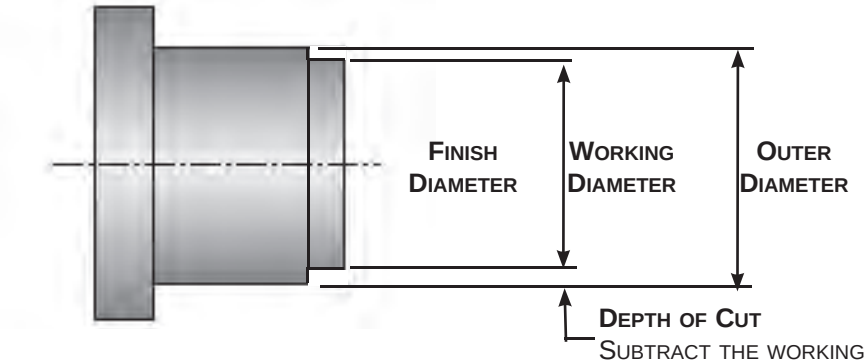


Depth of Cut
Subtract the working diameter from the outer diameter and divide by 2.

Example: 1" outer diameter with .976" working diameter.

$$\frac{1"-.976"}{2} = .012" \text{ depth of cut}$$

Setup Guide

Turning Applications

Decrease surface speed (SFM)
Increase feed (IPR)
Increase depth of cut
Set tool on center to .005" below center. Keep smaller inserts closer to center.

Modify Parameter →

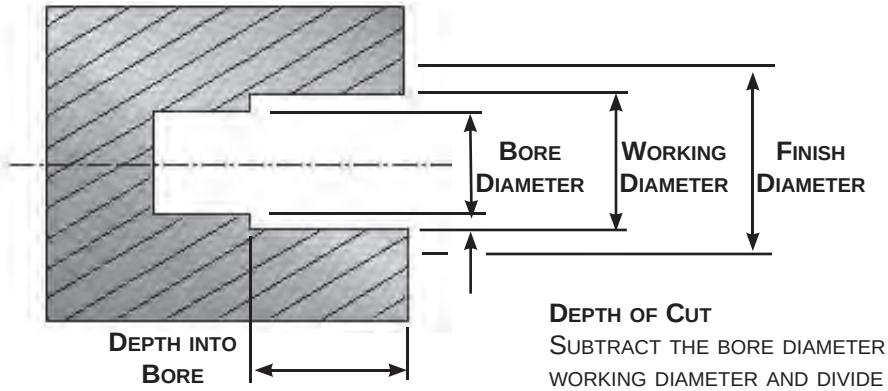
MBZ MBA MBE MBB MBF MBC MBG

Tool starts with: BT21 BT31 BT41 BT51 BT61 BT81

← Modify Parameter

Boring Applications

Decrease surface speed (SFM)
Increase feed (IPR)
Increase depth of cut
Set tool .002" to .010" above center. Keep smaller tools closer to center.



Depth of Cut
Subtract the bore diameter from the working diameter and divide by 2.

Example: 1" working diameter with .976" bore diameter.

$$\frac{1"-.976"}{2} = .012" \text{ depth of cut}$$

Cutting Paths:
- Internal tools designed for feeding into bore.
- External tools designed for feeding toward chuck.

Number of Passes
Subtract the finish diameter from the outer diameter and divide by 2 times the depth of cut per pass.

Example: 1" outer diameter with .875" finish diameter and .012" per pass.

$$\frac{1"-.875"}{2 \times .012"} = 5.2 \text{ or } 6 \text{ passes}$$

Note: Leave 30% - 50% of depth of cut for finish pass.

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Speeds & Feeds - MBZ, MBA, MBB, MBC Style Inserts & MICROBIT® Solid Carbide Tools

Material To Be Cut		Carbide Grade MBA,MBB,MBC,MBZ	Speed (SFM)	Feed (IPR)	Depth of Cut MBA, MBZ BT2, BT3	MBB, BT4,BT5	MBC, BT6, BT8
Aluminum	2021-6061	**DURA-MAX® 5000**	700-1400	.005-.012	.008	.008	.016
Brass		**DURA-MAX® 5000**	350-400	.001-.003	.006	.006	.012
Bronze		**DURA-MAX® 5000**	300-400	.001-.002	.006	.006	.012
Cast Iron	Gray	**DURA-MAX® 5000**	250-350	.004-.010	.007	.007	.015
	Ductile	**DURA-MAX® 5000**	250-350	.004-.010	.007	.007	.015
	Malleable	**DURA-MAX® 5000**	250-350	.004-.010	.007	.007	.015
Copper	101-757	**DURA-MAX® 5000**	600-800	.003-.005	.008	.008	.016
	834-978	**DURA-MAX® 5000**	600-800	.003-.005	.008	.008	.016
Magnesium	AZ, AM, EZ, ZE, HK Types	**DURA-MAX® 5000**	750-1500	.005-.012	.008	.008	.016
Nickel	Nickel 200-230	**DURA-MAX® 5000**	100-250	.002-.005	.004	.004	.008
	Monel	**DURA-MAX® 5000**	80-120	.001-.003	.004	.004	.008
	Inconel, Waspaloy	**DURA-MAX® 5000**	80-120	.001-.003	.004	.004	.008
	Hastelloy	**DURA-MAX® 5000**	80-120	.001-.003	.004	.004	.008
Plastic	Teflon (TFE, CTFE)	**DURA-MAX® 5000**	500-600	.003-.006	.007	.007	.015
	Nylon	**DURA-MAX® 5000**	700-800	.001-.003	.007	.007	.015
	Phenolic	**DURA-MAX® 5000**	700-800	.001-.003	.007	.007	.015
	Glass Filled	**DURA-MAX® 5000**	700-800	.001-.003	.005	.005	.015
Stainless Steels	201-385	**DURA-MAX® 5000**	100-250	.0015-.004	.005	.005	.010
	405-446	**DURA-MAX® 5000**	100-250	.0015-.004	.005	.005	.010
	14-4, 15-5, 16-6, 17-4 PH	**DURA-MAX® 5000**	300-400	.002-.004	.005	.005	.010
Steel	1005-1029	**DURA-MAX® 3000/4000**	100-300	.003-.007	.007	.007	.015
	1030-1055	**DURA-MAX® 3000/4000**	100-300	.003-.007	.007	.007	.015
	1060-1095	**DURA-MAX® 3000/4000**	150-400	.003-.005	.007	.007	.015
	10L45-10L50	**DURA-MAX® 3000/4000**	300-500	.004-.006	.007	.007	.015
	12L13-12L15	**DURA-MAX® 3000/4000**	300-500	.003-.005	.007	.007	.015
	41L30-41L50	**DURA-MAX® 3000/4000**	200-400	.003-.005	.007	.007	.015
	4140-4150	**DURA-MAX® 3000/4000**	150-400	.003-.005	.007	.007	.015
	4140 (35 HRc)	**DURA-MAX® 3000/4000**	90-125	.001-.004	.004	.004	.008
	8617-8622	**DURA-MAX® 3000/4000**	100-300	.002-.004	.007	.007	.015
	M1-M6	**DURA-MAX® 3000/4000**	150-250	.003-.008	.006	.006	.012
	H10-H19	**DURA-MAX® 3000/4000**	150-250	.003-.007	.006	.006	.012
	D2-D7	**DURA-MAX® 3000/4000**	150-250	.004-.010	.006	.006	.012
	A2-A9, 01-07	**DURA-MAX® 3000/4000**	150-250	.003-.008	.006	.006	.012
	W1, W2	**DURA-MAX® 3000/4000**	150-250	.003-.008	.006	.006	.012
	M-50, 52100	**DURA-MAX® 3000/4000**	300-400	.004-.010	.007	.007	.015
Titanium	Ti-6Al-6V	**DURA-MAX® 5000**	90-250	.001-.003	.005	.005	.010

THESE SPEEDS AND FEEDS ARE GIVEN AS A STARTING POINT ONLY AND MAY BE ADJUSTED UP OR DOWN DEPENDING ON CONDITIONS.
ANY TIME THERE IS AN INTERRUPTED CUT IN YOUR OPERATION, **DURA-MAX® 3000/4000** CARBIDE IS RECOMMENDED.

FORMULA FOR CONVERSION FROM SFM TO RPM

SFM = SURFACE FEET PER MINUTE RPM = REVOLUTIONS PER MINUTE IPR = INCHES PER REVOLUTION DIAMETER = CUTTING DIAMETER $\pi = 3.14$

$$\text{RPM} = \frac{\text{SFM} \times 12}{(\text{P}) \times \text{DIAMETER}}$$

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THINBIT® TROUBLESHOOTING INFORMATION

It is critical for small tooling to have correct set ups. Speeds and feeds, condition of toolholder, insert and machine, centerline heights, squareness of cutting edge to machine, rigid machine to toolholder relationships are vital for proper performance in all applications. The items listed are general guides, but will not solve all problems. Please call our sales office for additional assistance.

Problem	Things to try
Grooving	
Cutting oversized; Groove walls not square	Check insert squareness; Check toolholder condition; Check insert centerline; Check machine alignment; Decrease IPR
Chatter; Poor finish	Increase speed; Reduce feed; Check toolholder condition; Check centerline; Stub toolholder and review toolholder size and machine set up for maximum rigidity; Add coating; Add top rake
Built up edge; Insert chipping	Increase feed; Increase speed; Run with coolant; Use coated insert; Check insert centerline
Burr on part	Add chamfer to insert; Turn or bore diameter after groove
Insert breaking	Check insert squareness; Check toolholder condition; Check insert centerline; Check machine condition; Decrease IPR; Review speeds and feeds; Verify insert grade
Chip control	Increase feed; Use peck cycle; Mount with cutting edge down; Flood with coolant; Add chip control to insert
Face Grooving	
Cutting oversized; Groove walls not square	Check insert squareness; Check toolholder condition; Check insert centerline; Check machine alignment; Decrease IPR
Chatter; Poor finish	Increase speed; Reduce feed; Check toolholder condition; Check centerline; Stub toolholder and review toolholder size and machine set up for maximum rigidity; Add coating; Add top rake
Built up edge; Insert chipping	Increase feed; Increase speed; Run with coolant; Use coated insert; Check insert centerline
Burr on part	Add chamfer to insert; Turn or bore diameter after groove
Insert breaking	Check insert squareness; Verify clearance diameter; Check insert centerline; Check toolholder condition; Check machine condition; Decrease IPR; Review speeds and feeds; Verify insert grade
Chip control	Increase feed; Use peck cycle; Mount with cutting edge down; Flood with coolant; Add chip control to insert
Boring/Turning	
Chatter; Poor Finish	Increase speed; Reduce feed; Check toolholder condition; Check centerline; Verify chip evacuation; Verify coolant reaching cutting edge; Stub toolholder and review toolholder size and machine set up for maximum rigidity; Add coating; Add top rake
Built up edge; Insert chipping	Increase feed; Increase speed; Increase corner radius; Run with coolant; Use coated insert; Check insert centerline
Insert breaking	Check squareness; Verify clearance diameter; Check centerline; Check toolholder condition; Check machine condition; Decrease IPR; Review speeds and feeds; Verify insert grade
Chip control	Increase feed; Mount with cutting edge down; Flood with coolant; Add chip control to insert
Threading	
Chatter; Poor finish	Increase speed; Reduce depth of cut per pass; Check toolholder condition; Check centerline; Verify chip evacuation; Verify coolant reaching cutting edge; Stub toolholder and review toolholder size and machine set up for maximum rigidity; Add coating
Built up edge; Insert chipping	Increase depth of cut per pass; Increase speed; Increase corner radius; Run with coolant; Use coated insert; Check insert centerline
Insert breaking	Check squareness; Check centerline; Check toolholder condition; Check machine condition; Decrease depth of cut per pass; Review speeds and feeds; Verify insert grade
Parting	
Insert leading; Faces not square	Check insert squareness; Check toolholder condition; Check insert centerline; Check machine alignment; Decrease IPR; Add lead angle
Chatter; Poor finish	Increase speed; Reduce feed; Check toolholder condition; Check centerline; Stub toolholder and review toolholder size and machine set up for maximum rigidity; Add coating; Add top rake
Built up edge; Insert chipping	Increase feed; Increase speed; Run with coolant; Use coated insert; Check insert centerline
Burr on part	Chamfer before parting; Add lead angle to drop side of insert
Insert breaking	Check insert squareness; Check toolholder condition; Check insert centerline; Check machine condition; Decrease IPR; Review speeds and feeds; Verify insert grade
Chip control	Increase feed; Use peck cycle; Mount with cutting edge down; Flood with coolant; Add chip control to insert

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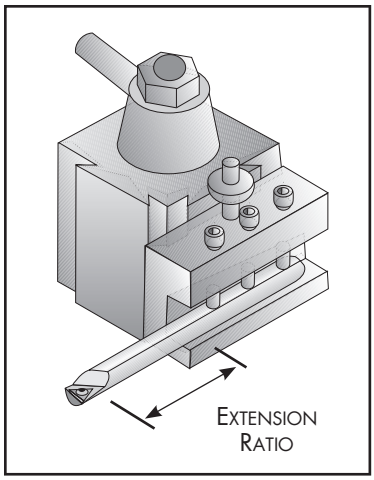


Extension Ratios

Bar Diameter	Steel 4 x ø	Heavy Metal 6 x ø	Carbide 8 x ø
.156"	.625"	.937"	1.250"
.187"	.750"	1.125"	1.500"
.250"	1.000"	1.500"	2.000"
.312"	1.250"	1.875"	2.500"
.375"	1.500"	2.250"	3.000"
.500"	2.000"	3.000"	4.000"
.625"	2.500"	3.750"	5.000"
.750"	3.000"		
1.000"	4.000"		

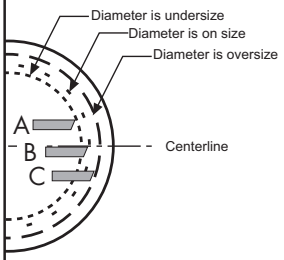
Shank Height	Steel
.312"	1.250"
.375"	1.500"
.500"	2.000"
.625"	2.500"
.750"	2.500"
1.000"	2.500"
1.250"	2.500"

Extending a toolholder beyond these recommendations can cause excessive deflection which will result in poor surface finish and reduced insert life. These recommendations may need to be reduced if cutting materials with low machinability, taking heavy cuts or using the tooling in non-rigid machine set-ups.

Toolholder Notes:

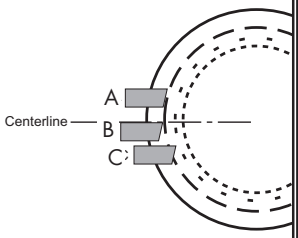
- To avoid burrs on your shanks, use only dog point screws. The use of cup point screws promotes burrs on the shanks and can result in problems removing or re-installing bars.
- Complete toolholders may be an assembly of several components each having an individual part number.
- Heavy Metal is a high density Tungsten based alloy that is very tough, stiff and vibration resistant.

Internal Tool & Face Grooving Cutting Heights



- Normal cutting forces cause tool deflection, therefore internal tools are manufactured to cut .002" to .010" above centerline.
- Setting tool above 'A' will cause diameter to be under desired size.
- Setting tool to cut at 'A' will cause insert to deflect to 'B' and cut desired diameter.
- Setting tool below 'A' will cause insert to deflect to 'C' and cause diameter to be oversized.
- Keep in mind if tools are mounted cutting edge toward floor, above center is toward floor.

External Tool Cutting Heights



- External tools are manufactured to cut on center to .005" below centerline.
- Setting tool to cut at 'A' can cause heel of insert to rub or cause failure.
- Setting tool to cut at 'B' will cause insert to deflect slightly and cut at 'C'.
- Setting tool below 'C' can cause insert to grab or fail.
- Keep in mind if tools are mounted cutting edge toward floor, below center is toward ceiling.

DEEPGROOVE® Head and Shank Compatibility Chart

Shank	Package	Page	Head	Clamp	Shank	Package	Page	Head	Clamp	Shank	Package	Page	Head	Clamp
DGS_ _XL	C	2-16	DGH4	DGC2	DGS_ _XR	B	2-16	DGH3	DGC1	DGS_ _ZR	N	2-8	DGH6	DGC6
	E	1-14	DGH2	DGC2		F	1-14	DGH1	DGC1		O	7-13	DGH3	DGC1
	S	7-14	DGH5	DGC5		T	7-14	DGH6	DGC6		Q	7-13	DGH1	DGC1
DGS_ _YR	D	2-16	DGH4	DGC2	DGS_ _YL	A	2-16	DGH3	DGC1	DGS_ _ZL	M	2-8	DGH5	DGC5
	G	1-14	DGH2	DGC2		H	1-14	DGH1	DGC1		P	7-13	DGH4	DGC2
	U	7-14	DGH5	DGC5		V	7-14	DGH6	DGC6		R	7-13	DGH2	DGC2

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