMA 32NGL 062	.062	.156	.375		●				●
	TNMA 32NGC 062	.062	.156	.375		●				●
	TNMA 32NGR 094	.094	.156	.375		●				●
	TNMA 32NGL 094	.094	.156	.375		●				●
	TNMA 32NGC 094	.094	.156	.375		●				●
	TNMA 32NG 125	.125	.156	.375		●				●
	TNMA 43NGR 062	.062	.156	.500		●				●
	TNMA 43NGL 062	.062	.156	.500		●				●
	TNMA 43NGC 062	.062	.156	.500		●				●
	TNMA 43NGR 094	.094	.234	.500		●				●
	TNMA 43NGL 094	.094	.234	.500		●				●
	TNMA 43NGC 094	.094	.234	.500		●				●
	TNMA 43NGR 125	.125	.234	.500		●				●
	TNMA 43NGL 125	.125	.234	.500		●				●
TNMA 43NGC 125	.125	.234	.500		●				●	
TNMA 43NG 187	.187	.234	.500		●				●	

Style:	Insert	Dimensions			Grades					
TPMA On Edge Grooving	Description	W	E	IC	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>NGR = Right Hand NGL = Left Hand NGC = Center</p> <p>Sharp Corners - No Radius</p> <p>TPMA Inserts for use in Carboloy® Tool Holders Only</p>	TPMA 32NGR 062	.062	.156	.375		●				●
	TPMA 32NGL 062	.062	.156	.375		●				●
	TPMA 32NGC 062	.062	.156	.375		●				●
	TPMA 32NGR 094	.094	.156	.375		●				●
	TPMA 32NGL 094	.094	.156	.375		●				●
	TPMA 32NGC 094	.094	.156	.375		●				●
	TPMA 32NG 125	.125	.156	.375		●				●
	TPMA 43NGR 062	.062	.156	.500		●				●
	TPMA 43NGL 062	.062	.156	.500		●				●
	TPMA 43NGC 062	.062	.156	.500		●				●
	TPMA 43NGR 094	.094	.234	.500		●				●
	TPMA 43NGL 094	.094	.234	.500		●				●
	TPMA 43NGC 094	.094	.234	.500		●				●
	TPMA 43NGR 125	.125	.234	.500		●				●
	TPMA 43NGL 125	.125	.234	.500		●				●
TPMA 43NGC 125	.125	.234	.500		●				●	
TPMA 43NG 187	.187	.234	.500		●				●	

Additional Sizes Available upon Request

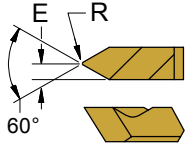
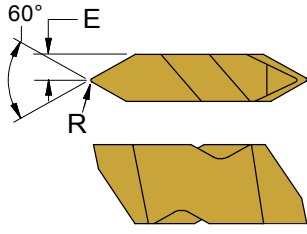
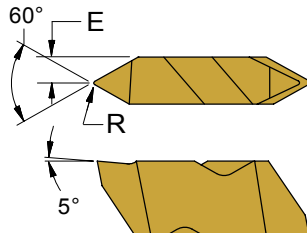
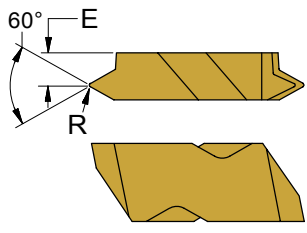
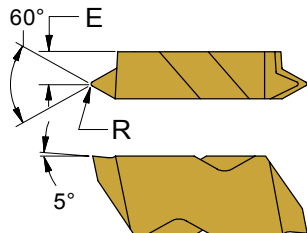


# GROOVING INSERTS

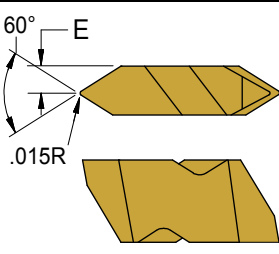
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<b>TNMC</b> <b>On Edge Grooving</b>	<b>Description</b>	<b>W</b>	<b>E</b>	<b>IC</b>	<b>C10</b>	<b>C23</b>	<b>C23J</b>	<b>310F</b>	<b>323F</b>	<b>323FG</b>
 <p>Right Hand Shown</p> <p>NGR = Right Hand NGL = Left Hand NGC = Center</p> <p>Sharp Corners - No Radius</p> <p>Additional Sizes Available on Request</p> <p>TNMC Inserts fit all Industry Std. Tool Holders except Carboly®</p>	TNMC 32NGR 032	.032	.057	.375		•				•
	TNMC 32NGL 032	.032	.057	.375		•				•
	TNMC 32NGC 032	.032	.057	.375		•				•
	TNMC 32NGR 062	.062	.156	.375		•				•
	TNMC 32NGL 062	.062	.156	.375		•				•
	TNMC 32NGC 062	.062	.156	.375		•				•
	TNMC 32NGR 094	.094	.156	.375		•				•
	TNMC 32NGL 094	.094	.156	.375		•				•
	TNMC 32NGC 094	.094	.156	.375		•				•
	TNMC 32NG 125	.125	.156	.375		•				•
	TNMC 43NGR 062	.062	.156	.500		•				•
	TNMC 43NGL 062	.062	.156	.500		•				•
	TNMC 43NGC 062	.062	.156	.500		•				•
	TNMC 43NGR 094	.094	.234	.500		•				•
	TNMC 43NGL 094	.094	.234	.500		•				•
	TNMC 43NGC 094	.094	.234	.500		•				•
	TNMC 43NGR 125	.125	.234	.500		•				•
	TNMC 43NGL 125	.125	.234	.500		•				•
	TNMC 43NGC 125	.125	.234	.500		•				•
	TNMC 43NGR 156	.156	.234	.500		•				•
	TNMC 43NGL 156	.156	.234	.500		•				•
	TNMC 43NGC 156	.156	.234	.500		•				•
	TNMC 43NG 187	.187	.234	.500		•				•
	TNMC 54NGR 156	.156	.275	.625		•				•
	TNMC 54NGL 156	.156	.275	.625		•				•
	TNMC 54NGR 187	.187	.275	.625		•				•
TNMC 54NGL 187	.187	.275	.625		•				•	
<b>Style:</b>	<b>Insert</b>	<b>Dimensions</b>			<b>Grades</b>					
<b>TPMC</b> <b>On Edge Grooving</b>	<b>Description</b>	<b>W</b>	<b>E</b>	<b>IC</b>	<b>C10</b>	<b>C23</b>	<b>C23J</b>	<b>310F</b>	<b>323F</b>	<b>323FG</b>
 <p>Right Hand Shown</p> <p>NGR = Right Hand NGL = Left Hand NGC = Center</p> <p>TPMC Inserts fit all Industry Std. Tool Holders except Carboly®</p>	TPMC 32NGR 062	.062	.156	.375		•				•
	TPMC 32NGL 062	.062	.156	.375		•				•
	TPMC 32NGC 062	.062	.156	.375		•				•
	TPMC 32NGR 094	.094	.156	.375		•				•
	TPMC 32NGL 094	.094	.156	.375		•				•
	TPMC 32NGC 094	.094	.156	.375		•				•
	TPMC 32NG 125	.125	.156	.375		•				•
	TPMC 43NGR 094	.094	.234	.500		•				•
	TPMC 43NGL 094	.094	.234	.500		•				•
	TPMC 43NGC 094	.094	.234	.500		•				•
	TPMC 43NGR 125	.125	.234	.500		•				•
	TPMC 43NGL 125	.125	.234	.500		•				•
	TPMC 43NGC 125	.125	.234	.500		•				•
	TPMC 43NG 187	.187	.234	.500		•				•

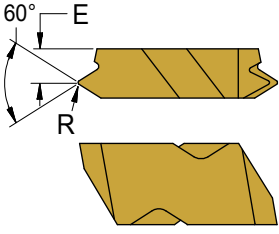
# THREADING INSERTS

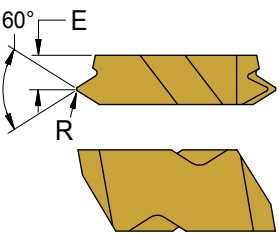
THREADING INSERTS

Style:	Insert Description		Dimensions			Grades					
<b>HT Size 1 ID Threading</b>  Left Hand Shown	Left Hand		PITCH	R	E	C10	C23	C23J	310F	323F	323FG
	HT 1L		12 - 24 tpi ID	0.003	.045	●			●		●
				± .001		●			●		●
<b>HT General Purpose</b>  Right Hand Shown	Left Hand	Right Hand	PITCH	R	E	C10	C23	C23J	310F	323F	323FG
		HT 2R	8 - 36 tpi OD	.004	.075		●			●	
	HT 2L		7 - 20 tpi ID	± .001			●		●		●
	HT 3R		6 - 20 tpi OD	.0065	.098		●		●		●
	HT 3L		5 - 12 tpi ID	± .0015			●		●		●
	HT 4R		4 - 20 tpi OD	.0065	.128		●		●		●
	HT 4L		4 - 12 tpi ID	± .0015			●		●		●
Use RH Inserts with RH External Holders - LH Inserts with RH Boring Bars See Pages 31-33											
<b>HTP 5° Positive Rake</b>  Right Hand Shown	Left Hand	Right Hand	PITCH	R	E	C10	C23	C23J	310F	323F	323FG
		HTP 2R	8 - 36 tpi OD	.004	.075		●			●	
	HTP 2L		7 - 20 tpi ID	± .001			●		●		●
	HTP 3R		6 - 20 tpi OD	.0065	.098		●		●		●
	HTP 3L		5 - 12 tpi ID	± .0015			●		●		●
	HTP 4R		4 - 20 tpi OD	.0065	.128		●		●		●
	HTP 4L		4 - 12 tpi ID	± .0015			●		●		●
Use RH Inserts with RH External Holders - LH Inserts with RH Boring Bars See Pages 31-33											
<b>HTF Close Shoulder</b>  Right Hand Shown	Left Hand	Right Hand	PITCH	R	E	C10	C23	C23J	310F	323F	323FG
		HTF 2R	14-44 tpi OD	.003	.110		●			●	
	HTF 2L		12-24 tpi ID	± .001			●		●		●
	HTF 3R		10-44 tpi OD	.003	.141		●		●		●
	HTF 3L		9-24 tpi ID	± .0015			●		●		●
	HTF 4R		10-44 tpi OD	.003	.201		●		●		●
	HTF 4L		9-24 tpi ID	± .0015			●		●		●
Use RH Inserts with RH External Holders - LH Inserts with RH Boring Bars See Pages 31-33											
<b>HTK 5° Positive Rake</b>  Right Hand Shown	Left Hand	Right Hand	PITCH	R	E	C10	C23	C23J	310F	323F	323FG
		HTK 2R	14-44 tpi OD	.003	.110		●			●	
	HTK 2L		12-24 tpi ID	± .001			●		●		●
	HTK 3R		10-44 tpi OD	.003	.141		●		●		●
	HTK 3L		9-24 tpi ID	± .0015			●		●		●
	HTK 4R		10-44 tpi OD	.003	.201		●		●		●
	HTK 4L		9-24 tpi ID	± .0015			●		●		●
Use RH Inserts with RH External Holders - LH Inserts with RH Boring Bars See Pages 31-33											

# THREADING INSERTS

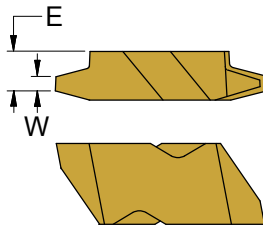
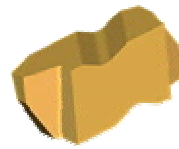
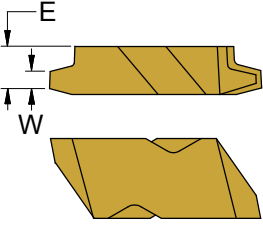
Style:	Insert Description		Dimensions			Grades					
<b>HT - C and HTP - C Coarse Pitch .015R</b>	Left Hand	Right Hand	PITCH	R	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p>		<b>HT 3RC</b>	6-11 tpi	.015	.098		●		●		●
		<b>HT 3LC</b>	6 tpi	-.001	.098		●		●		●
		<b>HTP 3RC</b>	6-11 tpi	.015	.098		●		●		●
		<b>HTP 3LC</b>	6 tpi	-.001	.098		●		●		●
		<b>HT 4RC</b>	4.5-11 tpi	.015	.128		●		●		●
		<b>HT 4LC</b>	4.5-6 tpi	-.001	.128		●		●		●

Style:	Insert Description		Dimensions			Grades					
<b>Creasing Style Full Profile 60°</b>	Internal LH*	External RH	PITCH	R	E	C10	C23	C23J	310F	323F	323FG
 <p>External RH Shown</p> <p>For Removing Burr From Crest of Thread</p> <p>* Use LH Inserts For RH Internal Threads</p> <p>For Tool Holder Information See Pages 26-28</p>		<b>HTC 3R8E</b>	8	.0150	.107		●		●		●
		<b>HTC 3L8I</b>	tpi	.0070	.107		●		●		●
		<b>HTC 3R12E</b>	12	.0100	.148		●		●		●
		<b>HTC 3L12I</b>	tpi	.0040	.148		●		●		●
		<b>HTC 3R14E</b>	14	.0088	.148		●		●		●
		<b>HTC 3L14I</b>	tpi	.0037	.148		●		●		●
		<b>HTC 3R16E</b>	16	.0075	.148		●		●		●
		<b>HTC 3L16I</b>	tpi	.0030	.148		●		●		●
		<b>HTC 3R18E</b>	18	.0070	.148		●		●		●
		<b>HTC 3L18I</b>	tpi	.0030	.148		●		●		●
		<b>HTC 3R20E</b>	20	.0062	.148		●		●		●
		<b>HTC 3L20I</b>	tpi	.0026	.148		●		●		●
		<b>HTC 3R24E</b>	24	.0045	.148		●		●		●
		<b>HTC 3L24I</b>	tpi	.0015	.148		●		●		●
		<b>HTC 3R28E</b>	12	.0039	.148		●		●		●
		<b>HTC 3L28I</b>	tpi	.0013	.148		●		●		●
	<b>HTC 3R32E</b>	10	.0034	.148		●		●		●	
	<b>HTC 3L32I</b>	tpi	.0010	.148		●		●		●	

Style:	Insert Description		Dimensions			Grades					
<b>Creasing Style NPT</b>	External RH	Internal LH*	PITCH	R	E	C10	C23	C23J	310F	323F	323FG
 <p>External RH Shown</p> <p>* Use LH Inserts For RH Internal Threads</p>		<b>HDC 36VR-75</b>	8	.0050	.100		●		●		●
		<b>HDC 38VL-75</b>	NPT	.0050	.100		●		●		●
		<b>HDC 3115VR-75</b>	11.5	.0040	.144		●		●		●
		<b>HDC 3115VL-75</b>	NPT	.0040	.144		●		●		●
		<b>HDC 314VR-75</b>	14	.0030	.144		●		●		●
		<b>HDC 314VL-75</b>	NPT	.0030	.144		●		●		●
		<b>HDC 318VR-75</b>	18	.0030	.144		●		●		●
		<b>HDC 318VL-75</b>	NPT	.0030	.144		●		●		●
		<b>HDC 327VR-75</b>	27	.0020	.144		●		●		●
		<b>HDC 327VL-75</b>	NPT	.0020	.144		●		●		●

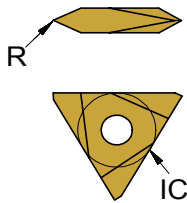
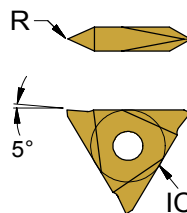
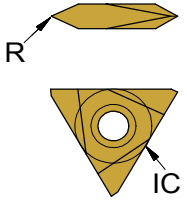
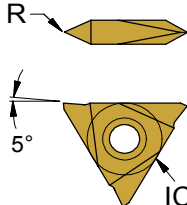
# THREADING INSERTS - ACME

THREADING INSERTS

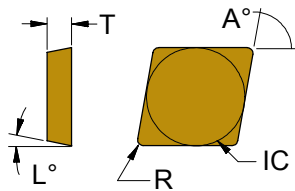
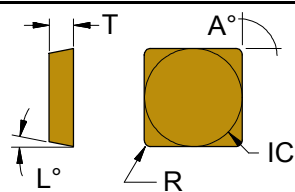
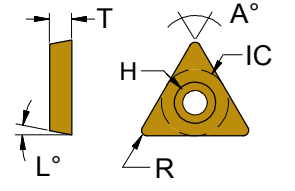
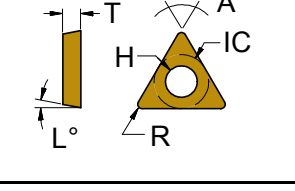
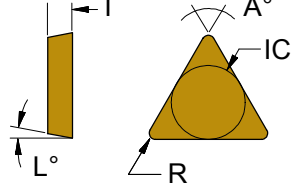
Style:	Insert Description		Dimensions			Grades					
HA - Acme	Left Hand*	Right Hand	PITCH	W	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>* Use LH Inserts For RH Internal Threads</p> <p>For Tool Holder Information See Pages 26-28</p>  <p>Left Hand Insert</p>		HA 3R16	16	.0206	.149		●		●		●
	HA 3L16		ACME				●		●		●
		HA 3R14	14	.0239	.149		●		●		●
	HA 3L14		ACME				●		●		●
		HA 3R12	12	.0283	.149		●		●		●
	HA 3L12		ACME				●		●		●
		HA 3R10	10	.0319	.149		●		●		●
	HA 3L10		ACME				●		●		●
		HA 3R8	8	.0411	.149		●		●		●
	HA 3L8		ACME				●		●		●
		HA 3R6	6	.0566	.149		●		●		●
	HA 3L6		ACME				●		●		●
		HA 3R5	5	.0689	.133		●		●		●
	HA 3L5		ACME				●		●		●
		HA 3R4	4	.0875	.133		●		●		●
	HA 3L4		ACME				●		●		●
		HA 4R10	10	.0319	.202		●		●		●
	HA 4L10		ACME				●		●		●
		HA 4R8	8	.0411	.202		●		●		●
	HA 4L8		ACME				●		●		●
		HA 4R6	6	.0566	.202		●		●		●
	HA 4L6		ACME				●		●		●
		HA 4R5	5	.0689	.202		●		●		●
	HA 4L5		ACME				●		●		●
		HA 4R4	4	.0875	.202		●		●		●
	HA 4L4		ACME				●		●		●
		HA 6R3	3	.1184	.283		●		●		●
	HA 6L3						●		●		●
	HA 6R25	2.5	.1431	.283		●		●		●	
HA 6L25						●		●		●	
	HA 6R2	2	.1802	.283		●		●		●	
HA 6L2		ACME				●		●		●	
Style:	Insert Description		Dimensions			Grades					
HAS - Stub Acme	Left Hand*	Right Hand	PITCH	W	E	C10	C23	C23J	310F	323F	323FG
 <p>Right Hand Shown</p> <p>* Use LH Inserts For RH Internal Threads</p>		HAS 3R16	16	.0238	.149		●		●		●
	HAS 3L16		S ACME				●		●		●
		HAS 3R14	14	.0276	.149		●		●		●
	HAS 3L14		S ACME				●		●		●
		HAS 3R12	12	.0326	.149		●		●		●
	HAS 3L12		S ACME				●		●		●
		HAS 3R10	10	.0370	.149		●		●		●
	HAS 3L10		S ACME				●		●		●
		HAS 3R8	8	.0476	.149		●		●		●
	HAS 3L8		S ACME				●		●		●
		HAS 3R6	6	.0652	.149		●		●		●
	HAS 3L6		S ACME				●		●		●
	HAS 3R5	5	.0793	.149		●		●		●	
HAS 3L5		S ACME				●		●		●	

# EDGE THREADING

EDGE THREADING

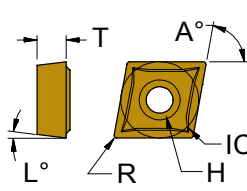
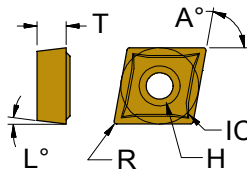
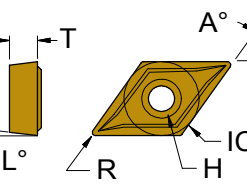
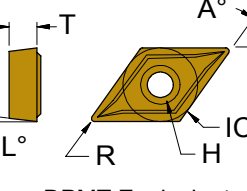
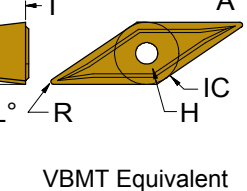
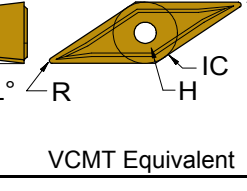
Style:	Insert	Dimensions			Grades					
<b>TNMA On Edge Threading</b>	Description	PITCH	R	IC	C10	C23	C23J	310F	323F	323FG
 <p>TNMA Inserts for use in Carboloy® Tool Holders Only</p>	<b>TNMA 32NV</b>	8 tpi Max	.003 -.005	.375		●				●
	<b>TNMA 43NV</b>	6 tpi Max	.005 -.008	.500		●				●
	<b>TNMA 54NV</b>	4 tpi Max	.005 -.008	.625		●				●
<b>TPMA Positive Rake On Edge Threading</b>	Description	PITCH	R	IC	C10	C23	C23J	310F	323F	323FG
 <p>TPMA Inserts for use in Carboloy® Tool Holders Only</p>	<b>TPMA 32NV</b>	8 tpi Max	.003 -.005	.375		●				●
	<b>TPMA 43NV</b>	6 tpi Max	.005 -.008	.500		●				●
	<b>TPMA 54NV</b>	4 tpi Max	.005 -.008	.625		●				●
<b>TNMC On Edge Threading</b>	Description	PITCH	R	IC	C10	C23	C23J	310F	323F	323FG
 <p>TNMC Inserts fit all Industry Std. Tool Holders except Carboloy®</p>	<b>TNMC 32NV</b>	8 tpi Max	.003 -.005	.375		●				●
	<b>TNMC 43NV</b>	6 tpi Max	.005 -.008	.500		●				●
	<b>TNMC 54NV</b>	4 tpi Max	.005 -.008	.625		●				●
	<b>TNMC 64NV</b>	4 tpi Max	.005 -.008	.750		●				●
	<b>TNMC 66NV</b>	3 tpi Max	.005 -.008	.750		●				●
<b>TPMC Positive Rake On Edge Threading</b>	Description	PITCH	R	IC	C10	C23	C23J	310F	323F	323FG
 <p>* 10° Positive Rake</p> <p>TPMC Inserts fit all Industry Std. Tool Holders except Carboloy®</p>	<b>TPMC 32NV</b>	8 tpi Max	.003 -.005	.375		●				●
	<b>TPMC 32NV-10 *</b>	8 tpi Max	.003 -.005	.375		●				●
	<b>TPMC 43NV</b>	6 tpi Max	.005 -.008	.500		●				●
	<b>TPMC 43NV-10 *</b>	6 tpi Max	.005 -.008	.500		●				●
	<b>TPMC 54NV</b>	4 tpi Max	.005 -.008	.625		●				●
	<b>TPMC 64NV</b>	4 tpi Max	.005 -.008	.750		●				●
	<b>TPMC 66NV</b>	3 tpi Max	.005 -.008	.750		●				●

# TURNING INSERTS

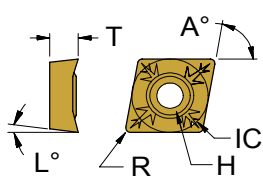
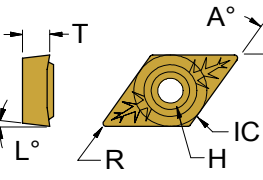
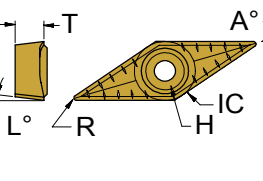
Style:	Insert	Dimensions						Grades						
ANSI - ISO Standards	Description	L	A	R	T	IC	H	C10	C23	C23J	310F	323F	323FG	
 <p>Additional Corner Radius Sizes Available On Request</p>	CPG 420	11°	80°	.004	.125	.500			•				•	
	CPG 420.5	11°	80°	.008	.125	.500			•				•	
	CPG 421	11°	80°	.016	.125	.500			•				•	
	CPG 422	11°	80°	.031	.125	.500			•				•	
	CPG 423	11°	80°	.047	.125	.500			•				•	
	CFG 4620	25°	80°	.004	.125	.464				•				•
	CFG 4621	25°	80°	.016	.125	.464				•				•
	CFG 4622	25°	80°	.031	.125	.464				•				•
	SPG 420	11°	90°	.004	.125	.500			•				•	
	SPG 420.5	11°	90°	.008	.125	.500			•				•	
	SPG 421	11°	90°	.016	.125	.500			•				•	
	SPG 422	11°	90°	.031	.125	.500			•				•	
	SPG 423	11°	90°	.047	.125	.500			•				•	
	TD 6P R002	10°	60°	.002	.125	.375	.125		•				•	
	TD 6P R007	10°	60°	.007	.125	.375	.125		•				•	
	TD 6P R015	10°	60°	.015	.125	.375	.125		•				•	
	TD 6P	10°	60°	.031	.125	.375	.125		•				•	
	TP 40	10°	60°	.005	.094	.250	.137		•				•	
	TP 41	10°	60°	.016	.094	.250	.137		•				•	
	TP 42	10°	60°	.031	.094	.250	.137		•				•	
	TP 61	10°	60°	.016	.125	.375	.163		•				•	
	TP 62	10°	60°	.031	.125	.375	.163		•				•	
 <p>Additional Corner Radius Sizes Available On Request</p> <p>* CFG &amp; TFG Inserts in Grade C23J Come with J Polished Tops</p> <p>CPG, SPG, and TPG Inserts Can Be Modified With J Polish On Request</p>	TFG 320.5 J *	25°	60°	.008	.125	.375				•			•	
	TFG 321 J *	25°	60°	.016	.125	.375				•			•	
	TFG 322 J *	25°	60°	.031	.125	.375				•			•	
	TPG 221	11°	60°	.016	.125	.250			•				•	
	TPG 222	11°	60°	.031	.125	.250			•				•	
	TPG 320 R003	11°	60°	.003	.125	.375			•				•	
	TPG 320 R005	11°	60°	.005	.125	.375			•				•	
	TPG 321	11°	60°	.016	.125	.375			•				•	
	TPG 322	11°	60°	.031	.125	.375			•				•	
	TPG 323	11°	60°	.047	.125	.375			•				•	
	TPG 324	11°	60°	.062	.125	.375			•				•	
	TPG 430	11°	60°	.004	.1875	.500			•				•	
	TPG 430.5	11°	60°	.008	.1875	.500			•				•	
TPG 431	11°	60°	.016	.1875	.500			•				•		
TPG 432	11°	60°	.031	.1875	.500			•				•		
TPG 433	11°	60°	.047	.1875	.500			•				•		

TURNING INSERTS

# TURNING INSERTS

Style:	Insert	Dimensions						Grades					
ANSI - ISO Standards	Description	L	A	R	T	IC	H	C10	C23	C23J	310F	323F	323FG
 <p>CCMT Equivalent</p>	CCGT 21.50 .000	7°	80°	.000	.094	.250	.110		●	●			●
	CCGT 21.50 .002	7°	80°	.002	.094	.250	.110		●	●			●
	CCGT 21.50	7°	80°	.004	.094	.250	.110		●	●			●
	CCGT 21.50.5	7°	80°	.008	.094	.250	.110		●	●			●
	CCGT 21.51	7°	80°	.016	.094	.250	.110		●	●			●
	CCGT 21.52	7°	80°	.031	.094	.250	.110		●	●			●
	CCGT 32.50 .000	7°	80°	.000	.156	.375	.173		●	●			●
	CCGT 32.50 .002	7°	80°	.002	.156	.375	.173		●	●			●
	CCGT 32.50	7°	80°	.004	.156	.375	.173		●	●			●
	CCGT 32.50.5	7°	80°	.008	.156	.375	.173		●	●			●
	CCGT 32.51	7°	80°	.016	.156	.375	.173		●	●			●
	CCGT 32.52	7°	80°	.031	.156	.375	.173		●	●			●
 <p>CPGM - CPMT Equivalent</p>	CPGT 21.50 .000	11°	80°	.000	.094	.250	.110		●	●			●
	CPGT 21.50 .002	11°	80°	.002	.094	.250	.110		●	●			●
	CPGT 21.50	11°	80°	.004	.094	.250	.110		●	●			●
	CPGT 21.50.5	11°	80°	.008	.094	.250	.110		●	●			●
	CPGT 21.51	11°	80°	.016	.094	.250	.110		●	●			●
	CPGT 21.52	11°	80°	.031	.094	.250	.110		●	●			●
	CPGT 32.50 .000	11°	80°	.000	.156	.375	.173		●	●			●
	CPGT 32.50 .002	11°	80°	.002	.156	.375	.173		●	●			●
	CPGT 32.50	11°	80°	.004	.156	.375	.173		●	●			●
	CPGT 32.50.5	11°	80°	.008	.156	.375	.173		●	●			●
	CPGT 32.51	11°	80°	.016	.156	.375	.173		●	●			●
	CPGT 32.52	11°	80°	.031	.156	.375	.173		●	●			●
 <p>DCMT Equivalent</p>	DCGT 21.50	7°	55°	.004	.094	.250	.110		●	●			●
	DCGT 21.50.5	7°	55°	.008	.094	.250	.110		●	●			●
	DCGT 21.51	7°	55°	.016	.094	.250	.110		●	●			●
	DCGT 21.52	7°	55°	.031	.094	.250	.110		●	●			●
	DCGT 32.50	7°	55°	.004	.156	.375	.173		●	●			●
	DCGT 32.50.5	7°	55°	.008	.156	.375	.173		●	●			●
	DCGT 32.51	7°	55°	.016	.156	.375	.173		●	●			●
	DCGT 32.52	7°	55°	.031	.156	.375	.173		●	●			●
 <p>DPMT Equivalent</p>	DPGT 21.50	11°	55°	.004	.094	.250	.110		●	●			●
	DPGT 21.50.5	11°	55°	.008	.094	.250	.110		●	●			●
	DPGT 21.52	11°	55°	.031	.094	.250	.110		●	●			●
	DPGT 32.50	11°	55°	.004	.156	.375	.173		●	●			●
	DPGT 32.50.5	11°	55°	.008	.156	.375	.173		●	●			●
	DPGT 32.51	11°	55°	.016	.156	.375	.173		●	●			●
 <p>VBMT Equivalent</p>	VBGT 220.5	5°	35°	.008	.125	.250	.110		●	●			●
	VBGT 221	5°	35°	.016	.125	.250	.110		●	●			●
	VBGT 222	5°	35°	.031	.125	.250	.110		●	●			●
	VBGT 330	5°	35°	.004	.1875	.375	.173		●	●			●
	VBGT 330.5	5°	35°	.008	.1875	.375	.173		●	●			●
	VBGT 331	5°	35°	.016	.1875	.375	.173		●	●			●
	VBGT 332	5°	35°	.031	.1875	.375	.173		●	●			●
 <p>VCMT Equivalent</p>	VCGT 220.5	7°	35°	.008	.125	.250	.110		●	●			●
	VCGT 221	7°	35°	.016	.125	.250	.110		●	●			●
	VCGT 222	7°	35°	.031	.125	.250	.110		●	●			●
	VCGT 330	7°	35°	.004	.1875	.375	.173		●	●			●
	VCGT 330.5	7°	35°	.008	.1875	.375	.173		●	●			●
	VCGT 331	7°	35°	.016	.1875	.375	.173		●	●			●
	VCGT 332	7°	35°	.031	.1875	.375	.173		●	●			●

# TURNING INSERTS

Style:	Insert	Dimensions						Grades	
ANSI-ISO High Positive Rake For Aluminum	Description	L	A	R	T	IC	H	C23J	323F
 <p>25° Positive Rake Chipbreaker</p>	CCGT 21.50.5-25P	7°	80°	.008	.094	.250	.110	•	•
	CCGT 21.51-25P	7°	80°	.016	.094	.250	.110	•	•
	CCGT 32.50-25P	7°	80°	.004	.156	.375	.173	•	•
	CCGT 32.50.5-25P	7°	80°	.008	.156	.375	.173	•	•
	CCGT 32.51-25P	7°	80°	.016	.156	.375	.173	•	•
	CCGT 32.52-25P	7°	80°	.031	.156	.375	.173	•	•
	CCGT 430.5-25P	7°	80°	.008	.1875	.500	.216	•	•
	CCGT 431-25P	7°	80°	.016	.1875	.500	.216	•	•
	CCGT 432-25P	7°	80°	.031	.1875	.500	.216	•	•
 <p>25° Positive Rake Chipbreaker</p>	DCGT 21.50.5-25P	7°	55°	.008	.094	.250	.110	•	•
	DCGT 21.51-25P	7°	55°	.016	.094	.250	.110	•	•
	DCGT 32.50.5-25P	7°	55°	.008	.156	.375	.173	•	•
	DCGT 32.51-25P	7°	55°	.016	.156	.375	.173	•	•
	DCGT 32.52-25P	7°	55°	.031	.156	.375	.173	•	•
 <p>25° Positive Rake Chipbreaker</p>	VCGT 220.5-25P	7°	35°	.008	.125	.250	.110	•	•
	VCGT 221-25P	7°	35°	.016	.125	.250	.110	•	•
	VCGT 331-25P	7°	35°	.016	.1875	.375	.216	•	•
	VCGT 332-25P	7°	35°	.031	.1875	.375	.216	•	•
<p>Polished High Positive Rake Grade C23J Inserts are Designed for Aluminum, Copper and Plastics            Use TiAlN Coated Grade 323F for Finishing Most Materials Including Stainless, Titanium &amp; Hardened Steels 45Rc +</p>									

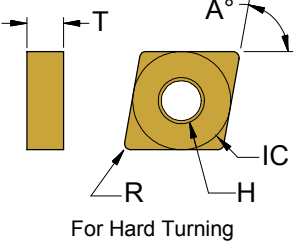
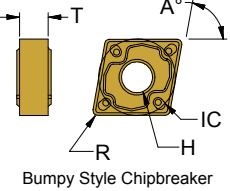
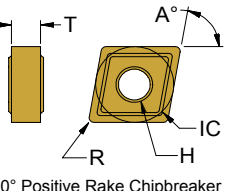
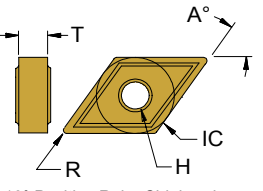
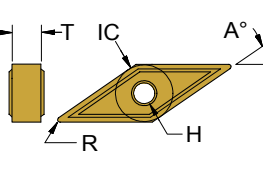
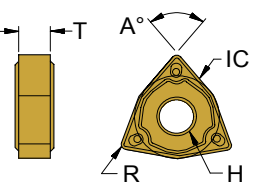
TURNING INSERTS



# TURNING INSERTS

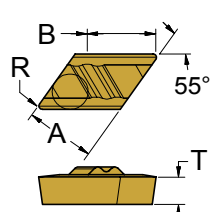
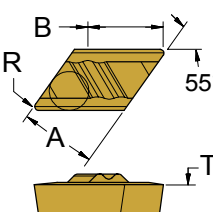
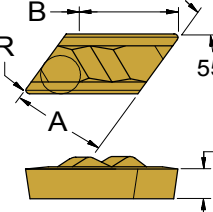
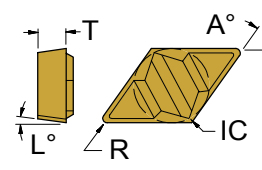
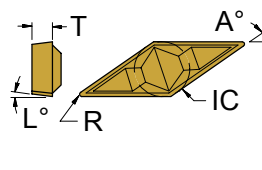
Style:	Insert	Dimensions						Grades				
ANSI - ISO Standards	Description	L	A	R	T	IC	H	C23	C23J	310F	323F	323FG
<p>10° Double Positive Rake for Finishing &amp; Light Roughing</p>	CNGP 430K .000	0°	80°	.000	.1875	.500	.203	●	●			●
	CNGP 430K .002	0°	80°	.002	.1875	.500	.203	●	●			●
	CNGP 430K	0°	80°	.004	.1875	.500	.203	●	●			●
	CNGP 430.5K	0°	80°	.008	.1875	.500	.203	●	●			●
	CNGP 431K	0°	80°	.016	.1875	.500	.203	●	●			●
	CNGP 432K	0°	80°	.031	.1875	.500	.203	●	●			●
	CNGP 433K	0°	80°	.047	.1875	.500	.203	●	●			●
<p>10° Positive Rake for Titanium &amp; High Temperature Alloys</p>	CNGG 430	0°	80°	.004	.1875	.500	.203	●	●			●
	CNGG 430.5	0°	80°	.008	.1875	.500	.203	●	●			●
	CNGG 431	0°	80°	.016	.1875	.500	.203	●	●			●
	CNGG 432	0°	80°	.031	.1875	.500	.203	●	●			●
	CNGG 433	0°	80°	.047	.1875	.500	.203	●	●			●
<p>2 Sided Insert for Finishing and Light Roughing</p>	DNGP 430K .000	0°	55°	.000	.1875	.500	.203	●	●			●
	DNGP 430K .002	0°	55°	.002	.1875	.500	.203	●	●			●
	DNGP 430K	0°	55°	.004	.1875	.500	.203	●	●			●
	DNGP 430.5K	0°	55°	.008	.1875	.500	.203	●	●			●
	DNGP 431K	0°	55°	.016	.1875	.500	.203	●	●			●
	DNGP 432K	0°	55°	.031	.1875	.500	.203	●	●			●
	DNGP 433K	0°	55°	.047	.1875	.500	.203	●	●			●
<p>2 Sided Light Finishing Insert</p>	VNGP 330K	0°	35°	.004	.1875	.375	.150	●	●			●
	VNGP 330.5K	0°	35°	.008	.1875	.375	.150	●	●			●
	VNGP 331K	0°	35°	.016	.1875	.375	.150	●	●			●
<p>2 Sided General Purpose Insert</p>	VNGP 330D	0°	35°	.004	.1875	.375	.150	●	●			●
	VNGP 330.5D	0°	35°	.008	.1875	.375	.150	●	●			●
	VNGP 331D	0°	35°	.016	.1875	.375	.150	●	●			●
	VNGP 332D	0°	35°	.031	.1875	.375	.150	●	●			●
<p>10° Double Positive Rake for Finishing &amp; Light Roughing</p>	WNGP 430K	0°	80°	.004	.1875	.500	.203	●	●			●
	WNGP 430.5K	0°	80°	.008	.1875	.500	.203	●	●			●
	WNGP 431K	0°	80°	.016	.1875	.500	.203	●	●			●
	WNGP 432K	0°	80°	.031	.1875	.500	.203	●	●			●
Inserts May Be Modified with Smaller Radius On Request												

# TURNING INSERTS

Style:	Insert	Dimensions					Grades	
Flat Top - No Chipbreaker	Description	A	R	T	IC	H	C23	323FG
 <p>For Hard Turning</p>	CNMA 432	80°	.031	.1875	.500	.203	•	•
	CNMA 433	80°	.047	.1875	.500	.203	•	•
Style:	Insert	Dimensions					Grades	
ANSI - ISO Standards	Description	A	R	T	IC	H	C23	323FG
 <p>Bumpy Style Chipbreaker</p>	CNMG 432GP	80°	.031	.1875	.500	.203	•	•
	For Light Roughing 300 Series Stainless, 15-5PH, 17-4PH, A286 and other Tough To Machine Alloys at Moderate Feeds & Speeds							
Style:	Insert	Dimensions					Grades	
 <p>10° Positive Rake Chipbreaker</p>	CNMG 432HT	80°	.031	.1875	.500	.203	•	•
	For Light Roughing in Titanium, Inconel® and other High Temperature Alloys HT Style Chipbreakers Provide Chip Control in Tough, Gummy Materials							
Style:	Insert	Dimensions					Grades	
 <p>10° Positive Rake Chipbreaker</p>	DNMG 431HT	55°	.016	.1875	.500	.203	•	•
	DNMG 432HT	55°	.031	.1875	.500	.203	•	•
For Light Roughing in Titanium, Inconel® and other High Temperature Alloys HT Style Chipbreakers Provide Chip Control in Tough, Gummy Materials								
Style:	Insert	Dimensions					Grades	
 <p>10° Positive Rake Chipbreaker</p>	VNMG 331HT	35°	.016	.1875	.375	.150	•	•
	VNMG 332HT	35°	.031	.1875	.375	.150	•	•
For Light Roughing in Titanium, Inconel® and other High Temperature Alloys HT Style Chipbreakers Provide Chip Control in Tough, Gummy Materials								
Style:	Insert	Dimensions					Grades	
 <p>Bumpy Style Chipbreaker</p>	WNMG 432GP	80°	.031	.1875	.500	.203	•	•
	For Light Roughing 300 Series Stainless, 15-5PH, 17-4PH, A286 and other Tough To Machine Alloys at Moderate Feeds & Speeds							

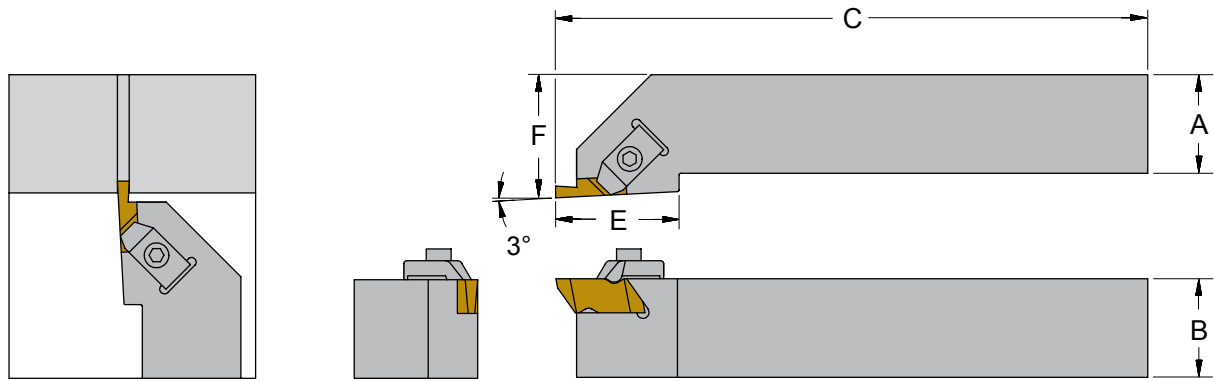
TURNING INSERTS

# PROFILING INSERTS

Style:	Insert Description		Dimensions					Grades						
HPR/L Profiling	Left Hand	Right Hand	A	R	T	B	IC	C10	C23	C23J	310F	323F	323FG	
 <p>Right Hand Shown</p>		HPR 50 R002	.365	.002	.125	.254	.250		•	•			•	
		HPL 50 R002								•	•			•
		HPR 50.5	.375	.005	.125	.263	.250		•	•				•
		HPL 50.5								•	•			•
		HPR 50.8	.375	.008	.125	.260	.250		•	•				•
		HPL 50.8								•	•			•
		HPR 51	.375	.016	.125	.253	.250		•	•				•
		HPL 51								•	•			•
 <p>Right Hand Shown</p>		HPR 130.5	.500	.005	.188	.321	.375		•	•			•	
		HPL 130.5								•	•			•
		HPR 130.8	.500	.008	.188	.318	.375		•	•				•
		HPL 130.8								•	•			•
		HPR 131F	.500	.016	.188	.311	.375		•	•				•
		HPL 131F								•	•			•
		HPR 132F	.500	.031	.188	.297	.375		•	•				•
		HPL 132F								•	•			•
 <p>Right Hand Shown</p>		HPR 331N	.733	.016	.188	.595	.375		•	•			•	
		HPL 331N								•	•			•
		HPR 332F	.733	.031	.188	.581	.375		•	•				•
		HPL 332F								•	•			•
		HPR 332N	.733	.031	.188	.581	.375		•	•				•
		HPL 332N								•	•			•
		HPL 332								•	•			•
Style:	Insert		Dimensions					Grades						
DPGR - VPGR	Description		A	R	T	L	IC	C23	C23J	310F	323F	323FG		
 <p>Profiling Inserts</p>		DPGR 430	55°	.004	.188	8°	.500	•				•		
		DPGR 430.5	55°	.008	.188	8°	.500	•					•	
		DPGR 431	55°	.016	.188	8°	.500	•					•	
		DPGR 432	55°	.031	.188	8°	.500	•					•	
 <p>Profiling Inserts</p>		VPGR 330	35°	.004	.188	8°	.375	•				•		
		VPGR 330.5	35°	.008	.188	8°	.375	•					•	
		VPGR 331	35°	.016	.188	8°	.375	•					•	
		VPGR 332	35°	.031	.188	8°	.375	•					•	
Inserts May Be Modified with Smaller Radius On Request														

# TOOL HOLDERS

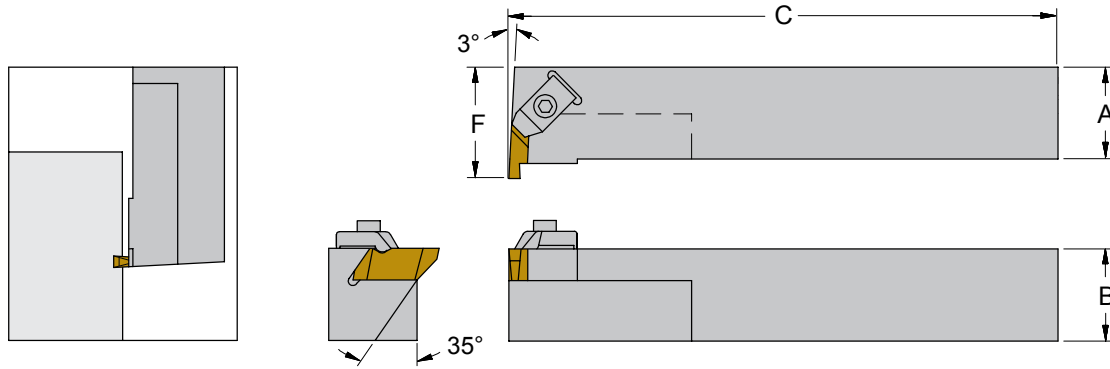
## Notch Style Threading & Grooving Tool Holders



Holder Description		Dimensions						Parts		EDP
Right Hand	Left Hand	Insert Size Grooving - Threading	A	B	C	E	F	Clamp	Screw	
TSR-62		HG 2xxxR - HT 2R	.375	.375	2.500	.750	.562	CM-74	S-310	•
	TSL-62	HG 2xxxL - HT 2L						CM-75		•
TSR-82		HG 2xxxR - HT 2R	.500	.500	3.500	.750	.750	CM-74	S-310	•
	TSL-82	HG 2xxxL - HT 2L						CM-75		•
TSR-102B		HG 2xxxR - HT 2R	.625	.625	4.500	.750	.875	CM-74	S-310	•
	TSL-102B	HG 2xxxL - HT 2L						CM-75		•
TSR-122B		HG 2xxxR - HT 2R	.750	.750	4.500	.750	1.000	CM-74	S-310	•
	TSL-122B	HG 2xxxL - HT 2L						CM-75		•
TSR-162C		HG 2xxxR - HT 2R	1.000	1.000	5.000	.750	1.250	CM-74	S-310	•
	TSL-162C	HG 2xxxL - HT 2L						CM-75		•
TSR-123B		HG 3xxxR - HT 3R	.750	.750	4.500	1.250	1.000	CM-72	S-412	•
	TSL-123B	HG 3xxxL - HT 3L						CM-73		•
TSR-163C		HG 3xxxR - HT 3R	1.000	1.000	5.000	1.250	1.250	CM-72	S-412	•
	TSL-163C	HG 3xxxL - HT 3L						CM-73		•
TSR-163D		HG 3xxxR - HT 3R	1.000	1.000	6.000	1.250	1.250	CM-72	S-412	•
	TSL-163D	HG 3xxxL - HT 3L						CM-73		•
TSR-203D		HG 3xxxR - HT 3R	1.250	1.250	6.000	1.380	1.500	CM-72	S-412	•
	TSL-203D	HG 3xxxL - HT 3L						CM-73		•
TSR-164D		HG 4xxxR - HT 4R	1.000	1.000	6.000	1.250	1.250	CM-72	S-412	•
	TSL-164D	HG 4xxxL - HT 4L						CM-73		•
TSR-204D		HG 4xxxR - HT 4R	1.250	1.250	6.000	1.500	1.500	CM-72	S-412	•
	TSL-204D	HG 4xxxL - HT 4L						CM-73		•
TSR-244D		HG 4xxxR - HT 4R	1.500	1.500	6.000	1.500	2.000	CM-72	S-412	•
	TSL-244D	HG 4xxxL - HT 4L						CM-73		•

TOOL HOLDERS

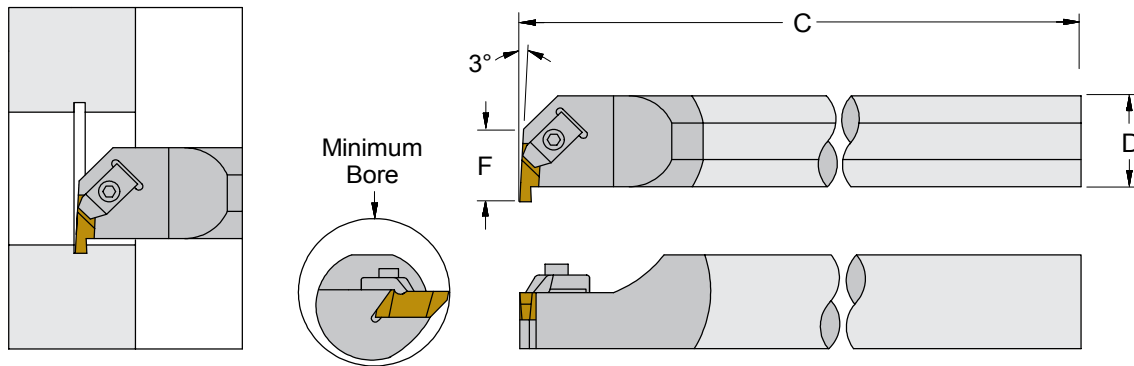
**Notch Style 90° Face Grooving & ID-OD Threading-Grooving Holders**



Right Hand Shown - Use Left Hand Inserts In 90° Right Hand Face Grooving Holders

Holder Description		Dimensions					Parts		EDP
Right Hand	Left Hand	Insert Size Face - ID Grooving	A	B	C	F	Clamp	Screw	
TER 163D		HF / HG 3xxxL	1.000	1.000	6.000	1.250	CM-73	S-412	●
	TEL 163D	HF / HG 3xxxR					CM-72		●
TER 164D		HF / HG 4xxxL	1.000	1.000	6.000	1.375	CM-73	S-412	●
	TEL 164D	HF / HG 4xxxR					CM-72		●

**Notch Style Carbide Shank ID Threading & Grooving Bars**



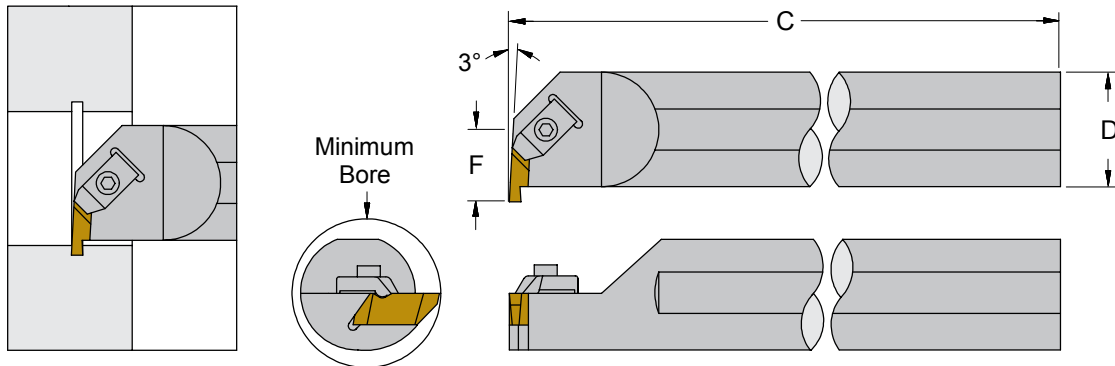
Right Hand Shown - Use Left Hand Inserts In Right Hand Boring Bars

Bar Description		Dimensions					Parts		EDP
Right Hand	Left Hand	Insert Size Grooving - Threading	D	Min Bore	C	F	Clamp	Screw	
C08-TER2		HG 2xxxL - HT 2L	.500	0.730	6.000	.437	CM-147	S-310	
	C08-TEL2	HG 2xxxR - HT 2R					CM-146		
C10-TER2		HG 2xxxL - HT 2L	.625	1.000	8.000	.500	CM-75	S-310	
	C10-TEL2	HG 2xxxR - HT 2R					CM-74		
C12-TER2		HG 2xxxL - HT 2L	.750	1.125	10.000	.562	CM-75	S-310	
	C12-TEL2	HG 2xxxR - HT 2R					CM-74		
C16-TER2		HG 2xxxL - HT 2L	1.000	1.375	12.000	.688	CM-75	S-310	
	C16-TEL2	HG 2xxxR - HT 2R					CM-74		
C16-TER3		HG 3xxxL - HT 3L	1.000	1.375	12.000	.688	CM-73	S-412	
	C16-TEL3	HG 3xxxR - HT 3R					CM-72		

Two Week Delivery On All Carbide Holders

# TOOL HOLDERS

## Notch Style Steel ID Threading & Grooving Bars With Through Coolant Holes



Right Hand Shown - Use Left Hand Inserts In Right Hand Boring Bars

\* Please Note: Minimum Bore Diameter for Horizon Size 2 Deep Grooving Inserts

Bar Description		Dimensions						Parts		EDP
Right Hand	Left Hand	Insert Size Grooving - Threading	D	Min Bore	Min Bore Deep*	C	F	Clamp	Screw	
A08-TER2		HG 2xxxL - HT 2L	.500	.730	1.075	6.000	.437	CM-147	S-310	●
	A08-TEL2	HG 2xxxR - HT 2R						CM-146		●
A10-TER2		HG 2xxxL - HT 2L	.625	1.000	1.200	8.000	.500	CM-75	S-310	●
	A10-TEL2	HG 2xxxR - HT 2R						CM-74		●
A12-TER2		HG 2xxxL - HT 2L	.750	1.125	1.325	10.000	.562	CM-75	S-310	●
	A12-TEL2	HG 2xxxR - HT 2R						CM-74		●
A16-TER2		HG 2xxxL - HT 2L	1.000	1.375	1.575	12.000	.688	CM-75	S-310	●
	A16-TEL2	HG 2xxxR - HT 2R						CM-74		●
A16-TER3		HG 3xxxL - HT 3L	1.000	1.375		12.000	.688	CM-73	S-412	●
	A16-TEL3	HG 3xxxR - HT 3R						CM-72		
A20-TER3		HG 3xxxL - HT 3L	1.250	1.750		14.000	.875	CM-73	S-412	
	A20-TEL3	HG 3xxxR - HT 3R						CM-72		
A24-TER3		HG 3xxxL - HT 3L	1.500	2.000		14.000	1.000	CM-73	S-412	
	A24-TEL3	HG 3xxxR - HT 3R						CM-72		
A28-TER3		HG 3xxxL - HT 3L	1.750	2.250		14.000	1.125	CM-73	S-412	
	A28-TEL3	HG 3xxxR - HT 3R						CM-72		
A32-TER3		HG 3xxxL - HT 3L	2.000	2.500		14.000	1.250	CM-73	S-412	
	A32-TEL3	HG 3xxxR - HT 3R						CM-72		

**NOTE:** These Boring Bars come with Through Coolant Holes  
Boring Bars without Coolant Holes are available in some sizes. Please call for Availability.

# TECHNICAL INFORMATION

## TECHNICAL INFORMATION \_\_\_\_\_ 29-43

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# CARBIDE GRADES

## HORIZON STOCKED STANDARD CARBIDE GRADES

Grade	ANSI	ISO	Color	Coating	Application	Materials
<b>C10</b>	C1-C5	K40 - P40	Gray	None	Small diameter work at low speeds	Non-ferrous
<b>C23</b>	C2-C3	K10-K20 / M20	Gray	None	Threading, Grooving	Aluminum, Plastics, and Non-metals
<b>C23J</b>	C2-C3	K10-K20 / M20	Gray	None	Finishing	Aluminum, Plastics, and Non-metals
<b>310F</b>	C1-C2 C5-C6	K25-K40 M25-M35 P35-P50	Gold	PVD TiALN	Threading, Grooving, small diameter work at low speeds	Steel, Stainless Steels, and Cast Iron
<b>323F</b>	C2-C3 C6-C7	K10-K20 M15-M20 P15-P25	Gold	PVD TiALN	Threading, Grooving	Stainless Steels and High Temp Alloys
<b>323FG</b>	C2-C3 C5-C6	P20-P30	Gold	PVD TiALN + TiN	First choice for general purpose threading, grooving, and finishing	All soft machining ferrous type materials

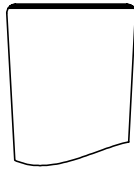
## HORIZON SPECIAL PURPOSE CARBIDE GRADES

Grade	ANSI	ISO	Color	Coating	Application	Materials
<b>309APS</b>	C2-C3	K10	Gray	PVD TiALN	Threading, Grooving, and Rough Turning (alternative to CBN)	Steels, Stainless Steels, and Cast Irons up to 62 Rc.
<b>310</b>	C1-C2 C5-C6	K25-K40 M25-M35 P35-P50	Gray	PVD TiALN	Replaced with 310F	
<b>311F</b>	C1	K25	Gray	PVD TiALN	Similar to 309 with more wear properties	Steels, Stainless Steels, and Cast Irons up to 62 Rc.
<b>311APS</b>	C1	K25	Bronze	PVD TiALN	Grade 311 with special hone for Rough Applications	Steels, Stainless Steels, and Cast Irons up to 62 Rc.
<b>314APS</b>	C1	K40	Bronze	PVD TiALN	Similar to 311 but designed for heavy interruption	Tough to machine, Cast Iron, or Abrasive materials
<b>320APS</b>	C2-C3	K15-K25	Gray-Black	PVD TiALN	Threading and Grooving	Cast Iron, or Abrasive Material
<b>323</b>	C2-C3 C6-C7	K10-K20 M15-M20 P15-P25	Gold	PVD TiALN	Replaced with 323F	
<b>323AL</b>	C2-C3 C5-C6	K10-K20 M15-M20 P15-P25	Bronze	PVD TiB2	Threading, Grooving, and Finishing	Aluminum and Titanium
<b>356FG</b>	C5-C6	P20 / P30	Gray	PVD TiALN + TiN	Threading and Grooving	Steel or Stainless Steels
<b>365APS</b>	C5	P35 / M25	Gray	PVD TiALN	Milling and Turning	Steel or Stainless Steels

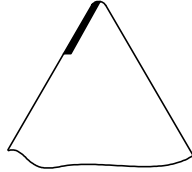


# GRADE APPLICATION RANGE

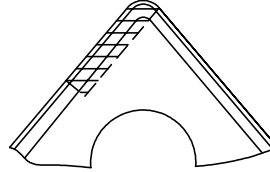
## Insert Heat and Wear Zones



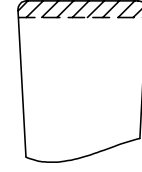
Grooving



Threading & Finishing



Roughing



Steel Grooving

Feeds .0005 to .003 IPR  
<sup>1</sup>( Group 10 and 23 Grades )

Feed Rates over .005 IPR  
<sup>2</sup>( Group 56 Grades )

<sup>1</sup> Threading, Grooving and Finishing operations generate considerable heat at the cutting edge. The Inserts often cut through abrasive, work hardened surfaces. Carbide Grades for these applications need to have high heat and wear resistant edges.

<sup>2</sup> Steel Cutting Inserts have to absorb and dissipate the large volume of heat that develops behind the cutting edge where the chips start to curl. Cratering can occur in this area due to high cutting forces. Steel Grades have additives and/or coatings to provide crater resistance. These Grades generally have less heat and wear resistant cutting edges than the Grades used in finishing applications. The edges on Steel Cutting Inserts are usually honed to prevent chipping.

### PRIMARY GRADES 1st choice for best results

Carbide Groups	Uncoated	TIN Coated	TiALN Coated	Applications
<b>10</b> Tough, Chip Resistant C1 Micrograin Grades	<b>C10</b>	<b>310FG</b>	<b>310</b>	<b>C10</b> C1 - High wear & chip resistance at very low speeds in most materials <b>310FG</b> C1-C2/C5 - Increased tool life, reduced chipping from built-up edge <b>310</b> C1-C2/C5 - Face Grooving - Small Diameter Threading and Grooving
<b>23</b> Heat & Wear Resistant C2-C3 Micrograin Grades	<b>C23</b>	<b>323FG</b>	<b>323</b>	<b>C23</b> C2-C3 - Non-Ferrous applications - <b>C23J</b> has polished chipbreakers <b>323FG</b> C2-C3/C6-TIN coating adds lubricity reducing edge build-up & chipping <b>323</b> C2-C3/C7 - Heat & wear resistance in Threading, Grooving & Finishing
<b>56</b> C5-C6 Crater Resistant Steel Cutting Grades	<b>C56</b>	<b>356FG</b>	<b>356</b>	<b>C56</b> C5-C6 - Uncoated Special Order only--use coated Grades 356 or 356FG <b>356FG</b> C5-C6 - For use where edge build-up is a problem with Grade 356 <b>356</b> C5-C6 - Steel Cutting Grade - moderate speeds, higher feeds than 323

### For specific applications

<b>320APS</b>	-	-	-	TiALN Coating for Cast Iron
---------------	---	---	---	-----------------------------

### Horizon Carbide - Standard Grade Application Ranges

#### Wear Resistant Grades for Cast Iron and Non-Ferrous Materials plus Threading, Grooving and Finishing Applications

	C2 ( K25 )	C3 ( K15 - K10 )	C4 ( K05-K01 )
	<b>323 - 323F</b>		
		<b>323FG</b>	
		<b>C23 - C23J</b>	
<b>310</b> Threading & Grooving			
<b>310FG</b> Threading & Grooving			
<b>C10</b> Threading & Grooving			

← Increasing Toughness - Shock & Impact Resistance      Increasing Hardness - Heat & Wear Resistance →

#### Crater Resistant Grades for Steel & Stainless plus Wear Resistant Grades for Threading, Grooving and Finishing

C5 ( P50 - P35 )	C6 ( P30 - P20 )	C7 ( P15 - P10 )	C8 ( P05 - P01 )
	<b>323 - 323F - 323FG</b> Threading, Grooving & Finishing		
	<b>323FG</b> Threading & Grooving		
	<b>356</b>		
	<b>356FG</b>		
<b>310</b> Threading & Grooving			
<b>310FG</b> Threading & Grooving			

# GRADE COMPARISONS

Horizon	Tool-Flo®	Kennametal®	Valenite®	Sandvik®	RTW®
<b>Stocked Standard Grades</b>					
<b>C10</b>	C22	K6	VC101	S6 ( Low SFM )	CQ22
<b>C23 C23J</b>	C25	K68	VC2 VC29	H10A H13A	CQ2 CQ23
<b>310F</b>	AT22	KC5025	VC5735	2015 4115	TN6025
<b>323F</b>	AT3	KC5010	VC5810	4125	TN6010
<b>323FG</b>	GP50	KC5010	VC5810	4125	TN6010
<b>Special Purpose Grades</b>					
<b>309APS</b>	CB200	KD120	VC727		
<b>311F</b>	CB400	KD120	VC727		
<b>311APS</b>	CB400	KD050	VC734		
<b>314APS</b>	CB400	KD050	VC734		
<b>320APS</b>	AC50				
<b>323AL</b>		KC5410			
<b>356FG</b>	AC50	KC810 KC850			R0321 R013
<b>365APS</b>					

These are Approximate Grade Comparisons  
 For Best Results Please Call Horizon Carbide Tool for Grade Recommendations.  
 See Page 7 for More Information on Horizon Carbide Grades



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# INSERT CONVERSIONS

Horizon	Tool-Flo®	Kennametal®	Valenite®	Sandvik® **	RTW®	Insert Style
<b>Notch Style Grooving Inserts</b>						
HF	FLF	NF	---	TLF	---	Face Grooving
HFD	FLFD	NFD	---	---	---	Deep Face Grooving
HG	FLG	NG	VLG	TLG	PG	ID or OD Grooving
HG RK-LK *	FLG CB *	NG RK-LK *	---	---	PG RK-LK *	With Chipbreaker *
HGD	FLGD	NGD	---	---	PGD	Deep Grooving
HGD RK-LK	---	NGD RK-LK *	---	---	PGD RK-LK *	Deep Grooving Chipbreaker*
HGP	FLGP	NGP	VLGP	TLGP	---	Positive Grooving
HP	---	NP	---	---	---	Back Turning
HR	FLR	NR	VLR	TLR	PR	Full Nose Radius
HRP	FLRP	NRP	VLRP	TLRP	PRP	Positive Full Nose Radius
HU	FLU	NU	---	TLU	---	45° Undercutting
HV	FLV	NV	---	TLV	---	Poly-V 40°
<b>Notch Style Threading Inserts</b>						
HA	FLA	NA	VLA	TLA	P	Acme
HAS	FLAS	NAS	VLAS	TLAS	PAS	Stub Acme
HDC	FLDC	NDC	VLDC	TLDC	PDC	NPT Full Profile
HJ	FLJ	NJ	---	TLJ	---	UNJ
HJF	FLJF	NJF	---	TLJF	---	UNJ Fine Pitch
HT	FLT	NT	VLT	TLT	PT	60° V Partial Profile
HTB	FLTB	NTB	---	TLTB	---	American Buttress
HTC	FLTC	NTC	---	TLTC	PTC	60° V Full Profile Topping
HTF	FLTF	NTF	VLTF	TLTF	PTF	60° V Fine Pitch
HTK	FLTK	NTK	VLTK	TLTK	PTK	60° V Fine Pitch Positive
HTP	FLTP	NTP	VLTP	TLTP	PTP	60° V Positive
<b>Notch Style Profiling Inserts</b>						
DPGR	DPGR	DPGR	---	---	---	55° Profiling
HPL	FLPL	NPL	---	---	---	LH 55° Profiling
HPR	FLPR	NPR	---	---	---	RH 55° Profiling
VPGR	VPGR	VPGR	---	---	---	35° Profiling

\* Horizon **RK-LK** Style Inserts have ground-in 15° to 18° positive rake "Chip Curlers" with sharp edges for free cutting action in tough materials. Competitive Grooving Inserts have molded chipbreakers designed for Steel. See page 36

\*\* TopLock® style Inserts available on Special Order. Industry Standard Inserts fit Sandvik TL® holders by changing to Kennametal® style insert clamps. See Pages 26 - 28 for replacement clamps.

# SPEEDS & FEEDS

Recommended Speeds & Feeds For Turning & Grooving With Horizon Carbide Inserts					
Material Group	Material Specs.	Surface Speeds (SFM) & Feed Rates (FPR)			
		Uncoated	Coated Grades		
		C23 & C23J	323FG	310F	323F
Aluminum	2024, 6061, 7075 etc.	Maximum SFM .001-.010+ FPR	Maximum SFM .001-.010+ FPR	---	---
Aluminum - Cast	A356 ( A380, A390 Use Diamond )	600-1000 .001-.010+ FPR	800-1000 .001-.010+ FPR	---	---
Copper	Most Alloys	600-1000 .001-.007 FPR	800-1000 .001-.007 FPR	---	---
Brass - Bronze	Most Free Machining Alloys	600-1000 .001-.010 FPR	800-1000 .001-.010 FPR	---	---
Carbon Steels - Soft	1010, 1018, 1025 1117, 12L14	---	300-500 .001-.005 FPR	200-300 .001-.008 FPR	300-600 .001-.005 FPR
Carbon Steels 25 Rc+	1045, 1070, 1144, A36	---	300-450 .001-.005 FPR	200-300 .001-.007 FPR	300-500 .001-.005 FPR
Alloy Steels	4130, 4140, 4330 4340, 8620	---	250-450 .001-.004 FPR	200-300 .001-.006 FPR	300-500 .001-.004 FPR
Alloy Steels 30 Rc+	4130, 4140, 4150 4330, 4340, 52100	---	250-450 .001-.004 FPR	200-300 .001-.005 FPR	300-450 .001-.004 FPR
Tool Steels - Annealed	O1, W1, S6, P20 A6, D2, H13, etc.	---	200-400 .001-.004 FPR	150-300 .001-.004 FPR	200-400 .001-.004 FPR
Stainless Steels	201, 202, 301, 302 303, 304, 410, 416	---	250-450 .001-.003 FPR	200-300 .001-.005 FPR	300-600 .001-.004 FPR
Stainless Steels	304L, 316, 316L, 420 422, 430, 455, 17-4PH	---	200-400 .001-.003 FPR	150-275 .001-.004 FPR	250-550 .001-.003 FPR
Stainless Steels	316VAR, 13-8MO PH 15-5 PH 36 Rc+, 440C	---	150-300 .001-.003 FPR	150-250 .001-.003 FPR	150-350 .001-.003 FPR
Titanium - CP	Commercially Pure	150-400 .001-.006 FPR	250-400 .001-.003 FPR	200-300 .001-.003 FPR	250-600 .001-.003 FPR
Titanium - Alloys	6AL-4V, 5AL-2.5SN	100-200 .001-.003 FPR	100-200 .001-.003 FPR	100-250 .001-.003 FPR	150-350 .001-.003 FPR
Titanium - Hardened	Alloys 36 Rc+	75-100 .001-.003 FPR	75-125 .001-.003 FPR	75-150 .001-.003 FPR	100-200 .001-.003 FPR
High Temp Alloys	Ni 200, Monel, Invar Kovar, Inconel 600	100-150 .001-.003 FPR	100-200 .001-.003 FPR	100-250 .001-.003 FPR	100-300 .001-.003 FPR
High Temp Alloys	A286, Inconel 625 718, X750, Hastelloy	75-150 .001-.003 FPR	100-150 .001-.003 FPR	75-200 .001-.003 FPR	100-200 .001-.003 FPR
High Temp Alloys	Hardened Alloys 35 Rc+, Stellite etc.	50-100 .001-.002 FPR	50-125 .001-.002 FPR	50-100 .001-.002 FPR	75-150 .001-.003 FPR
Core Iron	Low Carbon Iron & Soft Iron Alloys	---	300-500 .001-.004 FPR	200-300 .001-.005 FPR	300-600 .001-.005 FPR
Gray Cast Iron	150-325 BHN Class 20, 30, 35, 40	200-300 .001-.010+ FPR	200-600 .001-.010+ FPR	100-300 .001-.010+ FPR	250-600 .001-.010+ FPR
Gray Cast Iron	275-450 BHN Class 50, 55, 60	150-250 .001-.008+ FPR	150-450 .001-.008+ FPR	100-250 .001-.008+ FPR	200-500 .001-.008+ FPR
Alloy / Ductile Iron	60-40-18, 80-55-06 100-70-03, A536	100-250 .001-.008+ FPR	150-500 .001-.008+ FPR	100-300 .001-.008+ FPR	250-500 .001-.008+ FPR

**Horizon Carbide Grades are Designed to provide Long Tool Life at Higher Speeds and Light Feed Rates.**

- 1. Start near the top of the SFM Range using a Light Feed Rate to Reduce Built-up Edge & Insert Chipping.**
- 2. Adjust RPM & Feeds after Setup to achieve Optimum Tool Life. Use Higher Feed Rates in Soft Materials.**
- 3. In Hard Materials Use a Wear Resistant Grade like 323 or 323F at Medium to Low SFM and Light Feeds.**

**Formula to Calculate Surface Feet Per Minute (SFM):  $SFM = 3.1416 \times \text{Part Diameter, Divided by } 12 \times \text{RPM}$**

Recommended Speeds ( SFM ) For Threading With Horizon Carbide Inserts					
Material Group	Material Specs.	C23	323FG	310F	323F
Aluminum	2024, 6061, 7075	Maximum SFM	Maximum SFM	---	---
Copper, Brass, Bronze	Most Alloys	200-600	300-800	---	---
Low Carbon Steels	1018, 1025, 1117, 12L14	---	300-500	200-300	300-600
Medium Carbon Steels	1045, 1070, 1144,	---	300-450	200-300	300-500
Alloy Steels	4130, 4140, 8620	---	250-450	200-300	300-500
Alloy Steels 28 Rc+	4150, 4340, 52100	---	250-400	200-275	300-450
Stainless Steels	303, 304, 410, 416	---	225-400	200-300	250-450
Stainless Steels	316, 316L, 422, 17-4PH	---	200-375	150-275	225-400
Titanium - CP	Commercially Pure	150-300	200-400	200-300	250-500
Titanium - Alloys	6AL-4V, 5AL-2.5SN	100-200	100-225	100-250	150-275
Nickel / Cobalt Alloys	Monel, Invar, Kovar	100-250	100-300	100-300	100-300
High Temp Alloys	Inconel, Hastelloy, A286	75-150	100-150	75-200	100-200
Cast Iron 150-325 BHN	Class 20, 30, 35, 40	200-300	200-600	100-300	250-600
Cast Iron 375-450 BHN	Class 50, 55, 60	150-250	150-450	100-250	200-500
Alloy / Ductile Iron	60-40-18, 80-55-06	100-250	150-400	100-300	250-450

**Threading Guidelines For CNC Lathes**

**1. Start near the top of the SFM range for the material being threaded.**

Higher SFM reduces Built-up Edge, the major cause of poor tool life in threading. For Harder or more Abrasive Materials start in the Middle of the SFM range. Once setup is complete SFM can be adjusted for optimum tool life. Tough Micrograin Grade 310 reduces insert chipping from edge build-up at lower SFM and on parts under 1" Diameter.

**Formulas to calculate Revolutions Per Minute (RPM) and Surface Feet Per Minute (SFM) :**

$$RPM = SFM \times 12 \text{ Divided by Part Diameter} \times 3.1416$$

$$SFM = 3.1416 \times \text{Part Diameter, Divided by } 12 \times RPM$$

**2. Use the G76 Threading Cycle with Fanuc, Yasnac and similar CNC controls.**

If **P1, P2, P3, & P4** parameters are available, use **P1** for most applications. **G76 - P1** removes equal amounts of material with every pass. **P2** alternates between front & back cutting edges and should only be used on 6 tpi & coarser threads.

**3. Set Depth of Cut for the First Pass at 20% to 30% of the Thread Height Per Side.**

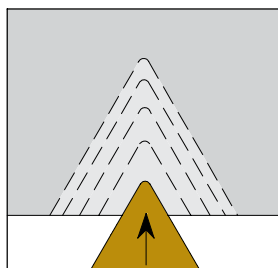
**G76** controls the depth of cut for the remaining passes. To find the **DOC** for the 1st Pass multiply the **PITCH** by **.6** to get the approximate **THREAD HEIGHT**. Multiply **THREAD HEIGHT** by **20 - 30%** to get the **DEPTH** of the 1st Pass. Use less than **20%** when threading hard materials or larger thread pitches. Don't use "Spring Passes" under .002 DOC Per Side!

**Example for calculating the DOC for the first pass on a 1/2-20 thread:**

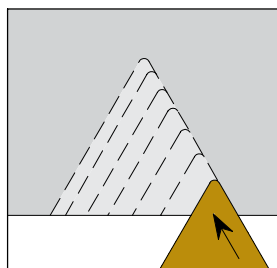
$$1" \quad 20 = .050 \text{ PITCH}), (.050 \times .6 = .030 \text{ ( THREAD HEIGHT ), } .030 \times .3 = .009 \text{ ( DEPTH OF 1st PASS )}$$

**4. Use the A55 Parameter to set the Infeed Angle.**

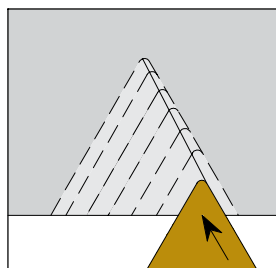
Most CNC Lathe Controls offer a choice of **A60, A55, A30 & A29**. **A60** is the default setting. **A55** is equivalent to setting the compound feed on a manual lathe to 27.5°. In most applications **A55** will double or triple tool life over **A60**. See below:



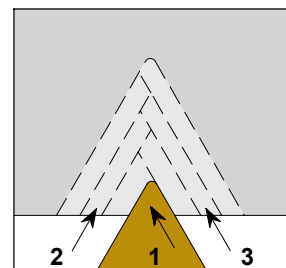
Radial Feed



Flank Feed - A60



Mod. Flank Feed - A55



Alternating Feed - P2

# “CHIP CURLER” INSERT INFO

## HORIZON RK - LK “CHIP CURLER” GROOVING INSERTS



**15° to 18° Positive Rakes Lower Cutting Forces and Reduce Built-Up Edge Problems**

**Sharp Cutting Edges for Tough, Gummy Materials like Stainless, Titanium and Inconel®**

**Free Cutting Action - Great for Small Diameters and Thin Walled Parts**

**Uncoated Inserts for Aluminum and Plastics have Polished Chip Curlers**

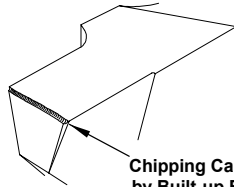
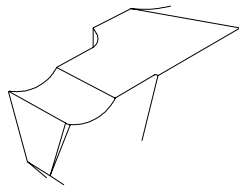
**Available in Standard Depth, Deep Depth and Face Grooving Inserts**

**PRECISION GROUND CUTTING EDGES MEAN BETTER FINISHED AND LONGER TOOL LIFE IN MOST APPLICATIONS!**

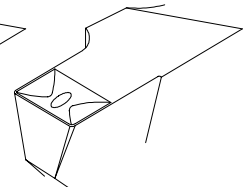
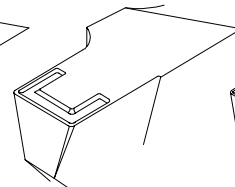
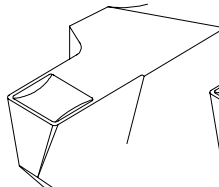
**Chip Curler Inserts**

**Standard Inserts**

**Competitive Chipbreaker Inserts**



Chipping Caused by Built-up Edge



Horizon Precision Ground “Chip Curler” Inserts prevent Edge Built-up in tough, gummy materials. Sharp, positive rake edges lower cutting forces providing easy chip flow.

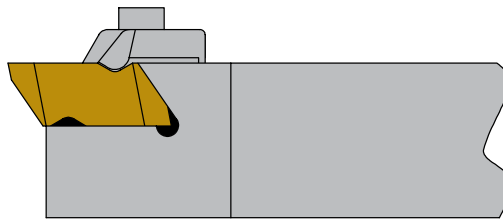
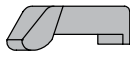
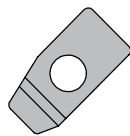
Recommended Feeds for tough materials - .0005 to .003 IPR. Softer Materials can be machined at higher feeds. Uncoated Inserts for Aluminum and Plastic have polished rakes.

Molded Chipbreaker Inserts are designed for machining Medium to High Carbon Steels at feed rates over .005 per rev. Most of these Inserts have a .003 to .010 wide land in front of the chipbreaker.

The area of chip contact rarely exceeds the land width at feeds under .005 IPR. At lighter feed rates performance difference is minimal between chipbreaker Inserts and standard flat top styles.

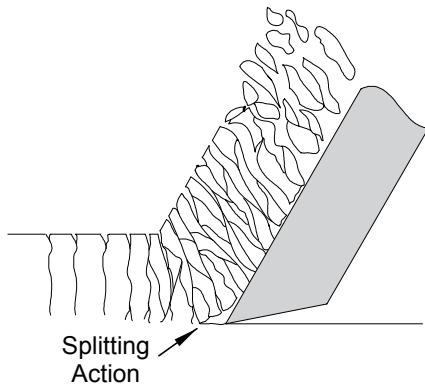


**Threading and Grooving Inserts are available with TL® Style Notches on Special Order**



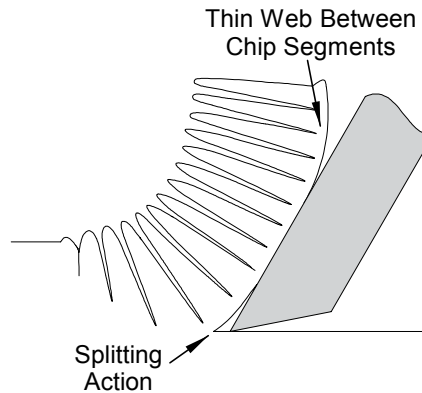
**Changing Clamps allows the use of Industry Standard Inserts in TL Holders**

# Chip Formation



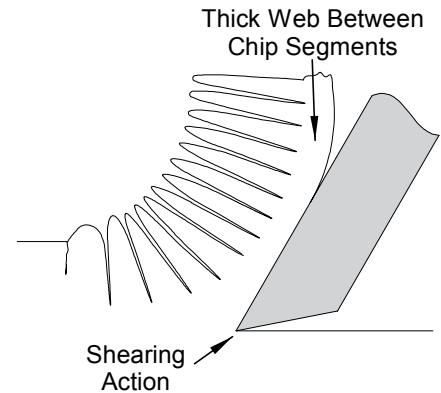
Cast Iron, Hard Brass and other materials that produce powdery chips

Chips begin breaking in front of the cutting edge. Chip controls is usually not a problem. Harder, more heat and wear resistant carbide grades such as 323 or 323F work well on these applications. Use sharp inserts for most Non-Ferrous materials. Most Cast Iron Inserts are honed to resist chipping. Abrasive flank wear is the primary failure mode.



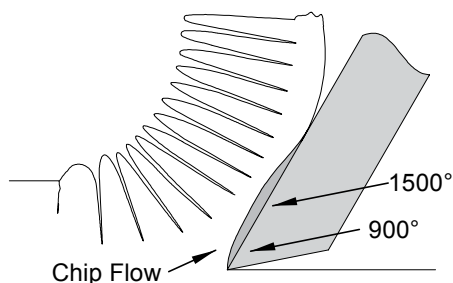
Carbon and Alloys Steels with Medium to High Carbon Content

1035, 1045, 1144, 4130, 4140, 4340 Carbon and Alloy Steels that contain at least .3% Carbon are hardenable by heating and quenching. The cutting action is similar to a wedge splitting wood. High pressure develops in the zone behind the cutting edge where chips start to curl. Cratering can occur in this area. Steel cutting grades and coatings help eliminate this problem.

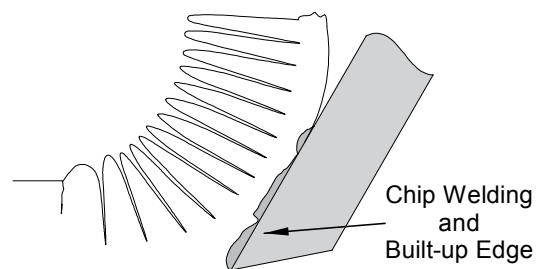


Low Carbon Steels, Stainless, Nickel Alloys, Titanium, Aluminum & Copper

Tough, gummy metals that need to be sheared. Chips are thicker and more difficult to break than those produced at the same feeds in Steel. Chip welding and edge build-up is a common problem in these materials. Sharp Inserts with positive rake chipbreakers work well in these applications. Horizon RK/LK style Grooving Inserts are recommended.



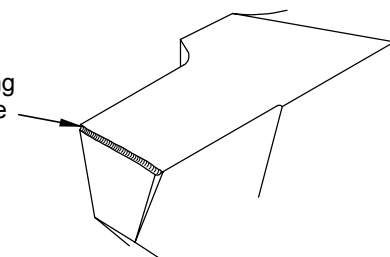
Under optimum cutting conditions, the underside of the chips soften to become almost fluid as they pass across the Insert. This helps chips flow easily out of the cut. The flow zone behind the cutting edge is where the highest heat and pressure develops. Cratering can also occur in this area.



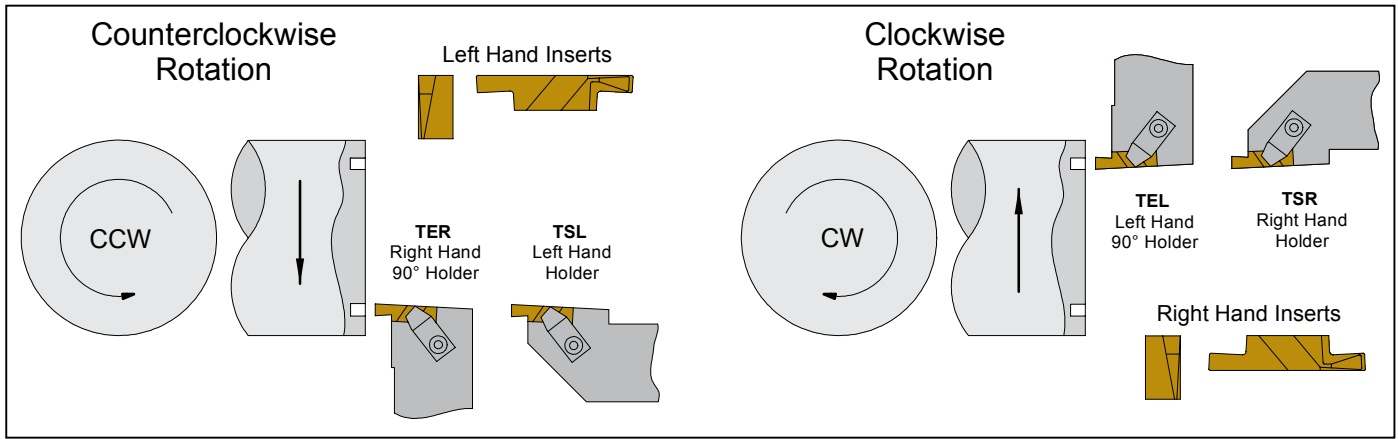
Built-up edge occurs when the SFM is too low to generate enough heat to keep chips from pressure welding to the Insert. This results in poor finish and edge chipping. Increased SFM, positive rake geometry and coated Inserts reduce chip welding. Use grades 110 or 310 to resist chipping when the SFM can not be sufficiently increased.

A .002 to .003 wide area of chipping or cratering across the top face of a grooving Insert is usually an indication of edge build-up. In most instances increasing the SFM will correct the problem. Also check to insure that the tool is not running above center. Horizon RK / LK Chip Curler inserts help prevent build-up in tough, gummy materials.

.002 - .003 Chipping or Cratering at the Cutting Edge



# FACE GROOVING



Counterclockwise Spindle Rotation is the recommended method for most face grooving applications

Horizon Face Grooving Inserts					
Specials	Standards	Insert	W	E - Max. Depth	Min. Groove Dia.
		HF 3062L or R	.062	.125	1.000
		HF 3072L or R	.072	.125	1.000
		HF 3094L or R	.094	.185	1.000
		HF 3098L or R	.098	.185	1.000
		HF 3110L or R	.110	.185	1.125
		HF 3125L or R	.125	.185	1.125
		HF 3156L or R	.156	.185	1.200
		HF 3189L or R	.189	.185	1.200
		HF 4250L or R	.250	.255	2.250
		HFD 3125L or R	.125	.250	1.875
		HFD 4189L or R	.189	.375	2.250
		HFD 4250L or R	.250	.500	2.250

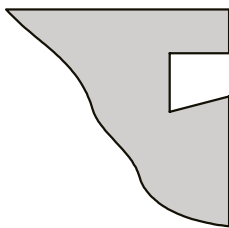
TiAlN Coated Micrograin Grade 310 is the 1st Choice for most Face Grooving applications. In Stainless and Softer Steels start at 300 SFM and .0005 to .002 Feed; Titanium, Inconel & other High Temp Alloys start at 100 - 150 SFM and .0005 to .0015 Feed. Use Uncoated Grade C23 for Aluminum, Copper and Plastics at higher Speeds and Feeds.

Standard Grooving Inserts can be used for Larger Diameter Face Grooving without Modification			
Insert	Insert Width	Maximum Groove Depth	Minimum Groove Diameter
HG 20xxL or R	Under .047	.055	2.125
HG 20xxL or R	.047 to .062	.080	2.750
HG 20xxL or R	.062 and up	.115	3.500
HG 30xxL or R	Under .047	.055	2.125
HG 30xxL or R	.047 to .062	.080	2.750
HG 30xxL or R	.062 to .094	.115	3.500
HG 30xxL or R	.094 to .125	.192	6.00
HG 31xxL or R	.125 and up	.205	6.500
HG 4125L or R	.125	.205	7.250
HG 4156L or R	.156	.205	7.250
HG 4189L or R	.189	.255	8.250
HG 4250L or R	.250	.255	8.250

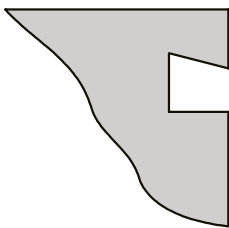


# DOVETAIL FACE GROOVING

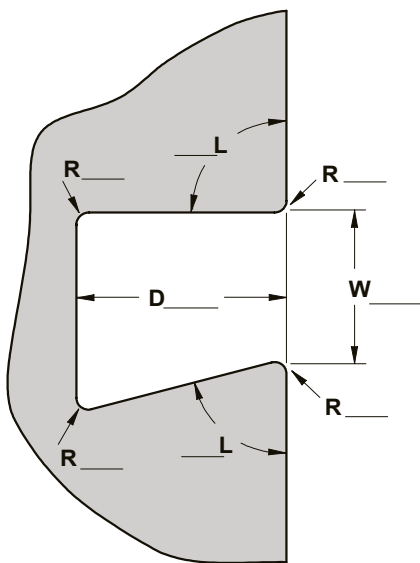
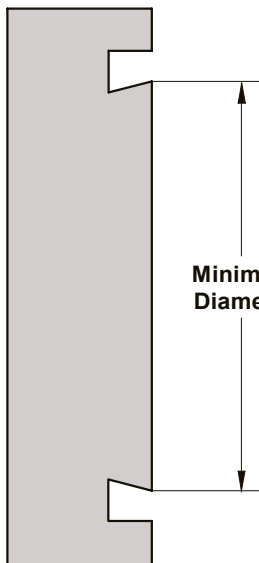
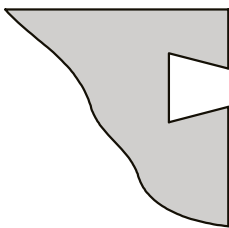
Type 1



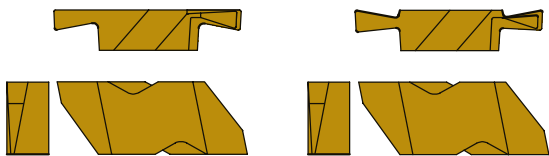
Type 2



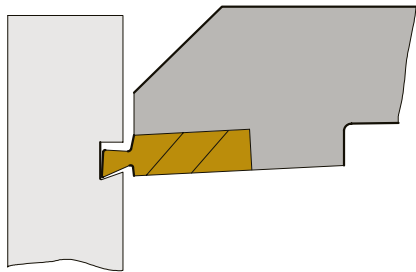
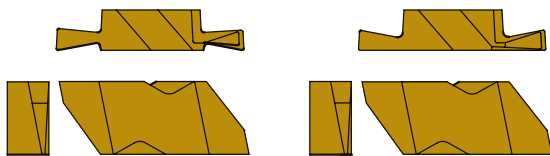
Type 3



Left Hand Inserts for Counterclockwise Rotation



Right Hand Inserts for Clockwise Rotation



**CORRECT**  
Ramp in with  
Multiple Passes



**WRONG**  
Can Result in  
Insert Breakage



Infeed for Dovetail  
Face Grooving

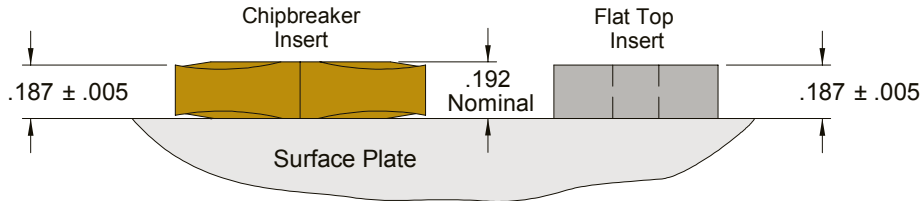
Dovetail Face Grooves are used in the High Vacuum and Hydraulic Industries to retain O-Ring Seals in Plates and Flanges. There is no Industry Standard for these types of grooves. Dovetail Grooving Inserts are made to Print. Horizon Stocks a number of Special Inserts in frequently used sizes. Call for availability.

TiALN Coated Grade 310 is the First Choice for Face Grooving tough materials. Start at 150 to 300 SFM with a Feed Rate of .0005 to .001 Per Rev. Ramp into the cut as shown above. For best results machine an entry groove with a Standard Face Grooving Insert the width of the top of the Dovetail Groove.

TECHNICAL INFORMATION

# INSERT TECHNICAL INFORMATION

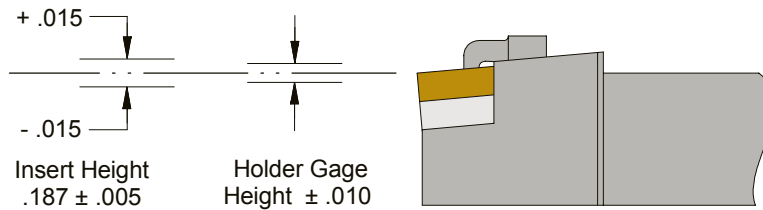
## Cutting Edge Height vs. Insert Thickness



The Industry Standard thickness tolerance for “G” (ground) and “M” (molded) class Inserts is  $\pm .005$ . This standard was established before the introduction of molded chipbreakers and creates confusion regarding double sided turning Inserts.

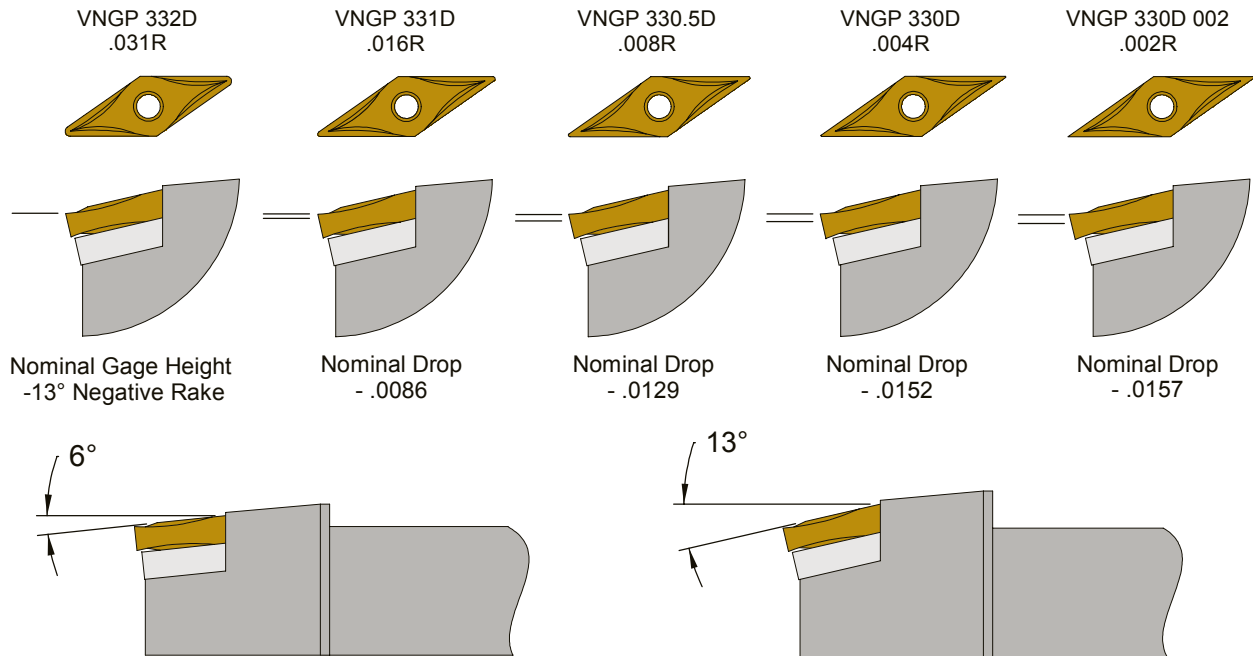
Negative rake chipbreaker Inserts are nominally thicker than flat top Inserts. An elevated pad on both sides of the Inserts keep the unused edges from contacting the tool holder or shim seat. The tolerance refers to the cutting edge height rather than the Insert thickness. The easiest way to measure the cutting edge height is with a height gage on a surface plate.

## Tool Holder Insert Height



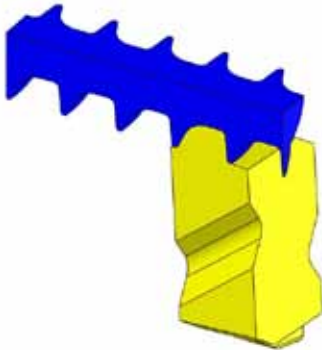
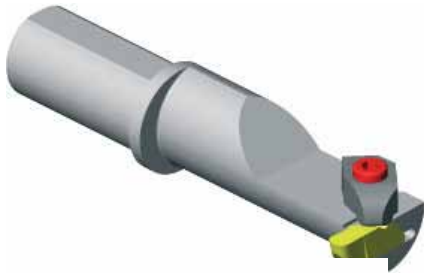
The Industry Standard for Insert height in tool holders is  $\pm .010$ . This creates a Center Height range of  $.030 (\pm .015)$  when combined with the Insert tolerance of  $\pm .005$ . For best results on smaller diameter parts and/or small nose radius Inserts the center height should be adjusted to a maximum of  $\pm .001$ .

## Insert Cutting Edge Height



Insert heights for most negative rake tool holders are set using  $.031R$  Gage Inserts. There are no geometry standards for negative rake  $35^\circ$  tool holders. Insert rake angles vary between manufacturers and range from  $-6^\circ$  to  $-13^\circ$ . This causes problems with inserts having a nose radius other than  $.031R$ . Center Heights for smaller radius inserts drop due to the negative rake angles. The drop is significant with  $35^\circ$  and  $55^\circ$  Negative Rake inserts. Horizon DNGP and VNGP Inserts are ground to the low side of the height tolerance to reduce center height problems.

# FAST Delivery on Specials!



*Intricate form threading inserts designed to customer part drawing.*

*Complex undercutting inserts.*

*Dovetail OD, ID, and face grooving inserts.*

*Bone screw threading inserts.*

*Special form inserts.*

*We stock a large inventory of special blanks designed for unique applications.*

*Standard tolerances for special inserts are +/- .001*

*Closer tolerances on request*

*Special inserts can be supplied with any commercially available coating process*

*Close tolerance, "state of the art" grinding machines for accurate and precision ground inserts.*

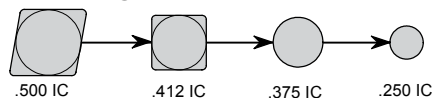
*SolidWorks 3D CAD Software used for Engineering and Special Tooling Design.*

*For Fast Quotes send your Drawings, Part Prints, SolidWorks or DFX/DWG CAD files.*

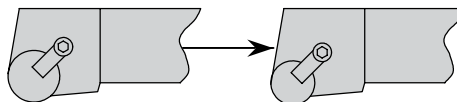
*We also provide Special Tool Holders and Boring Bars, and Intricate Holders for Cat and HSK.*



## We Regrind Ceramic Inserts



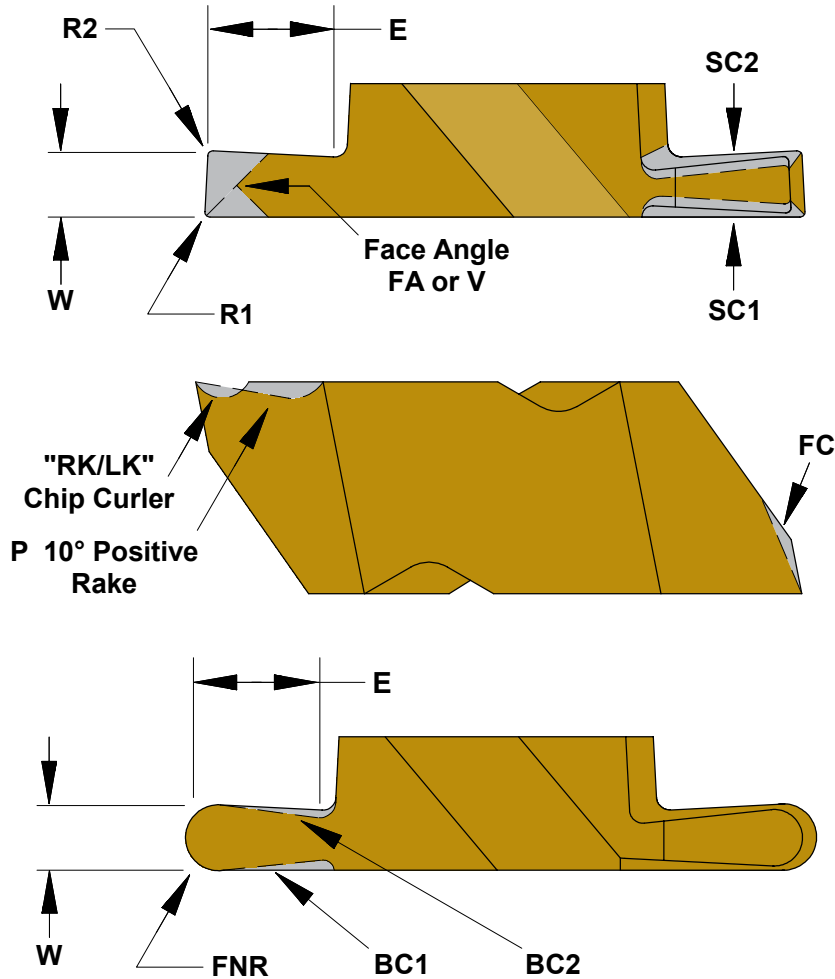
*New or Used Ceramic Inserts Reground, Reshaped or Downsized.  
Get the maximum use out of expensive Ceramic Inserts.  
Our Standard Regrind Tolerance is  $\pm .0005$*



*We can provide Special Tool Holders for Resized Ceramic Inserts.*

*Horizon Specializes in Grinding Whisker Reinforced and other High Tech Ceramic Materials.  
50 Piece Min. Quantity for Regrinding Used Ceramic Inserts. Call for additional information.*

# QUICK MODIFICATIONS



## Quick Modifications Guide for Standard Threading and Grooving Inserts

<b>E</b> - Back Distance or Maximum Depth of Cut	<b>FA</b> - Face Angle **
<b>W</b> - Width of Cut	<b>V</b> - Threading or Grooving Angle **
<b>R1</b> - Outer Corner Radius *	<b>FC</b> - Increased Face Clearance Angle
<b>R2</b> - Inner Corner Radius *	<b>SC1</b> - Outer Side Clearance Angle
<b>FNR</b> - Full Nose Radius **	<b>SC2</b> - Inner Side Clearance Angle
<b>RK/LK</b> - 10° - 20° Chip Curler - RH or LH Inserts **	<b>BC1</b> - Outer Back Clearance Angle *
<b>P</b> - 10° Positive Rake - Standard Rake is 5° **	<b>BC2</b> - Inner Back Clearance Angle *

\* Width of Cut may change with modifications  
 \*\* Width and/or Depth of Cut may change with modifications

### Uncoated Inserts modified in 1 to 3 Working Days - Please add 3 to 10 Days for Coatings.

Horizon can provide inserts with any commercially available coating. Some coated Inserts can be re-coated after modification: PVD TIN can be re-coated with TIN, TiCN or TiALN coatings: TiALN coated Inserts can be re-coated with PVD TIN. Note: PVD re-coating can chip or flake off due to excess coating thickness. Performance is not guaranteed on recoated inserts.

Some Insert modifications don't require re-coating. Aside from cosmetics, the removal of PVD coating from the periphery of a Carbide Insert has minimal effect on it's performance in most applications so long as the coating on the Top Surface of the Insert remains intact.

**Please Contact Horizon Carbide Tool for Price and Delivery on Modified Standard Inserts**

# SPECIAL TOOLING REQUEST FORM



Fax or Send Request to:

2404 S. Industrial Park Ave. Tempe, AZ 85282  
(480) 968-0957 Fax (480) 968-8042  
info@horizoncarbide.com

(BOLD = required information)

Date \_\_\_\_\_ Page \_\_\_\_ Of \_\_\_\_

End User \_\_\_\_\_ Phone \_\_\_\_\_

Contact \_\_\_\_\_ Fax \_\_\_\_\_

Address \_\_\_\_\_ Pager or VM \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_ Zip \_\_\_\_\_ E-mail \_\_\_\_\_

Horizon Distributor/Quote Contact \_\_\_\_\_ Phone/Email \_\_\_\_\_

### Machine Information

Turning \_\_\_\_ Milling \_\_\_\_ Machine Make & Model \_\_\_\_\_

Age & Condition \_\_\_\_\_ HP \_\_\_\_\_ Max RPM \_\_\_\_\_ Max Table Feed - IPM \_\_\_\_\_

Limitations \_\_\_\_\_ Coolant - Dry \_\_\_\_ Wet \_\_\_\_ Type \_\_\_\_\_

Fixturing / Workholding \_\_\_\_\_

Interruptions to the cut? YES or NO

### Part Information

Description \_\_\_\_\_

Material \_\_\_\_\_ Condition \_\_\_\_\_

(include material specification if possible)

Hardness (Rc) \_\_\_\_\_ Tolerance \_\_\_\_\_ Surface Finish Requirements \_\_\_\_\_

### Tool Information

(please attach a complete sketch or part drawing to which we can design the tooling)

Tool Description \_\_\_\_\_

Shank Size / Description \_\_\_\_\_ Right or Left Hand Cutting \_\_\_\_\_

Current Tooling \_\_\_\_\_ Diameter Being Cut \_\_\_\_\_

Special Tool Holder Requirements \_\_\_\_\_ Quantities to be Quoted:

Current Problem or Objective \_\_\_\_\_

Inserts _____
Boring Bars _____
Holders _____

**SolidWorks**

Manufacturing  
Network  
Partner

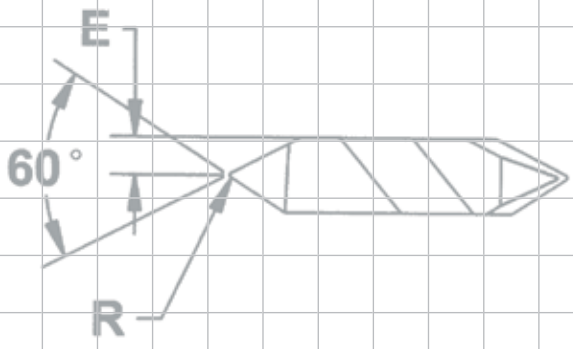
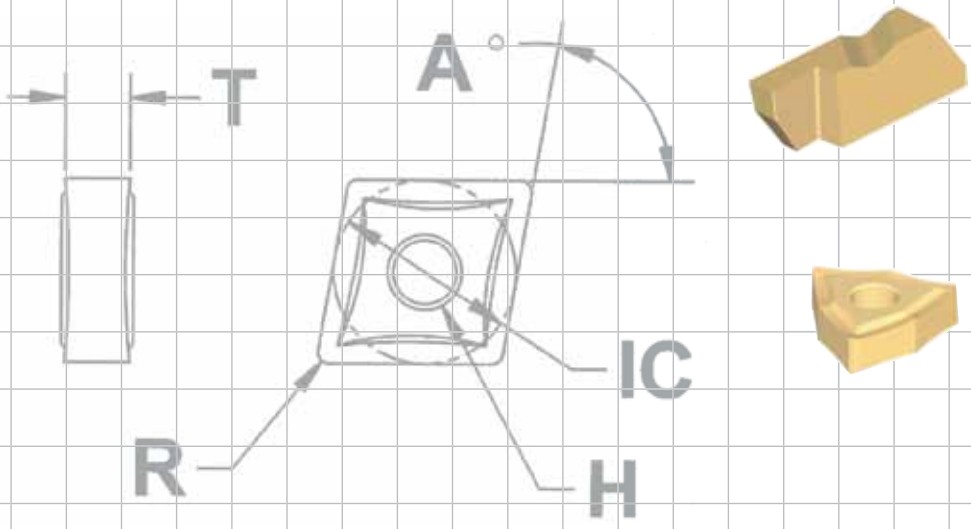
Please Attach Drawings of Your Parts and Special Tooling.  
You can also E-mail us SolidWorks or DXF-DWG CAD Files.



BLANK

inside back

cover



**SolidWorks** Manufacturing Network Partner

→ eDRAWINGS®

See our web site for details

WEBSITE: [www.horizoncarbide.com](http://www.horizoncarbide.com)  
 e-mail: [info@horizoncarbide.com](mailto:info@horizoncarbide.com)



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**FAX: 480.968.8042**

**Outside AZ, Call: 1-800-968-0957**

