TurnLine

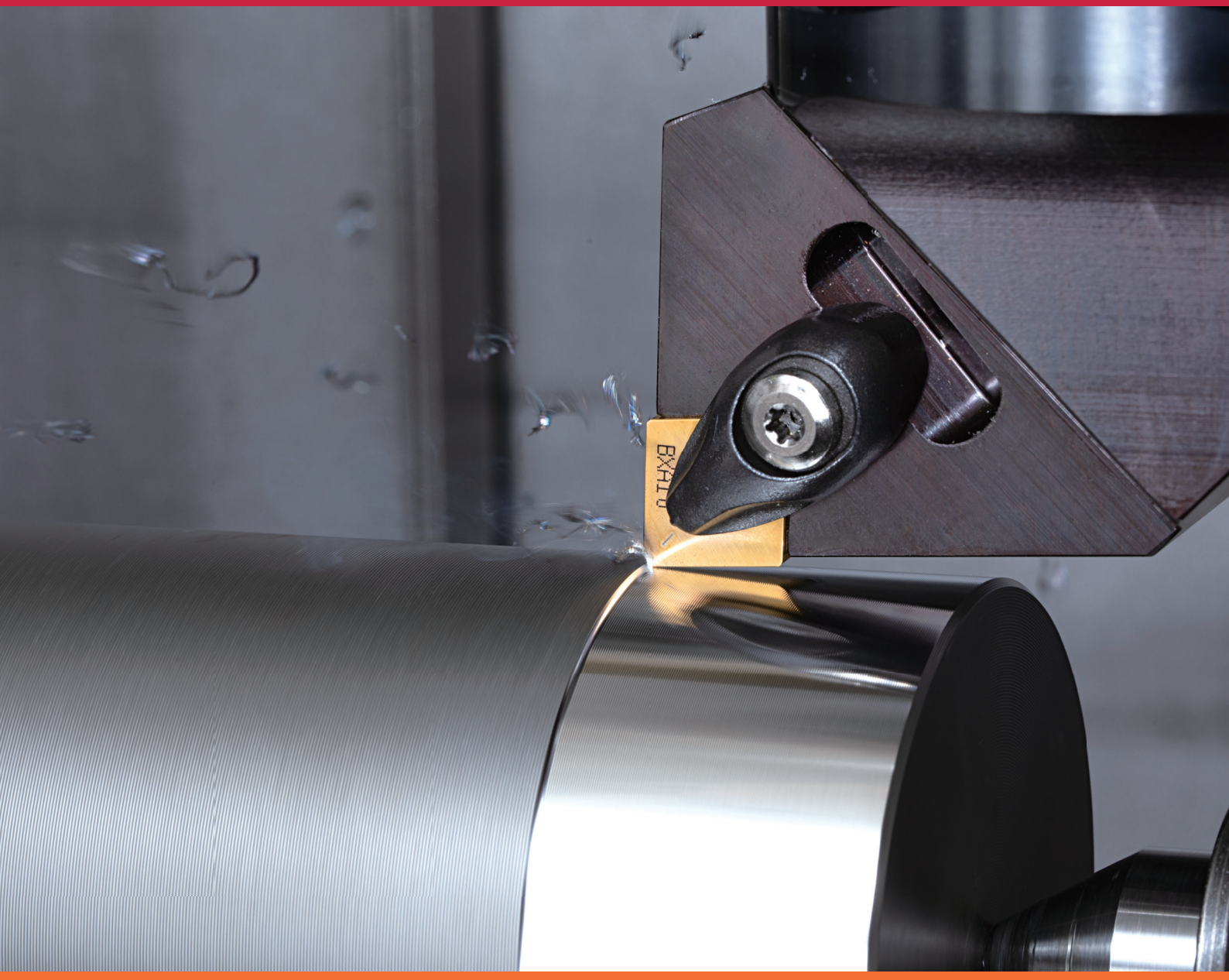
BXA10

www.tungaloy.com/us

Tungaloy Report No. 537-US

Member IMC Group Tungaloy INDUSTRY 4.0

Coated CBN grade with a whole new level of cutting performance for hardened steel



INDUSTRY 4.0

FEED the SPEED!


ACCELERATED MACHINING

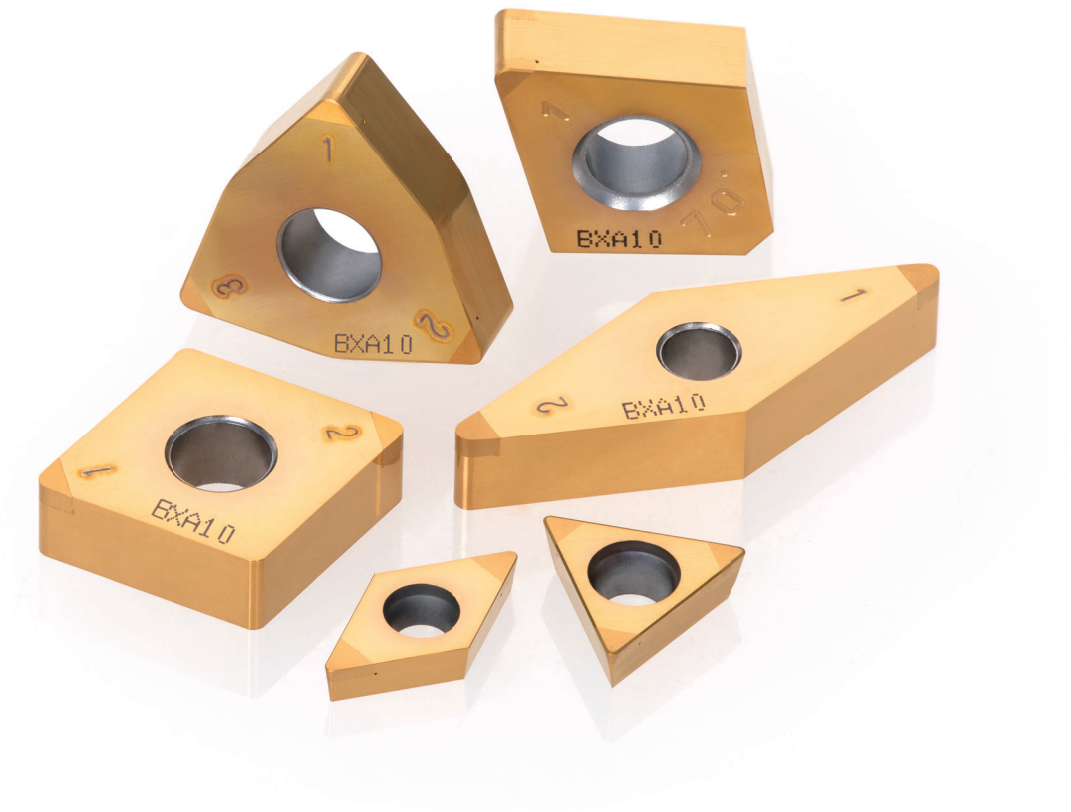
TurnLine

BXA10

TUNGALOY

TUNG FORCE TURN

ACCELERATED MACHINING



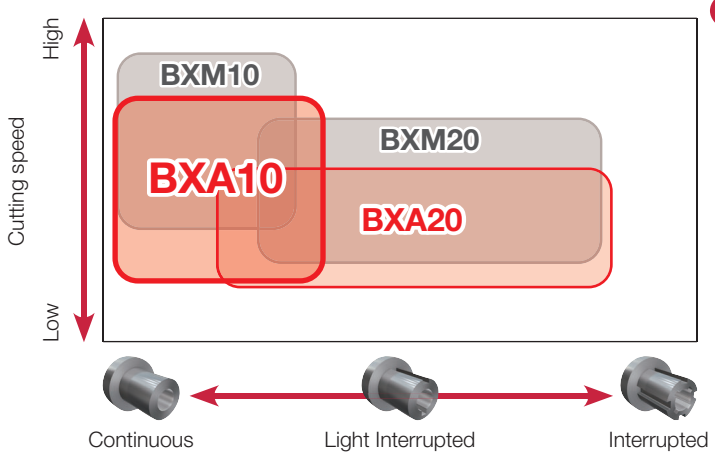
With new BXA10 available in the series, a wider range of continuous and light interrupted cuts are now covered along with versatile BXA20 grade

BXA10
TUNGALOY

Incredible reliability
in hardened steel turning

APPLICATION AREA

The best suitable grade can be selected for your application requirements



New

BXA10
First choice for continuous to light interrupted cuts
For *Vc* = 760 sfm or less

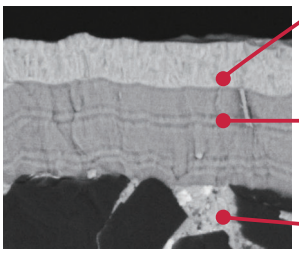
BXA20
First choice for light to heavy interrupted cuts
For *Vc* = 590 sfm or less

BXM10
Complementary grade for continuous to light interrupted cuts
For extremely high cutting speeds of *Vc* = 980 sfm

BXM20
Complementary grade for light to heavy interrupted cuts
For high cutting speeds of *Vc* = 660 sfm

GRADE PROPERTIES

BXA10



TiCN layer with high thermal stability and wear resistance

TiAlN layer with good adhesion and resistance to delamination and chipping

Dedicated CBN substrate with excellent flank wear and crater wear resistance

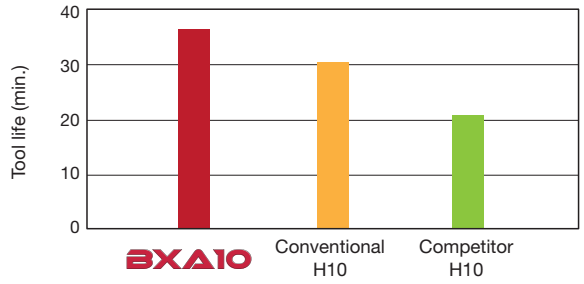
STANDARD CUTTING CONDITIONS

ISO	Grade	Workpiece condition	Cutting speed *Vc* (sfm)	Depth of cut *ap* (in)	Feed *f* (ipr)
H	BXA10	Continuous	330 - 760	0.002 - 0.020	0.002 - 0.012
		Light interrupted	330 - 760	0.002 - 0.012	0.002 - 0.008
	BXA20	Continuous	197 - 590	0.002 - 0.020	0.002 - 0.012
		Interrupted	197 - 590	0.002 - 0.012	0.002 - 0.008

CUTTING PERFORMANCE

BXA10

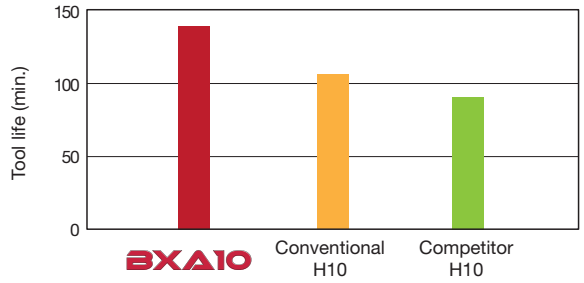
External turning (continuous cutting)



H

Insert : CNGA 432
Workpiece material : 4140 (Alloy steel, 58-60HRC)
Cutting speed : *V*c = 660 sfm
Feed : *f* = 0.006 ipr
Depth of cut : *a*p = 0.006"
Coolant : Wet

Face turning (light interrupted cutting)



H

Insert : CNGA 432
Workpiece material : 4140 (59-61HRC)
Cutting speed : *V*c = 430 sfm
Feed : *f* = 0.006 ipr
Depth of cut : *a*p = 0.006"
Coolant : Wet

5 edge preparation options covering various hard turning applications

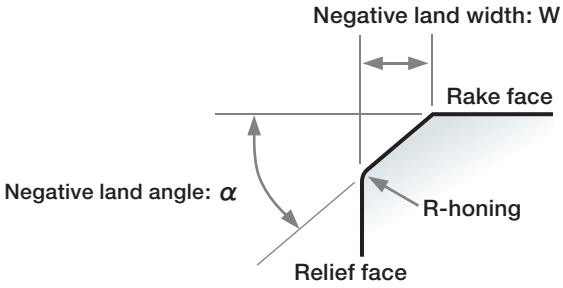
Edge preparations

Negative land angle → Large

Negative land width → Wide

W (in) \ α	15°	25°	35°
0.002	LF	-	LC
0.005	L	Standard	-
0.007	-	-	H

BXA10 inserts



S	0	1	3	2	5
Edge prep. ID	Negative land width W			Negative land angle α	

S ··· Chamfered + R-honing

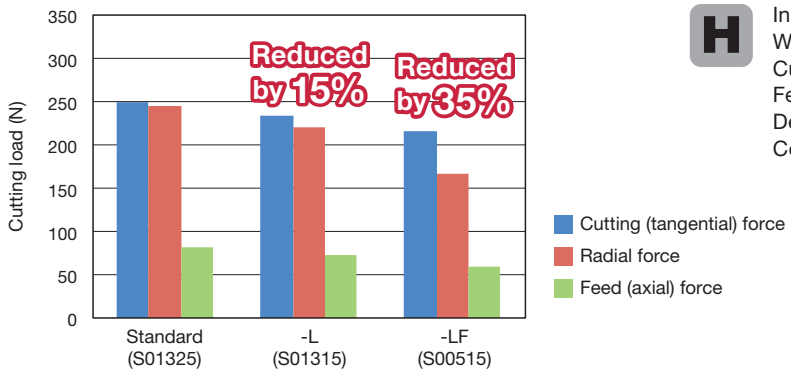
Selections of edge preparations

Allows you to select the most suited types of edge prep for your applications

	Problem	Solution
Standard (S01325)	Generates burrs	-LF (S00515)
	Generates flank wear	-L (S01315)
	Generates crater wear	-LC (S00535)
	Generates fractures	-H (S01835)

Cutting loads

The -L and -LF provide reduced cutting loads over the standard edge prep type

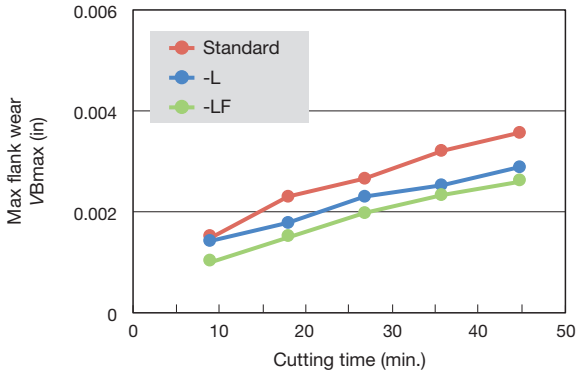


H

Insert : 2QP-CNGA 432
Workpiece material : 4140 (Alloy steel, 60HRC)
Cutting speed : *Vc* = 330 sfm
Feed : *f* = 0.012 ipr
Depth of cut : *ap* = 0.008"
Coolant : Dry

Flank wear

The -L and -LF provide reduced flank wear over the standard edge prep type

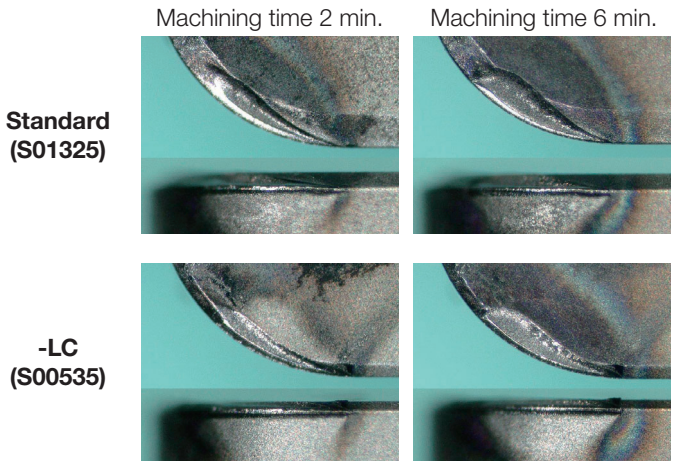


H

Insert : 2QP-CNGA 432
Workpiece material : 4140 (Alloy steel, 60HRC)
Cutting speed : *Vc* = 430 sfm
Feed : *f* = 0.006 ipr
Depth of cut : *ap* = 0.008"
Coolant : Wet

Crater wear

The -LC provides reduced crater wear over the standard edge prep type
Reduces insert fracture induced by crater wear

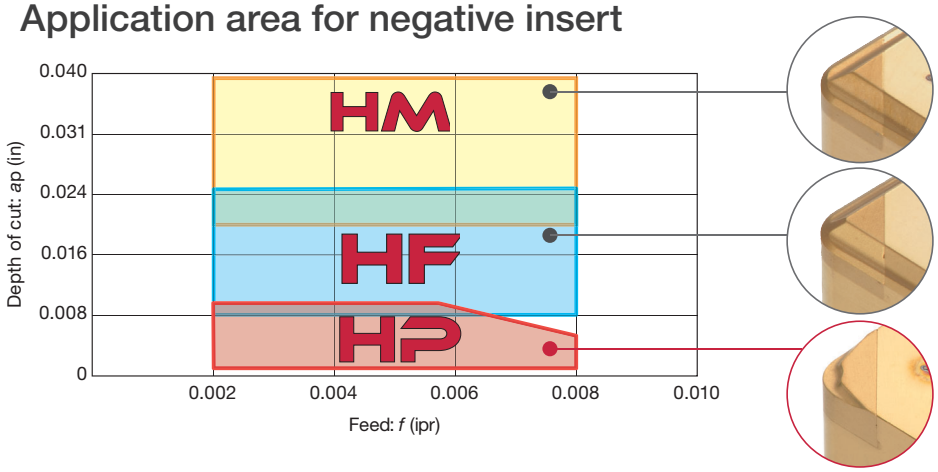


H

Insert : 2QP-CNGA 432
Workpiece material : 4140 (Alloy steel, 60HRC)
Cutting speed : *Vc* = 660 sfm
Feed : *f* = 0.004 ipr
Depth of cut : *ap* = 0.008"
Coolant : Wet

HP chipbreaker

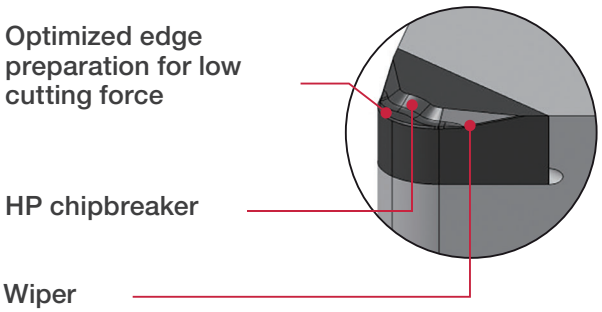
Application area for negative insert



1. By separating the chipbreaker from the cutting edge, the cutting force imposed on the cutting edge during machining is significantly reduced, thus providing long tool life.

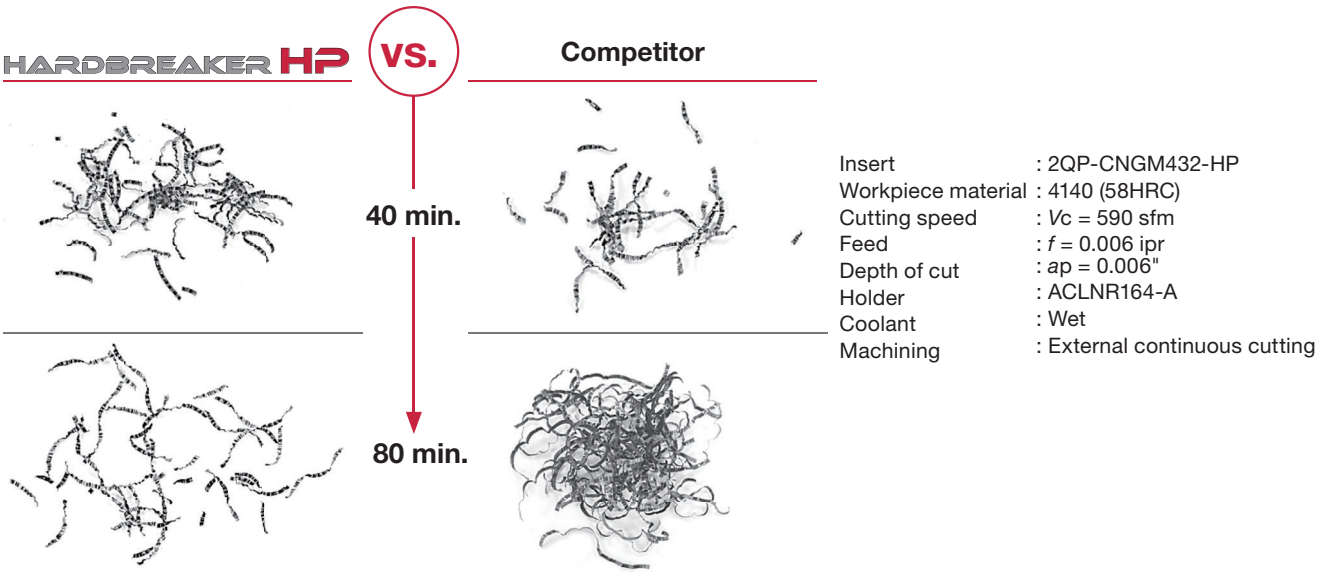
2. The cutting edge preparation is designed to ensure easy cutting at low cutting forces, while maintaining close tolerances with no deviations.

3. The **HP** style chipbreaker, combined with built-in wipers, yields excellent surface quality and good chip control.



Cutting performance

Chip control is stable for a long time

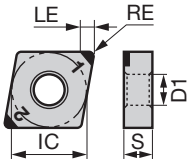


Insert	: 2QP-CNGM432-HP
Workpiece material	: 4140 (58HRC)
Cutting speed	: *Vc* = 590 sfm
Feed	: *f* = 0.006 ipr
Depth of cut	: *a*p = 0.006"
Holder	: ACLNR164-A
Coolant	: Wet
Machining	: External continuous cutting

INSERT 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



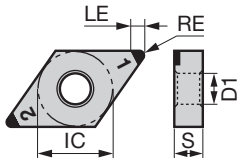
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-CNGA	**2QP-CNGA 430.5**	**2QP-CNGA120402**	●	●			2	0.091	0.008	0.500	0.187	0.203	○							
	2QP-CNGA 431	2QP-CNGA120404	●	●	●	●	2	0.091	0.016	0.500	0.187	0.203	○							
	2QP-CNGA 432	2QP-CNGA120408	●	●	●	●	2	0.087	0.031	0.500	0.187	0.203	○							
	2QP-CNGA 433	2QP-CNGA120412	●	●	●	●	2	0.094	0.047	0.500	0.187	0.203	○							
	2QP-CNGA 434	2QP-CNGA120416	●	●			2	0.130	0.063	0.500	0.187	0.203	○							
	2QP-CNGA 435	2QP-CNGA120420	●	●			2	0.126	0.079	0.500	0.187	0.203	○							
	2QP-CNGA 436	2QP-CNGA120424	●	●			2	0.122	0.094	0.500	0.187	0.203	○							
2QP-CNGA-L**	**2QP-CNGA 430.5-L**	**2QP-CNGA120402-L**	●	●			2	0.091	0.008	0.500	0.187	0.203			○					
	2QP-CNGA 431-L	2QP-CNGA120404-L	●	●	●	●	2	0.091	0.016	0.500	0.187	0.203			○					
	2QP-CNGA 432-L	2QP-CNGA120408-L	●	●	●	●	2	0.087	0.031	0.500	0.187	0.203			○					
	2QP-CNGA 433-L	2QP-CNGA120412-L	●	●	●	●	2	0.094	0.047	0.500	0.187	0.203			○					
2QP-CNGA-LF**	**2QP-CNGA 430.5-LF**	**2QP-CNGA120402-LF**	●	●			2	0.091	0.008	0.500	0.187	0.203				○				
	2QP-CNGA 431-LF	2QP-CNGA120404-LF	●	●			2	0.091	0.016	0.500	0.187	0.203				○				
	2QP-CNGA 432-LF	2QP-CNGA120408-LF	●	●			2	0.087	0.031	0.500	0.187	0.203				○				
	2QP-CNGA 433-LF	2QP-CNGA120412-LF	●	●			2	0.094	0.047	0.500	0.187	0.203				○				
2QP-CNGA-LC**	**2QP-CNGA 430.5-LC**	**2QP-CNGA120402-LC**	●	●			2	0.091	0.008	0.500	0.187	0.203					○			
	2QP-CNGA 431-LC	2QP-CNGA120404-LC	●	●			2	0.091	0.016	0.500	0.187	0.203					○			
	2QP-CNGA 432-LC	2QP-CNGA120408-LC	●	●			2	0.087	0.031	0.500	0.187	0.203					○			
	2QP-CNGA 433-LC	2QP-CNGA120412-LC	●	●			2	0.094	0.047	0.500	0.187	0.203					○			
2QP-CNGA-H**	**2QP-CNGA 431-H**	**2QP-CNGA120404-H**	●	●		●	2	0.091	0.016	0.500	0.187	0.203						○		
	2QP-CNGA 432-H	2QP-CNGA120408-H	●	●		●	2	0.087	0.031	0.500	0.187	0.203						○		
	2QP-CNGA 433-H	2QP-CNGA120412-H	●	●		●	2	0.094	0.047	0.500	0.187	0.203						○		
2QP-CNGAWL**	**2QP-CNGA 431-WL**	**2QP-CNGA120404WL**	●	●	●	●	2	0.091	0.016	0.500	0.187	0.203							○	
	2QP-CNGA 432-WL	2QP-CNGA120408WL	●	●	●	●	2	0.087	0.031	0.500	0.187	0.203							○	
	2QP-CNGA 433-WL	2QP-CNGA120412WL	●	●	●	●	2	0.094	0.047	0.500	0.187	0.203							○	

●: New product
●: Line up

INSERT NEGATIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●◐	●	●◐



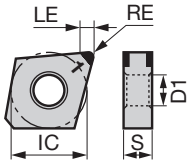
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-DNGA	2QP-DNGA 331	2QP-DNGA110404	●	●			2	0.098	0.016	0.375	0.187	0.150	○							
	2QP-DNGA 332	2QP-DNGA110408	●	●			2	0.083	0.031	0.375	0.187	0.150	○							
	2QP-DNGA 333	2QP-DNGA110412	●	●			2	0.079	0.047	0.375	0.187	0.150	○							
	2QP-DNGA 430.5	2QP-DNGA150402	●	●			2	0.106	0.008	0.500	0.187	0.203	○							
	2QP-DNGA 431	2QP-DNGA150404	●	●	●	●	2	0.098	0.016	0.500	0.187	0.203	○							
	2QP-DNGA 432	2QP-DNGA150408	●	●	●	●	2	0.083	0.031	0.500	0.187	0.203	○							
	2QP-DNGA 433	2QP-DNGA150412	●	●	●	●	2	0.079	0.047	0.500	0.187	0.203	○							
	2QP-DNGA 434	2QP-DNGA150416	●	●			2	0.134	0.063	0.500	0.187	0.203	○							
	2QP-DNGA 435	2QP-DNGA150420	●	●			2	0.118	0.079	0.500	0.187	0.203	○							
	2QP-DNGA 436	2QP-DNGA150424	●	●			2	0.102	0.094	0.500	0.187	0.203	○							
	2QP-DNGA 441	2QP-DNGA150604	●	●	●	●	2	0.098	0.016	0.500	0.250	0.203	○							
	2QP-DNGA 442	2QP-DNGA150608	●	●	●	●	2	0.083	0.031	0.500	0.250	0.203	○							
	2QP-DNGA 443	2QP-DNGA150612	●	●	●	●	2	0.079	0.047	0.500	0.250	0.203	○							
2QP-DNGA**-L	2QP-DNGA 430.5-L	2QP-DNGA150402-L	●	●			2	0.106	0.008	0.500	0.187	0.203			○					
	2QP-DNGA 431-L	2QP-DNGA150404-L	●	●	●	●	2	0.098	0.016	0.500	0.187	0.203			○					
	2QP-DNGA 432-L	2QP-DNGA150408-L	●	●	●	●	2	0.083	0.031	0.500	0.187	0.203			○					
	2QP-DNGA 433-L	2QP-DNGA150412-L	●	●		●	2	0.079	0.047	0.500	0.187	0.203			○					
	2QP-DNGA 441-L	2QP-DNGA150604-L	●	●			2	0.098	0.016	0.500	0.250	0.203			○					
	2QP-DNGA 442-L	2QP-DNGA150608-L	●	●			2	0.083	0.031	0.500	0.250	0.203			○					
	2QP-DNGA 443-L	2QP-DNGA150612-L	●	●			2	0.079	0.047	0.500	0.250	0.203			○					
2QP-DNGA**-LF	2QP-DNGA 430.5-LF	2QP-DNGA150402-LF	●	●			2	0.106	0.008	0.500	0.187	0.203				○				
	2QP-DNGA 431-LF	2QP-DNGA150404-LF	●	●			2	0.098	0.016	0.500	0.187	0.203				○				
	2QP-DNGA 432-LF	2QP-DNGA150408-LF	●	●			2	0.083	0.031	0.500	0.187	0.203				○				
	2QP-DNGA 433-LF	2QP-DNGA150412-LF	●	●			2	0.079	0.047	0.500	0.187	0.203				○				
	2QP-DNGA 441-LF	2QP-DNGA150604-LF	●	●			2	0.098	0.016	0.500	0.250	0.203				○				
	2QP-DNGA 442-LF	2QP-DNGA150608-LF	●	●			2	0.083	0.031	0.500	0.250	0.203				○				
	2QP-DNGA 443-LF	2QP-DNGA150612-LF	●	●			2	0.079	0.047	0.500	0.250	0.203				○				
2QP-DNGA**-LC	2QP-DNGA 430.5-LC	2QP-DNGA150402-LC	●	●			2	0.106	0.008	0.500	0.187	0.203					○			
	2QP-DNGA 431-LC	2QP-DNGA150404-LC	●	●			2	0.098	0.016	0.500	0.187	0.203					○			
	2QP-DNGA 432-LC	2QP-DNGA150408-LC	●	●			2	0.083	0.031	0.500	0.187	0.203					○			
	2QP-DNGA 433-LC	2QP-DNGA150412-LC	●	●			2	0.079	0.047	0.500	0.187	0.203					○			
	2QP-DNGA 441-LC	2QP-DNGA150604-LC	●	●			2	0.098	0.016	0.500	0.250	0.203					○			
	2QP-DNGA 442-LC	2QP-DNGA150608-LC	●	●			2	0.083	0.031	0.500	0.250	0.203					○			
	2QP-DNGA 443-LC	2QP-DNGA150612-LC	●	●			2	0.079	0.047	0.500	0.250	0.203					○			
2QP-DNGA**-H	2QP-DNGA 431-H	2QP-DNGA150404-H	●	●		●	2	0.098	0.016	0.500	0.187	0.203						○		
	2QP-DNGA 432-H	2QP-DNGA150408-H	●	●		●	2	0.083	0.031	0.500	0.187	0.203						○		
	2QP-DNGA 433-H	2QP-DNGA150412-H	●	●		●	2	0.079	0.047	0.500	0.187	0.203						○		
	2QP-DNGA 441-H	2QP-DNGA150604-H	●	●			2	0.098	0.016	0.500	0.250	0.203						○		
	2QP-DNGA 442-H	2QP-DNGA150608-H	●	●			2	0.083	0.031	0.500	0.250	0.203						○		
	2QP-DNGA 443-H	2QP-DNGA150612-H	●	●			2	0.079	0.047	0.500	0.250	0.203						○		

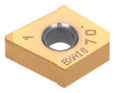
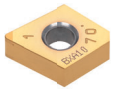
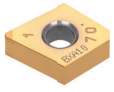
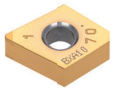
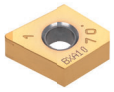
●: New product
●: Line up

INSERT NEGATIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●◐	●	●◐



Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	Dimension (in) LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-GNGA (Corner angle 70°) (1) 	* 2QP-GNGA 430.5	2QP-GNGA120402	●	●			2	0.087	0.008	0.500	0.187	0.203	○							
	* 2QP-GNGA 431	2QP-GNGA120404	●	●		●	2	0.083	0.016	0.500	0.187	0.203	○							
	* 2QP-GNGA 432	2QP-GNGA120408	●	●		●	2	0.083	0.031	0.500	0.187	0.203	○							
	* 2QP-GNGA 433	2QP-GNGA120412	●	●		●	2	0.087	0.047	0.500	0.187	0.203	○							
2QP-GNGA-L** (Corner angle 70°) (1) 	* 2QP-GNGA 430.5-L	2QP-GNGA120402-L	●	●			2	0.087	0.008	0.500	0.187	0.203			○					
	* 2QP-GNGA 431-L	2QP-GNGA120404-L	●	●			2	0.083	0.016	0.500	0.187	0.203			○					
	* 2QP-GNGA 432-L	2QP-GNGA120408-L	●	●			2	0.083	0.031	0.500	0.187	0.203			○					
	* 2QP-GNGA 433-L	2QP-GNGA120412-L	●	●			2	0.087	0.047	0.500	0.187	0.203			○					
2QP-GNGA-LF** (Corner angle 70°) (1) 	* 2QP-GNGA 430.5-LF	2QP-GNGA120402-LF	●	●			2	0.087	0.008	0.500	0.187	0.203				○				
	* 2QP-GNGA 431-LF	2QP-GNGA120404-LF	●	●			2	0.083	0.016	0.500	0.187	0.203				○				
	* 2QP-GNGA 432-LF	2QP-GNGA120408-LF	●	●			2	0.083	0.031	0.500	0.187	0.203				○				
	* 2QP-GNGA 433-LF	2QP-GNGA120412-LF	●	●			2	0.087	0.047	0.500	0.187	0.203				○				
2QP-GNGA-LC** (Corner angle 70°) (1) 	* 2QP-GNGA 430.5-LC	2QP-GNGA120402-LC	●	●			2	0.087	0.008	0.500	0.187	0.203					○			
	* 2QP-GNGA 431-LC	2QP-GNGA120404-LC	●	●			2	0.083	0.016	0.500	0.187	0.203					○			
	* 2QP-GNGA 432-LC	2QP-GNGA120408-LC	●	●			2	0.083	0.031	0.500	0.187	0.203					○			
	* 2QP-GNGA 433-LC	2QP-GNGA120412-LC	●	●			2	0.087	0.047	0.500	0.187	0.203					○			
2QP-GNGA-H** (Corner angle 70°) (1) 	* 2QP-GNGA 431-H	2QP-GNGA120404-H	●	●			2	0.083	0.016	0.500	0.187	0.203						○		
	* 2QP-GNGA 432-H	2QP-GNGA120408-H	●	●			2	0.083	0.031	0.500	0.187	0.203						○		
	* 2QP-GNGA 433-H	2QP-GNGA120412-H	●	●			2	0.087	0.047	0.500	0.187	0.203						○		

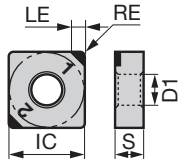
(1) Tungaloy's standard

●: New product
●: Line up

INSERT NEGATIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●◐	●	●◐



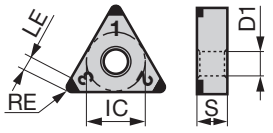
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	Dimension (in) LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-SNGA	2QP-SNGA 431	2QP-SNGA120404	●	●		●	2	0.094	0.016	0.500	0.187	0.203	○							
	2QP-SNGA 432	2QP-SNGA120408	●	●		●	2	0.094	0.032	0.500	0.187	0.203	○							
	2QP-SNGA 433	2QP-SNGA120412	●	●		●	2	0.094	0.047	0.500	0.187	0.203	○							
2QP-SNGA-L**	2QP-SNGA 431-L	2QP-SNGA120404-L	●	●		●	2	0.094	0.016	0.500	0.187	0.203			○					
	2QP-SNGA 432-L	2QP-SNGA120408-L	●	●		●	2	0.094	0.032	0.500	0.187	0.203			○					
	2QP-SNGA 433-L	2QP-SNGA120412-L	●	●		●	2	0.094	0.047	0.500	0.187	0.203			○					
2QP-SNGA-LF**	2QP-SNGA 432-LF	2QP-SNGA120408-LF	●	●			2	0.094	0.032	0.500	0.187	0.203				○				
	2QP-SNGA 433-LF	2QP-SNGA120412-LF	●	●			2	0.094	0.047	0.500	0.187	0.203				○				
																				

●: New product
●: Line up

INSERT NEGATIVE TYPE

● : Continuous cutting
ᑕ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●ᑕ	●	●ᑕ



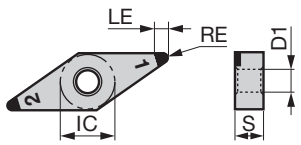
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
3QP-TNGA	3QP-TNGA 330.5	3QP-TNGA160402	●	●			3	0.091	0.008	0.375	0.187	0.150	○							
	3QP-TNGA 331	3QP-TNGA160404	●	●	●	●	3	0.087	0.016	0.375	0.187	0.150	○							
	3QP-TNGA 332	3QP-TNGA160408	●	●	●	●	3	0.075	0.031	0.375	0.187	0.150	○							
	3QP-TNGA 333	3QP-TNGA160412	●	●	●	●	3	0.094	0.047	0.375	0.187	0.150	○							
	3QP-TNGA 334	3QP-TNGA160416	●	●			3	0.130	0.063	0.375	0.187	0.150	○							
	3QP-TNGA 335	3QP-TNGA160420	●	●			3	0.118	0.079	0.375	0.187	0.150	○							
	3QP-TNGA 336	3QP-TNGA160424	●	●			3	0.106	0.094	0.375	0.187	0.150	○							
3QP-TNGA**-L	3QP-TNGA 330.5-L	3QP-TNGA160402-L	●	●			3	0.091	0.008	0.375	0.187	0.150			○					
	3QP-TNGA 331-L	3QP-TNGA160404-L	●	●	●	●	3	0.087	0.016	0.375	0.187	0.150			○					
	3QP-TNGA 332-L	3QP-TNGA160408-L	●	●	●	●	3	0.075	0.031	0.375	0.187	0.150			○					
	3QP-TNGA 333-L	3QP-TNGA160412-L	●	●	●	●	3	0.094	0.047	0.375	0.187	0.150			○					
3QP-TNGA**-LF	3QP-TNGA 330.5-LF	3QP-TNGA160402-LF	●	●			3	0.091	0.008	0.375	0.187	0.150				○				
	3QP-TNGA 331-LF	3QP-TNGA160404-LF	●	●			3	0.087	0.016	0.375	0.187	0.150				○				
	3QP-TNGA 332-LF	3QP-TNGA160408-LF	●	●			3	0.075	0.031	0.375	0.187	0.150				○				
	3QP-TNGA 333-LF	3QP-TNGA160412-LF	●	●			3	0.094	0.047	0.375	0.187	0.150				○				
3QP-TNGA**-LC	3QP-TNGA 330.5-LC	3QP-TNGA160402-LC	●	●			3	0.091	0.008	0.375	0.187	0.150					○			
	3QP-TNGA 331-LC	3QP-TNGA160404-LC	●	●			3	0.087	0.016	0.375	0.187	0.150					○			
	3QP-TNGA 332-LC	3QP-TNGA160408-LC	●	●			3	0.075	0.031	0.375	0.187	0.150					○			
	3QP-TNGA 333-LC	3QP-TNGA160412-LC	●	●			3	0.094	0.047	0.375	0.187	0.150					○			
3QP-TNGA**-H	3QP-TNGA 331-H	3QP-TNGA160404-H	●	●		●	3	0.087	0.016	0.375	0.187	0.150						○		
	3QP-TNGA 332-H	3QP-TNGA160408-H	●	●		●	3	0.075	0.031	0.375	0.187	0.150						○		
	3QP-TNGA 333-H	3QP-TNGA160412-H	●	●		●	3	0.094	0.047	0.375	0.187	0.150						○		
3QP-TNGA**WG	3QP-TNGA 331-WG	3QP-TNGA160404WG	●	●		●	3	0.094	0.016	0.375	0.187	0.150							○	
	3QP-TNGA 332-WG	3QP-TNGA160408WG	●	●	●	●	3	0.087	0.031	0.375	0.187	0.150							○	

●: New product
●: Line up

INSERT 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	●	●◐	●	●◐				



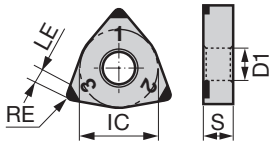
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	Dimension (in) No. of corners	LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-VNGA	**2QP-VNGA 330.5**	**2QP-VNGA160402**	●	●			2	0.138	0.008	0.375	0.187	0.150	○							
	2QP-VNGA 331	2QP-VNGA160404	●	●	●	●	2	0.122	0.016	0.375	0.187	0.150	○							
	2QP-VNGA 332	2QP-VNGA160408	●	●	●	●	2	0.087	0.031	0.375	0.187	0.150	○							
	2QP-VNGA 333	2QP-VNGA160412	●	●		●	2	0.118	0.047	0.375	0.187	0.150	○							
2QP-VNGA-L**	**2QP-VNGA 330.5-L**	**2QP-VNGA160402-L**	●	●			2	0.138	0.008	0.375	0.187	0.150			○					
	2QP-VNGA 331-L	2QP-VNGA160404-L	●	●	●	●	2	0.122	0.016	0.375	0.187	0.150			○					
	2QP-VNGA 332-L	2QP-VNGA160408-L	●	●	●	●	2	0.087	0.031	0.375	0.187	0.150			○					
	2QP-VNGA 333-L	2QP-VNGA160412-L	●	●			2	0.118	0.047	0.375	0.187	0.150			○					
2QP-VNGA-LF**	**2QP-VNGA 330.5-LF**	**2QP-VNGA160402-LF**	●	●			2	0.138	0.008	0.375	0.187	0.150				○				
	2QP-VNGA 331-LF	2QP-VNGA160404-LF	●	●			2	0.122	0.016	0.375	0.187	0.150				○				
	2QP-VNGA 332-LF	2QP-VNGA160408-LF	●	●			2	0.087	0.031	0.375	0.187	0.150				○				
	2QP-VNGA 333-LF	2QP-VNGA160412-LF	●	●			2	0.118	0.047	0.375	0.187	0.150				○				
2QP-VNGA-LC**	**2QP-VNGA 330.5-LC**	**2QP-VNGA160402-LC**	●	●			2	0.138	0.008	0.375	0.187	0.150					○			
	2QP-VNGA 331-LC	2QP-VNGA160404-LC	●	●			2	0.122	0.016	0.375	0.187	0.150					○			
	2QP-VNGA 332-LC	2QP-VNGA160408-LC	●	●			2	0.087	0.031	0.375	0.187	0.150					○			
	2QP-VNGA 333-LC	2QP-VNGA160412-LC	●	●			2	0.118	0.047	0.375	0.187	0.150					○			
2QP-VNGA-H**	**2QP-VNGA 331-H**	**2QP-VNGA160404-H**	●	●		●	2	0.122	0.016	0.375	0.187	0.150						○		
	2QP-VNGA 332-H	2QP-VNGA160408-H	●	●		●	2	0.087	0.031	0.375	0.187	0.150						○		
	2QP-VNGA 333-H	2QP-VNGA160412-H	●	●			2	0.118	0.047	0.375	0.187	0.150						○		

●: New product
●: Line up

INSERT NEGATIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●◐	●	●◐



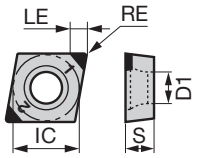
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
3QP-WNGA	3QP-WNGA 431	3QP-WNGA080404	●	●			3	0.091	0.016	0.500	0.187	0.203	○							
	3QP-WNGA 432	3QP-WNGA080408	●	●	●	●	3	0.087	0.031	0.500	0.187	0.203	○							
	3QP-WNGA 433	3QP-WNGA080412	●	●			3	0.094	0.047	0.500	0.187	0.203	○							
3QP-WNGA-L**	3QP-WNGA 432-L	3QP-WNGA080408-L	●	●			3	0.087	0.031	0.500	0.187	0.203			○					
3QP-WNGA-LF**	3QP-WNGA 432-LF	3QP-WNGA080408-LF	●	●			3	0.087	0.031	0.500	0.187	0.203				○				
3QP-WNGA-H**	3QP-WNGA 432-H	3QP-WNGA080408-H	●	●			3	0.087	0.031	0.500	0.187	0.203						○		
3QP-WNGAWL**	3QP-WNGA 432-WL	3QP-WNGA080408WL	●	●	●	●	3	0.087	0.031	0.500	0.187	0.203							○	

●: New product
●: Line up

INSERT POSITIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●◐	●	●◐



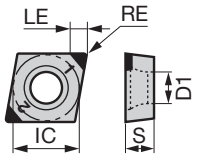
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	Dimension (in) LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-CCGW	**2QP-CCGW 21.50.5**	**2QP-CCGW060202**	●	●	●	●	2	0.091	0.008	0.250	0.094	0.110	○							
	2QP-CCGW 21.51	2QP-CCGW060204	●	●	●	●	2	0.091	0.016	0.250	0.094	0.110	○							
	2QP-CCGW 21.52	2QP-CCGW060208	●	●			2	0.087	0.031	0.250	0.094	0.110	○							
	2QP-CCGW 32.50.5	**2QP-CCGW09T302**	●	●			2	0.091	0.008	0.375	0.156	0.173	○							
	2QP-CCGW 32.51	2QP-CCGW09T304	●	●	●	●	2	0.091	0.016	0.375	0.156	0.173	○							
	2QP-CCGW 32.52	2QP-CCGW09T308	●	●	●	●	2	0.087	0.031	0.375	0.156	0.173	○							
2QP-CCGW-L**	**2QP-CCGW 21.50.5-L**	**2QP-CCGW060202-L**	●	●			2	0.091	0.008	0.250	0.094	0.110			○					
	2QP-CCGW 21.51-L	2QP-CCGW060204-L	●	●			2	0.091	0.016	0.250	0.094	0.110			○					
	2QP-CCGW 21.52-L	2QP-CCGW060208-L	●	●			2	0.087	0.031	0.250	0.094	0.110			○					
	2QP-CCGW 32.50.5-L	**2QP-CCGW09T302-L**	●	●			2	0.091	0.008	0.375	0.156	0.173			○					
	2QP-CCGW 32.51-L	2QP-CCGW09T304-L	●	●			2	0.091	0.016	0.375	0.156	0.173			○					
	2QP-CCGW 32.52-L	2QP-CCGW09T308-L	●	●			2	0.087	0.031	0.375	0.156	0.173			○					
2QP-CCGW-LF**	**2QP-CCGW 21.50.5-LF**	**2QP-CCGW060202-LF**	●	●			2	0.091	0.008	0.250	0.094	0.110				○				
	2QP-CCGW 21.51-LF	2QP-CCGW060204-LF	●	●			2	0.091	0.016	0.250	0.094	0.110				○				
	2QP-CCGW 21.52-LF	2QP-CCGW060208-LF	●	●			2	0.087	0.031	0.250	0.094	0.110				○				
	2QP-CCGW 32.50.5-LF	**2QP-CCGW09T302-LF**	●	●			2	0.091	0.008	0.375	0.156	0.173				○				
	2QP-CCGW 32.51-LF	2QP-CCGW09T304-LF	●	●			2	0.091	0.016	0.375	0.156	0.173				○				
	2QP-CCGW 32.52-LF	2QP-CCGW09T308-LF	●	●			2	0.087	0.031	0.375	0.156	0.173				○				
2QP-CCGW-LC**	**2QP-CCGW 21.50.5-LC**	**2QP-CCGW060202-LC**	●	●			2	0.091	0.008	0.250	0.094	0.110					○			
	2QP-CCGW 21.51-LC	2QP-CCGW060204-LC	●	●			2	0.091	0.016	0.250	0.094	0.110					○			
	2QP-CCGW 21.52-LC	2QP-CCGW060208-LC	●	●			2	0.087	0.032	0.250	0.094	0.110					○			
	2QP-CCGW 32.50.5-LC	**2QP-CCGW09T302-LC**	●	●			2	0.091	0.008	0.375	0.156	0.173					○			
	2QP-CCGW 32.51-LC	2QP-CCGW09T304-LC	●	●			2	0.091	0.016	0.375	0.156	0.173					○			
	2QP-CCGW 32.52-LC	2QP-CCGW09T308-LC	●	●			2	0.087	0.032	0.375	0.156	0.173					○			

●: New product
●: Line up

INSERT POSITIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20				
P	Steel								
M	Stainless								
K	Cast iron								
N	Non-ferrous								
S	Superalloy								
H	Hard material	●	◐	●	◐				



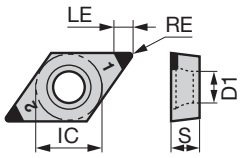
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	Dimension (in) LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-CCGWWL**	**2QP-CCGW 32.51-WL**	**2QP-CCGW09T304WL**	●	●			2	0.091	0.016	0.375	0.156	0.173							○	
	2QP-CCGW 32.52-WL	**2QP-CCGW09T308WL**	●	●			2	0.087	0.031	0.375	0.156	0.173							○	
																				
2QP-CPGW	**2QP-CPGW 2.51.50.5**	**2QP-CPGW080202**	●	●			2	0.091	0.008	0.313	0.094	0.134	○							
	2QP-CPGW 2.51.51	**2QP-CPGW080204**	●	●			2	0.091	0.016	0.313	0.094	0.134	○							
	**2QP-CPGW 2.51.52**	**2QP-CPGW080208**	●	●			2	0.087	0.031	0.313	0.094	0.134	○							
	2QP-CPGW 320.5	**2QP-CPGW090302**	●	●			2	0.091	0.008	0.313	0.094	0.134	○							
	2QP-CPGW 321	**2QP-CPGW090304**	●	●			2	0.091	0.016	0.375	0.125	0.173	○							
	2QP-CPGW 322	**2QP-CPGW090308**	●	●			2	0.087	0.031	0.375	0.125	0.173	○							

●: New product
●: Line up

INSERT POSITIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●◐	●	●◐



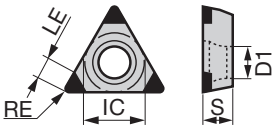
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	Dimension (in) LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-DCGW	2QP-DCGW 21.50.5	2QP-DCGW070202	●	●	●	●	2	0.106	0.008	0.250	0.094	0.110	○							
	2QP-DCGW 21.51	2QP-DCGW070204	●	●	●	●	2	0.098	0.016	0.250	0.094	0.110	○							
	2QP-DCGW 21.52	2QP-DCGW070208	●	●			2	0.083	0.031	0.250	0.094	0.110	○							
	2QP-DCGW 32.50.2	2QP-DCGW11T301	●	●			2	0.110	0.004	0.375	0.156	0.173	○							
	2QP-DCGW 32.50.5	2QP-DCGW11T302	●	●	●	●	2	0.106	0.008	0.375	0.156	0.173	○							
	2QP-DCGW 32.51	2QP-DCGW11T304	●	●	●	●	2	0.098	0.016	0.375	0.156	0.173	○							
	2QP-DCGW 32.52	2QP-DCGW11T308	●	●	●	●	2	0.083	0.031	0.375	0.156	0.173	○							
2QP-DCGW**-L	2QP-DCGW 21.50.5-L	2QP-DCGW070202-L	●	●			2	0.106	0.008	0.250	0.094	0.110			○					
	2QP-DCGW 21.51-L	2QP-DCGW070204-L	●	●			2	0.098	0.016	0.250	0.094	0.110			○					
	2QP-DCGW 21.52-L	2QP-DCGW070208-L	●	●			2	0.083	0.031	0.250	0.094	0.110			○					
	2QP-DCGW 32.50.5-L	2QP-DCGW11T302-L	●	●			2	0.106	0.008	0.375	0.156	0.173			○					
	2QP-DCGW 32.51-L	2QP-DCGW11T304-L	●	●			2	0.098	0.016	0.375	0.156	0.173			○					
	2QP-DCGW 32.52-L	2QP-DCGW11T308-L	●	●			2	0.083	0.031	0.375	0.156	0.173			○					
2QP-DCGW**-LF	2QP-DCGW 21.50.5-LF	2QP-DCGW070202-LF	●	●			2	0.106	0.008	0.250	0.094	0.110				○				
	2QP-DCGW 21.51-LF	2QP-DCGW070204-LF	●	●			2	0.098	0.016	0.250	0.094	0.110				○				
	2QP-DCGW 21.52-LF	2QP-DCGW070208-LF	●	●			2	0.083	0.031	0.250	0.094	0.110				○				
	2QP-DCGW 32.50.5-LF	2QP-DCGW11T302-LF	●	●			2	0.106	0.008	0.375	0.156	0.173				○				
	2QP-DCGW 32.51-LF	2QP-DCGW11T304-LF	●	●			2	0.098	0.016	0.375	0.156	0.173				○				
	2QP-DCGW 32.52-LF	2QP-DCGW11T308-LF	●	●			2	0.083	0.031	0.375	0.156	0.173				○				
2QP-DCGW**-LC	2QP-DCGW 21.50.5-LC	2QP-DCGW070202-LC	●	●			2	0.106	0.008	0.250	0.094	0.110					○			
	2QP-DCGW 21.51-LC	2QP-DCGW070204-LC	●	●			2	0.098	0.016	0.250	0.094	0.110					○			
	2QP-DCGW 21.52-LC	2QP-DCGW070208-LC	●	●			2	0.083	0.031	0.250	0.094	0.110					○			
	2QP-DCGW 32.50.5-LC	2QP-DCGW11T302-LC	●	●			2	0.106	0.008	0.375	0.156	0.173					○			
	2QP-DCGW 32.51-LC	2QP-DCGW11T304-LC	●	●			2	0.098	0.016	0.375	0.156	0.173					○			
	2QP-DCGW 32.52-LC	2QP-DCGW11T308-LC	●	●			2	0.083	0.031	0.375	0.156	0.173					○			

●: New product
●: Line up

INSERT POSITIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	◐	●	◐



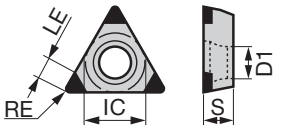
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	No. of corners	Dimension (in) LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
3QP-TPGW	3QP-TPGW 630.5	3QP-TPGW080202	●	●			3	0.091	0.008	0.187	0.094	0.091	○							
	3QP-TPGW 631	3QP-TPGW080204	●	●	●	●	3	0.087	0.016	0.187	0.094	0.091	○							
	3QP-TPGW 632	3QP-TPGW080208	●	●			3	0.075	0.031	0.187	0.094	0.091	○							
	3QP-TPGW 730.5	3QP-TPGW090202	●	●			3	0.091	0.008	0.219	0.094	0.098	○							
	3QP-TPGW 731	3QP-TPGW090204	●	●	●	●	3	0.087	0.016	0.219	0.094	0.098	○							
	3QP-TPGW 732	3QP-TPGW090208	●	●			3	0.075	0.031	0.219	0.094	0.098	○							
	3QP-TPGW 21.50.5	3QP-TPGW110202	●	●		●	3	0.091	0.008	0.250	0.094	0.110	○							
	3QP-TPGW 21.51	3QP-TPGW110204	●	●	●	●	3	0.087	0.016	0.250	0.094	0.110	○							
	3QP-TPGW 21.52	3QP-TPGW110208	●	●			3	0.075	0.031	0.250	0.094	0.110	○							
	3QP-TPGW 220.5	3QP-TPGW110302	●	●		●	3	0.091	0.008	0.250	0.125	0.134	○							
	3QP-TPGW 221	3QP-TPGW110304	●	●	●	●	3	0.087	0.016	0.250	0.125	0.134	○							
	3QP-TPGW 222	3QP-TPGW110308	●	●	●	●	3	0.075	0.031	0.250	0.125	0.134	○							
	3QP-TPGW 2.520.5	3QP-TPGW130302	●	●		●	3	0.091	0.008	0.313	0.125	0.134	○							
	3QP-TPGW 2.521	3QP-TPGW130304	●	●	●	●	3	0.087	0.016	0.313	0.125	0.134	○							
	3QP-TPGW 2.522	3QP-TPGW130308	●	●			3	0.075	0.031	0.313	0.125	0.134	○							
	3QP-TPGW 32.50.5	3QP-TPGW16T302	●	●			3	0.091	0.008	0.375	0.156	0.173	○							
	3QP-TPGW 32.51	3QP-TPGW16T304	●	●	●	●	3	0.087	0.016	0.375	0.156	0.173	○							
	3QP-TPGW 32.52	3QP-TPGW16T308	●	●	●	●	3	0.075	0.031	0.375	0.156	0.173	○							
	3QP-TPGW 330.5	3QP-TPGW160402	●	●			3	0.091	0.008	0.375	0.187	0.173	○							
	3QP-TPGW 331	3QP-TPGW160404	●	●	●	●	3	0.087	0.016	0.375	0.187	0.173	○							
	3QP-TPGW 332	3QP-TPGW160408	●	●		●	3	0.075	0.031	0.375	0.187	0.173	○							
3QP-TPGW**-L	3QP-TPGW 220.5-L	3QP-TPGW110302-L	●	●			3	0.091	0.008	0.250	0.125	0.134			○					
	3QP-TPGW 221-L	3QP-TPGW110304-L	●	●			3	0.087	0.016	0.250	0.125	0.134			○					
	3QP-TPGW 222-L	3QP-TPGW110308-L	●	●			3	0.075	0.031	0.250	0.125	0.134			○					
3QP-TPGW**-LF	3QP-TPGW 220.5-LF	3QP-TPGW110302-LF	●	●			3	0.091	0.008	0.250	0.125	0.134				○				
	3QP-TPGW 221-LF	3QP-TPGW110304-LF	●	●			3	0.087	0.016	0.250	0.125	0.134				○				
	3QP-TPGW 222-LF	3QP-TPGW110308-LF	●	●			3	0.075	0.031	0.250	0.125	0.134				○				
3QP-TPGW**-LC	3QP-TPGW 220.5-LC	3QP-TPGW110302-LC	●	●			3	0.091	0.008	0.250	0.125	0.134					○			
	3QP-TPGW 221-LC	3QP-TPGW110304-LC	●	●			3	0.087	0.016	0.250	0.125	0.134					○			
	3QP-TPGW 222-LC	3QP-TPGW110308-LC	●	●			3	0.075	0.031	0.250	0.125	0.134					○			
3QP-TPGW**-H	3QP-TPGW 330.5-H	3QP-TPGW160402-H	●	●			3	0.091	0.008	0.375	0.187	0.173						○		
	3QP-TPGW 331-H	3QP-TPGW160404-H	●	●			3	0.087	0.016	0.375	0.187	0.173						○		
	3QP-TPGW 332-H	3QP-TPGW160408-H	●	●			3	0.075	0.031	0.375	0.187	0.173						○		

●: New product
●: Line up

INSERT POSITIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

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



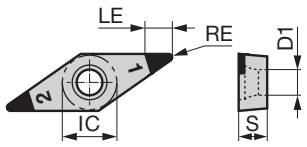
Shape	Designation								Dimension (in)						Edge prep.							
	Inch	Metric	BXA10	BXA20	BXM10	BXM20				No. of corners	LE	RE	IC	S	D1	Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
3QP-TCGW	3QP-TCGW 730.5	3QP-TCGW090202	●	●						3	0.091	0.008	0.219	0.094	0.098	○						
	3QP-TCGW 731	3QP-TCGW090204	●	●						3	0.087	0.016	0.219	0.094	0.098	○						
	3QP-TCGW 732	3QP-TCGW090208	●	●						3	0.075	0.031	0.219	0.094	0.098	○						
	3QP-TCGW 21.50.5	3QP-TCGW110202	●	●						3	0.091	0.008	0.250	0.094	0.110	○						
	3QP-TCGW 21.51	3QP-TCGW110204	●	●						3	0.087	0.016	0.250	0.094	0.110	○						
	3QP-TCGW 21.52	3QP-TCGW110208	●	●						3	0.075	0.031	0.250	0.094	0.110	○						
	3QP-TCGW 32.50.5	3QP-TCGW16T302	●	●						3	0.091	0.008	0.375	0.156	0.173	○						
	3QP-TCGW 32.51	3QP-TCGW16T304	●	●						3	0.087	0.016	0.375	0.156	0.173	○						
	3QP-TCGW 32.52	3QP-TCGW16T308	●	●						3	0.075	0.031	0.375	0.156	0.173	○						

●: New product
●: Line up

INSERT POSITIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

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



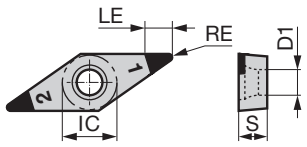
Shape	Designation Inch	Designation Metric	BXA10	BXA20	BXM10	BXM20	Dimension (in) No. of corners	LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-VBGW	2QP-VBGW 21.50.5	2QP-VBGW110202	●	●			2	0.138	0.008	0.250	0.094	0.110	○							
	2QP-VBGW 21.51	2QP-VBGW110204	●	●			2	0.122	0.016	0.250	0.094	0.110	○							
	2QP-VBGW 21.52	2QP-VBGW110208	●	●			2	0.087	0.031	0.250	0.094	0.110	○							
	2QP-VBGW 220.2	2QP-VBGW110301	●	●			2	0.146	0.004	0.250	0.125	0.110	○							
	2QP-VBGW 220.5	2QP-VBGW110302	●	●			2	0.138	0.008	0.250	0.125	0.110	○							
	2QP-VBGW 221	2QP-VBGW110304	●	●	●	●	2	0.122	0.016	0.250	0.125	0.110	○							
	2QP-VBGW 222	2QP-VBGW110308	●	●	●	●	2	0.087	0.031	0.250	0.125	0.110	○							
	2QP-VBGW 330.5	2QP-VBGW160402	●	●			2	0.138	0.008	0.375	0.187	0.173	○							
	2QP-VBGW 331	2QP-VBGW160404	●	●	●	●	2	0.122	0.016	0.375	0.187	0.173	○							
	2QP-VBGW 332	2QP-VBGW160408	●	●	●	●	2	0.087	0.031	0.375	0.187	0.173	○							
	2QP-VBGW 333	2QP-VBGW160412	●	●			2	0.118	0.047	0.375	0.187	0.173	○							
2QP-VBGW**-L	2QP-VBGW 220.5-L	2QP-VBGW110302-L	●	●			2	0.138	0.008	0.250	0.125	0.110			○					
	2QP-VBGW 221-L	2QP-VBGW110304-L	●	●			2	0.122	0.016	0.250	0.125	0.110			○					
	2QP-VBGW 222-L	2QP-VBGW110308-L	●	●			2	0.087	0.031	0.250	0.125	0.110			○					
	2QP-VBGW 330.5-L	2QP-VBGW160402-L	●	●			2	0.138	0.008	0.375	0.187	0.173			○					
	2QP-VBGW 331-L	2QP-VBGW160404-L	●	●			2	0.122	0.016	0.375	0.187	0.173			○					
	2QP-VBGW 332-L	2QP-VBGW160408-L	●	●			2	0.087	0.031	0.375	0.187	0.173			○					
2QP-VBGW**-LF	2QP-VBGW 220.5-LF	2QP-VBGW110302-LF	●	●			2	0.138	0.008	0.250	0.125	0.110				○				
	2QP-VBGW 221-LF	2QP-VBGW110304-LF	●	●			2	0.122	0.016	0.250	0.125	0.110				○				
	2QP-VBGW 222-LF	2QP-VBGW110308-LF	●	●			2	0.087	0.031	0.250	0.125	0.110				○				
	2QP-VBGW 330.5-LF	2QP-VBGW160402-LF	●	●			2	0.138	0.008	0.375	0.187	0.173				○				
	2QP-VBGW 331-LF	2QP-VBGW160404-LF	●	●			2	0.122	0.016	0.375	0.187	0.173				○				
	2QP-VBGW 332-LF	2QP-VBGW160408-LF	●	●			2	0.087	0.031	0.375	0.187	0.173				○				
2QP-VBGW**-LC	2QP-VBGW 220.5-LC	2QP-VBGW110302-LC	●	●			2	0.138	0.008	0.250	0.125	0.110					○			
	2QP-VBGW 221-LC	2QP-VBGW110304-LC	●	●			2	0.122	0.016	0.250	0.125	0.110					○			
	2QP-VBGW 222-LC	2QP-VBGW110308-LC	●	●			2	0.087	0.031	0.250	0.125	0.110					○			
	2QP-VBGW 330.5-LC	2QP-VBGW160402-LC	●	●			2	0.138	0.008	0.375	0.187	0.173					○			
	2QP-VBGW 331-LC	2QP-VBGW160404-LC	●	●			2	0.122	0.016	0.375	0.187	0.173					○			
	2QP-VBGW 332-LC	2QP-VBGW160408-LC	●	●			2	0.087	0.031	0.375	0.187	0.173					○			

●: New product
●: Line up

INSERT POSITIVE TYPE

● : Continuous cutting
◐ : Light interrupted cutting
✠ : Heavy interrupted cutting

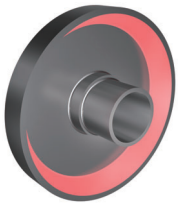
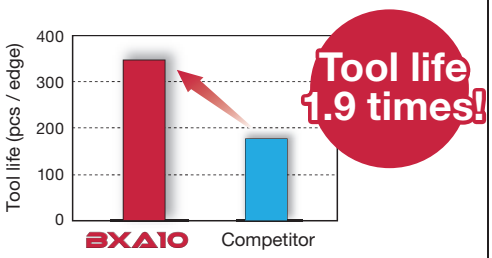
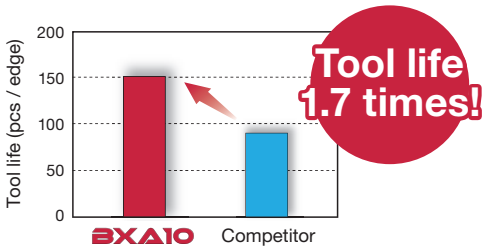
		BXA10	BXA20	BXM10	BXM20
P	Steel				
M	Stainless				
K	Cast iron				
N	Non-ferrous				
S	Superalloy				
H	Hard material	●	●◐	●	●◐

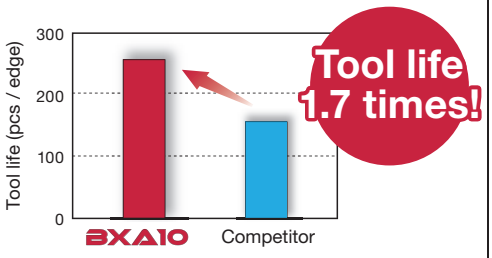
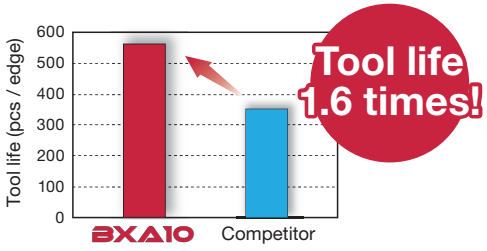


Shape	Designation		BXA10	BXA20	BXM10	BXM20	No. of corners	Dimension (in) LE	RE	IC	S	D1	Edge prep. Standard	Sharp edge	L	LF	LC	H	Wiper	Chipbreaker
2QP-VCGW	**2QP-VCGW 630.5**	**2QP-VCGW080202**	●	●			2	0.138	0.080	0.187	0.094	0.091	○							
	2QP-VCGW 631	2QP-VCGW080204	●	●			2	0.122	0.016	0.187	0.094	0.091	○							
	2QP-VCGW 632	2QP-VCGW080208	●	●			2	0.087	0.031	0.187	0.094	0.091	○							
	**2QP-VCGW 330.5**	**2QP-VCGW160402**	●	●			2	0.138	0.080	0.375	0.187	0.173	○							
	2QP-VCGW 331	2QP-VCGW160404	●	●	●	●	2	0.122	0.016	0.375	0.187	0.173	○							
	2QP-VCGW 332	2QP-VCGW160408	●	●			2	0.087	0.031	0.375	0.187	0.173	○							
2QP-VCGW-H**	**2QP-VCGW 330.5-H**	**2QP-VCGW160402-H**	●	●			2	0.138	0.080	0.375	0.187	0.173						○		
	2QP-VCGW 331-H	2QP-VCGW160404-H	●	●			2	0.122	0.016	0.375	0.187	0.173						○		
	2QP-VCGW 332-H	2QP-VCGW160408-H	●	●			2	0.087	0.031	0.375	0.187	0.173						○		

●: New product
●: Line up

PRACTICAL EXAMPLES

Workpiece type		Automotive parts (Gear)	Automotive parts (CVT)
Insert		2QP-CNGA 432	2QP-DNGA 432
Grade		BXA10	BXA10
Workpiece material		4140 (62HRC)	4140 (HV720 - 850)
			
Cutting conditions	Cutting speed: *Vc* (sfm)	330	430
	Feed : *f* (ipr)	0.002	0.004
	Depth of cut : *ap* (in)	0.006	0.006
	Coolant	Dry	Wet
Results		 Flank wear-resistant, BXA10 grade has provided 190% increase in tool life over the competitor's.	 Good coating layer adhesion of BXA10 ensured edge toughness during machining, provided high and stable quality surface finishing.

Workpiece type		Automotive parts (Stater)	Automotive parts (Ring)
Insert		2QP-DCGW 32.52	2QP-CCGW 32.52-L
Grade		BXA10	BXA10
Workpiece material		4140 (62HRC)	5115 (60HRC)
			
Cutting conditions	Cutting speed: *Vc* (sfm)	550	590
	Feed : *f* (ipr)	0.003	0.004 (Boring) and 0.006 (Facing)
	Depth of cut : *ap* (in)	0.008 x 2 passes	0.004
	Coolant	Wet	Dry
Results		 Crater wear resistant BXA10 has prevented catastrophic insert failure, providing 170% increase in tool life.	 BXA10 in combination with the -L edge prep has enhanced the insert's cutting edge toughness, prolonging tool life by 160%.

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