

TurnLine



# WAVYJOINT

[www.tungaloy.com/us](http://www.tungaloy.com/us)

Tungaloy Report No. 515S1-US

Expansion of **BXA10 corner radius, edge prep.** and now available in cost-efficient **MiniForce-Turn**



**INDUSTRY 4.0**  
*FEED the SPEED!*



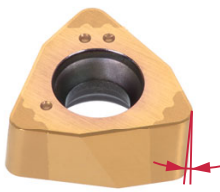
## Expanded lineup of WavyJoint CBN inserts

### Double-sided **positive** insert with CBN tips

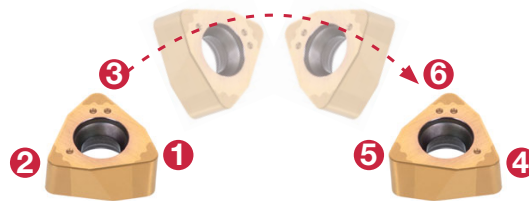
MiniForce-Turn now offers WavyJoint CBN inserts that provide additional strength and security in aggressive cutting conditions.

#### ■ WXGQ0403... insert

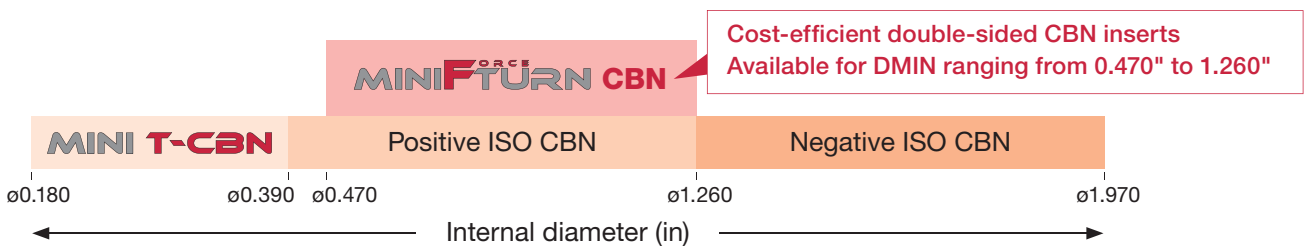
Double-sided positive inserts



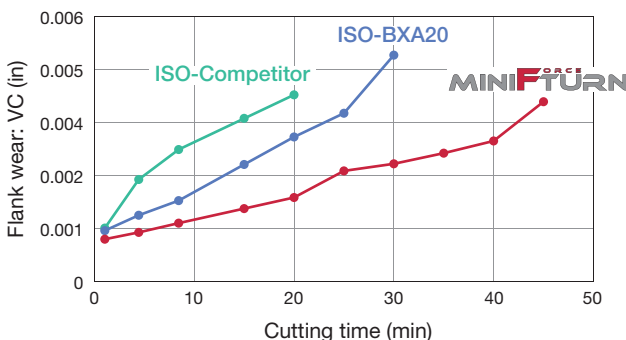
6-edged insert with dovetail design



#### ■ Application range – ID turning of hardened steel



#### ■ Cutting performance – for ID turning of continuous cut (4xD)



Insert : 6QS-WXGQ 221SPL BXA20 (**MiniForce-Turn**)  
 2QP-CCGW 21.51 BXA20 (ISO)  
 CCGW 21.51 type Competitor's H20 grade (ISO)

Toolholder : E10M-SWLXR04-D120 (**MiniForce-Turn**)  
 E10M-SCLCR06-D120 (ISO)

Workpiece material : 4140 (60HRC)  
 Cutting speed :  $V_c = 490$  sfm  
 Feed :  $f = 0.004$  ipr  
 Depth of cut :  $a_p = 0.006$ "  
 Coolant : Wet

Due to unique geometry design, **MiniForce-Turn** insert provides double tool life over competitor's ISO positive insert.

## Double-sided **negative** inserts

Expanded lineup for BXA10 and more corner radius variations.

### BXA10

Shape	Corner R (in)				
	0.008	0.016	0.031	0.047	Wiper
<b>C</b>	-	●	●	●	●
<b>D</b>	●	●	●	●	-
<b>S</b>	-	●	●	●	-
<b>T</b>	-	●	●	●	-
<b>V</b>	●	●	●	●	-
<b>W</b>	-	●	●	●	●

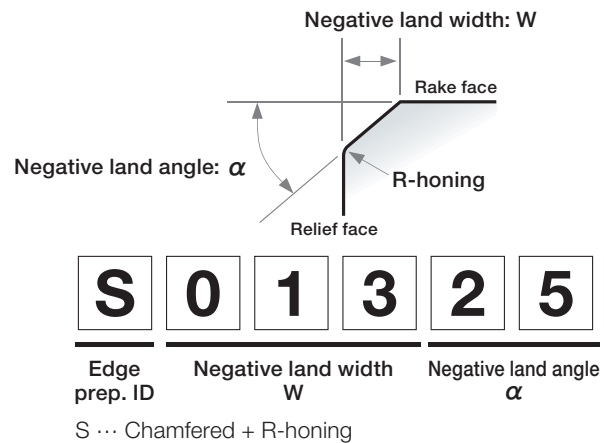
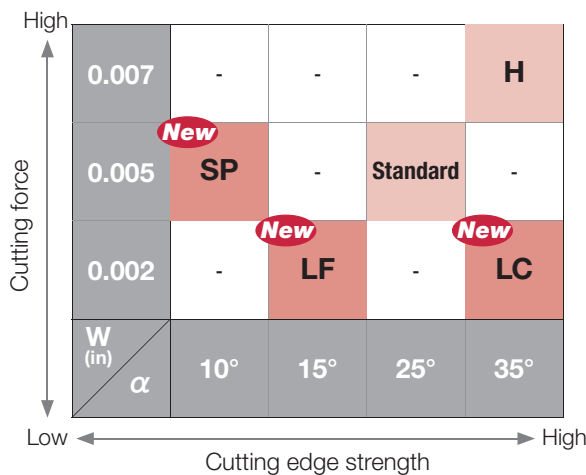
### BXA20

Shape	Corner R (in)				
	0.008	0.016	0.031	0.047	Wiper
<b>C</b>	-	●	●	●	●
<b>D</b>	●	●	●	●	-
<b>S</b>	-	●	●	●	-
<b>T</b>	-	●	●	●	-
<b>V</b>	●	●	●	●	-
<b>W</b>	-	●	●	●	●

● : New product

## Edge preparations

For expanded application range.



**New MiniForce-Turn CBN inserts** are available with SP (S01310) style edge preparation, which is designed to form a high rake angle identical to standard ISO positive insert when positioned on the toolholder for smooth cutting.

New ISO negative inserts are offered with LF (S00515) and LC (S00535) styles for wider application coverage.

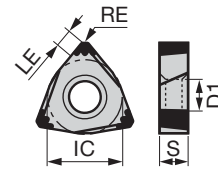
## STANDARD CUTTING CONDITIONS


ISO	Grade	Shape	Workpiece condition	Cutting speed Vc (sfm)	Depth of cut ap (in)	Feed f (ipr)
<b>H</b>	<b>BXA10</b>	ISO Negative type	Continuous	328 - 755	0.002 - 0.031	0.001 - 0.012
			Light interrupted	328 - 755	0.002 - 0.031	0.001 - 0.008
		<b>MINIFURN</b>	Continuous	328 - 755	0.002 - 0.020	0.001 - 0.012
			Light interrupted	328 - 755	0.002 - 0.020	0.001 - 0.008
	<b>BXA20</b>	ISO Negative type	Continuous	197 - 591	0.002 - 0.031	0.001 - 0.012
			Interrupted	197 - 591	0.002 - 0.031	0.001 - 0.008
		<b>MINIFURN</b>	Continuous	197 - 591	0.002 - 0.020	0.001 - 0.012
			Interrupted	197 - 591	0.002 - 0.020	0.001 - 0.008

## CBN INSERTS POSITIVE TYPE **MINIFURN**

- : Continuous cutting
- : Light interrupted cutting
- ✱ : Heavy interrupted cutting

P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●		



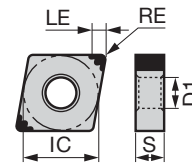
Shape	Designation		BXA10	BXA20	No. of corners	Dimension (in)					Edge prep.					Wiper	Chipbreaker
	Inch	Metric				LE	RE	IC	S	D1	Standard	SP	L	LFLC	H		
																	
<b>6QS-WXGQ</b>	6QS-WXGQ 220.5SPR	6QS-WXGQ040302SPR	●	●	6	0.071	0.008	0.250	0.125	0.106	○						
	6QS-WXGQ 220.5SPL	6QS-WXGQ040302SPL	●	●	6	0.071	0.008	0.250	0.125	0.106	○						
	6QS-WXGQ 221SPR	6QS-WXGQ040304SPR	●	●	6	0.071	0.016	0.250	0.125	0.106	○						
	6QS-WXGQ 221SPL	6QS-WXGQ040304SPL	●	●	6	0.071	0.016	0.250	0.125	0.106	○						
	6QS-WXGQ 222SPR	6QS-WXGQ040308SPR	●	●	6	0.067	0.031	0.250	0.125	0.106	○						
	6QS-WXGQ 222SPL	6QS-WXGQ040308SPL	●	●	6	0.067	0.031	0.250	0.125	0.106	○						







● : New product

## CBN INSERTS NEGATIVE TYPE

- : Continuous cutting
- : Light interrupted cutting
- ✱ : Heavy interrupted cutting

P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●		



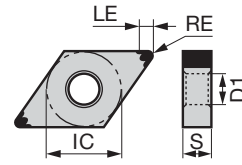
Shape	Designation		BXA10	BXA20	No. of corners	Dimension (in)					Edge prep.					Wiper	Chipbreaker
	Inch	Metric				LE	RE	IC	S	D1	Standard	SP	L	LFLC	H		
																	
<b>4QS-CNGA</b>	4QS-CNGA 431	4QS-CNGA120404	●	●	4	0.063	0.016	0.500	0.187	0.203	○						
	4QS-CNGA 432	4QS-CNGA120408	●	●	4	0.059	0.031	0.500	0.187	0.203	○						
	4QS-CNGA 433	4QS-CNGA120412	●	●	4	0.067	0.047	0.500	0.187	0.203	○						
																	
<b>4QS-CNGA**-LF</b>	4QS-CNGA 431-LF	4QS-CNGA120404-LF	●	●	4	0.063	0.016	0.500	0.187	0.203				○			
	4QS-CNGA 432-LF	4QS-CNGA120408-LF	●	●	4	0.059	0.031	0.500	0.187	0.203				○			
	4QS-CNGA 433-LF	4QS-CNGA120412-LF	●	●	4	0.067	0.047	0.500	0.187	0.203				○			
																	
<b>4QS-CNGA**-LC</b>	4QS-CNGA 431-LC	4QS-CNGA120404-LC	●	●	4	0.063	0.016	0.500	0.187	0.203				○			
	4QS-CNGA 432-LC	4QS-CNGA120408-LC	●	●	4	0.059	0.031	0.500	0.187	0.203				○			
	4QS-CNGA 433-LC	4QS-CNGA120412-LC	●	●	4	0.067	0.047	0.500	0.187	0.203				○			
																	
<b>4QS-CNGA**-H</b>	4QS-CNGA 431-H	4QS-CNGA120404-H	●	●	4	0.063	0.016	0.500	0.187	0.203							○
	4QS-CNGA 432-H	4QS-CNGA120408-H	●	●	4	0.059	0.031	0.500	0.187	0.203							○
	4QS-CNGA 433-H	4QS-CNGA120412-H	●	●	4	0.067	0.047	0.500	0.187	0.203							○
																	
<b>4QS-CNGA**WL</b>	4QS-CNGA 431 WL	4QS-CNGA120404WL	●	●	4	0.063	0.016	0.500	0.187	0.203							○
	4QS-CNGA 432 WL	4QS-CNGA120408WL	●	●	4	0.071	0.031	0.500	0.187	0.203							○
	4QS-CNGA 433 WL	4QS-CNGA120412WL	●	●	4	0.083	0.047	0.500	0.187	0.203							○
																	
<b>4QS-CNGG**-HM</b>	4QS-CNGG432-HM	4QS-CNGG120408-HM		●	4	0.059	0.031	0.500	0.187	0.203							○
	4QS-CNGG433-HM	4QS-CNGG120412-HM		●	4	0.067	0.047	0.500	0.187	0.203							○

● : New product  
● : Line up

## CBN INSERTS NEGATIVE TYPE

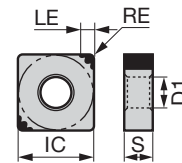
- : Continuous cutting
- ◐ : Light interrupted cutting
- ◑ : Heavy interrupted cutting

P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●	●	●



Shape	Designation		BXA10	BXA20	No. of corners	Dimension (in)					Edge prep.					Wiper	Chipbreaker			
						Inch	Metric	LE	RE	IC	S	D1	Standard	SP	L			LF	LC	H
	<b>4QS-DNGA</b>	<b>4QS-DNGA 430.5</b>	<b>4QS-DNGA150402</b>	●	●	4	0.087	0.008	0.500	0.187	0.203	○								
		4QS-DNGA 431	4QS-DNGA150404	●	●	4	0.079	0.016	0.500	0.187	0.203	○								
		4QS-DNGA 432	4QS-DNGA150408	●	●	4	0.063	0.031	0.500	0.187	0.203	○								
		4QS-DNGA 433	4QS-DNGA150412	●	●	4	0.063	0.047	0.500	0.187	0.203	○								
	<b>4QS-DNGA**</b>	<b>4QS-DNGA 430.5-LF</b>	<b>4QS-DNGA150402-LF</b>	●	●	4	0.087	0.008	0.500	0.187	0.203									
		4QS-DNGA 431-LF	4QS-DNGA150404-LF	●	●	4	0.079	0.016	0.500	0.187	0.203									
		4QS-DNGA 432-LF	4QS-DNGA150408-LF	●	●	4	0.063	0.031	0.500	0.187	0.203									
		4QS-DNGA 433-LF	4QS-DNGA150412-LF	●	●	4	0.063	0.047	0.500	0.187	0.203									
	<b>4QS-DNGA**</b>	<b>4QS-DNGA 430.5-LC</b>	<b>4QS-DNGA150402-LC</b>	●	●	4	0.087	0.008	0.500	0.187	0.203									
		4QS-DNGA 431-LC	4QS-DNGA150404-LC	●	●	4	0.079	0.016	0.500	0.187	0.203									
		4QS-DNGA 432-LC	4QS-DNGA150408-LC	●	●	4	0.063	0.031	0.500	0.187	0.203									
		4QS-DNGA 433-LC	4QS-DNGA150412-LC	●	●	4	0.063	0.047	0.500	0.187	0.203									
	<b>4QS-DNGA**</b>	<b>4QS-DNGA 431-H</b>	<b>4QS-DNGA150404-H</b>	●	●	4	0.079	0.016	0.500	0.187	0.203									
		4QS-DNGA 432-H	4QS-DNGA150408-H	●	●	4	0.063	0.031	0.500	0.187	0.203									
		4QS-DNGA 433-H	4QS-DNGA150412-H	●	●	4	0.063	0.047	0.500	0.187	0.203									
	<b>4QS-DNGG**</b>	<b>4QS-DNGG 432-HM</b>	<b>4QS-DNGG150408-HM</b>	●		4	0.063	0.031	0.500	0.187	0.203									

P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●	●	●



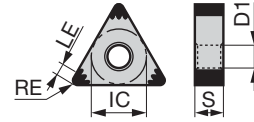
Shape	Designation		BXA10	BXA20	No. of corners	Dimension (in)					Edge prep.					Wiper	Chipbreaker			
						Inch	Metric	LE	RE	IC	S	D1	Standard	SP	L			LF	LC	H
	<b>4QS-SNGA</b>	<b>4QS-SNGA 431</b>	<b>4QS-SNGA120404</b>	●	●	4	0.071	0.016	0.500	0.187	0.203	○								
		4QS-SNGA 432	4QS-SNGA120408	●	●	4	0.071	0.031	0.500	0.187	0.203	○								
		4QS-SNGA 433	4QS-SNGA120412	●	●	4	0.071	0.047	0.500	0.187	0.203	○								

- : New product
- : Line up

## CBN INSERTS NEGATIVE TYPE

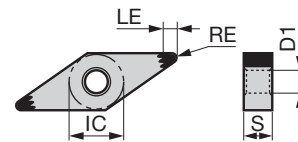
- : Continuous cutting
- ◐ : Light interrupted cutting
- ✱ : Heavy interrupted cutting

P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●	●	●



Shape	Designation		BXA10	BXA20	No. of corners	Dimension (in)					Edge prep.					Wiper	Chipbreaker	
	Inch	Metric				LE	RE	IC	S	D1	Standard	SP	L	LF	LC			H
	<b>6QS-TNGA</b>	<b>6QS-TNGA 331</b>	<b>6QS-TNGA160404</b>	●	●	6	0.075	0.016	0.375	0.187	0.150	○						
		6QS-TNGA 332	6QS-TNGA160408	●	●	6	0.063	0.031	0.375	0.187	0.150	○						
		6QS-TNGA 333	6QS-TNGA160412	●	●	6	0.071	0.047	0.375	0.187	0.150	○						
	<b>6QS-TNGA**-LF</b>	<b>6QS-TNGA 331-LF</b>	<b>6QS-TNGA160404-LF</b>	●	●	6	0.075	0.016	0.375	0.187	0.150							
		6QS-TNGA 332-LF	6QS-TNGA160408-LF	●	●	6	0.063	0.031	0.375	0.187	0.150							
		6QS-TNGA 333-LF	6QS-TNGA160412-LF	●	●	6	0.071	0.047	0.375	0.187	0.150							
	<b>6QS-TNGA**-LC</b>	<b>6QS-TNGA 331-LC</b>	<b>6QS-TNGA160404-LC</b>	●	●	6	0.075	0.016	0.375	0.187	0.150							
		6QS-TNGA 332-LC	6QS-TNGA160408-LC	●	●	6	0.063	0.031	0.375	0.187	0.150							
		6QS-TNGA 333-LC	6QS-TNGA160412-LC	●	●	6	0.071	0.047	0.375	0.187	0.150							
	<b>6QS-TNGA**-H</b>	<b>6QS-TNGA 331-H</b>	<b>6QS-TNGA160404-H</b>	●	●	6	0.075	0.016	0.375	0.187	0.150							
		6QS-TNGA 332-H	6QS-TNGA160408-H	●	●	6	0.063	0.031	0.375	0.187	0.150							
		6QS-TNGA 333-H	6QS-TNGA160412-H	●	●	6	0.071	0.047	0.375	0.187	0.150							
	<b>6QS-TNGG**-HM</b>	<b>6QS-TNGG 332-HM</b>	<b>6QS-TNGG160408-HM</b>	●		6	0.063	0.031	0.375	0.187	0.150							

P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●	●	●



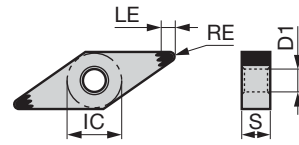
Shape	Designation		BXA10	BXA20	No. of corners	Dimension (in)					Edge prep.					Wiper	Chipbreaker	
	Inch	Metric				LE	RE	IC	S	D1	Standard	SP	L	LF	LC			H
	<b>4QS-VNGA</b>	<b>4QS-VNGA 330.5</b>	<b>4QS-VNGA160402</b>	●	●	4	0.118	0.008	0.375	0.187	0.150	○						
		4QS-VNGA 331	4QS-VNGA160404	●	●	4	0.102	0.016	0.375	0.187	0.150	○						
		4QS-VNGA 332	4QS-VNGA160408	●	●	4	0.067	0.031	0.375	0.187	0.150	○						
		4QS-VNGA 333	4QS-VNGA160412	●	●	4	0.067	0.047	0.375	0.187	0.150	○						
	<b>4QS-VNGA**-LF</b>	<b>4QS-VNGA 330.5-LF</b>	<b>4QS-VNGA160402-LF</b>	●	●	4	0.118	0.008	0.375	0.187	0.150							
		4QS-VNGA 331-LF	4QS-VNGA160404-LF	●	●	4	0.102	0.016	0.375	0.187	0.150							
		4QS-VNGA 332-LF	4QS-VNGA160408-LF	●	●	4	0.067	0.031	0.375	0.187	0.150							
		4QS-VNGA 333-LF	4QS-VNGA160412-LF	●	●	4	0.067	0.047	0.375	0.187	0.150							

- : New product
- : Line up

## CBN INSERTS NEGATIVE TYPE

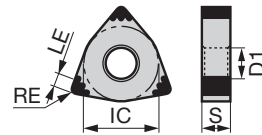
- : Continuous cutting
- ◐ : Light interrupted cutting
- ◑ : Heavy interrupted cutting

P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●●		



Shape	Designation		BXA10	BXA20	No. of corners	Dimension (in)					Edge prep.					Wiper	Chipbreaker			
						Inch	Metric	LE	RE	IC	S	D1	Standard	SP	L			LF	LC	H
	<b>4QS-VNGA**</b> -LC	<b>4QS-VNGA 330.5-LC</b>	<b>4QS-VNGA160402-LC</b>	●	●	4	0.118	0.008	0.375	0.187	0.150									
		4QS-VNGA 331-LC	4QS-VNGA160404-LC	●	●	4	0.102	0.016	0.375	0.187	0.150									
		4QS-VNGA 332-LC	4QS-VNGA160408-LC	●	●	4	0.067	0.031	0.375	0.187	0.150									
		4QS-VNGA 333-LC	4QS-VNGA160412-LC	●	●	4	0.067	0.047	0.375	0.187	0.150									
	<b>4QS-VNGA**</b> -H	<b>4QS-VNGA 331-H</b>	<b>4QS-VNGA160404-H</b>	●	●	4	0.102	0.016	0.375	0.187	0.150									
		4QS-VNGA 332-H	4QS-VNGA160408-H	●	●	4	0.067	0.031	0.375	0.187	0.150									
		4QS-VNGA 333-H	4QS-VNGA160412-H	●	●	4	0.067	0.047	0.375	0.187	0.150									
	<b>4QS-VNGG**</b> -HM	<b>4QS-VNGG 332-HM</b>	<b>4QS-VNGG160408-HM</b>	●		4	0.067	0.031	0.375	0.187	0.150									

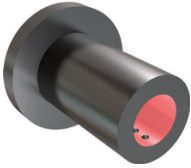

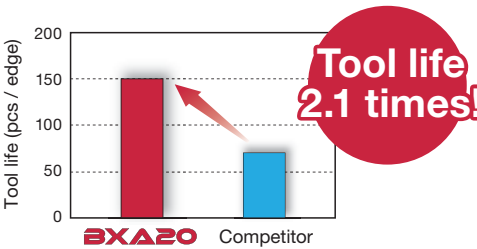
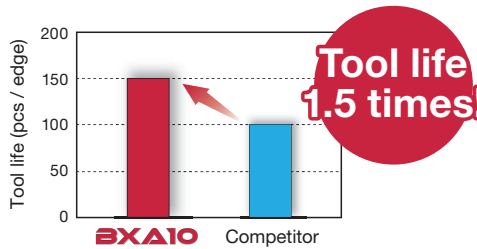
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●●		



Shape	Designation		BXA10	BXA20	No. of corners	Dimension (in)					Edge prep.					Wiper	Chipbreaker			
						Inch	Metric	LE	RE	IC	S	D1	Standard	SP	L			LF	LC	H
	<b>6QS-WNGA</b>	<b>6QS-WNGA 431</b>	<b>6QS-WNGA080404</b>	●	●	6	0.063	0.016	0.500	0.187	0.203	○								
		6QS-WNGA 432	6QS-WNGA080408	●	●	6	0.059	0.031	0.500	0.187	0.203	○								
		6QS-WNGA 433	6QS-WNGA080412	●	●	6	0.067	0.047	0.500	0.187	0.203	○								
	<b>6QS-WNGA**</b> -LF	<b>6QS-WNGA 432-LF</b>	<b>6QS-WNGA080408-LF</b>	●	●	6	0.059	0.031	0.500	0.187	0.203									
	<b>6QS-WNGA**</b> -H	<b>6QS-WNGA 432-H</b>	<b>6QS-WNGA080408-H</b>	●	●	6	0.059	0.031	0.500	0.187	0.203									
	<b>6QS-WNGA**</b> WL	<b>6QS-WNGA 432 WL</b>	<b>6QS-WNGA080408WL</b>	●	●	6	0.071	0.031	0.500	0.187	0.203									

- : New product
- : Line up

# PRACTICAL EXAMPLES

Workpiece type		Machine part	Gear part
Insert		6QS-WXGQ 221SPL	6QS-WXGQ 221SPL
Grade		BXA20	BXA10
		4140 (60HRC)	4140 (60HRC)
Workpiece material		 <b>H</b>	 <b>H</b>
Cutting conditions	Cutting speed: $V_c$ (sfm)	295	230
	Feed : $f$ (ipr)	0.002	0.001
	Depth of cut : $a_p$ (in)	0.003	0.004
	Coolant	Dry	Dry
Results		 <p><b>Tool life 2.1 times!</b></p> <p>Strong cutting edge design of MiniForce-Turn insert provided fracture resistance, prolonging tool life by 2.1 times over the competitor's positive insert.</p>	 <p><b>Tool life 1.5 times!</b></p> <p>MiniForce-Turn insert provided 1.5 times longer tool life over competitor's positive insert, while also eliminated chatter during machining.</p>



[www.tungaloy.com/us](http://www.tungaloy.com/us)

follow us at:

facebook.com/tungaloyamerica  
 twitter.com/tungaloy  
 instagram.com/tungaloyamerica  
 linkedin.com/company/tungaloy-america



AS9100 Certified  
 78006  
 2015.11.04  
 ISO 14001 Certified  
 EC97J1123  
 1997.11.26

Distributed by:



FIND US ON THE CLOUD!  
[machiningcloud.com](http://machiningcloud.com)

