

For Aluminum and Difficult-to-cut Materials

# **BXD4000**

## Multi functional indexable cutter

**BXD** series of milling cutters excels in high performance machining of aluminum.

- Low cutting resistance combined with toughness and rigidity allows for superior cutting performance.

- High aluminum removal rates of more than 125 in<sup>3</sup>/min.

**NEW**

- Low cutting resistance GL breaker for aluminum alloy cutting!

- **LC15TF**

New DLC-coated inserts for outstanding aluminum alloy machining performance.



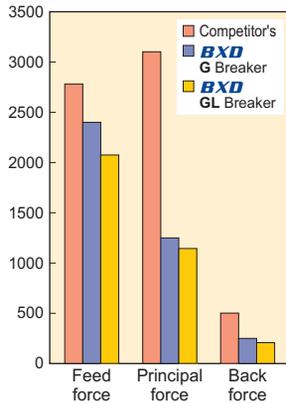
# Milling Cutters for Aluminum and Difficult-to-cut Materials

## ***BXD4000***

### ■ Features

## Low Resistance & High Rigidity Inserts

Specially designed inserts for **BXD** cutters to give excellent performance and high efficiency milling on a wide range of materials.

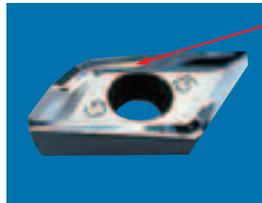


### Cutting resistance of **BXD**

**GL Breaker** **NEW**  
Cutting resistance can be reduced by 20% compared with the standard G breaker! (Only for aluminum)



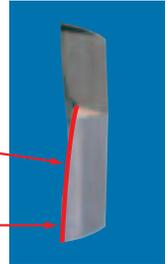
<Cutting conditions>  
Workpiece : Aluminum alloy  
Cutting speed : 3280 SFM  
Width of cut : 2.36 inch  
Depth of cut : .079 inch



Double phased helical rake angles

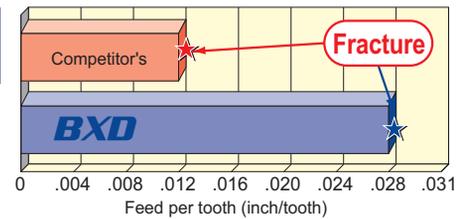
Helical flank

Concave cutting edge line



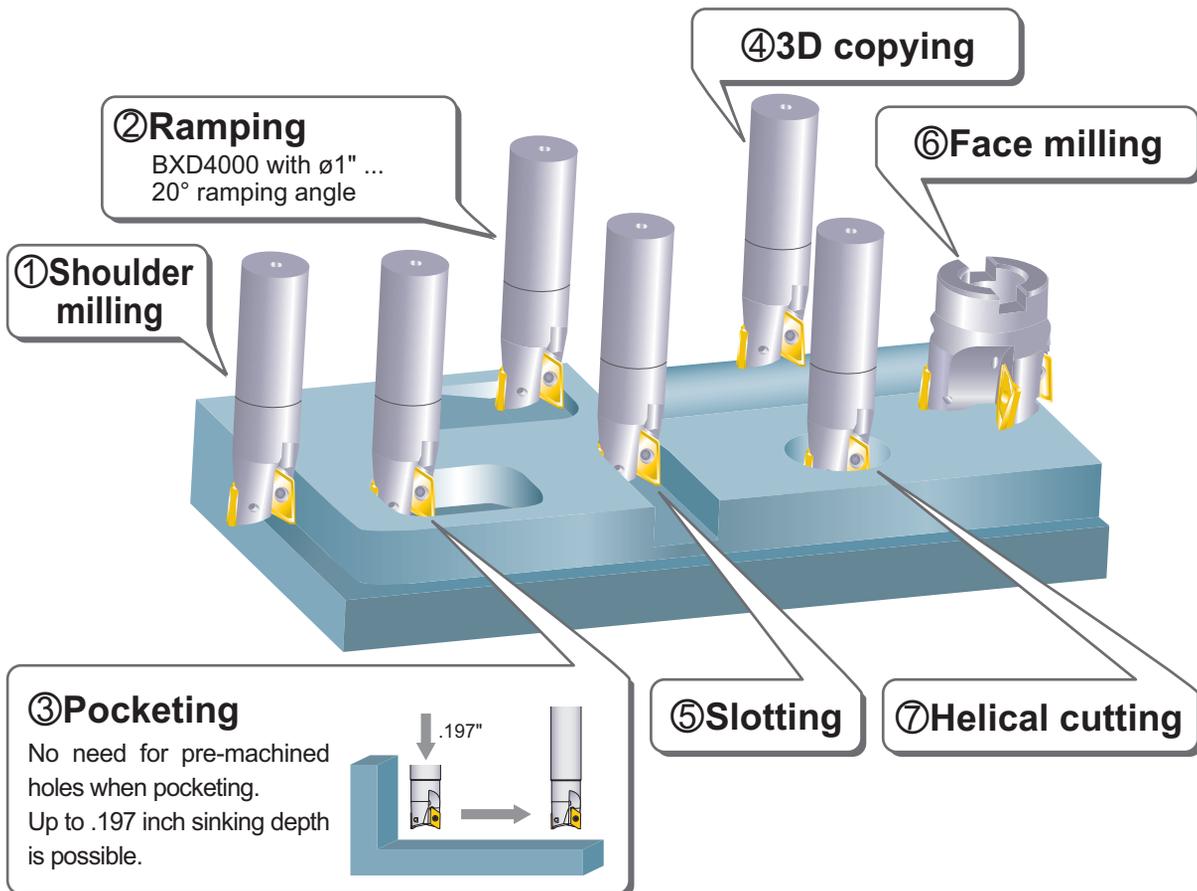
### Fracture resistance of **BXD**

<Cutting conditions>  
Workpiece : Carbon steel  
Cutting speed : 525 SFM  
Width of cut : .197 inch  
Depth of cut : .197 inch



## Multi functional milling

**BXD** for excellent ramping and overall performance.

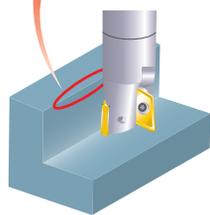
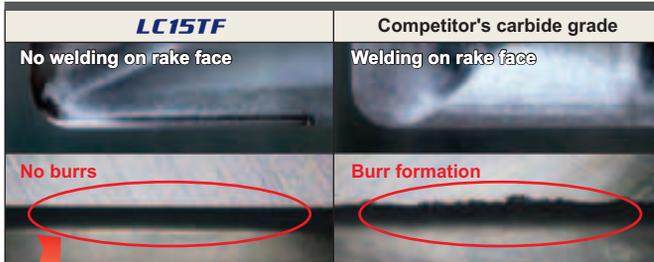


# Grade Features

## LC15TF

Highly wear and fracture resistant micro-grain cemented carbide **TF15** coupled with Mitsubishi's unique, weld resistant DLC coating provides better surface finishes and enables stable, high-grade machining without burrs. **LC15TF** for both wet and dry machining.

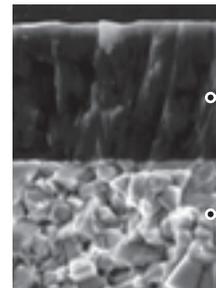
### ● Dry machining example in Aluminum alloy



<Cutting conditions>

Holder : BXD4000R202SA20S  
 Insert : XDGT1550PDFR-G08  
 Workpiece : Aluminum alloy  
 Cutting speed : 655 SFM  
 Feed per tooth : .004 IPT  
 Depth of cut :  $ap=.197$  inch,  $ae=.315$  inch  
 Cutting time : 30 min  
 Dry, Down cutting

## MIRACLE® Coated VP15TF



MIRACLE® coating (Al,Ti)N

Cemented carbide substrate **TF15**

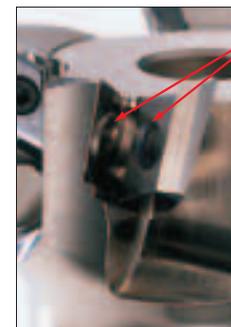
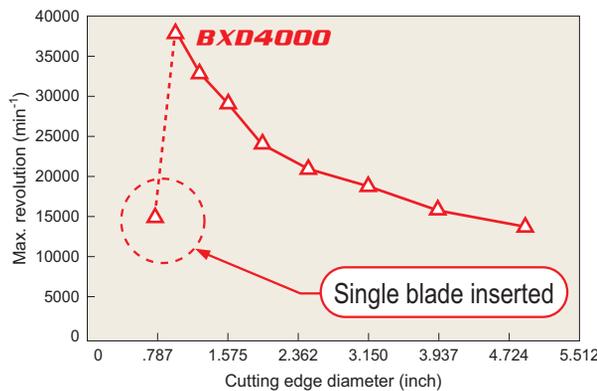
Wear and fracture resistant **TF15** substrate coupled with MIRACLE coating. For high oxidation resistance and adhesion strength to improve tool life on a wide range of difficult to cut materials.

## TF15

Micro-grain cemented carbide with superior resistance to wear and fracturing. **TF15** ensures stable cutting and efficient machining of aluminum alloy. The special mirror treatment on rake the rake face prevents chip welding for reliability and longer tool life.

# Secure High-revolution Milling!

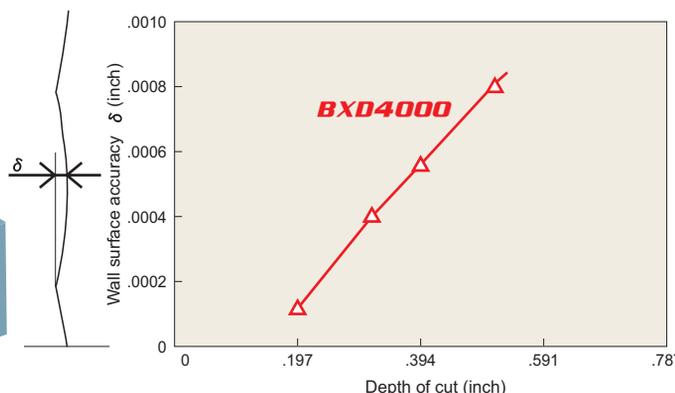
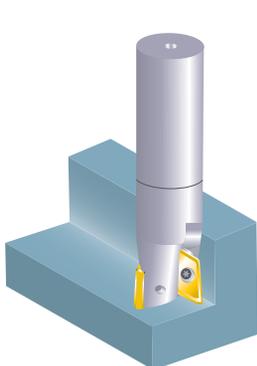
Specially designed screws and Mitsubishi's proprietary "Anti Fly Insert" mechanism (AFI mechanism) guarantees secure and safe high revolution milling.



AFI mechanism

# Excellent Wall Accuracy

Specially designed G-class inserts with a helical cutting edge for excellent wall accuracy.



Data obtained from performance tests with BXD4000R162SA16S

Nose radius : R.063  
 Revolution : 20,000 (min<sup>-1</sup>)  
 Feed per tooth : .008 IPT  
 Width of cut : .118 inch  
 Workpiece : Aluminum alloy  
 Wet cutting

Wall surface accuracy varies depending on the diameter of the tool.

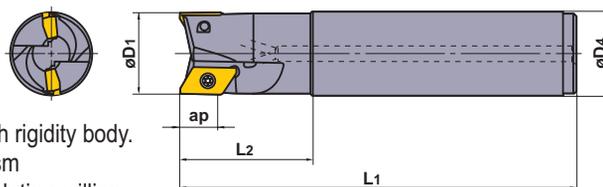
# Milling Cutters for Aluminum and Difficult-to-cut Materials

# BXD4000

## Shank Type



- Air / coolant through.
- Low resistance inserts & high rigidity body.
- The Anti Fly Insert mechanism guarantees secure high-revolution milling.



Light Alloy	Cast Iron	General Steel	Stainless Steel	Hardened Steel
➔				

Right hand tool holder only.

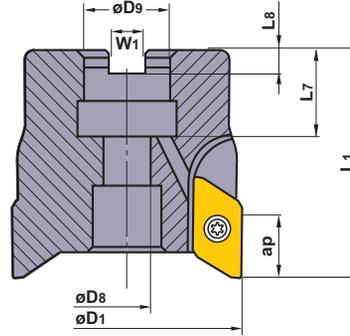
Type	Insert Corner Re	Order Number	Stock	Number of Teeth R	Dimensions (inch)				Max. Depth of Cut ap	Ramping Angle (°)	Max. Spindle Speed (min <sup>-1</sup> )		
					D1	L1	D4	L2					
A	.016   .125	<b>BXD4000R162SA12S</b>	●	2	1.000	6.000	.750	2.000	.591	20	38,000	TS4SL	TKY15W
		<b>162SA16S</b>	●	2	1.000	6.000	1.000	2.000	.591	20	38,000	TS4SL	TKY15W
		<b>202SA20S</b>	●	2	1.250	6.000	1.250	2.000	.591	13	33,000	TS4SL	TKY15W
		<b>243SA20S</b>	●	3	1.500	6.000	1.250	2.000	.591	10	29,000	TS4SL	TKY15W
B	.157   .197	<b>BXD4000R162SA12SB</b>	●	2	1.000	6.000	.750	2.000	.591	20	38,000	TS4SL	TKY15W
		<b>162SA16SB</b>	●	2	1.000	6.000	1.000	2.000	.591	20	38,000	TS4SL	TKY15W
		<b>202SA20SB</b>	●	2	1.250	6.000	1.250	2.000	.591	13	33,000	TS4SL	TKY15W
		<b>243SA20SB</b>	●	3	1.500	6.000	1.250	2.000	.591	10	29,000	TS4SL	TKY15W

● Please pay special attention to your safety when high speed machining.

## Inserts

Work Material	P Steel		M Stainless Steel		K Cast Iron		N Non-Ferrous Metal		S Heat-resistant Alloy, Titanium Alloy		Cutting Conditions :			
	●		●		●		●		●		● : Stable Cutting ● : General Cutting ✖ : Unstable Cutting			
	●		●		●		●		●		Honing : E : Round F : Sharp			
Shape	Order Number	Class	Honing	Coated		Carbide		Dimensions (inch)					Geometry	
				VP15TF	LC15TF	TF15	L1	L4	S1	F1	Re			
	<b>XDGT1550PDFR-G04</b>	G	F	★	●			.866	.630	.197	.059	.016		
	<b>1550PDFR-G08</b>	G	F	★	●			.866	.630	.197	.043	.031		
	<b>1550PDFR-G12</b>	G	F	★	★			.866	.630	.197	.028	.047		
	<b>1550PDFR-G16</b>	G	F	★	●			.866	.630	.197	.016	.063		
	<b>1550PDFR-G20</b>	G	F	★	●			.854	.630	.197	.008	.079		
	<b>1550PDFR-G30</b>	G	F	★	●			.787	.630	.197	.024	.118		
	<b>1550PDFR-G32</b>	G	F	★	★			.787	.630	.197	.016	.125		
	<b>1550PDFR-G40</b>	G	F	★	●			.748	.630	.197	.020	.157		
	<b>1550PDFR-G50</b>	G	F	★	●			.709	.630	.197	.016	.197		
	<b>XDGT1550PDER-G04</b>	G	E	●				.866	.630	.197	.059	.016		
	<b>1550PDER-G08</b>	G	E	●				.866	.630	.197	.043	.031		
	<b>1550PDER-G12</b>	G	E	★				.866	.630	.197	.028	.047		
	<b>1550PDER-G16</b>	G	E	●				.866	.630	.197	.016	.063		
	<b>1550PDER-G20</b>	G	E	●				.854	.630	.197	.008	.079		
<b>1550PDER-G30</b>	G	E	●				.787	.630	.197	.024	.118			
<b>1550PDER-G32</b>	G	E	★				.787	.630	.197	.016	.125			
<b>1550PDER-G40</b>	G	E	●				.748	.630	.197	.020	.157			
Lower Cutting Resistance Type	<b>XDGT1550PDFR-GL04</b>	G	F		●			.866	.630	.197	.059	.016		
	<b>1550PDFR-GL08</b>	G	F		●			.866	.630	.197	.043	.031		

Arbor Type



D1	Coolant thru Set Bolt
1.5	HSCU25014H
2	HSCU37513H
2.5	HSCU37513H
3	HSCU50014H
4	HSCU75016H

Right hand tool holder only.

Type	Insert Corner Re	Order Number	Stock	Number of Teeth	Dimensions (inch)							Max. Depth of Cut ap	Ramping Angle (°)	Max. Spindle Speed (min <sup>-1</sup> )	Insert Screw	Wrench
					D1	L1	D9	L7	D8	W1	L8					
A	.016   .125	<b>BXD4000R1503</b>	●	3	1.500	1.969	.500	.630	.276	.250	.156	.591	10	29,000	TS4SL	TKY15W
		<b>0203</b>	●	3	2.000	.1969	.750	.748	.415	.313	.187	.591	7	24,000	TS4SL	TKY15W
		<b>0204</b>	●	4	2.000	1.969	.750	.748	.415	.313	.187	.591	7	24,000	TS4SL	TKY15W
		<b>2504</b>	●	4	2.500	1.969	.750	.748	.415	.313	.187	.591	5	21,000	TS4SL	TKY15W
		<b>0305</b>	●	5	3.000	1.969	1.000	1.024	.539	.375	.219	.591	3	19,000	TS4SL	TKY15W
		<b>0406</b>	●	6	4.000	2.480	1.500	1.181	.787	.625	.375	.591	3	16,000	TS4SL	TKY15W
B	.157   .197	<b>BXD4000R1503B</b>	●	3	1.500	1.969	.500	.630	.276	.250	.156	.591	10	29,000	TS4SL	TKY15W
		<b>0203B</b>	●	3	2.000	1.969	.750	.748	.415	.313	.187	.591	7	24,000	TS4SL	TKY15W
		<b>0204B</b>	●	4	2.000	1.969	.750	.748	.415	.313	.187	.591	7	24,000	TS4SL	TKY15W
		<b>2504B</b>	●	4	2.500	1.969	.750	.748	.415	.313	.187	.591	5	21,000	TS4SL	TKY15W
		<b>0305B</b>	●	5	3.000	1.969	1.000	1.024	.539	.375	.219	.591	3	19,000	TS4SL	TKY15W
		<b>0406B</b>	●	6	4.000	2.480	1.500	1.181	.787	.625	.375	.591	3	16,000	TS4SL	TKY15W

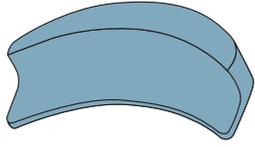
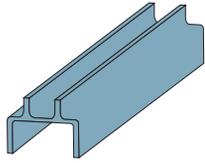
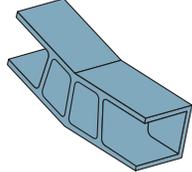
Combination of Holder and Insert Corner Radius

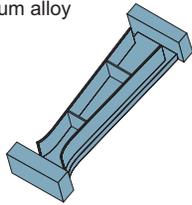
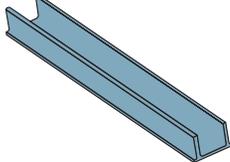
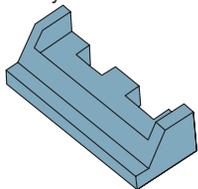
Holder	~(S) Holder							~B Holder	
	BXD4000R○○○○○○(S)							BXD4000R○○○○○○B	
Insert Corner Radius (Re)	R .016"	R .031"	R .047"	R .063"	R .079"	R .118"	R .125"	R .157"	R .197"
	XDGT.....-G04	XDGT.....-G08	XDGT.....-G12	XDGT.....-G16	XDGT.....-G20	XDGT.....-G30	XDGT.....-G32	XDGT.....-G40	XDGT.....-G50

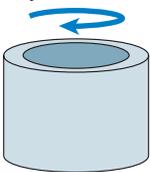
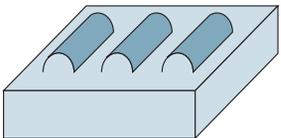
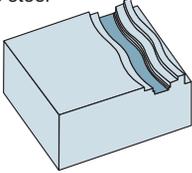
(Note) Other combinations of holder and insert corner R are not acceptable.

# Milling Cutters for Aluminum and Difficult-to-cut Materials

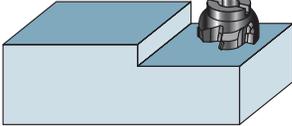
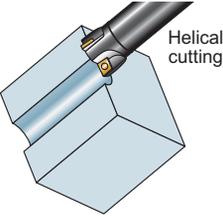
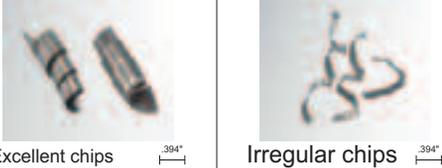
## Application Examples

Holder		BXD4000R202SA20S	BXD4000R0204	BXD4000R0204
Insert (Grade)		XDGT1550PDFR-GL04(TF15)	XDGT1550PDFR-G04(TF15)	XDGT1550PDFR-G08(TF15)
Workpiece		Aluminum alloy 	Aluminum alloy 	Aluminum alloy 
Machine		BT40	M/C (HSK-F63 80HP)	M/C (BT50 40HP)
Cutting Conditions	Revolution (min <sup>-1</sup> )	10,000	20,000	10,000
	Cutting Speed (SFM)	3,270	10,350	5,235
	Depth of Cut (inch)	.175	.197	.201
	Width of Cut (inch)	1.250	1.378	2.000
	Table Feed (IPM)	300	480	320
	Metal Removal Rate (in <sup>3</sup> /min)	66	130	129
Result		The spindle load from the G type breaker was 60%, but the GL breaker load indicator was only 40%, therefore displaying a lower cutting resistance.	<b>BXD</b> for lower cutting noise, excellent chip discharge and superior surface finish.	<b>BXD</b> achieved more than 12 times longer tool life.

Holder		BXD4000R162SA16S	BXD4000R202SA20S	BXD4000R162SA16S
Insert (Grade)		XDGT1550PDFR-G20(TF15)	XDGT1550PDFR-G30(TF15)	XDGT1550PDFR-G04(TF15)
Workpiece		Aluminum alloy 	Aluminum alloy 	Aluminum alloy 
Machine		M/C (BT40 40HP)	M/C (BT50 25HP)	M/C (BT50 30HP)
Cutting Conditions	Revolution (min <sup>-1</sup> )	30,000	7,000	7,500
	Cutting Speed (SFM)	7,740	2,305	1,930
	Depth of Cut (inch)	.630	.197	.118
	Width of Cut (inch)	.630	1.260	.984
	Table Feed (IPM)	540	84	60
	Metal Removal Rate (in <sup>3</sup> /min)	214	21	7
Result		<b>BXD</b> obtained excellent wall surface accuracy.	<b>BXD</b> achieved more than 10 times longer tool life.	The <b>BXD</b> displayed low resistance and achieved long tool life.

Holder		BXD4000R2504	BXD4000R0204	BXD4000R162SA16S
Insert (Grade)		XDGT1550PDFR-G04(LC15TF)	XDGT1550PDFR-G08(LC15TF)	XDGT1550PDFR-G08(VP15TF)
Workpiece		Aluminum alloy 	Aluminum alloy 	Stainless steel 
Machine		M/C (BT40 15HP)	M/C (BT40 15HP)	M/C (BT40 25HP)
Cutting Conditions	Revolution (min <sup>-1</sup> )	5,600	12,000	1,783
	Cutting Speed (SFM)	3,635	6,180	460
	Depth of Cut (inch)	.157	.079	.276
	Width of Cut (inch)	.059	.984	.787
	Table Feed (IPM)	291	960	14
	Metal Removal Rate (in <sup>3</sup> /min)	3	75	3
Result		LC15TF produced a superior surface finish compared to the competitors non-coated carbide grade that generated a dull surface finish.	Less welding and longer tool life after more than 1 hour duration of machining time with air blow.	The tool could be used on a smaller BT40 type spindle machining center because of the low cutting resistance of inserts.

## Application Examples

Holder		BXD4000R0406		Competitor's	
Insert (Grade)		XDGT1550PDER-G16 (VP15TF)			
Workpiece		Titanium alloy 			Carbon steel 
Machine		M/C (BT50 20HP)	M/C (BT50 20HP)		
Cutting Conditions	Revolution (min <sup>-1</sup> )	102	38		
	Cutting Speed (SFM)	130	49		
	Depth of Cut (inch)	.472	.197		
	Width of Cut (inch)	3.5	3.5		
	Table Feed (IPM)	2.45	.46		
Metal Removal Rate (in <sup>3</sup> /min)		4	.32		
Result				<ul style="list-style-type: none"> <li>• Accuracy of surface the finished surface flatness is .0002".</li> <li>• Compared to competitor's products, the <b>BXD</b> has lower cutting noise and provides a better surface finish.</li> </ul>	
		<ul style="list-style-type: none"> <li>• Chip problems solved.</li> <li>• Low resistant.</li> <li>• Excellent all surface accuracy and in surface finish.</li> </ul>			

Holder		BXD4000R0204	
Insert (Grade)		XDGT1550PDER-G04 (VP15TF)	
Machine		M/C (BT50 15HP)	
Cutting Conditions	Revolution (min <sup>-1</sup> )	1,230	
	Cutting Speed (SFM)	635	
	Depth of Cut (inch)	.197	
	Width of Cut (inch)	.197	
	Pitch (inch)	.197	
Table Feed (IPM)		20	
Result		<ul style="list-style-type: none"> <li>• Accuracy of surface the finished surface flatness is .0002".</li> <li>• Compared to competitor's products, the <b>BXD</b> has lower cutting noise and provides a better surface finish.</li> </ul>	

● Please note that you may not be able to machine materials as shown above, due to rigidity of your tools, of work, or of clamping.

## Operational Guidance

- Use only prescribed inserts and parts.
- The maximum guaranteed revolution for safety purposes is determined using ISO 15641:2001
- Make sure that the cutter operates under the maximum allowable revolution! If the spindle revolution is equal to or higher than the values shown in the following table, we recommend that you balance the tool and holder together so that it confirms to G40 or higher based on "JIS B 0905".

Cutting Edge Diameter (inch)	φ1.000"	φ1.250"	φ1.750"	φ2.000"	φ2.500"	φ3.000"	φ4.000"	φ5.000"
Revolution (min <sup>-1</sup> )	12,000	9,500	8,500	7,600	6,800	6,000	5,400	4,800

- Please use a special clamping bolt when using the arbor type with through coolant holes.
- Cutting tools have sharp cutting edges and handling them with bare hands may cause injuries. Always wear protectors such as gloves in handling indexable inserts.
- Always apply the recommended clamp torque values as shown below.

BXD4000 : 35 – 44 in.·lbs. (4 – 5N·m)

## Recommended Cutting Conditions

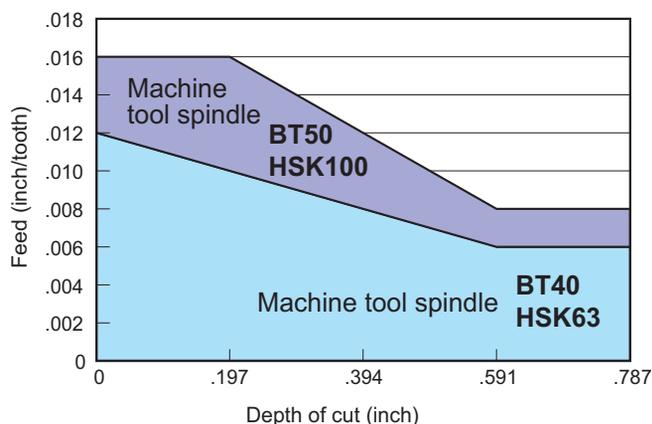
	Work Material	Hardness	Grade	Cutting Speed (SFM)	Feed per Tooth (inch/tooth)
<b>P</b>	Mild Steel	≤180HB	<b>VP15TF</b>	590 (490–655)	.006 (.004–.008)
	Carbon Steel Alloy Steel	≤280HB	<b>VP15TF</b>	490 (390–655)	.006 (.004–.008)
		280–350HB	<b>VP15TF</b>	460 (390–525)	.006 (.004–.008)
<b>M</b>	Stainless Steel	≤270HB	<b>VP15TF</b>	460 (390–525)	.008 (.004–.012)
<b>S</b>	Ti Alloy	—	<b>VP15TF</b>	130 (100–195)	.004 (.004–.012)
	Heat Resistant Alloy	—	<b>VP15TF</b>	100 (65–130)	.006 (.004–.008)
<b>N</b>	Aluminum Alloy	—	<b>LC15TF TF15</b>	3280 (655–9840)	.012 (.004–.020)

The figure above are the guidelines for conditions of general cutting by a standard type tool.

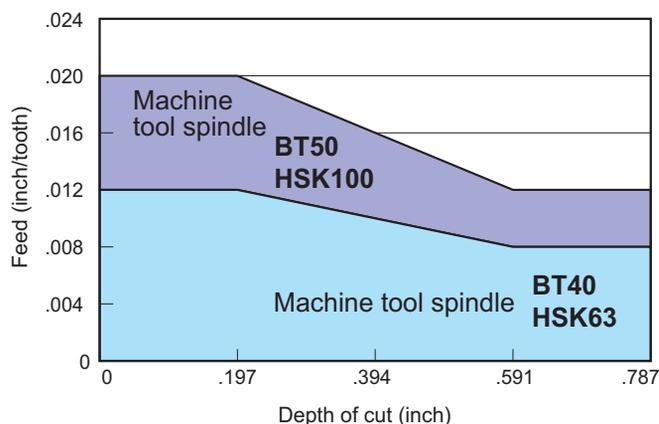
The conditions vary depending on machine strength, the length of overhang, and work clamping conditions.

Please adjust table feed when using long shank type tool.

### Proper combinations of depth of cut and feed in grooving



### Proper combinations of depth of cut and feed when the width of cut=1/2D<sub>1</sub>



#### For Your Safety

- Don't handle inserts and chips without gloves. ● Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ● Please use safety covers and wear safety glasses. ● When using compounded cutting oils, please take fire precautions. ● When attaching inserts or spare parts, please use only the correct wrench or spanner. ● When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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