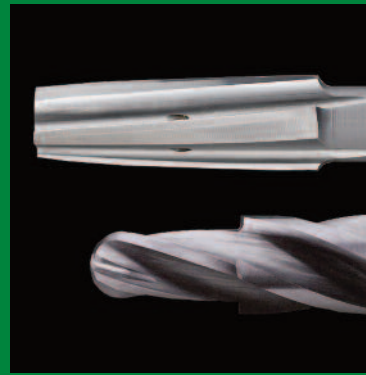
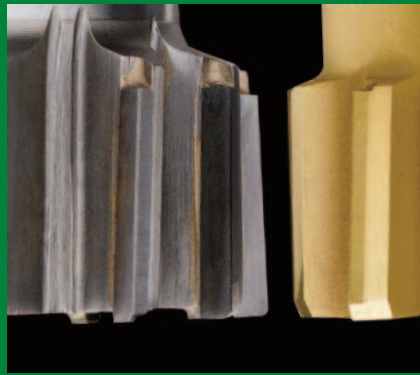


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**METCUT**™



# HOLEMAKING & HOLE FINISHING

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# HOLEMAKING & HOLE FINISHING

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## Metcut spade blades give you the edge!

- Highest performance in the industry
- Faster penetration rates – 35% to 100% higher "in-feed" rates than competitors' blades
- More holes per blade – 25% to 50% wear-life improvement over competitors' blades
- Less down time
- Interchangeable with other conventional spade blades
- Improved surface finish – elimination of secondary operations
- Complete standard and specials drill body / holder offering.
- Lower variability

### Premium blade construction:

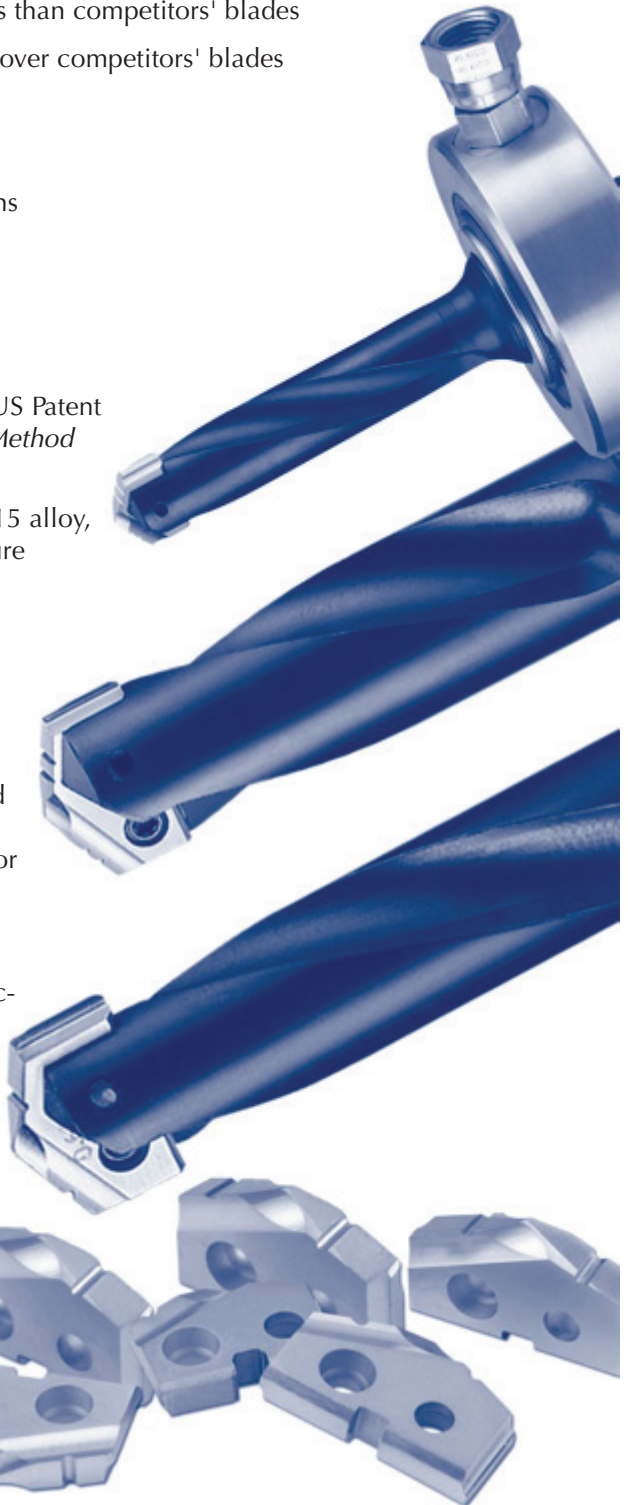
- Unique cutting geometry protected under Kennametal Inc. US Patent Number 63701702 (April 16, 2002) "*Spade Blade Drill and Method of Making*".
- Fabricated from a pressed and HIP sintered powder metal T-15 alloy, yielding a more uniform and consistent metallurgical structure provides lower variability than competing blades.

### Premium service and support:

- A specials program that delivers custom engineered spade blade and spade blade holder sizes and geometries to fulfill every customer requirement.
- A complete line of straight and helical fluted holders offered with both straight and taper shank styles; all holders are engineered to accommodate the option of a coolant gland for use where coolant through the spindle is lacking.

### Premium Coatings:

- **TiN** (Titanium Nitride) gives longer tool life and added lubricity, while allowing more aggressive machining of steels.
- **TiCN** (Titanium Carbonitride) is a general purpose coating well suited to machining of mild steel, ductile cast iron and nonferrous materials such as aluminum and copper alloys. TiCN is superior in preventing excessive BUE (built-up edge).
- **"G"** is comprised of more than 20 layers of TiCN and TiAlN with an overcoat of TiN optimized for drilling mild steel and ductile cast iron.
- **TiAlN** (Titanium Aluminum Nitride) a multilayer, mixed phase coating designed for high-speed machining in alloy steels, high temp alloys, gray cast iron and titanium. Performance advantages require TiAlN coated tools to be operated at relatively high speeds, typically 50% greater than other PVD coatings such as TiN.
- **CX-H** is a proprietary coating designed for optimal drilling of abrasive, short chipping nonferrous alloys (e.g. red brass, Al-Si alloys).
- **Diamond** coating is designed for abrasive nonferrous alloys.







## Application Information

**T-15 HSS spade blades** are recommended:

- For replacing steel twist drills resulting in 2X to 3X higher penetration rates and up to 4X to 5X longer wearlife.
- For providing straighter and more consistent holes with superior surface finishes than can be produced using either HSS twist drills or carbide indexable drills.
- When rigidity of the machine or the fixture requires a more forgiving, durable and tougher tool; T-15 steel possesses a higher transverse rupture strength and is more impact-resistant than comparable carbide spade blades and/or carbide indexable drills.
- In applications requiring hole depths up through 15X to 20X diameter; pecking may be required for depths above 7X diameter for some materials.
- As a more cost effective alternative to carbide indexable drills since T-15 steel spade blades operate at comparable penetration rates to single-effective indexable drills in materials <35 Rc, and one spade blade holder accommodates multiple diameter blades.

**Carbide spade blades** are recommended:

- For high productivity applications in which wearlife must be maximized; typically limited to hole depths less than 5X diameter.
- For use in highly abrasive materials such as cast iron, cast aluminum, etc.; or in harder steel alloys, typically 30 to 45 Rc.
- To exceed the performance of single-effective indexable drills by 20% to 50% in materials <45 Rc.
- To get improved productivity in contrast to T-15 steel spade blades by allowing 50% to 100% higher speeds; operational parameters of carbide blades recommend hole depths < 5X diameter, rigid set-ups, and 50% to 100% higher coolant pressures.

**Spade blade holders** generally can accommodate a range of blade sizes up to 1.30 to 1.35 times the smallest blade size. It is therefore possible to cover the entire range of hole sizes with just a few spade drill holders. Contrast this with the inventories required for indexable drills and steel taper shank drills.

**Straight fluted spade blade holders** are recommended for horizontal machining center applications to maximize chip evacuation given their inherent open flute construction.

**Helical fluted spade blade holders** may be necessary for vertical machining center applications to break chips, enhancing chip removal.

**R-8 (Bridgeport) holders** and blades are used in Bridgeport machines that require a R-8 taper holder.

**Through coolant** via the spindle cooling is preferable for optimal drilling with spade blades. However, if spindle cooling is unavailable, then coolant glands or inducers should be used to provide through coolant capability. All METCUT spade blade holders are manufactured with both the option of through the spindle cooling or with a rotary coolant gland. Flood coolant is not recommended, but can be used for very short hole depths, less than one diameter. Through coolant *must* be used with spade drill depths greater than one diameter.

**Half-size spade blade holders** (see pages 16–20) may be required where the penetration rate (in-feed) exceeds the recommended values by more than 25%. They are also recommended for use in gummy materials (e.g., aluminum, copper alloys) where torque forces can exceed the yield strength of the spade blade holder, typically where the spade blade diameter exceeds the spade blade body diameter by more than 25%. Without half-size holders, the spade blade's excessive overhang can expose it to premature failure and the holder to potential catastrophic break-up.

Series 0, 1 and 2 spade blade diameters have both full size and half size holders that provide proper support to the blade under most circumstances. Standard full-size holders can accommodate the full diameter range for a given spade blade series. Half-size holders should be used only for blade diameters that exceed the half-size spade blade holder body diameter by at least 0.010".



## Upgrade your tool crib with METCUT Spade Blade Holders

You've heard about the performance advantages of METCUT spade blades and you want to try them. But you've got an investment in tool holders. How can you make a cost effective switch? Let us prove the value of genuine METCUT spade blades and holders.

**Why settle for universal-style toolholders?**

**UPGRADE TO METCUT!**

*Superior hole making solutions by design.™*

### METCUT spade blade inserts:

- Increase average wear life by up to 2.5 times over coated universal-style blades
- Increase productivity (ipm) by as much as 50% over universal-style blades
- Cost up to 50% less than same substrate material universal-style blades

### Universal-style spade blade inserts:

- Lower wear life which means costly tool change-outs and machine down time
- Lower ipm which gives fewer parts per machine-hour, less productivity
- Higher investment costs in blade inventory without higher return on investment

## Spade Blade Holder Cross-Reference

### Taper Shank, Straight Flute Holders

Universal Type Series	METCUT Blade Series	Blade Diameter Range	Morse Taper No.	Short Length			Standard Length			Long Length		
				Max. Drill Depth	OAL	METCUT Holder	Max. Drill Depth	OAL	METCUT Holder	Max. Drill Depth	OAL	METCUT Holder
A	2	31/32"-1-3/8"	3	3.07	9.44	<b>7S2S</b>	7.82	14.19	<b>7S2L</b>	10.89	17.26	<b>7S2E</b>
AA	2	1-1/8"-1-3/8"	3	2.88	9.44	<b>7S2.5S</b>	7.63	15.19	<b>*7S2.5L-4M</b>	—	—	—
B	3	1-3/8"-1-7/8"	4	4.33	12.13	<b>7S3S</b>	8.43	16.13	<b>7S3M</b>	13.18	20.38	<b>7S3L</b>
C,D	4	1-7/8"-2-9/16"	4	5.90	13.62	<b>7S4S</b>	9.90	17.63	<b>7S4M</b>	16.02	23.75	<b>7S4L</b>
E,F	5,6	2-1/2"-3-1/2"	5	6.24	15.38	<b>7S5S</b>	11.99	21.13	<b>7S5M</b>	17.74	26.88	<b>7S5L</b>
G	7,8	3-1/2"-4-1/2"	5	6.88	16.28	<b>7S7S</b>	12.25	22.28	<b>7S7M</b>	19.45	30.53	<b>7S7L</b>

\*#4 Morse Taper

### Straight Shank, Straight Flute Holders

Universal Type Series	METCUT Blade Series	Blade Diameter Range	Shank Dia.	Short Length			Standard Length			Long Length		
				Max. Drill Depth	OAL	METCUT Holder	Max. Drill Depth	OAL	METCUT Holder	Max. Drill Depth	OAL	METCUT Holder
A	2	31/32"-1-3/8"	1.25	3.07	8.00	<b>7S2SS</b>	7.82	12.75	<b>7S2SL</b>	10.89	15.92	<b>7S2SE</b>
AA	2	1-1/8"-1-3/8"	1.25	2.88	8.00	<b>7S2.5SS</b>	7.63	12.75	<b>7S2.5SL</b>	—	—	—
B	3	1-3/8"-1-7/8"	1.50	4.33	9.88	<b>7S3SS</b>	8.43	13.88	<b>7S3SM</b>	13.18	18.63	<b>7S3SL</b>
C,D	4	1-7/8"-2-9/16"	1.50	5.90	11.38	<b>7S4SS</b>	9.90	15.38	<b>7S4SM</b>	16.02	21.50	<b>7S4SL</b>
E,F	5,6	2-1/2"-3-1/2"	2.00	6.24	12.50	<b>7S5SS</b>	11.99	18.25	<b>7S5SM</b>	17.74	24.00	<b>7S5SL</b>
G	7,8	3-1/2"-4-1/2"	3.00	6.88	15.25	<b>7S7SS</b>	12.25	21.25	<b>7S7SM</b>	19.45	29.50	<b>7S7SL</b>



# Minimum Coolant Volumetric Flow Rate and Coolant Pressure for T-15 HSS and Carbide Spade Blades

Note: These flow rates and coolant pressures are general recommendations for water-based coolants. They are guidelines for achieving maximum tool life and chip evacuation at the recommended speeds and feeds.

The table recommends adjusted flow and pressure rates for blade size, blade material, and holder length (short, medium, long, extended length). Since carbide blades are normally used in applications 5 x diameter or less, the long and extended length holders are not listed.

Holder* Length	X & Z .375"-.508"		0 .509"-.690"		1 .691"-.960"		2 .961"-1.380"		3 1.381"-1.879"		4 & 5 1.880"-3.000"		6, 7 & 8 3.001"-4.500"		
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	
<b>Low Carbon Steel 1010, 1020, 1025, 1522, etc.</b>															
<b>T-15 HSS</b>															
Flow (GPM)	S/M	2.4	2.6	2.4	2.6	3.7	4.2	6.0	7.0	11.0	12.0	26.0	30.0	36.0	40.0
	L	2.8	3.0	2.8	3.0	4.3	4.8	6.9	8.1	12.7	13.8	29.9	34.5	41.4	46.0
	E	3.1	3.4	3.1	3.4	4.8	5.5	7.8	9.1	14.3	15.6	33.8	39.0	46.8	52.0
Pressure (PSI)	S/M	160.0	170.0	75.0	90.0	75.0	95.0	60.0	80.0	55.0	75.0	30.0	40.0	>50.0	
	L	184.0	195.5	86.3	103.5	86.3	109.3	69.0	92.0	63.3	86.3	34.5	46.0	>57.5	
	E	208.0	221.0	97.5	117.0	97.5	123.5	78.0	104.0	71.5	97.5	39.0	52.0	>65.0	
<b>Carbide</b>															
Flow (GPM)	S/M	2.6	2.9	2.9	3.1	4.4	5.0	7.5	8.8	15.4	16.8				
Pressure (PSI)	S/M	200.0	212.5	105.0	126.0	105.0	133.0	96.0	128.0	104.5	142.5				
<b>Free Machining Steel 1118, 1215, 12L14, etc.</b>															
<b>T-15 HSS</b>															
Flow (GPM)	S/M	2.5	2.7	2.8	3.0	4.4	5.2	7.0	8.0	12.0	14.0	30.0	33.0	37.0	41.0
	L	2.9	3.1	3.2	3.5	5.1	6.0	8.1	9.2	13.8	16.1	34.5	38.0	42.6	47.2
	E	3.3	3.5	3.6	3.9	5.7	6.8	9.1	10.4	15.6	18.2	39.0	42.9	48.1	53.3
Pressure (PSI)	S/M	175.0	185.0	100.0	120.0	105.0	140.0	80.0	115.0	75.0	100.0	40.0	50.0	>60.0	
	L	201.3	212.8	115.0	138.0	120.8	161.0	92.0	132.3	86.3	115.0	46.0	57.5	>69.0	
	E	227.5	240.5	130.0	156.0	136.5	182.0	104.0	149.5	97.5	130.0	52.0	65.0	>78.0	
<b>Carbide</b>															
Flow (GPM)	S/M	2.8	3.0	3.4	3.6	5.3	6.2	8.8	10.0	16.8	19.6				
Pressure (PSI)	S/M	218.8	231.3	140.0	168.0	147.0	196.0	128.0	184.0	142.5	190.0				
<b>Medium Carbon Steel 1040, 1050, 1527, 1144, etc.</b>															
<b>T-15 HSS</b>															
Flow (GPM)	S/M	2.3	2.5	2.3	2.6	3.6	4.1	5.0	6.0	10.0	12.0	26.0	30.0	36.0	40.0
	L	2.6	2.9	2.6	3.0	4.1	4.7	5.8	6.9	11.5	13.8	29.9	34.5	41.4	46.0
	E	3.0	3.3	3.0	3.4	4.7	5.3	6.5	7.8	13.0	15.6	33.8	39.0	46.8	52.0
Pressure (PSI)	S/M	155.0	165.0	70.0	85.0	70.0	90.0	55.0	75.0	50.0	70.0	30.0	40.0	>50.0	
	L	178.3	189.8	80.5	97.8	80.5	103.5	63.3	86.3	57.5	80.5	34.5	46.0	>57.5	
	E	201.5	214.5	91.0	110.5	91.0	117.0	71.5	97.5	65.0	91.0	39.0	52.0	>65.0	
<b>Carbide</b>															
Flow (GPM)	S/M	2.5	2.8	2.8	3.1	4.3	4.9	6.3	7.5	14.0	16.8				
Pressure (PSI)	S/M	193.8	206.3	98.0	119.0	98.0	126.0	88.0	120.0	95.0	133.0				
<b>Alloy Steel 4140, 5140, 8640, etc.</b>															
<b>T-15 HSS</b>															
Flow (GPM)	S/M	2.2	2.4	2.2	2.4	3.5	3.9	5.0	6.0	10.0	11.0	26.0	28.0	31.0	36.0
	L	2.5	2.8	2.5	2.8	4.0	4.5	5.8	6.9	11.5	12.7	29.9	32.2	35.7	41.4
	E	2.9	3.1	2.9	3.1	4.6	5.1	6.5	7.8	13.0	14.3	33.8	36.4	40.3	46.8
Pressure (PSI)	S/M	155.0	165.0	65.0	75.0	65.0	80.0	50.0	70.0	45.0	60.0	30.0	35.0	>40.0	
	L	178.3	189.8	74.8	86.3	74.8	92.0	57.5	80.5	51.8	69.0	34.5	40.3	>46.0	
	E	201.5	214.5	84.5	97.5	84.5	104.0	65.0	91.0	58.5	78.0	39.0	45.5	>52.0	
<b>Carbide</b>															
Flow (GPM)	S/M	2.4	2.6	2.6	2.9	4.2	4.7	6.3	7.5	14.0	15.4				
Pressure (PSI)	S/M	193.8	206.3	91.0	105.0	91.0	112.0	80.0	112.0	85.5	114.0				
<b>High Strength Alloy 4340, 4330V, 300M, etc.</b>															
<b>T-15 HSS</b>															
Flow (GPM)	S/M	2.2	2.4	2.2	2.4	2.9	3.1	4.0	5.0	7.0	8.0	21.0	23.0	27.0	30.0
	L	2.5	2.8	2.5	2.8	3.3	3.6	4.6	5.8	8.1	9.2	24.2	26.5	31.1	34.5
	E	2.9	3.1	2.9	3.1	3.8	4.0	5.2	6.5	9.1	10.4	27.3	29.9	35.1	39.0
Pressure (PSI)	S/M	150.0	160.0	55.0	60.0	45.0	50.0	25.0	30.0	25.0	30.0	20.0	25.0	>30.0	
	L	172.5	184.0	63.3	69.0	51.8	57.5	28.8	34.5	28.8	34.5	23.0	28.8	>34.5	
	E	195.0	208.0	71.5	78.0	58.5	65.0	32.5	39.0	32.5	39.0	26.0	32.5	>39.0	
<b>Carbide</b>															
Flow (GPM)	S/M	2.4	2.6	2.6	2.9	3.5	3.7	5.0	6.3	9.8	11.2				
Pressure (PSI)	S/M	187.5	200.0	77.0	84.0	63.0	70.0	40.0	48.0	47.5	57.0				

\* See holder dimensions in holder listings pp 16-20



Holder* Length	X & Z .375"-.506"		0 .509"-.630"		1 .691"-.960"		2 .961"-1.380"		3 1.381"-1.879"		4 & 5 1.880"-3.000"		6, 7 & 8 3.001"-4.500"	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High

## Structural Steel A36, A285, A516, etc.

T-15 HSS															
Flow (GPM)	S/M	2.3	2.5	2.4	2.6	3.5	3.9	5.0	6.0	9.0	10.0	23.0	26.0	31.0	35.0
	L	2.6	2.9	2.8	3.0	4.0	4.5	5.8	6.9	10.4	11.5	26.5	29.9	35.7	40.3
	E	3.0	3.3	3.1	3.4	4.6	5.1	6.5	7.8	11.7	13.0	29.9	33.8	40.3	45.5
Pressure (PSI)	S/M	155.0	165.0	75.0	85.0	65.0	80.0	40.0	55.0	40.0	50.0	25.0	30.0	>40.0	
	L	178.3	189.8	86.3	97.8	74.8	92.0	46.0	63.3	46.0	57.5	28.8	34.5	>46.0	
	E	201.5	214.5	97.5	110.5	84.5	104.0	52.0	71.5	52.0	65.0	32.5	39.0	>52.0	
Carbide															
Flow (GPM)	S/M	2.5	2.8	2.9	3.1	4.2	4.7	6.3	7.5	12.6	14.0				
Pressure (PSI)	S/M	193.8	206.3	105.0	119.0	91.0	112.0	64.0	88.0	76.0	95.0				

## Tool Steel H-13, H-21, A-4, O-2, etc.

T-15 HSS															
Flow (GPM)	S/M	2.3	2.5	2.3	2.5	2.9	3.1	4.0	5.0	7.0	8.0	21.0	23.0	27.0	30.0
	L	2.6	2.9	2.6	2.9	3.3	3.6	4.6	5.8	8.1	9.2	24.2	26.5	31.1	34.5
	E	3.0	3.3	3.0	3.3	3.8	4.0	5.2	6.5	9.1	10.4	27.3	29.9	35.1	39.0
Pressure (PSI)	S/M	145.0	155.0	55.0	60.0	45.0	50.0	25.0	30.0	25.0	30.0	20.0	25.0	>30.0	
	L	166.8	178.3	63.3	69.0	51.8	57.5	28.8	34.5	28.8	34.5	23.0	28.8	>34.5	
	E	188.5	201.5	71.5	78.0	58.5	65.0	32.5	39.0	32.5	39.0	26.0	32.5	>39.0	
Carbide															
Flow (GPM)	S/M	2.5	2.8	2.8	3.0	3.5	3.7	5.0	6.3	9.8	11.2				
Pressure (PSI)	S/M	181.3	193.8	77.0	84.0	63.0	70.0	40.0	48.0	47.5	57.0				

## Stainless Steel 303, 416, 420, 17-4PH, etc.

T-15 HSS															
Flow (GPM)	S/M	2.3	2.5	2.3	2.6	3.5	3.7	5.0	6.0	9.0	10.0	23.0	26.0	33.0	37.0
	L	2.6	2.9	2.6	3.0	4.0	4.3	5.8	6.9	10.4	11.5	26.5	29.9	38.0	42.6
	E	3.0	3.3	3.0	3.4	4.6	4.8	6.5	7.8	11.7	13.0	29.9	33.8	42.9	48.1
Pressure (PSI)	S/M	160.0	170.0	70.0	85.0	65.0	75.0	40.0	55.0	40.0	50.0	25.0	30.0	>35.0	
	L	184.0	195.5	80.5	97.8	74.8	86.3	46.0	63.3	46.0	57.5	28.8	34.5	>40.3	
	E	208.0	221.0	91.0	110.5	84.5	97.5	52.0	71.5	52.0	65.0	32.5	39.0	>45.5	
Carbide															
Flow (GPM)	S/M	2.5	2.8	2.8	3.1	4.2	4.4	6.3	7.5	12.6	14.0				
Pressure (PSI)	S/M	200.0	212.5	98.0	119.0	91.0	105.0	64.0	88.0	76.0	95.0				

## Cast Iron Gray, Ductile, Nodular

T-15 HSS															
Flow (GPM)	S/M	2.2	2.4	2.2	2.4	3.1	3.3	4.0	5.0	8.0	9.0	23.0	26.0	27.0	30.0
	L	2.5	2.8	2.5	2.8	3.6	3.8	4.6	5.8	9.2	10.4	26.5	29.9	31.1	34.5
	E	2.9	3.1	2.9	3.1	4.0	4.3	5.2	6.5	10.4	11.7	29.9	33.8	35.1	39.0
Pressure (PSI)	S/M	155.0	165.0	60.0	65.0	50.0	60.0	30.0	40.0	30.0	35.0	25.0	30.0	>30.0	
	L	178.3	189.8	69.0	74.8	57.5	69.0	34.5	46.0	34.5	40.3	28.8	34.5	>34.5	
	E	201.5	214.5	78.0	84.5	65.0	78.0	39.0	52.0	39.0	45.5	32.5	39.0	>39.0	
Carbide															
Flow (GPM)	S/M	2.4	2.6	2.6	2.9	3.7	4.0	5.0	6.3	11.2	12.6				
Pressure (PSI)	S/M	193.8	206.3	84.0	91.0	70.0	84.0	48.0	64.0	57.0	66.5				

## Aluminum

T-15 HSS															
Flow (GPM)	S/M	2.6	2.8	3.3	3.7	5.3	6.1	8.0	9.0	14.0	16.0	30.0	33.0	37.0	41.0
	L	3.0	3.2	3.8	4.3	6.1	7.0	9.2	10.4	16.1	18.4	34.5	38.0	42.6	47.2
	E	3.4	3.6	4.3	4.8	6.9	7.9	10.4	11.7	18.2	20.8	39.0	42.9	48.1	53.3
Pressure (PSI)	S/M	185.0	200.0	140.0	180.0	150.0	200.0	115.0	160.0	90.0	125.0	40.0	50.0	>60.0	
	L	212.8	230.0	161.0	207.0	172.5	230.0	132.3	184.0	103.5	143.8	46.0	57.5	>69.0	
	E	240.5	260.0	182.0	234.0	195.0	260.0	149.5	208.0	117.0	162.5	52.0	65.0	>78.0	
Carbide															
Flow (GPM)	S/M	2.9	3.1	4.0	4.4	6.4	7.3	10.0	11.3	19.6	22.4				
Pressure (PSI)	S/M	231.3	250.0	196.0	252.0	210.0	280.0	184.0	256.0	171.0	237.5				

## High Temp. Alloy Hastelloy B, Inconel 600, etc.

T-15 HSS															
Flow (GPM)	S/M	2.2	2.4	2.2	2.4	3.1	3.2	4.0	5.0	7.0	8.0	23.0	26.0	27.0	30.0
	L	2.5	2.8	2.5	2.8	3.6	3.7	4.6	5.8	8.1	9.2	26.5	29.9	31.1	34.5
	E	2.9	3.1	2.9	3.1	4.0	4.2	5.2	6.5	9.1	10.4	29.9	33.8	35.1	39.0
Pressure (PSI)	S/M	150.0	160.0	60.0	65.0	50.0	55.0	30.0	35.0	25.0	30.0	25.0	30.0	>30.0	
	L	172.5	184.0	69.0	74.8	57.5	63.3	34.5	40.3	28.8	34.5	28.8	34.5	>34.5	
	E	195.0	208.0	78.0	84.5	65.0	71.5	39.0	45.5	32.5	39.0	32.5	39.0	>39.0	
Carbide															
Flow (GPM)	S/M	2.4	2.6	2.6	2.9	3.7	3.8	5.0	6.3	9.8	11.2				
Pressure (PSI)	S/M	187.5	200.0	84.0	91.0	70.0	77.0	48.0	56.0	47.5	57.0				





Recommended Starting Speeds (SFM) and Feeds (IPR) — T-15 HSS Blades

MATERIAL	Hardness Bhn	SPEEDS (SFM) Coatings					FEED (IPR) Series/Diameters							
		TiCN or "G"	TiAlN	CX-H	Diamond	Y & Z	0	1	2	3	4	5	6, 7, 8	
						.375 to .508	.509 to .690	.691 to .960	.961 to 1.380	1.381 to 1.879	1.880 to 2.570	2.571 to 3.000	3.001 to 4.500	
Low Carbon Steel 1010, 1020, 1025, 1522, etc.	85 – 125 125 – 175 175 – 225 225 – 275	175 165 155 145	225 210 200 185	NR NR NR NR	240 230 215 NR	NR NR NR NR	.008 .007 .006 .006	.011 .010 .009 .008	.013 .012 .011 .010	.016 .016 .015 .014	.020 .020 .019 .018	.023 .022 .021 .021	.025 .024 .023 .023	.028 .027 .026 .025
Free Machining Steel 1118, 1215, 12L14, etc.	100 – 150 150 – 200 200 – 250	200 180 160	260 240 220	NR NR 250	NR NR 230	NR NR NR	.008 .007 .006	.011 .010 .010	.014 .013 .013	.017 .016 .016	.021 .020 .020	.025 .023 .023	.026 .024 .024	.028 .026 .026
Medium Carbon Steel 1030, 1040, 1050, 1527, 1140, 1144, 1151, etc.	125 – 175 175 – 225 225 – 275 275 – 325	165 155 145 135	210 190 170 160	NR NR 215 200	NR NR NR NR	NR NR NR NR	.007 .006 .006 .005	.009 .008 .008 .007	.012 .011 .010 .009	.016 .015 .014 .012	.020 .019 .018 .016	.023 .022 .021 .019	.025 .023 .022 .021	.027 .025 .024 .023
Alloy Steel 4140, 5140, 8640, etc.	125 – 175 175 – 225 225 – 275 275 – 325 325 – 375	150 140 130 120 110	195 180 165 150 140	NR NR NR NR NR	200 185 NR NR NR	NR NR NR NR NR	.007 .007 .006 .005 .004	.009 .009 .008 .007 .006	.011 .010 .010 .009 .009	.015 .014 .013 .012 .012	.018 .017 .016 .015 .015	.021 .019 .019 .017 .017	.023 .021 .020 .018 .018	.025 .023 .021 .020 .020
High Strength Alloy 4340, 4330V, etc.	225 – 300 300 – 350 350 – 400	90 70 NR	105 85 NR	130 100 80	NR NR NR	NR NR NR	.006 .005 .004	.008 .007 .006	.010 .009 .008	.012 .011 .010	.015 .014 .012	.017 .016 .014	.019 .018 .016	.021 .021 .019
Structural Steel A36, A285, A516, etc.	100 – 150 150 – 250 250 – 350	150 125 100	180 160 135	NR 190 160	NR NR NR	NR NR NR	.007 .006 .005	.010 .009 .008	.012 .011 .009	.015 .013 .011	.018 .016 .014	.021 .019 .017	.023 .021 .019	.026 .024 .022
Tool Steel H-13, H-21, A-4, O-2, S-3, etc	150 – 200 200 – 250 250 – 350 350 – 400	85 75 45 NR	105 90 NR NR	NR 110 70 50	NR NR NR NR	NR NR NR NR	.007 .006 .005 .004	.008 .007 .006 .005	.009 .008 .007 .006	.011 .011 .009 .007	.013 .013 .011 .009	.015 .015 .013 .012	.016 .016 .014 .013	.018 .018 .016 .014
Stainless Steel 416, 420, 17-4PH, etc.	135 – 185 185 – 275 275 – 350	80 NR NR	100 85 75	120 105 90	100 95 80	NR NR NR	.007 .006 .005	.008 .007 .006	.010 .009 .007	.012 .011 .009	.015 .013 .011	.017 .015 .013	.019 .017 .015	.021 .019 .017
Cast Iron Gray, Ductile, Nodular	120 – 150 150 – 200 200 – 220 220 – 260 260 – 320	180 160 140 120 100	225 200 175 150 125	270 240 210 180 150	250 220 190 165 135	225 200 175 150 125	.008 .007 .006 .005 .004	.013 .011 .009 .007 .006	.017 .014 .012 .010 .007	.020 .018 .016 .012 .009	.024 .022 .018 .014 .012	.027 .025 .021 .017 .014	.029 .027 .023 .019 .016	.031 .029 .025 .021 .018
Aluminum - Wrought Cast	— —	NR NR	700 400	NR NR	750 500	750 500	.007 .008	.012 .013	.015 .016	.019 .020	.021 .022	.024 .025	.025 .026	.026 .027
Copper Alloys	—	NR	450	NR	550	600	.007	.012	.015	.019	.021	.024	.025	.026
High Temp. Alloy Hastelloy B, Inconel 600, etc.	140 – 210 210 – 280 280 – 340	NR NR NR	35 30 25	45 40 35	NR NR NR	NR NR NR	.006 .005 .004	.007 .006 .006	.008 .007 .007	.010 .008 .008	.013 .010 .009	.015 .012 .011	.016 .013 .012	.017 .014 .013
Titanium Alloys	—	NR	40	50	45	NR	.005	.007	.008	.010	.012	.015	.016	.017

NR = Not Recommended

Formulas: IPM = RPM x IPR ★ SFM = .262 x RPM x Diameter ★ RPM = SFM x 3.82 ÷ Diameter

Premium Coatings:

- **TiN** (Titanium Nitride) gives longer tool life and added lubricity, while allowing more aggressive machining of steels.
- **TiCN** (Titanium Carbonitride) is a general purpose coating well suited to machining of mild steel, ductile cast iron and nonferrous materials such as aluminum and copper alloys. TiCN is superior in preventing excessive BUE (built-up edge).
- **"G"** is comprised of more than 20 layers of TiCN and TiAlN with an overcoat of TiN optimized for drilling mild steel and ductile cast iron.
- **TiAlN** (Titanium Aluminum Nitride) a multilayer, mixed phase coating designed for high-speed machining in alloy steels, high temp alloys, gray cast iron and titanium. Performance advantages require TiAlN coated tools to be operated at relatively high speeds, typically 50% greater than other PVD coatings such as TiN.
- **CX-H** is a proprietary coating designed for optimal drilling of abrasive, short chipping nonferrous alloys (e.g. red brass, Al-Si alloys).
- **Diamond** coating is designed for abrasive nonferrous alloys.



Decimal Size	Inch Size	Metric Size	TiN Coated EDP Number	TiCN Coated EDP Number	TiAlN Coated EDP Number
<b>Series X: .375" through .436"</b>					
.3740	—	9,5	7FX-0374T	7FX-0374N	7FX-0374A
.3750	3/8	—	7FX-0375T	7FX-0375N	7FX-0375A
.3860	W	—	7FX-0386T	7FX-0386N	7FX-0386A
.3890	SAE #4	—	7FX-0389T	7FX-0389N	7FX-0389A
.3906	25/64	—	7FX-0391T	7FX-0391N	7FX-0391A
.3937	—	10,0	7FX-0394T	7FX-0394N	7FX-0394A
.4016	—	10,2	7FX-0402T	7FX-0402N	7FX-0402A
.4063	13/32	—	7FX-0406T	7FX-0406N	7FX-0406A
.4134	—	10,5	7FX-0413T	7FX-0413N	7FX-0413A
.4219	27/64	—	7FX-0422T	7FX-0422N	7FX-0422A
.4252	—	10,8	7FX-0425T	7FX-0425N	7FX-0425A
.4331	—	11,0	7FX-0433T	7FX-0433N	7FX-0433A
<b>Series Z: .437" through .508"</b>					
.4375	7/16	—	7FZ-0438T	7FZ-0438N	7FZ-0438A
.4520	SAE #5	—	7FZ-0452T	7FZ-0452N	7FZ-0452A
.4531	29/64	—	7FZ-0453T	7FZ-0453N	7FZ-0453A
.4646	—	11,8	7FZ-0465T	7FZ-0465N	7FZ-0465A
.4688	15/32	—	7FZ-0469T	7FZ-0469N	7FZ-0469A
.4724	—	12,0	7FZ-0472T	7FZ-0472N	7FZ-0472A
.4844	31/64	—	7FZ-0484T	7FZ-0484N	7FZ-0484A
.4921	—	12,5	7FZ-0492T	7FZ-0492N	7FZ-0492A
.5000	1/2	—	7FZ-0500T	7FZ-0500N	7FZ-0500A
<b>Series 0: .509" through .690"</b>					
.5090	SAE #6	—	7F0-0509T	7F0-0509N	7F0-0509A
.5118	—	13,0	7F0-0512T	7F0-0512N	7F0-0512A
.5156	33/64	—	7F0-0516T	7F0-0516N	7F0-0516A
.5313	17/32	—	7F0-0531T	7F0-0531N	7F0-0531A
.5469	35/64	—	7F0-0547T	7F0-0547N	7F0-0547A
.5512	—	14,0	7F0-0551T	7F0-0551N	7F0-0551A
.5625	9/16	—	7F0-0563T	7F0-0563N	7F0-0563A
.5709	—	14,5	7F0-0571T	7F0-0571N	7F0-0571A
.5781	37/64	—	7F0-0578T	7F0-0578N	7F0-0578A
.5906	—	15,0	7F0-0591T	7F0-0591N	7F0-0591A
.5938	19/32	—	7F0-0594T	7F0-0594N	7F0-0594A
.6094	39/64	—	7F0-0609T	7F0-0609N	7F0-0609A
.6102	—	15,5	7F0-0610T	7F0-0610N	7F0-0610A
.6250	5/8	—	7F0-0625T	7F0-0625N	7F0-0625A
.6299	—	16,0	7F0-0630T	7F0-0630N	7F0-0630A
.6406	41/64	—	7F0-0641T	7F0-0641N	7F0-0641A
.6496	—	16,5	7F0-0650T	7F0-0650N	7F0-0650A
.6563	21/32	—	7F0-0656T	7F0-0656N	7F0-0656A
.6611	—	16,8	7F0-0661T	7F0-0661N	7F0-0661A
.6693	—	17,0	7F0-0669T	7F0-0669N	7F0-0669A
.6719	43/64	—	7F0-0672T	7F0-0672N	7F0-0672A
.6875	11/16	—	7F0-0688T	7F0-0688N	7F0-0688A
.6890	SAE #8	17,5	7F0-0689T	7F0-0689N	7F0-0689A
<b>Series 1: .691" through .960"</b>					
.7031	45/64	—	7F1-0703T	7F1-0703N	7F1-0703A
.7087	—	18,0	7F1-0709T	7F1-0709N	7F1-0709A
.7188	23/32	—	7F1-0719T	7F1-0719N	7F1-0719A
.7283	—	18,5	7F1-0728T	7F1-0728N	7F1-0728A
.7344	47/64	—	7F1-0734T	7F1-0734N	7F1-0734A
.7480	—	19,0	7F1-0748T	7F1-0748N	7F1-0748A

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# T-15 HSS Spade Blades



Decimal Size	Inch Size	Metric Size	TiN Coated EDP Number	TiCN Coated EDP Number	TiAlN Coated EDP Number
<b>(continued) Series 1: .691" through .960"</b>					
.7500	3/4		7F1-0750T	7F1-0750N	7F1-0750A
.7580	—	19,25	7F1-0758T	7F1-0758N	7F1-0758A
.7656	49/64	—	7F1-0766T	7F1-0766N	7F1-0766A
.7677	—	19,5	7F1-0768T	7F1-0768N	7F1-0768A
.7813	25/32	—	7F1-0781T	7F1-0781N	7F1-0781A
.7874	—	20,0	7F1-0787T	7F1-0787N	7F1-0787A
.7969	51/64	—	7F1-0797T	7F1-0797N	7F1-0797A
.8060	SAE #10	—	7F1-0806T	7F1-0806N	7F1-0806A
.8071	—	20,5	7F1-0807T	7F1-0807N	7F1-0807A
.8125	13/16	—	7F1-0813T	7F1-0813N	7F1-0813A
.8268	—	21,0	7F1-0827T	7F1-0827N	7F1-0827A
.8281	53/64	—	7F1-0828T	7F1-0828N	7F1-0828A
.8438	27/32	—	7F1-0844T	7F1-0844N	7F1-0844A
.8594	55/64	—	7F1-0859T	7F1-0859N	7F1-0859A
.8661	—	22,0	7F1-0866T	7F1-0866N	7F1-0866A
.8750	7/8	—	7F1-0875T	7F1-0875N	7F1-0875A
.8906	57/64	—	7F1-0891T	7F1-0891N	7F1-0891A
.9063	29/32	—	7F1-0906T	7F1-0906N	7F1-0906A
.9219	59/64	—	7F1-0922T	7F1-0922N	7F1-0922A
.9375	15/16	—	7F1-0938T	7F1-0938N	7F1-0938A
.9449	—	24,0	7F1-0945T	7F1-0945N	7F1-0945A
.9531	61/64	—	7F1-0953T	7F1-0953N	7F1-0953A
.9600	—	24,4	7F1-0960T	7F1-0960N	7F1-0960A
<b>Series 2: .961" through 1.380"</b>					
.9688	31/32	—	7F2-0969T	7F2-0969N	7F2-0969A
.9810	SAE #12	—	7F2-0981T	7F2-0981N	7F2-0981A
.9843	—	25,0	7F2-0984T	7F2-0984N	7F2-0984A
1.0000	1	—	7F2-1000T	7F2-1000N	7F2-1000A
1.0156	1-1/64	—	7F2-1016T	7F2-1016N	7F2-1016A
1.0236	—	26,0	7F2-1024T	7F2-1024N	7F2-1024A
1.0313	1-1/32	—	7F2-1031T	7F2-1031N	7F2-1031A
1.0469	1-3/64	—	7F2-1047T	7F2-1047N	7F2-1047A
1.0625	1-1/16	—	7F2-1063T	7F2-1063N	7F2-1063A
1.0781	1-5/64	—	7F2-1078T	7F2-1078N	7F2-1078A
1.0938	1-3/32	—	7F2-1094T	7F2-1094N	7F2-1094A
1.1024	—	28,0	7F2-1102T	7F2-1102N	7F2-1102A
1.1060	SAE #14	—	7F2-1106T	7F2-1106N	7F2-1106A
1.1094	1-7/64	—	7F2-1109T	7F2-1109N	7F2-1109A
1.1250	1-1/8	—	7F2-1125T	7F2-1125N	7F2-1125A
1.1310	—	—	7F2-1131T	7F2-1131N	7F2-1131A
1.1406	1-9/64	—	7F2-1141T	7F2-1141N	7F2-1141A
1.1417	—	29,0	7F2-1142T	7F2-1142N	7F2-1142A
1.1563	1-5/32	—	7F2-1156T	7F2-1156N	7F2-1156A
1.1614	—	29,5	7F2-1161T	7F2-1161N	7F2-1161A
1.1811	—	30,0	7F2-1181T	7F2-1181N	7F2-1181A
1.1875	1-3/16	—	7F2-1188T	7F2-1188N	7F2-1188A
1.1929	—	30,3	7F2-1193T	7F2-1193N	7F2-1193A
1.2031	1-13/64	—	7F2-1203T	7F2-1203N	7F2-1203A
1.2188	1-7/32	—	7F2-1219T	7F2-1219N	7F2-1219A
1.2205	—	31,0	7F2-1221T	7F2-1221N	7F2-1221A
1.2310	SAE #16	—	7F2-1231T	7F2-1231N	7F2-1231A
1.2344	1-15/64	—	7F2-1234T	7F2-1234N	7F2-1234A
1.2500	1-1/4	—	7F2-1250T	7F2-1250N	7F2-1250A
1.2598	—	32,0	7F2-1260T	7F2-1260N	7F2-1260A

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Decimal Size	Inch Size	Metric Size	TiN Coated EDP Number	TiCN Coated EDP Number	TiAlN Coated EDP Number
1.2656	1-17/64	—	7F2-1266T	7F2-1266N	7F2-1266A
1.2813	1-9/32	—	7F2-1281T	7F2-1281N	7F2-1281A
1.2992	—	33,0	7F2-1299T	7F2-1299N	7F2-1299A
1.3125	1-5/16	—	7F2-1313T	7F2-1313N	7F2-1313A
1.3281	1-21/64	—	7F2-1328T	7F2-1328N	7F2-1328A
1.3386	—	34,0	7F2-1339T	7F2-1339N	7F2-1339A
1.3438	1-11/32	—	7F2-1344T	7F2-1344N	7F2-1344A
1.3594	1-23/64	—	7F2-1359T	7F2-1359N	7F2-1359A
1.3750	1-3/8	—	7F2-1375T	7F2-1375N	7F2-1375A
1.3780	—	35,0	7F2-1378T	7F2-1378N	7F2-1378A

### Series 3: 1.381" through 1.879"

1.3906	1-25/64	—	7F3-1391T	7F3-1391N	7F3-1391A
1.4063	1-13/32	—	7F3-1406T	7F3-1406N	7F3-1406A
1.4173	—	36,0	7F3-1417T	7F3-1417N	7F3-1417A
1.4375	1-7/16	—	7F3-1438T	7F3-1438N	7F3-1438A
1.4531	1-29/64	—	7F3-1453T	7F3-1453N	7F3-1453A
1.4567	—	37,0	7F3-1457T	7F3-1457N	7F3-1457A
1.4688	1-15/32	—	7F3-1469T	7F3-1469N	7F3-1469A
1.4844	1-31/64	—	7F3-1484T	7F3-1484N	7F3-1484A
1.4961	—	38,0	7F3-1496T	7F3-1496N	7F3-1496A
1.5000	1-1/2	—	7F3-1500T	7F3-1500N	7F3-1500A
1.5156	1-33/64	—	7F3-1516T	7F3-1516N	7F3-1516A
1.5250	—	38,74	7F3-1525T	7F3-1525N	7F3-1525A
1.5313	1-17/32	—	7F3-1531T	7F3-1531N	7F3-1531A
1.5354	—	39,0	7F3-1535T	7F3-1535N	7F3-1535A
1.5430	SAE #20	—	7F3-1543T	7F3-1543N	7F3-1543A
1.5625	1-9/16	—	7F3-1563T	7F3-1563N	7F3-1563A
1.5748	—	40,0	7F3-1575T	7F3-1575N	7F3-1575A
1.5781	1-37/64	—	7F3-1578T	7F3-1578N	7F3-1578A
1.5938	1-19/32	—	7F3-1594T	7F3-1594N	7F3-1594A
1.6142	—	41,0	7F3-1614T	7F3-1614N	7F3-1614A
1.6250	1-5/8	—	7F3-1625T	7F3-1625N	7F3-1625A
1.6535	—	42,0	7F3-1654T	7F3-1654N	7F3-1654A
1.6563	1-21/32	—	7F3-1656T	7F3-1656N	7F3-1656A
1.6875	1-11/16	—	7F3-1688T	7F3-1688N	7F3-1688A
1.6929	—	43,0	7F3-1693T	7F3-1693N	7F3-1693A
1.7031	1-45/64	—	7F3-1703T	7F3-1703N	7F3-1703A
1.7188	1-23/32	—	7F3-1719T	7F3-1719N	7F3-1719A
1.7323	—	44,0	7F3-1732T	7F3-1732N	7F3-1732A
1.7500	1-3/4	—	7F3-1750T	7F3-1750N	7F3-1750A
1.7656	1-49/64	—	7F3-1766T	7F3-1766N	7F3-1766A
1.7717	—	45,0	7F3-1772T	7F3-1772N	7F3-1772A
1.7813	1-25/32	—	7F3-1781T	7F3-1781N	7F3-1781A
1.7930	SAE #24	—	7F3-1793T	7F3-1793N	7F3-1793A
1.8110	—	46,0	7F3-1811T	7F3-1811N	7F3-1811A
1.8125	1-13/16	—	7F3-1813T	7F3-1813N	7F3-1813A
1.8281	1-53/64	—	7F3-1828T	7F3-1828N	7F3-1828A
1.8438	1-27/32	—	7F3-1844T	7F3-1844N	7F3-1844A
1.8504	—	47,0	7F3-1850T	7F3-1850N	7F3-1850A
1.8750	1-7/8	—	7F3-1875T	7F3-1875N	7F3-1875A

### Series 4: 1.880" through 2.570"

1.8800	—	—	7F4-1880T	7F4-1880N	7F4-1880A
1.8898	—	48,0	7F4-1890T	7F4-1890N	7F4-1890A
1.9063	1-29/32	—	7F4-1906T	7F4-1906N	7F4-1906A
1.9291	—	49,0	7F4-1929T	7F4-1929N	7F4-1929A

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# T-15 HSS Spade Blades



Decimal Size	Inch Size	Metric Size	TiN Coated EDP Number	TiCN Coated EDP Number	TiAlN Coated EDP Number
<b>(continued) Series 4: 1.880" through 2.570"</b>					
1.9375	1-15/16	—	7F4-1938T	7F4-1938N	7F4-1938A
1.9688	1-31/32	—	7F4-1969T	7F4-1969N	7F4-1969A
2.0000	2	—	7F4-2000T	7F4-2000N	7F4-2000A
2.0079	—	51,0	7F4-2008T	7F4-2008N	7F4-2008A
2.0156	2-1/64	—	7F4-2016T	7F4-2016N	7F4-2016A
2.0313	2-1/32	—	7F4-2031T	7F4-2031N	7F4-2031A
2.0472	—	52,0	7F4-2047T	7F4-2047N	7F4-2047A
2.0625	2-1/16	—	7F4-2063T	7F4-2063N	7F4-2063A
2.0866	—	53,0	7F4-2087T	7F4-2087N	7F4-2087A
2.0938	2-3/32	—	7F4-2094T	7F4-2094N	7F4-2094A
2.1250	2-1/8	—	7F4-2125T	7F4-2125N	7F4-2125A
2.1260	—	54,0	7F4-2126T	7F4-2126N	7F4-2126A
2.1563	2-5/32	—	7F4-2156T	7F4-2156N	7F4-2156A
2.1654	—	55,0	7F4-2165T	7F4-2165N	7F4-2165A
2.1875	2-3/16	—	7F4-2188T	7F4-2188N	7F4-2188A
2.2047	—	56,0	7F4-2205T	7F4-2205N	7F4-2205A
2.2188	2-7/32	—	7F4-2219T	7F4-2219N	7F4-2219A
2.2441	—	57,0	7F4-2244T	7F4-2244N	7F4-2244A
2.2500	2-1/4	—	7F4-2250T	7F4-2250N	7F4-2250A
2.2559	—	57,3	7F4-2256T	7F4-2256N	7F4-2256A
2.2813	2-9/32	—	7F4-2281T	7F4-2281N	7F4-2281A
2.2835	—	58,0	7F4-2284T	7F4-2284N	7F4-2284A
2.3125	2-5/16	—	7F4-2313T	7F4-2313N	7F4-2313A
2.3228	—	59,0	7F4-2323T	7F4-2323N	7F4-2323A
2.3438	2-11/32	—	7F4-2344T	7F4-2344N	7F4-2344A
2.3622	—	60,0	7F4-2362T	7F4-2362N	7F4-2362A
2.3750	2-3/8	—	7F4-2375T	7F4-2375N	7F4-2375A
2.3906	2-25/64	—	7F4-2391T	7F4-2391N	7F4-2391A
2.4016	—	61,0	7F4-2402T	7F4-2402N	7F4-2402A
2.4063	2-13/32	—	7F4-2406T	7F4-2406N	7F4-2406A
2.4375	2-7/16	—	7F4-2438T	7F4-2438N	7F4-2438A
2.4409	—	62,0	7F4-2441T	7F4-2441N	7F4-2441A
2.4688	2-15/32	—	7F4-2469T	7F4-2469N	7F4-2469A
2.4803	—	63,0	7F4-2480T	7F4-2480N	7F4-2480A
2.5000	2-1/2	—	7F4-2500T	7F4-2500N	7F4-2500A
2.5197	—	64,0	7F4-2520T	7F4-2520N	7F4-2520A
2.5313	2-17/32	—	7F4-2531T	7F4-2531N	7F4-2531A
2.5591	—	65,0	7F4-2559T	7F4-2559N	7F4-2559A
2.5625	2-9/16	—	7F4-2563T	7F4-2563N	7F4-2563A
<b>Series 5: 2.500" through 3.000"</b>					
2.5000	2-1/2	—	7F5-2500T	7F5-2500N	7F5-2500A
2.5197	—	64,0	7F5-2520T	7F5-2520N	7F5-2520A
2.5313	2-17/32	—	7F5-2531T	7F5-2531N	7F5-2531A
2.5625	2-9/16	—	7F5-2563T	7F5-2563N	7F5-2563A
2.5984	—	66,0	7F5-2598T	7F5-2598N	7F5-2598A
2.6250	2-5/8	—	7F5-2625T	7F5-2625N	7F5-2625A
2.6563	2-21/32	—	7F5-2656T	7F5-2656N	7F5-2656A
2.6772	—	68,0	7F5-2677T	7F5-2677N	7F5-2677A
2.6875	2-11/16	—	7F5-2688T	7F5-2688N	7F5-2688A
2.7188	2-23/32	—	7F5-2719T	7F5-2719N	7F5-2719A
2.7500	2-3/4	—	7F5-2750T	7F5-2750N	7F5-2750A
2.7559	—	70,0	7F5-2756T	7F5-2756N	7F5-2756A
2.7813	2-25/32	—	7F5-2781T	7F5-2781N	7F5-2781A
2.8125	2-13/16	—	7F5-2813T	7F5-2813N	7F5-2813A

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Decimal Size	Inch Size	Metric Size	TiN Coated EDP Number	TiCN Coated EDP Number	TiAlN Coated EDP Number
2.8346	—	72,0	7F5-2835T	7F5-2835N	7F5-2835A
2.8438	2-27/32	—	7F5-2844T	7F5-2844N	7F5-2844A
2.8750	2-7/8	—	7F5-2875T	7F5-2875N	7F5-2875A
2.9063	2-29/32	—	7F5-2906T	7F5-2906N	7F5-2906A
2.9134	—	74,0	7F5-2913T	7F5-2913N	7F5-2913A
2.9375	2-15/16	—	7F5-2938T	7F5-2938N	7F5-2938A
2.9688	2-31/32	—	7F5-2969T	7F5-2969N	7F5-2969A
2.9921	—	76,0	7F5-2992T	7F5-2992N	7F5-2992A
3.0000	3	—	7F5-3000T	7F5-3000N	7F5-3000A

## Series 6: 3.001" through 3.500"

3.0625	3-1/16	—	7F6-3063T	7F6-3063N	7F6-3063A
3.0709	—	78,0	7F6-3071T	7F6-3071N	7F6-3071A
3.1250	3-1/8	—	7F6-3125T	7F6-3125N	7F6-3125A
3.1496	—	80,0	7F6-3150T	7F6-3150N	7F6-3150A
3.1875	3-3/16	—	7F6-3188T	7F6-3188N	7F6-3188A
3.2283	—	82,0	7F6-3228T	7F6-3228N	7F6-3228A
3.2500	3-1/4	—	7F6-3250T	7F6-3250N	7F6-3250A
3.3071	—	84,0	7F6-3307T	7F6-3307N	7F6-3307A
3.3125	3-5/16	—	7F6-3313T	7F6-3313N	7F6-3313A
3.3750	3-3/8	—	7F6-3375T	7F6-3375N	7F6-3375A
3.3858	—	86,0	7F6-3386T	7F6-3386N	7F6-3386A
3.4375	3-7/16	—	7F6-3438T	7F6-3438N	7F6-3438A
3.4646	—	88,0	7F6-3465T	7F6-3465N	7F6-3465A
3.5000	3-1/2	—	7F6-3500T	7F6-3500N	7F6-3500A

## Series 7: 3.501" through 4.000"

3.5433	—	90,0	7F7-3543T	7F7-3543N	7F7-3543A
3.5625	3-9/16	—	7F7-3563T	7F7-3563N	7F7-3563A
3.6250	3-5/8	—	7F7-3625T	7F7-3625N	7F7-3625A
3.6875	3-11/16	—	7F7-3688T	7F7-3688N	7F7-3688A
3.7008	—	94,0	7F7-3701T	7F7-3701N	7F7-3701A
3.7500	3-3/4	—	7F7-3750T	7F7-3750N	7F7-3750A
3.7795	—	96,0	7F7-3780T	7F7-3780N	7F7-3780A
3.8125	3-13/16	—	7F7-3813T	7F7-3813N	7F7-3813A
3.8583	—	98,0	7F7-3858T	7F7-3858N	7F7-3858A
3.8750	3-7/8	—	7F7-3875T	7F7-3875N	7F7-3875A
3.9375	3-15/16	—	7F7-3938T	7F7-3938N	7F7-3938A
4.0000	4	—	7F7-4000T	7F7-4000N	7F7-4000A

## Series 8: 4.001" through 4.500"

4.0625	4-1/16	—	7F8-4063T	7F8-4063N	7F8-4063A
4.0945	—	104,0	7F8-4095T	7F8-4095N	7F8-4095A
4.1250	4-1/8	—	7F8-4125T	7F8-4125N	7F8-4125A
4.1875	4-3/16	—	7F8-4188T	7F8-4188N	7F8-4188A
4.2500	4-1/4	—	7F8-4250T	7F8-4250N	7F8-4250A
4.3125	4-5/16	—	7F8-4313T	7F8-4313N	7F8-4313A
4.3750	4-3/8	—	7F8-4375T	7F8-4375N	7F8-4375A
4.4094	—	112,0	7F8-4409T	7F8-4409N	7F8-4409A
4.4375	4-7/16	—	7F8-4438T	7F8-4438N	7F8-4438A
4.5000	4-1/2	—	7F8-4500T	7F8-4500N	7F8-4500A

## Blade Sets for R-8 (Bridgeport) Holders

- Series 0 TiN Coated Spade Blade Set C53100  
10 sizes: 33/64, 17/32, 35/64, 9/16, 37/64, 19/32, 39/64, 5/8, 21/32, 11/16
- Series 1 TiN Coated Spade Blade Set C53101  
10 sizes: 45/64, 23/32, 3/4, 49/64, 25/32, 13/16, 27/32, 7/8, 29/32, 15/16
- Series 2 TiN Coated Spade Blade Set C53102  
10 sizes: 31/32, 63/64, 1, 1-1/32, 1-1/16, 1-1/8, 1-5/32, 1-3/16, 1-1/4, 1-3/8





## Recommended Starting Speeds (SFM) and Feeds (IPR) — Carbide Blades

MATERIAL	Hardness Bhn	SPEEDS (SFM) Coatings					FEED (IPR) Series/Diameters									
		TiN	TiCN or TiN/TiCN		TiAlN	CX-H	Diamond	Y & Z	0	1	2	3				
			to	to				to	to	to						
Low Carbon Steel	85 – 125	300	375	NR	375	NR	0.375 to 0.508	0.509 to 0.690	0.691 to 0.960	0.961 to 1.380	1.381 to 1.879	.009	.011	.014	.017	.020
1010, 1020, 1025, 1522, etc.	125 – 175 175 – 225 225 – 275	275 225 190	325 275 240	NR NR NR	325 NR NR	NR NR NR	.008 .007 .006	.010 .010 .009	.014 .013 .012	.016 .016 .014	.019 .018 .017					
Free Machining Steel	100 – 150	325	375	NR	NR	NR	.010	.012	.016	.019	.023					
1118, 1215, 12L14, etc.	150 – 200 200 – 250	275 250	350 325	NR NR	NR NR	NR NR	.009 .008	.011 .010	.014 .013	.018 .017	.021 .020					
Medium Carbon Steel	125 – 175	250	300	NR	NR	NR	.008	.010	.013	.016	.019					
1030, 1040, 1050, 1527, 1140, 1144, 1151, etc.	175 – 225 225 – 275 275 – 325	210 175 150	260 230 200	NR NR NR	NR NR NR	NR NR NR	.007 .007 .006	.009 .009 .008	.012 .011 .010	.015 .014 .013	.019 .018 .016					
Alloy Steel	125 – 175	250	275	NR	NR	NR	.008	.009	.012	.015	.018					
4140, 5140, 8640, etc.	175 – 225 225 – 275 275 – 325 325 – 375	225 200 190 160	250 230 220 NR	NR NR NR NR	NR NR NR NR	NR NR NR NR	.007 .006 .005 .005	.009 .008 .007 .007	.012 .011 .010 .009	.014 .014 .013 .012	.017 .016 .015 .015					
High Strength Alloy	225 – 300	150	175	200	NR	NR	.006	.009	.010	.012	.015					
4340, 4330V, etc.	300 – 350 350 – 400	125 NR	150 NR	175 150	NR NR	NR NR	.005 .004	.008 .007	.009 .008	.011 .010	.014 .012					
Structural Steel	100 – 150	250	275	325	NR	NR	.008	.011	.013	.015	.018					
A36, A285, A516, etc.	150 – 250 250 – 350	200 175	230 200	265 225	NR NR	NR NR	.007 .006	.009 .008	.012 .010	.013 .012	.016 .014					
Tool Steel	150 – 200	160	190	NR	NR	NR	.007	.008	.009	.011	.013					
H-13, H-21, A-4, O-2, S-3, etc.	200 – 250 250 – 350 350 – 400	110 75 NR	150 NR NR	175 135 95	NR NR NR	NR NR NR	.006 .005 .004	.007 .006 .005	.008 .007 .006	.011 .009 .007	.013 .011 .009					
Stainless Steel	135 – 185	150	175	250	NR	NR	.009	.010	.013	.014	.016					
416, 420, 17-4PH, etc.	185 – 275 275 – 350	NR NR	150 100	200 150	NR NR	NR NR	.008 .007	.009 .008	.012 .011	.013 .012	.015 .014					
Cast Iron	120 – 150	300	400	450	400	NR	.009	.013	.017	.020	.024					
Gray, Ductile, Nodular	150 – 200 200 – 220 220 – 260 260 – 320	275 225 200 175	350 300 275 225	400 350 325 275	350 300 300 250	NR NR NR NR	.008 .008 .007 .006	.012 .011 .011 .009	.016 .014 .013 .011	.019 .018 .016 .014	.022 .020 .018 .016					
Aluminum - Wrought	—	NR	1300	NR	1300	1450	.010	.014	.018	.022	.024					
Cast	—	NR	850	NR	900	1000	.008	.013	.016	.020	.022					
Copper Alloys	—	NR	750	NR	900	800	.009	.012	.015	.019	.021					
High Temp. Alloy	140 – 210	NR	85	100	90	NR	.005	.007	.008	.010	.012					
Hastelloy B, Inconel 600, etc.	210 – 280 280 – 340	NR NR	70 55	85 70	NR NR	NR NR	.005 .004	.006 .005	.007 .006	.010 .008	.012 .010					

NR = Not Recommended

Formulas: IPM = RPM x IPR ★ SFM = .262 x RPM x Diameter ★ RPM = SFM x 3.82 ÷ Diameter

### Premium Coatings:

- **TiN** (Titanium Nitride) gives longer tool life and added lubricity, while allowing more aggressive machining of steels.
- **TiCN** (Titanium Carbonitride) is a general purpose coating well suited to machining of mild steel, ductile cast iron and nonferrous materials such as aluminum and copper alloys. TiCN is superior in preventing excessive BUE (built-up edge).
- **“G”** is comprised of more than 20 layers of TiCN and TiAlN with an overcoat of TiN optimized for drilling mild steel and ductile cast iron.
- **TiAlN** (Titanium Aluminum Nitride) a multilayer, mixed phase coating designed for high-speed machining in alloy steels, high temp alloys, gray cast iron and titanium. Performance advantages require TiAlN coated tools to be operated at relatively high speeds, typically 50% greater than other PVD coatings such as TiN.
- **CX-H** is a proprietary coating designed for optimal drilling of abrasive, short chipping nonferrous alloys (e.g. red brass, Al-Si alloys).
- **Diamond** coating is designed for abrasive nonferrous alloys.



Decimal Size	Inch Size	Metric Size	TiN Coating EDP Number	TiCN Coating EDP Number	TiAlN Coating EDP Number
<b>Series Y: .375 through .436</b>					
.3740	—	9,50	9CY-0374T	9CY-0374N	9CY-0374A
.3750	3/8	—	9CY-0375T	9CY-0375N	9CY-0375A
.3860	W	—	9CY-0386T	9CY-0386N	9CY-0386A
.3890	SAE #4	—	9CY-0389T	9CY-0389N	9CY-0389A
.3906	25/64	—	9CY-0391T	9CY-0391N	9CY-0391A
.3937	—	10,0	9CY-0394T	9CY-0394N	9CY-0394A
.4016	—	10,2	9CY-0402T	9CY-0402N	9CY-0402A
.4063	13/32	—	9CY-0406T	9CY-0406N	9CY-0406A
.4134	—	10,5	9CY-0413T	9CY-0413N	9CY-0413A
.4219	27/64	—	9CY-0422T	9CY-0422N	9CY-0422A
.4252	—	10,8	9CY-0425T	9CY-0425N	9CY-0425A
.4313	—	11,0	9CY-0433T	9CY-0433N	9CY-0433A
<b>Series Z: .437 through .508</b>					
.4375	7/16	—	9CZ-0438T	9CZ-0438N	9CZ-0438A
.4520	SAE #5	—	9CZ-0452T	9CZ-0452N	9CZ-0452A
.4531	29/64	—	9CZ-0453T	9CZ-0453N	9CZ-0453A
.4688	15/32	—	9CZ-0469T	9CZ-0469N	9CZ-0469A
.4724	—	12,0	9CZ-0472T	9CZ-0472N	9CZ-0472A
.4844	31/64	—	9CZ-0484T	9CZ-0484N	9CZ-0484A
.4921	—	12,5	9CZ-0492T	9CZ-0492N	9CZ-0492A
.5000	1/2	—	9CZ-0500T	9CZ-0500N	9CZ-0500A
<b>Series 0: .509 through .690</b>					
.5090	SAE #6	—	9C0-0509T	9C0-0509N	9C0-0509A
.5118	—	13,0	9C0-0512T	9C0-0512N	9C0-0512A
.5156	33/64	—	9C0-0516T	9C0-0516N	9C0-0516A
.5313	17/32	—	9C0-0531T	9C0-0531N	9C0-0531A
.5469	35/64	—	9C0-0547T	9C0-0547N	9C0-0547A
.5512	—	14,0	9C0-0551T	9C0-0551N	9C0-0551A
.5625	9/16	—	9C0-0563T	9C0-0563N	9C0-0563A
.5706	—	14,5	9C0-0571T	9C0-0571N	9C0-0571A
.5781	37/64	—	9C0-0578T	9C0-0578N	9C0-0578A
.5909	—	15,0	9C0-0591T	9C0-0591N	9C0-0591A
.5938	19/32	—	9C0-0594T	9C0-0594N	9C0-0594A
.6094	39/64	—	9C0-0609T	9C0-0609N	9C0-0609A
.6102	—	15,5	9C0-0610T	9C0-0610N	9C0-0610A
.6250	5/8	—	9C0-0625T	9C0-0625N	9C0-0625A
.6299	—	16,0	9C0-0630T	9C0-0630N	9C0-0630A
.6406	41/64	—	9C0-0641T	9C0-0641N	9C0-0641A
.6496	—	16,5	9C0-0650T	9C0-0650N	9C0-0650A
.6563	21/32	—	9C0-0656T	9C0-0656N	9C0-0656A
.6693	—	17,0	9C0-0669T	9C0-0669N	9C0-0669A
.6719	43/64	—	9C0-0672T	9C0-0672N	9C0-0672A
.6875	11/16	—	9C0-0688T	9C0-0688N	9C0-0688A
.6890	SAE #8	17,5	9C0-0689T	9C0-0689N	9C0-0689A
<b>Series 1: .691 through .960</b>					
.7031	45/64	—	9C1-0703T	9C1-0703N	9C1-0703A
.7087	—	18,0	9C1-0709T	9C1-0709N	9C1-0709A
.7188	23/32	—	9C1-0719T	9C1-0719N	9C1-0719A
.7283	—	18,5	9C1-0728T	9C1-0728N	9C1-0728A
.7344	47/64	—	9C1-0734T	9C1-0734N	9C1-0734A
.7480	—	19,0	9C1-0748T	9C1-0748N	9C1-0748A
.7500	3/4	—	9C1-0750T	9C1-0750N	9C1-0750A
.7656	49/64	—	9C1-0766T	9C1-0766N	9C1-0766A

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Decimal Size	Inch Size	Metric Size	TiN Coating EDP Number	TiCN Coating EDP Number	TiAlN Coating EDP Number
<b>(continued) Series 1: .691" through .960"</b>					
.7677	—	19,5	9C1-0768T	9C1-0768N	9C1-0768A
.7813	25/32	—	9C1-0781T	9C1-0781N	9C1-0781A
.7874	—	20,0	9C1-0787T	9C1-0787N	9C1-0787A
.7969	51/64	—	9C1-0797T	9C1-0797N	9C1-0797A
.8060	SAE #10	—	9C1-0806T	9C1-0806N	9C1-0806A
.8071	—	20,5	9C1-0807T	9C1-0807N	9C1-0807A
.8125	13/16	—	9C1-0813T	9C1-0813N	9C1-0813A
.8268	—	21,0	9C1-0827T	9C1-0827N	9C1-0827A
.8438	27/32	—	9C1-0844T	9C1-0844N	9C1-0844A
.8594	55/64	—	9C1-0859T	9C1-0859N	9C1-0859A
.8661	—	22,0	9C1-0866T	9C1-0866N	9C1-0866A
.8750	7/8	—	9C1-0875T	9C1-0875N	9C1-0875A
.8906	57/64	—	9C1-0891T	9C1-0891N	9C1-0891A
.9063	29/32	—	9C1-0906T	9C1-0906N	9C1-0906A
.9219	59/64	—	9C1-0922T	9C1-0922N	9C1-0922A
.9375	15/16	—	9C1-0938T	9C1-0938N	9C1-0938A
.9449	—	24,0	9C1-0945T	9C1-0945N	9C1-0945A
<b>Series 2: .961" through 1.380"</b>					
.9688	31/32	—	9C2-0969T	9C2-0969N	9C2-0969A
.9810	SAE #12	—	9C2-0981T	9C2-0981N	9C2-0981A
.9843	—	25,0	9C2-0984T	9C2-0984N	9C2-0984A
1.0000	1	—	9C2-1000T	9C2-1000N	9C2-1000A
1.0156	1-1/64	—	9C2-1016T	9C2-1016N	9C2-1016A
1.0236	—	26,0	9C2-1024T	9C2-1024N	9C2-1024A
1.0313	1-1/32	—	9C2-1031T	9C2-1031N	9C2-1031A
1.0625	1-1/16	—	9C2-1063T	9C2-1063N	9C2-1063A
1.0938	1-3/32	—	9C2-1094T	9C2-1094N	9C2-1094A
1.1024	—	28,0	9C2-1102T	9C2-1102N	9C2-1102A
1.1060	SAE #14	—	9C2-1106T	9C2-1106N	9C2-1106A
1.1250	1-1/8	—	9C2-1125T	9C2-1125N	9C2-1125A
1.1417	—	29,0	9C2-1142T	9C2-1142N	9C2-1142A
1.1563	1-5/32	—	9C2-1156T	9C2-1156N	9C2-1156A
1.1614	—	29,5	9C2-1161T	9C2-1161N	9C2-1161A
1.1811	—	30,0	9C2-1181T	9C2-1181N	9C2-1181A
1.1875	1-3/16	—	9C2-1188T	9C2-1188N	9C2-1188A
1.2008	—	30,5	9C2-1201T	9C2-1201N	9C2-1201A
1.2188	1-7/32	—	9C2-1219T	9C2-1219N	9C2-1219A
1.2205	—	31,0	9C2-1221T	9C2-1221N	9C2-1221A
1.2310	SAE #16	—	9C2-1231T	9C2-1231N	9C2-1231A
1.2500	1-1/4	—	9C2-1250T	9C2-1250N	9C2-1250A
1.2598	—	32,0	9C2-1260T	9C2-1260N	9C2-1260A
1.2813	1-9/32	—	9C2-1281T	9C2-1281N	9C2-1281A
1.2992	—	33,0	9C2-1299T	9C2-1299N	9C2-1299A
1.3125	1-5/16	—	9C2-1313T	9C2-1313N	9C2-1313A
1.3386	—	34,0	9C2-1339T	9C2-1339N	9C2-1339A
1.3438	1-11/32	—	9C2-1344T	9C2-1344N	9C2-1344A
1.3750	1-3/8	—	9C2-1375T	9C2-1375N	9C2-1375A
1.3780	—	35,0	9C2-1378T	9C2-1378N	9C2-1378A
<b>Series 3: 1.381" through 1.879"</b>					
1.5430	SAE #20	—	9C3-1543T	9C3-1543N	9C3-1543A
1.7930	SAE #24	—	9C3-1793T	9C3-1793N	9C3-1793A



Max/ Drill Depth	Body Length	Overall Length	Shank Diameter	Shank Length	Pipe Tap	Straight Flute EDP Number	Helical Flute EDP Number
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## Holders with Straight Shanks



<b>Series X: .375" through .436"</b>							
1.09	1.59	3.97	0.75	2.375	1/8	7SXSS	—
2.19	2.68	5.06	0.75	2.375	1/8	7SXSM	—
4.38	4.87	7.25	0.75	2.375	1/8	7SXSE	—
<b>Series Z: .437" through .508"</b>							
1.58	3.37	5.75	0.75	2.375	1/8	7SZSS	7HZSS
2.59	4.38	6.76	0.75	2.375	1/8	7SZSM	7HZSM
3.59	5.38	7.76	0.75	2.375	1/8	7SZSL	7HZSL
4.46	6.25	8.63	0.75	2.375	1/8	7SZSE	7HZSE
<b>Series 0: .509" through .690"</b>							
2.18	3.97	6.35	0.75	2.375	1/8	7S0SS	7H0SS
3.44	5.33	7.71	0.75	2.375	1/8	7S0SM	7H0SM
4.86	6.75	9.13	0.75	2.375	1/8	7S0SL	7H0SL
7.90	9.80	12.17	0.75	2.375	1/8	7S0SE	7H0SE
<b>Series 0.5: .609" through .690"</b>							
1.98	3.97	6.35	0.75	2.375	1/4	7S0.5SS	7H0.5SS
3.34	5.33	7.71	0.75	2.375	1/4	7S0.5SM	7H0.5SM
4.76	6.75	9.13	0.75	2.375	1/4	7S0.5SL	7H0.5SL
7.80	9.80	12.17	0.75	2.375	1/4	7S0.5SE	7H0.5SE
<b>Series 1: .690" through .960"</b>							
2.76	4.85	7.23	1.00	2.375	1/4	7S1SS	7H1SS
4.71	6.80	9.18	1.00	2.375	1/4	7S1SM	7H1SM
6.63	8.72	11.10	1.00	2.375	1/4	7S1SL	7H1SL
10.66	12.75	15.12	1.00	2.375	1/4	7S1SE	7H1SE
<b>Series 1.5: .859" through .960"</b>							
2.55	4.85	7.22	1.00	2.375	1/4	7S1.5SS	7H1.5SS
4.80	6.80	9.18	1.00	2.375	1/4	7S1.5SM	7H1.5SM
6.42	8.72	11.10	1.00	2.375	1/4	7S1.5SL	7H1.5SL
10.45	12.75	15.12	1.00	2.375	1/4	7S1.5SE	7H1.5SE
<b>Series 2: .961" through 1.380"</b>							
3.07	5.56	8.00	1.25	2.437	1/4	7S2SS	7H2SS
5.45	7.94	10.38	1.25	2.437	1/4	7S2SM	7H2SM
7.82	10.31	12.75	1.25	2.437	1/4	7S2SL	7H2SL
10.89	13.38	15.82	1.25	2.437	1/4	7S2SE	7H2SE
<b>Series 2.5: 1.187" through 1.380"</b>							
2.88	5.56	8.00	1.25	2.437	1/4	7S2.5SS	7H2.5SS
5.26	5.56	8.00	1.25	2.437	1/4	7S2.5SM	7H2.5SM
7.63	10.31	12.75	1.25	2.437	1/4	7S2.5SL	7H2.5SL
10.70	13.38	15.82	1.25	2.437	1/4	7S2.5SE	7H2.5SE
<b>Series 3: 1.381" through 1.879"</b>							
4.43	7.25	9.88	1.50	2.625	1/4	7S3SS	7H3SS
8.43	11.25	13.88	1.50	2.625	1/4	7S3SM	7H3SM
13.18	16.00	18.63	1.50	2.625	1/4	7S3SL	7H3SL



Max/ Drill Depth	Body Length	Overall Length	Shank Diameter	Shank Length	Pipe Tap	Straight Flute EDP Number	Helical Flute EDP Number
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## Holders with Straight Shanks (continued)



Series 4: 1.880" through 2.570"							
5.90	8.75	11.38	1.50	2.625	1/4	7S4SS	7H4SS
9.90	12.75	15.38	1.50	2.625	1/4	7S4SM	7H4SM
16.02	18.87	21.50	1.50	2.625	1/4	7S4SL	7H4SL
Series 5: 2.500" through 3.500" holds series 5 + series 6 blades							
6.24	9.25	12.50	2.00	3.250	1/4	7S5SS	—
11.99	15.00	18.25	2.00	3.250	1/4	7S5SM	7H5SM
17.74	20.75	24.00	2.00	3.250	1/4	7S5SL	7H5SL
Series 7: 3.501 through 4.500" holds series 7 + series 8 blades							
6.88	8.63	15.25	3.00	6.625	1/4	7S7SS	—
12.25	14.63	21.25	3.00	6.625	1/4	7S7SM	—
19.45	22.86	29.50	3.00	6.625	1/4	7S7SL	—

## Metric Size Holders with Straight Shanks

Series Y: 9,50 through 11,07							
31,75	69,45	119,45	20,00	50,00	1/8-28 BSP	8SYSS	
60,33	98,03	148,03	20,00	50,00	1/8-28 BSP	8SYSM	
111,13	148,83	198,83	20,00	50,00	1/8-28 BSP	8SYSL	
Series Z: 11,10 through 12,90							
31,75	69,45	119,45	20,00	50,00	1/8-28 BSP	8SZSS	
60,33	98,03	148,03	20,00	50,00	1/8-28 BSP	8SZSM	
111,13	148,83	198,83	20,00	50,00	1/8-28 BSP	8SZSL	
Series 0: 12,93 through 17,53							
34,93	73,03	123,03	20,00	50,00	1/8-28 BSP	8S0SS	
63,50	101,60	151,60	20,00	50,00	1/8-28 BSP	8S0SM	
114,30	152,40	202,40	20,00	50,00	1/8-28 BSP	8S0SL	
Series 0.5: 15,47 through 17,53							
34,93	73,03	123,03	20,00	50,00	1/8-28 BSP	8S0.5SS	
63,50	101,60	151,60	20,00	50,00	1/8-28 BSP	8S0.5SM	
114,30	152,40	202,40	20,00	50,00	1/8-28 BSP	8S0.5SL	
Series 1: 17,54 through 24,38							
66,68	109,93	165,93	25,00	56,00	1/4-19 BSP	8S1SS	
117,48	160,73	216,73	25,00	56,00	1/4-19 BSP	8S1SM	
168,28	211,53	267,53	25,00	56,00	1/4-19 BSP	8S1SL	
269,88	313,13	369,13	25,00	56,00	1/4-19 BSP	8S1SE	
Series 1.5: 21,82 through 24,38							
66,68	109,93	165,93	25,00	56,00	1/4-19 BSP	8S1.5SS	
117,48	160,73	216,73	25,00	56,00	1/4-19 BSP	8S1.5SM	
168,28	211,53	267,53	25,00	56,00	1/4-19 BSP	8S1.5SL	
269,88	313,13	369,13	25,00	56,00	1/4-19 BSP	8S1.5SE	

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Max/ Drill Depth	Body Length	Overall Length	Shank Diameter	Shank Length	Pipe Tap	Straight Flute EDP Number	Helical Flute EDP Number
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## Metric Size Holders with Straight Shanks

(continued)



### Series 2: 24,41 through 35,05

85,73	130,18	190,19	32,00	60,00	1/4-19 BSP	8S2SS	
136,53	180,98	240,98	32,00	60,00	1/4-19 BSP	8S2SM	
187,33	231,78	291,78	32,00	60,00	1/4-19 BSP	8S2SL	
288,93	333,38	393,38	32,00	60,00	1/4-19 BSP	8S2SE	

### Series 2.5: 30,15 through 35,05

85,73	132,16	192,16	32,00	60,00	1/4-19 BSP	8S2.5SS	
136,53	183,36	243,36	32,00	60,00	1/4-19 BSP	8S2.5SM	
187,33	234,16	294,16	32,00	60,00	1/4-19 BSP	8S2.5SL	
288,93	335,76	395,76	32,00	60,00	1/4-19 BSP	8S2.5SE	

### Series 3: 35,08 through 47,73

120,65	173,04	243,04	40,00	70,00	1/4-19 BSP	8S3SS	
158,75	211,14	281,14	40,00	70,00	1/4-19 BSP	8S3SM	
209,55	261,94	331,94	40,00	70,00	1/4-19 BSP	8S3SL	

### Series 4: 47,95 through 65,28

130,18	184,94	254,94	40,00	70,00	1/4-19 BSP	8S4SS	
180,98	235,74	305,74	40,00	70,00	1/4-19 BSP	8S4SM	
231,78	286,54	356,54	40,00	70,00	1/4-19 BSP	8S4SL	

### Series 5: 63,50 through 88,90 holds series 5 + series 6

171,45	227,01	307,01	50,00	80,00	1/4-19 BSP	8S5SS	
222,25	277,81	357,81	50,00	80,00	1/4-19 BSP	8S5SM	
273,05	328,61	408,61	50,00	80,00	1/4-19 BSP	8S5SL	

### Series 7: 88,93 through 114,30 holds series 7 + series 8

171,45	238,13	328,13	63,00	90,00	1/4-19 BSP	8S7SS	
222,25	288,93	378,93	63,00	90,00	1/4-19 BSP	8S7SM	
273,05	339,73	429,73	63,00	90,00	1/4-19 BSP	8S7SL	

## HOLDERS for R-8 (Bridgeport) Applications

Max/ Drill Depth	Gage Length	Overall Length	Morse Taper	Pipe Tap	Straight Flute EDP Number	Helical Flute EDP Number
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### Series 0: .509" through .690"

3.29	5.19	9.19	R8 (16°50')	1/16-27	—	7H0SR8
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### Series 1: .691" through .960"

3.34	5.19	9.19	R8 (16°50')	1/16-27	—	7H1SR8
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### Series 2: .961" through 1.380"

3.32	5.19	9.19	R8 (16°50')	1/16-27	—	7H2SR8
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Max/ Drill Depth	Gage Length	Overall Length	Morse Taper	Pipe Tap	Straight Flute EDP Number	Helical Flute EDP Number
<b>Series Y: .375" through .436"</b>						
1.39	3.37	6.31	2	1/8	7SYTS	7HYTS
2.27	4.25	7.19	2	1/8	7SYTM	7HYTM
3.15	5.13	8.07	2	1/8	7SYTL	7HYTL
4.46	6.44	9.38	2	1/8	7SYTE	7HYTE
<b>Series Z: .437" through .508"</b>						
1.58	3.56	6.50	2	1/8	7SZTS	7HZTS
2.59	4.56	7.50	2	1/8	7SZTM	7HZTM
3.59	5.57	8.51	2	1/8	7SZTL	7HZTL
4.46	6.44	9.38	2	1/8	7SZTE	7HZTE
<b>Series 0: .509" through .695"</b>						
2.18	4.16	7.10	2	1/8	7S0TS	7H0TS
3.44	5.52	8.46	2	1/8	7S0TM	7H0TM
4.86	6.94	9.88	2	1/8	7S0TL	7H0TL
7.90	10.00	12.93	2	1/8	7S0TE	7H0TE
<b>Series 0.5: .609" through .695"</b>						
1.98	4.16	7.10	2	1/8	—	—
3.34	5.52	8.46	2	1/8	—	7H0.5TM
4.76	6.94	9.88	2	1/8	7S0.5TL	7H0.5TL
7.80	10.00	12.93	2	1/8	7S0.5TE	7H0.5TE
<b>Series 1: .690" through .960"</b>						
2.76	5.04	8.73	3	1/4	7S1TS	7H1TS
4.71	6.99	10.68	3	1/4	7S1TM	7H1TM
6.63	8.91	12.60	3	1/4	7S1TL	7H1TL
10.66	12.94	16.63	3	1/4	7S1TE	7H1TE
<b>Series 1.5: .859" through .960"</b>						
2.55	5.04	8.73	3	1/4	7S1.5TS	—
4.80	6.99	10.68	3	1/4	7S1.5TM	—
6.42	8.91	12.60	3	1/4	—	7H1.5TL
10.45	12.94	16.63	3	1/4	—	7H1.5TE
<b>Series 2: .961" through 1.380"</b>						
3.07	5.75	9.44	3	1/4	7S2TS	7H2TS
5.45	8.13	11.82	3	1/4	7S2TM	7H2TM
7.82	10.50	14.19	3	1/4	7S2TL	7H2TL
10.89	13.57	17.26	3	1/4	7S2TE	7H2TE
<b>Series 2.5: 1.187" through 1.380"</b>						
2.88	5.75	9.44	3	1/4	7S2.5TS	7H2.5TS
2.88	5.75	9.44	4	1/4	7S2.5TS-4MT	—
5.26	8.13	11.82	3	1/4	—	7H2.5TM
5.26	8.13	11.82	4	1/4	7S2.5TM-4MT	—
7.63	10.50	14.19	3	1/4	7S2.5TL	7H2.5TL
7.63	10.50	14.19	4	1/4	7S2.5TL-4MT	—
10.70	13.57	17.26	3	1/4	7S2.5TE	7H2.5TE

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Max/ Drill Depth	Gage Length	Overall Length	Morse Taper	Pipe Tap	Straight Flute EDP Number	Helical Flute EDP Number
<b> Holders with Taper Shanks (continued) </b>						
<b> Series 3: 1.381" through 1.879" </b>						
4.43	7.50	12.13	4	1/4	7S3TS	7H3TS
8.43	11.50	16.13	4	1/4	7S3TM	7H3TM
13.18	16.25	20.88	4	1/4	7S3TL	7H3TL
<b> Series 4: 1.880" through 2.570" </b>						
5.90	9.00	13.62	4	1/4	7S4TS	7H4TS
9.90	13.00	17.63	4	1/4	7S4TM	7H4TM
16.02	19.12	23.75	4	1/4	7S4TL	7H4TL
<b> Series 5: 2.500" through 3.500" holds series 5 + series 6 blades </b>						
6.24	9.50	15.38	5	1/4	7S5TS	—
11.99	15.25	21.13	5	1/4	7S5TM	7H5TM
17.74	21.00	26.88	5	1/4	7S5TL	7H5TL
<b> Series 7: 3.501 through 4.500" holds series 7 + series 8 blades </b>						
6.88	10.41	16.28	5	1/4	7S7TS	—
12.25	16.41	22.28	5	1/4	7S7TM	—
19.45	24.65	30.53	5	1/4	7S7TL	—

## ACCESSORIES

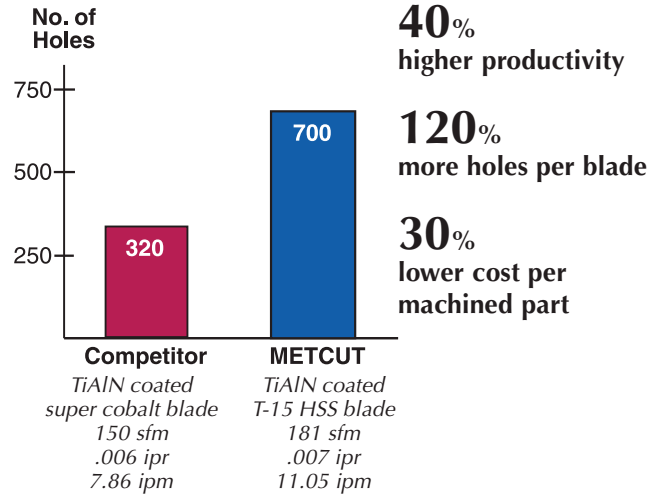
Holder Series Number	Coolant Gland EDP Number	Locating Pin EDP Number	Torx Screw EDP Number	Torx Wrench EDP Number
X	—	—	MS-1454	56-2025
Y	290-1100	SP-1	56-1013	56-2017
Z	290-1100	SP-1	56-1015	56-2026
0, 0.5	290-1100 290-1075A*	SP-2	56-1014	56-2017
1, 1.5	290-1125 290-1100A*	SP-3	56-1020	56-2028
2, 2.5	290-1150 290-1100A*	SP-4	56-1018	56-2015
3, 4	290-1175	SP-5	56-1585	56-2020
5	290-1250	SP-6	56-1025	56-2125
7	290-1300	SP-6	56-1025	56-2125

\* R-8 (Bridgeport) holders only



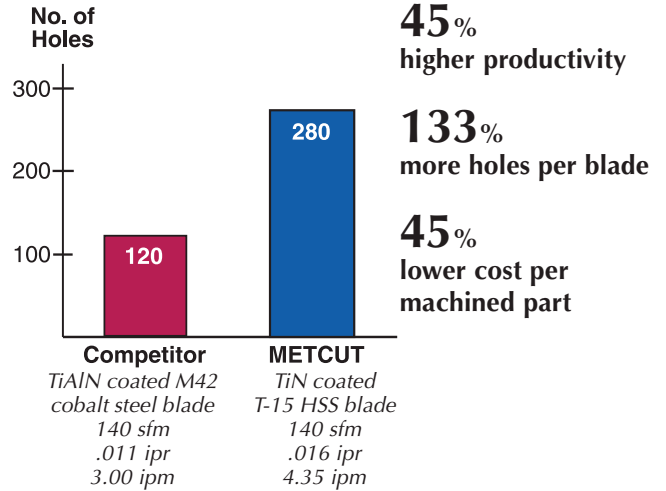
## 1010 Carbon Steel 25 Rc

Drill diameter: 7/16" (.4375") Hole depth: 1.000"



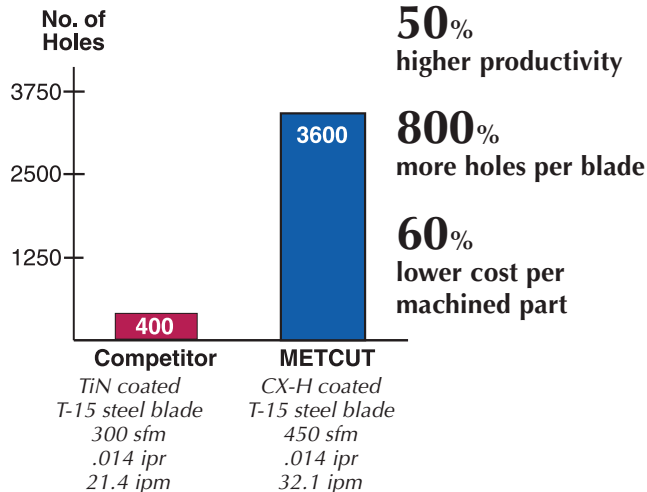
## A-36 Structural Steel 38 Rc

Drill diameter: 1-31/32" (1.9688") Hole depth: 0.6250"



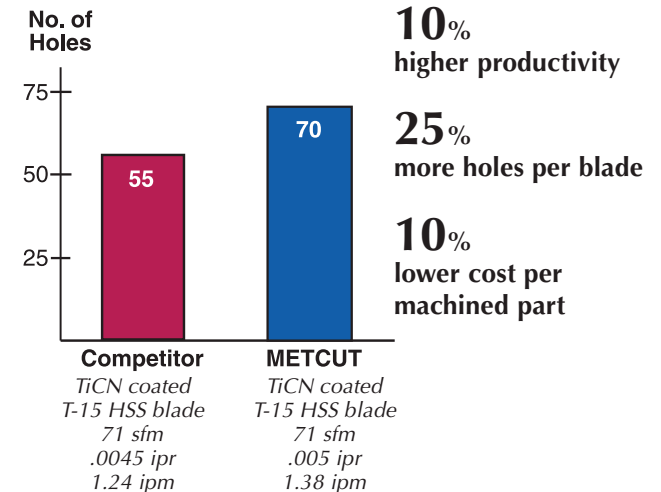
## Red Brass 150 Bhn

Drill diameter: 3/4" (.7500") Hole depth: 1.000"



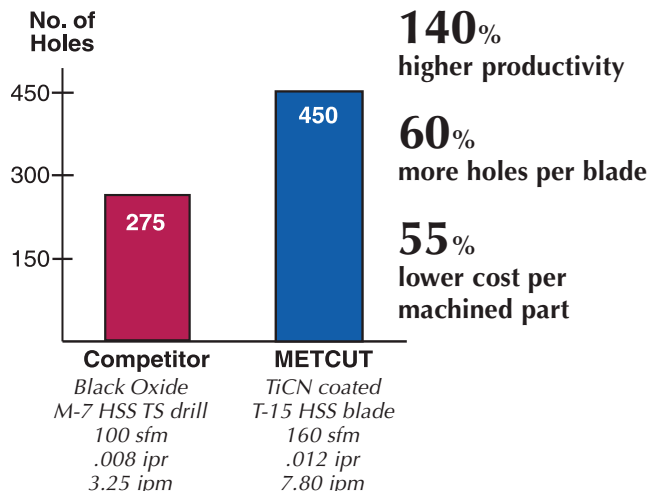
## 15-5 PH Stainless Steel 35 to 38 Rc

Drill diameter: 0.9843" (25,00mm) Hole depth: 5.20"



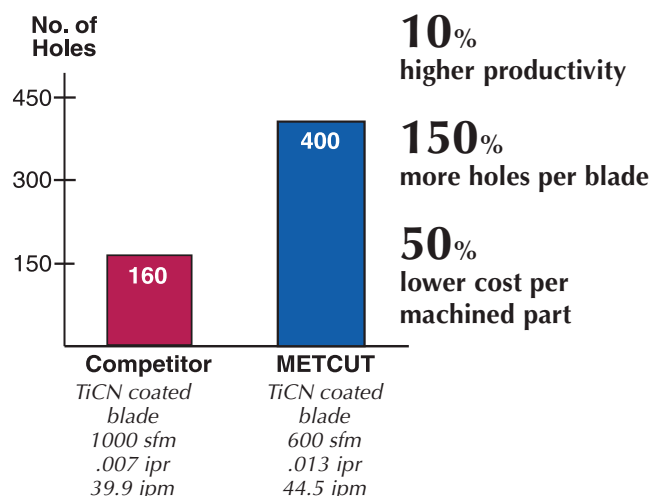
## Structural Iron

Drill diameter: 15/16" (.9375") Hole depth: 2.500"



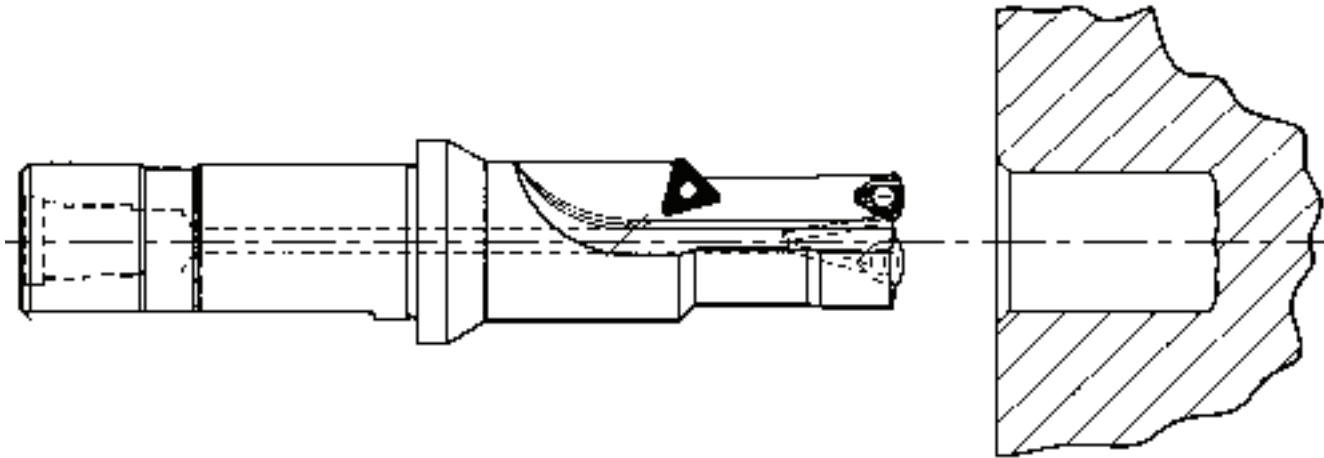
## 6061-T6 Aluminum Alloy

Drill diameter: 17,00mm (.6692") Hole depth: 2.00"

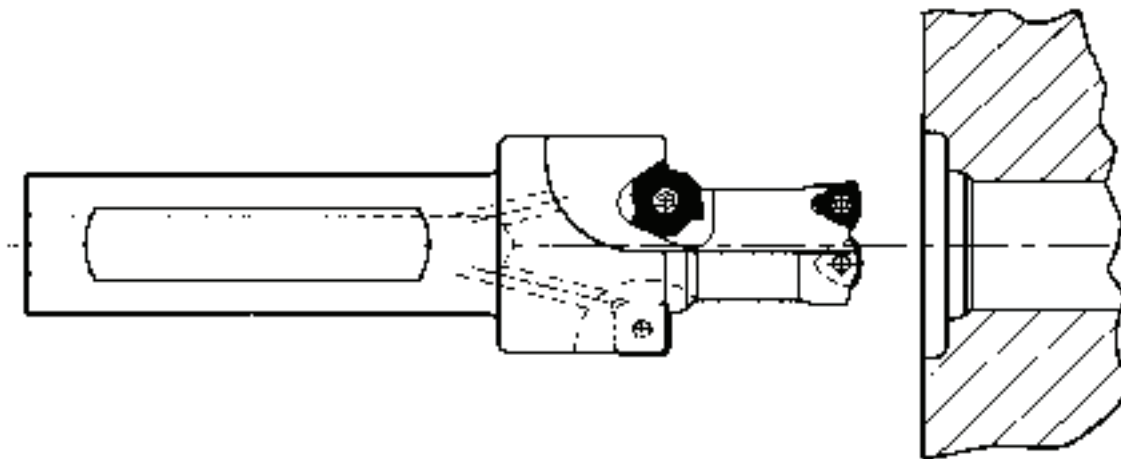


**Examples of Special Drilling and Port Contour Cutting Tools**

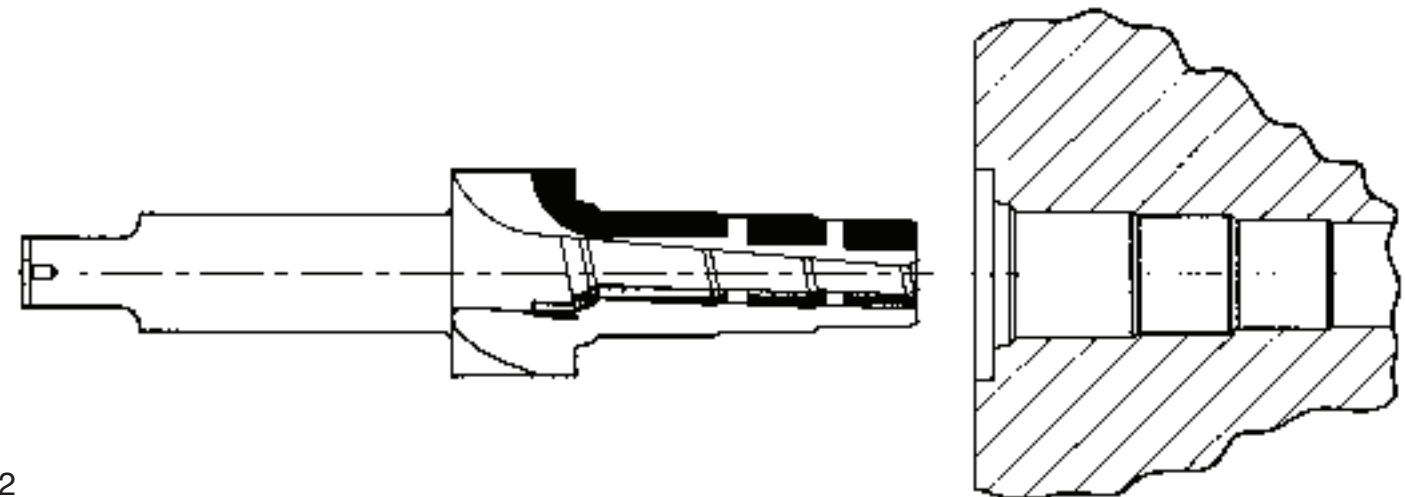
**Drill from Solid and Chamfer Tool**



**Drill from Solid and SAE Port Contour Tool**



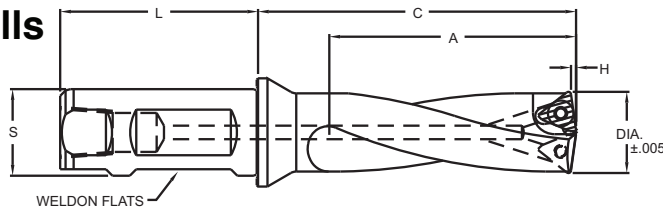
**SAE Port Contour Cutter with Two Extra Bore Diameters**





# Indexable Drills

## Double-Feed Drills



Diameter	Part Number	S Shank Diameter	L Shank Length	C Body Length	A Effective Drilling Depth	H Arc Projection	Inserts (2 req'd) Part Number	Torx Screws (2 req'd) Part Number
<b>3:1 Depth To Diameter Ratio</b>								
.8125	<b>277-3081</b>	1.000	2.281	3.38	2.44	.08	H-081-HJ	056-1016
.8268	<b>277-3082</b>	1.000	2.281	3.50	2.56	.08	H-082-HJ	056-1016
.8661	<b>277-3086</b>	1.000	2.281	3.60	2.68	.08	H-086-HJ	056-1016
.8750	<b>277-3087</b>	1.000	2.281	3.54	2.63	.08	H-087-HJ	056-1016
.9375	<b>277-3093</b>	1.000	2.281	3.71	2.81	.09	H-093-HJ	056-1016
.9449	<b>277-3094</b>	1.000	2.281	3.82	2.92	.09	H-094-HJ	056-1016
1.0000	<b>277-3100</b>	1.000	2.281	3.87	3.00	.09	H-100-HJ	056-1020
1.0625	<b>277-3106</b>	1.250	2.281	4.28	3.19	.10	H-106-HJ	056-1020
1.1024	<b>277-3110</b>	1.250	2.281	4.45	3.41	.10	H-110-HJ	056-1020
1.1250	<b>277-3112</b>	1.250	2.281	4.42	3.38	.10	H-112-HJ	056-1020
1.1875	<b>277-3118</b>	1.250	2.281	4.61	3.56	.11	H-118-HJ	056-1020
1.2500	<b>277-3125</b>	1.250	2.281	4.75	3.75	.11	H-125-HJ	056-1833
1.3125	<b>277-3131</b>	1.500	2.688	5.16	3.94	.13	H-131-HJ	056-1833
1.3750	<b>277-3137</b>	1.500	2.688	5.29	4.13	.13	H-137-HJ	056-1833
1.4375	<b>277-3143</b>	1.500	2.688	5.49	4.31	.14	H-143-HJ	056-1833
1.5000	<b>277-3150</b>	1.500	2.688	5.62	4.50	.14	H-150-HJ	056-1833
1.6250	<b>277-3162</b>	1.500	2.688	6.01	4.88	.15	H-162-HJ	056-1834
1.7500	<b>277-3175</b>	2.000	3.250	6.71	5.25	.16	H-175-HJ	056-1834
1.8750	<b>277-3187</b>	2.000	3.250	7.11	5.63	.17	H-187-HJ	056-1834
2.0000	<b>277-3200</b>	2.000	3.250	7.37	6.00	.18	H-200-HJ	056-1585
<b>5:1 Depth To Diameter Ratio</b>								
.8125	<b>277-5081</b>	1.000	2.281	5.00	4.06	.08	H-081-HJ	056-1016
.8268	<b>277-5082</b>	1.000	2.281	5.15	4.21	.08	H-082-HJ	056-1016
.8661	<b>277-5086</b>	1.000	2.281	5.33	4.41	.08	H-086-HJ	056-1016
.8750	<b>277-5087</b>	1.000	2.281	5.29	4.38	.08	H-087-HJ	056-1016
.9375	<b>277-5093</b>	1.000	2.281	5.58	4.69	.09	H-093-HJ	056-1016
.9449	<b>277-5094</b>	1.000	2.281	5.71	4.81	.09	H-094-HJ	056-1016
1.0000	<b>277-5100</b>	1.000	2.281	5.87	5.00	.09	H-100-HJ	056-1020
1.0625	<b>277-5106</b>	1.250	2.281	6.41	5.31	.10	H-106-HJ	056-1020
1.1024	<b>277-5110</b>	1.250	2.281	6.65	5.61	.10	H-110-HJ	056-1020
1.1250	<b>277-5112</b>	1.250	2.281	6.67	5.63	.10	H-112-HJ	056-1020
1.1875	<b>277-5118</b>	1.250	2.281	6.99	5.94	.11	H-118-HJ	056-1020
1.2500	<b>277-5125</b>	1.250	2.281	7.25	6.25	.11	H-125-HJ	056-1833
1.3125	<b>277-5131</b>	1.500	2.688	7.78	6.56	.13	H-131-HJ	056-1833
1.3750	<b>277-5137</b>	1.500	2.688	8.80	6.88	.13	H-137-HJ	056-1833
1.4375	<b>277-5143</b>	1.500	2.688	8.36	7.19	.14	H-143-HJ	056-1833
1.5000	<b>277-5150</b>	1.500	2.688	8.62	7.50	.14	H-150-HJ	056-1833
1.6250	<b>277-5162</b>	1.500	2.688	9.26	8.13	.15	H-162-HJ	056-1834
1.7500	<b>277-5175</b>	2.000	3.250	10.21	8.75	.16	H-175-HJ	056-1834
1.8750	<b>277-5187</b>	2.000	3.250	10.86	9.38	.17	H-187-HJ	056-1834
2.0000	<b>277-5200</b>	2.000	3.250	11.37	10.00	.18	H-200-HJ	056-1585
<b>7:1 Depth To Diameter Ratio</b>								
0.8125	<b>277-7081</b>	1.000	2.281	6.63	5.69	.08	H-081-HJ	056-1016
0.8750	<b>277-7087</b>	1.000	2.281	7.04	6.13	.08	H-087-HJ	056-1016
0.9375	<b>277-7093</b>	1.000	2.281	7.46	6.56	.09	H-093-HJ	056-1016
1.0000	<b>277-7100</b>	1.000	2.281	7.87	7.00	.09	H-100-HJ	056-1020
1.0625	<b>277-7106</b>	1.250	2.281	8.53	7.44	.10	H-106-HJ	056-1020
1.1250	<b>277-7112</b>	1.250	2.281	8.92	7.88	.10	H-112-HJ	056-1020
1.1875	<b>277-7118</b>	1.250	2.281	9.36	8.31	.11	H-118-HJ	056-1020
1.2500	<b>277-7125</b>	1.250	2.281	9.75	8.75	.11	H-125-HJ	056-1833
1.3125	<b>277-7131</b>	1.500	2.688	10.41	9.19	.13	H-131-HJ	056-1833
1.3750	<b>277-7137</b>	1.500	2.688	10.79	9.63	.13	H-137-HJ	056-1833
1.4375	<b>277-7143</b>	1.500	2.688	11.24	10.06	.14	H-143-HJ	056-1833
1.5000	<b>277-7150</b>	1.500	2.688	11.62	10.50	.14	H-150-HJ	056-1833
1.6250	<b>277-7162</b>	1.500	2.688	12.51	11.38	.15	H-162-HJ	056-1834
1.7500	<b>277-7175</b>	2.000	3.250	13.71	12.25	.16	H-175-HJ	056-1834
1.8750	<b>277-7187</b>	2.000	3.250	14.61	13.13	.17	H-187-HJ	056-1834
2.0000	<b>277-7200</b>	2.000	3.250	15.37	14.00	.18	H-200-HJ	056-1585

Note: Inserts must be ordered separately.

Note: Chip disposal will be impaired if hole depth exceeds effective drilling depth.

# Application Information

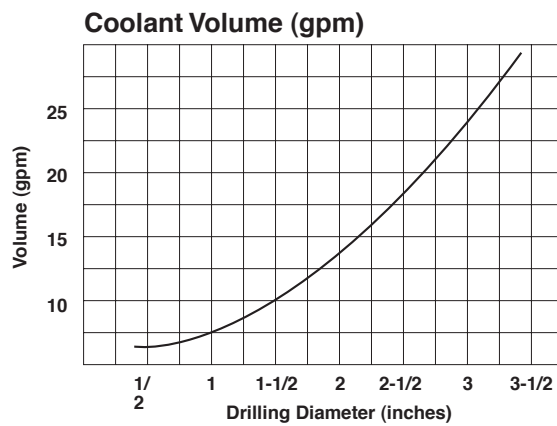
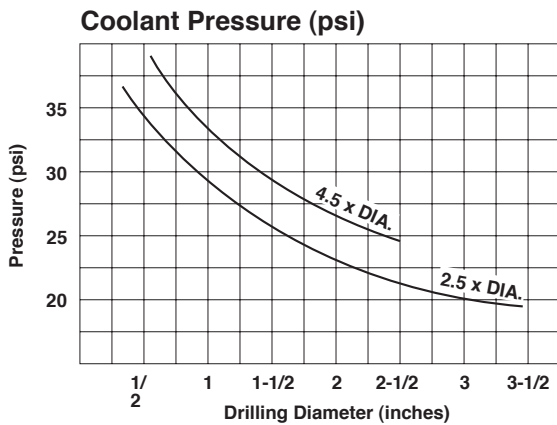
Material Group	Hardness		Cutting Speed*								Feed Rate**						
			m/min.								mm/min.						
	BHN	Rockwell	30	61	91	122	152	183	274	366	.025	0.05	0.1	0.15	0.2	0.25	
		SFM								IPR							
		100	200	300	400	500	600	900	1200	.001	.002	.004	.006	.008	.010		
11 <b>Low Carbon Steels</b> 1018, 12L14 8620, 11L17	125	28 Rc															
200																	
275																	
12 <b>Medium Carbon Steels</b> 1045, 4140 1030, 86L40	125	35 Rc															
225																	
325																	
13 <b>Alloy Steels &amp; Tool Steel</b> 4340, H13 P20, 52100	225	35 Rc 45 Rc															
325																	
425																	
14 <b>Cast Irons</b> Ductile, Gray Nodular Malleable	125	35 Rc															
225																	
325																	
15 <b>Austenitic Stainless Steel</b> 304, 316 Nitronic 40	125	24 Rc 40 Rc															
250																	
375																	
16 <b>Martensitic Stainless Steel</b> 410, 414 502, 440A	125	28 Rc 45 Rc															
275																	
425																	
17 <b>Precipitation Hardening Stainless Steel</b> 17-4PH, PH15-7MO	150	30 Rc 47 Rc															
285																	
440																	
18 <b>High Temp. Alloys</b> Monel, Inconel Hastelloy, Rene	75	28 Rc 50 Rc															
275																	
475																	
19 <b>Titanium Alloys</b>	100	47 Rc															
220																	
440																	
20 <b>Copper Alloys</b> Brass, Bronze																	
21 <b>Aluminum</b>																	

\* Recommended insert grades are labeled in order of preference (1st, 2nd, 3rd).

\*\* Feed rates shown can be increased by up to 50% when using square negative rake drills, and increased up to 100% when using double-feed drills.

# Application Information

## Application Guidelines



### Concentricity

On live spindle applications such as boring mills and machining centers, it is necessary to have a rigid and true running spindle. Spindle runout must be no more than .004" TIR.

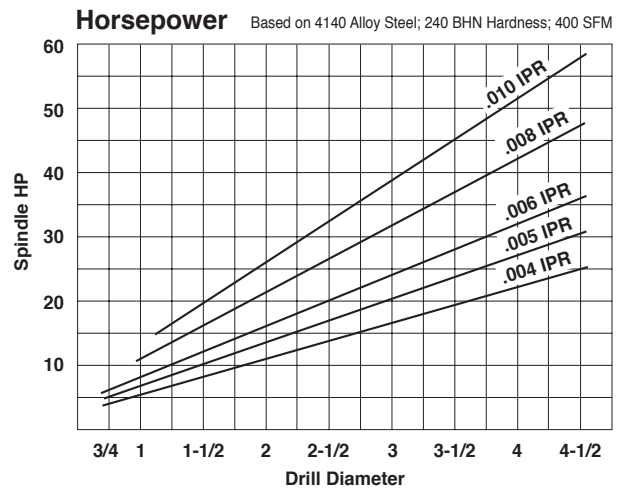
On turning machine applications, it is necessary that the drill be on center or concentric with the spindle centerline within .004" TIR. Angularity must not exceed .003" in 6". Both of these conditions are easily checked with an indicator magnetically mounted on the face of the spindle. Another way to check concentricity is to drill a hole and measure size. Then rotate the drill 180°, drill a hole, and measure size. One quarter of the difference between the two hole sizes is the distance the drill is off center.

### Starting Feed Rate

In some extremely tough materials, it may be advisable to reduce the feed to about 30% per revolution until the full diameter of the drill is in the cut. The same procedure may be necessary when using extra length drills.

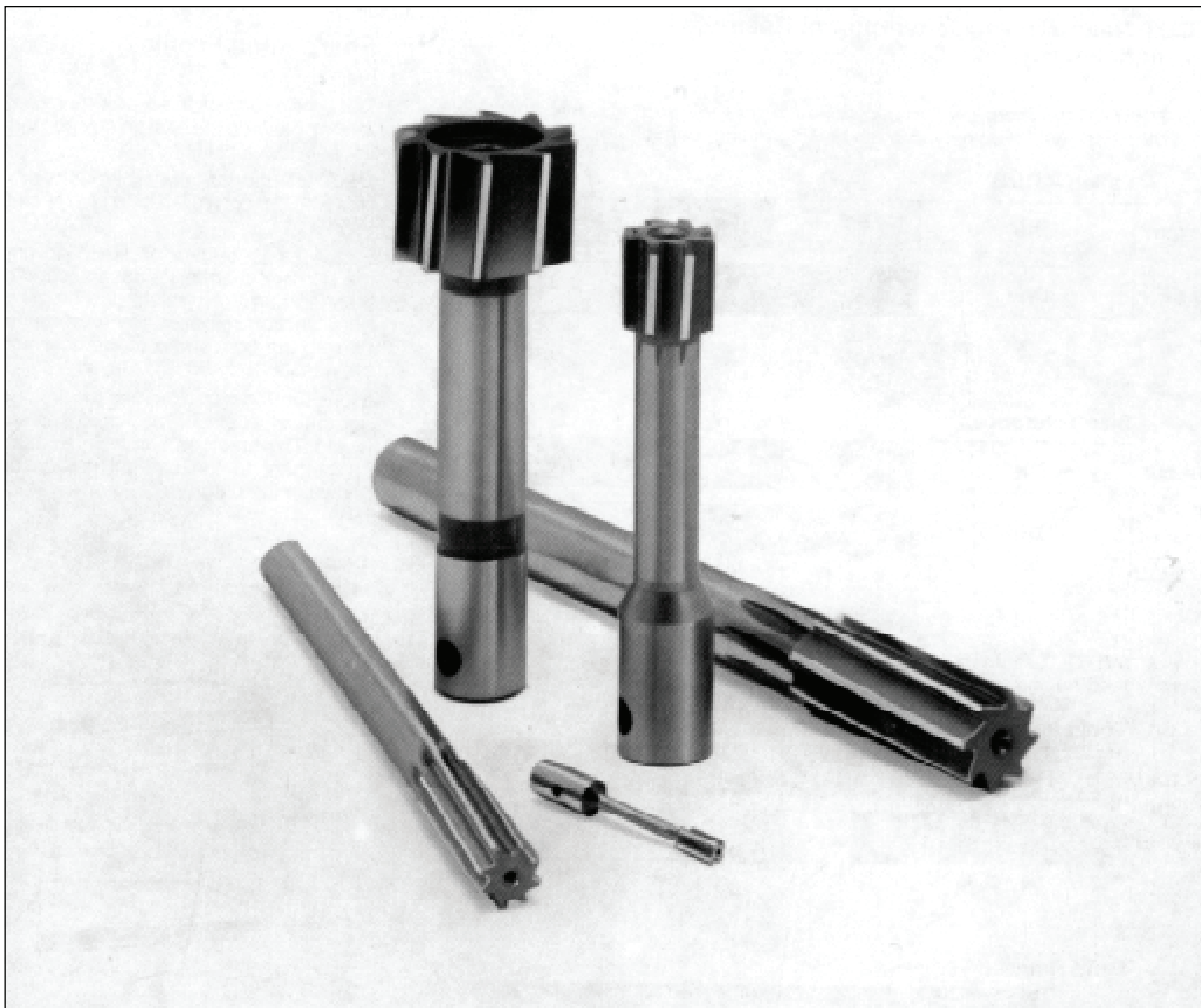
### Coolant

In steel cutting applications, coolant should be fed through the tool to insure maximum cooling at the cutting edge and to flush chips out of the hole. Shallow holes may be drilled in steel with a well-directed flow of flood coolant. Cast iron can be run dry or with flood coolant, but through-the-tool coolant is preferable.



## Troubleshooting Guide

Problem	Cause	Solution
Drill body rubbing in the hole	1. Drill is off-center and cutting a small hole 2. Drill is deflecting	1. Correct the off-center condition 2. Reduce penetration rate
Center insert chipping	1. Drill is off-center 2. Improper grade selection	1. Correct off-center condition 2. See insert grade selection chart
Chips snarling and clogging	1. Feed is too light to break chips 2. RPM too slow 3. Insufficient coolant	1. Increase feed rate 2. Increase RPM 3. Use coolant pressure booster pump
Chatter or vibration	1. Too much overhang 2. Lack of rigidity in the machine tool or the set-up	1. Reduce overhang 2. Take appropriate corrective measures
Severe retract marks	1. Excessive penetration rate causes drill to deflect and cut undersize	1. Reduce penetration rate



## Higher Feed Rates, Longer Tool Life

METCUT® reamers are designed to operate at feed rates up to twice conventional reamer feed rates, resulting in higher productivity. And METCUT® reamers last longer, which means less machine downtime due to tool changes, and more production per tool. The net result is that METCUT® reamers provide the lowest cost per hole.

## Surface Finishes of 25 RMS or Better

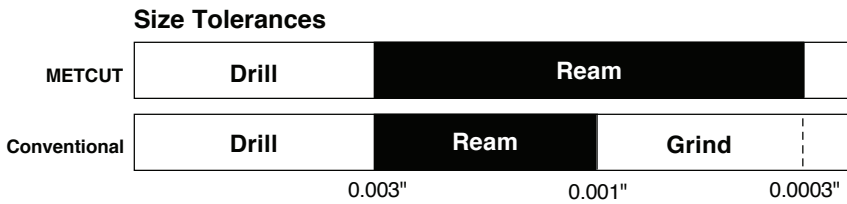
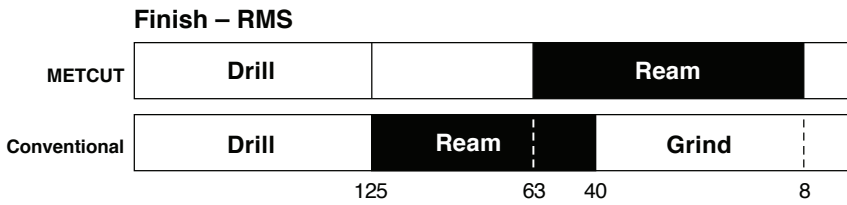
The use of METCUT® reamers can eliminate the need for some subsequent grinding, honing or burnishing operations by producing surface finishes of 25 RMS or better in free-machining materials. Hole-finishing accuracy and repeatability are unmatched:

- Roundness accuracy to within 0.0001".
- Hole size accuracy to within 0.0003".
- Straightness accuracy to within 0.0002".
- Higher depth-to-diameter ratios at above tolerances.
- Technical assistance available to achieve **16RMS** or better, and consistently hold hole size to less than **.0003"**

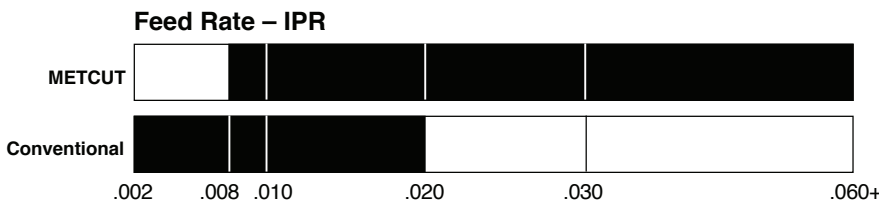
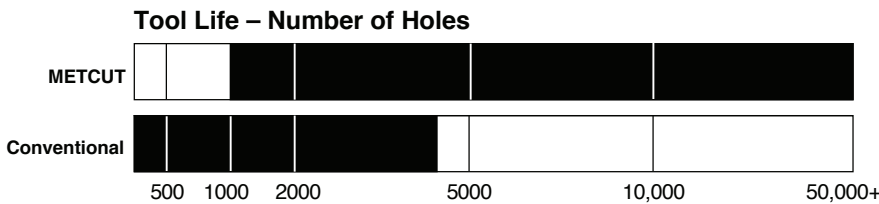
# Reamers

## METCUT Reamers vs. Conventional Reamers – Performance Overview

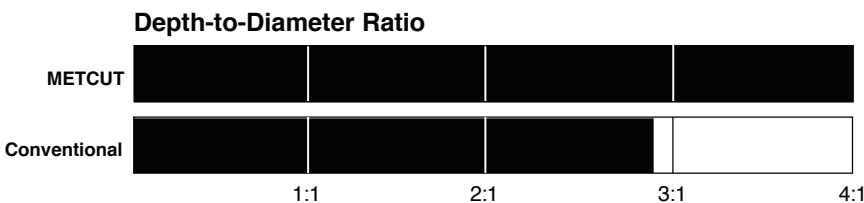
METCUT reamers can produce surface finishes and size tolerances otherwise achieved only through finish grinding, burnishing, or honing.



METCUT reamers provide significantly increased tool life and higher feed rates.



METCUT reamers offer higher depth-to-diameter ratios at stated size, straightness and roundness tolerances.



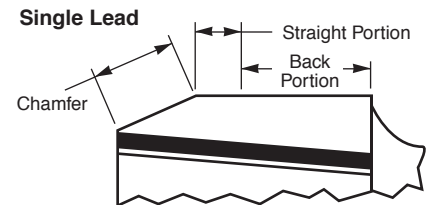
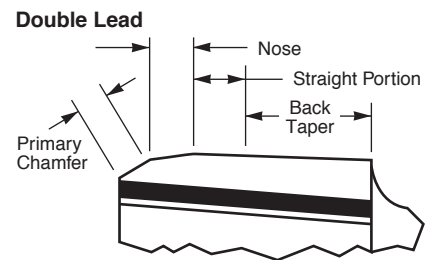
## Sharpening Profile

The profile form on the reamer is important in obtaining the best finish and longest possible tool life.

METCUT offers two basic types of profiles with our controlled CNC form type sharpening methods.

I. The Double Lead Profile for enhanced surface finish. Following the primary chamfer, a nose section is blended into the straight portion. The nose section removes the feed marks prior to the final sizing of the hole and provides a 25 to 50 RMS finish.

II. Single Lead Profile for enhanced tool life where finish is not as critical. This provides a profile of a chamfer tangent to the straight portion as shown in the diagram.





## What Makes METCUT Reamers Better?

### Custom Sharpened For Your Application

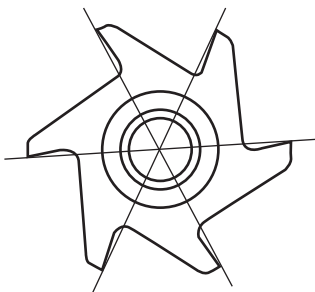
Our application engineers will select a sharpening profile best suited to accomplish your specific hole finishing and production objectives. Significant variables include the material you are reaming, the surface finish you require, and the tool life you require. Generally, there is a trade-off between degree of surface finish and tool life (the finer the finish required, the shorter the tool life). METCUT engineers will work to optimize the variables to best meet your quality, productivity, and cost objectives.

When ordering, please provide the following information:

- Roundness, size and straightness tolerances.
- Finish requirement.
- Material to be reamed.
- Stationary or rotating work piece.
- Diameter of bushing (if applicable).
- Floating or fixed tool holder.
- Blind hole clearance.
- Any other special feature of the application, such as cross holes, intersection holes, etc.

### Irregularly-Spaced Flutes

Irregular spacing is a standard feature of all METCUT oil-feed reamers. This type of spacing provides a controlled cutting action that resists chatter and the formation of "welts." This flute spacing design, combined with the oil-feed and cam-controlled sharpening features allows these reamers to produce surface finishes which do not require additional finishing operations. The teeth are spaced diametrically opposite each other for easy and accurate inspection.

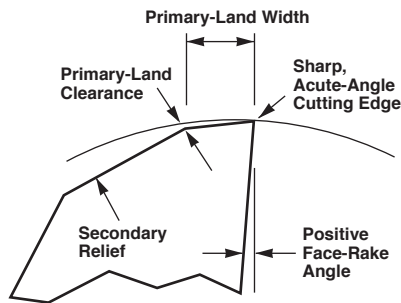


### Unique Cutting-Edge Geometry Ensures "Free Cutting Action"

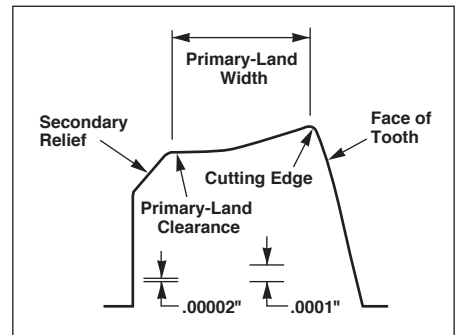
A precise combination of positive clearance angles, sharp cutting edges, and irregularly spaced flutes serves to minimize friction, harmonics, chatter, welts, and galling – common problems that diminish the life and performance of conventional reamers.

This unique cutting-edge design is produced on the most sophisticated CNC production equipment, ensuring that each cutting edge is accurately ground. All of the reamers produced to a particular set of specifications are virtually identical providing maximum tool-to-tool repeatability. State-of-the-art electronic gaging equipment ensures that flute height variation, land width, and clearance angles are being held to allowable limits.

#### METCUT Tooth Profile

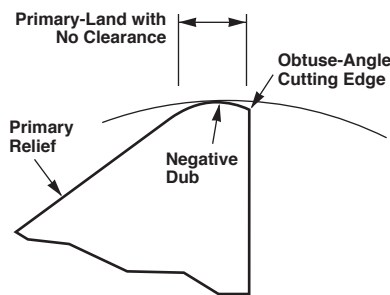


Only the sharp cutting edge is in contact with the workpiece.

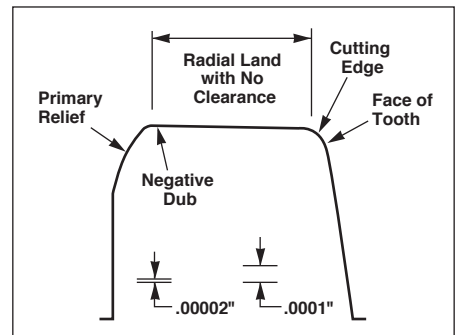


METCUT tooth profile as measured and graphed by our electronic gaging equipment

#### Conventional Tooth Profile



The back of the tooth is in greater contact with the work than the cutting edge.

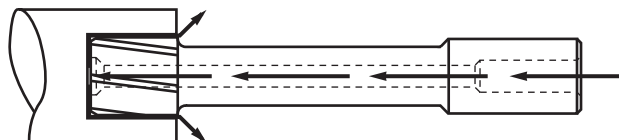


Conventional tooth profile as measured and graphed by our electronic gaging equipment

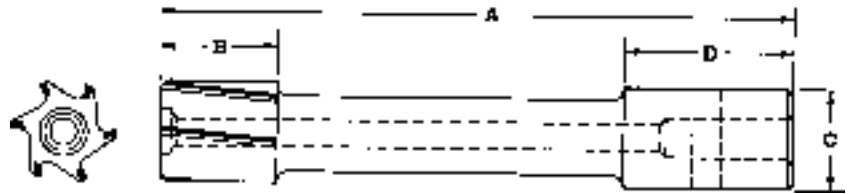
### Designed for Effective Chip Disposal

Coolant-Feed reamers provide maximum chip-flushing action in blind-hole reaming applications. The coolant is fed through the reamer body; it hits the end of the blind hole and is forced back through the flutes, flushing the chips from the cutting area while lubricating and cooling the cutting edges.

#### Oil Flow in Coolant-Feed Reamer Application



# Custom Sharpened Reamers – Coolant Feed Carbide

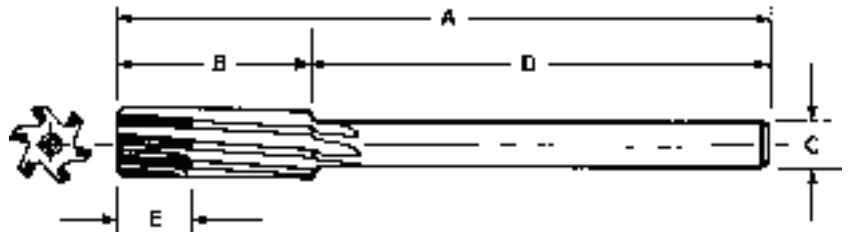


		Diameter	Part Number	A	B	C	D	Number of Flutes				
Coolant Feed	Solid Carbide	.0930 to .125	<b>SOFC0125</b>	2.500	.375	.250	.750	4				
		.1251 to .157	<b>SOFC0157</b>	2.500	.375	.250	.750	4				
		.1571 to .175	<b>SOFC0175</b>	2.500	.375	.250	.750	6				
		.1751 to .210	<b>SOFC0210</b>	2.500	.375	.375	.750	6				
		.2101 to .255	<b>SOFC0255</b>	2.500	.500	.375	.750	6				
		.2551 to .286	<b>SOFC0286</b>	2.500	.500	.375	.750	6				
	Carbide Tipped		.2861 to .318	<b>SOFC0318</b>	2.500	.500	.375	.750	6			
			.3181 to .380	<b>SOFC0380</b>	2.500	.500	.375	.750	6			
			.3801 to .436	<b>OFC0436</b>	2.625	.500	.375	.750	6			
				.4361 to .505	<b>OFC0505</b>	3.500	.625	.625	1.000	6		
				.5051 to .630	<b>OFC0630</b>	3.750	.750	.625	1.000	6		
				.6301 to .755	<b>OFC0755</b>	4.250	.750	.625	1.000	6		
					.7551 to .880	<b>OFC0880</b>	4.750	.875	.625	1.000	6	
					.8801 to 1.005	<b>OFC1005</b>	5.500	1.000	1.000	1.500	8	
					1.0051 to 1.130	<b>OFC1130</b>	6.000	1.250	1.000	1.500	8	
						1.1301 to 1.255	<b>OFC1255</b>	6.000	1.250	1.000	1.500	8
						1.2551 to 1.380	<b>OFC1380</b>	6.000	1.250	1.000	1.500	8
						1.3801 to 1.505	<b>OFC1505</b>	6.000	1.250	1.000	1.500	8
		1.5051 to 1.630	<b>OFC1630</b>	6.000	1.250	1.000	1.500	10				
		1.6301 to 1.755	<b>OFC1755</b>	6.000	1.250	1.000	1.500	10				
		1.7551 to 1.880	<b>OFC1880</b>	6.000	1.250	1.000	1.500	10				
		1.8801 to 2.015	<b>OFC2015</b>	6.000	1.250	1.000	1.500	10				

All dimensions shown in inches.

Diameter Tolerance:  $\pm 0.0001$

# Custom Sharpened Reamers – Chucking Carbide



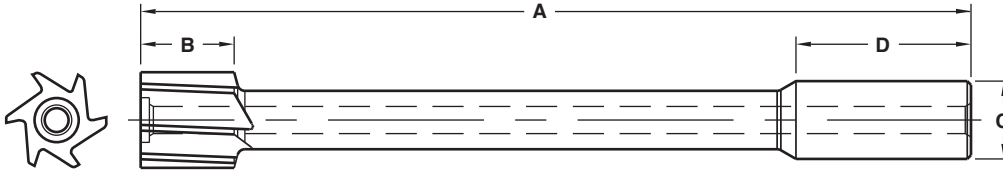
		Diameter	Part Number	A	B	C	D	E	Number of Flutes
Non Coolant Feed	Solid Carbide	.0930 to .1250	<b>SCRC0125</b>	2.250	.625	.0880/.0870	1.625	.625	4
		.1251 to .1570	<b>SCRC0157</b>	2.500	.750	.1190/.1180	1.750	.750	4
		.1571 to .1875	<b>SCRC0187</b>	2.750	.875	.1510/.1500	1.875	.875	6
		.1876 to .2188	<b>SCRC0218</b>	3.000	1.000	.1805/.1795	2.000	1.000	6
		.2189 to .2500	<b>SCRC0250</b>	3.000	1.000	.2075/.2065	2.000	1.000	6
		.2501 to .2812	<b>SCRC0281</b>	3.250	1.125	.2485/.2475	2.125	1.125	6
		.2813 to .3125	<b>SCRC0312</b>	3.250	1.125	.2792/.2782	2.125	1.125	6
		.3126 to .3437	<b>SCRC0343</b>	3.500	1.250	.2792/.2782	2.250	1.250	6
		.3438 to .3750	<b>SCRC0375</b>	3.500	1.250	.3105/.3095	2.250	1.250	6
Coolant Feed	Carbide Tipped	.2550 to .2969	<b>CRC0296</b>	6.000	1.500	.2485/.2475	4.500	.500	4
		.2970 to .3438	<b>CRC0343</b>	6.000	1.500	.2792/.2782	4.500	.500	6
		.3439 to .4062	<b>CRC0406</b>	7.000	1.750	.3105/.3095	5.250	.500	6
		.4063 to .4688	<b>CRC0468</b>	7.000	1.750	.3730/.3720	5.250	.500	6
		.4689 to .5312	<b>CRC0531</b>	8.000	2.000	.4355/.4345	6.000	.625	6
		.5313 to .5938	<b>CRC0593</b>	8.000	2.000	.4355/.4345	6.000	.625	6
		.5939 to .6875	<b>CRC0687</b>	9.000	2.250	.5620/.5605	6.750	.750	6
		.6876 to .8125	<b>CRC0812</b>	9.500	2.500	.6245/.6230	7.000	.750	6
		.8126 to .9375	<b>CRC0937</b>	10.000	2.625	.7495/.7480	7.375	.875	6
		.9376 to 1.0313	<b>CRC1031</b>	10.500	2.750	.8745/.8730	7.750	.875	8
		1.0314 to 1.1560	<b>CRC1156</b>	11.000	2.875	.9995/.9980	8.125	.875	8
		1.1561 to 1.2810	<b>CRC1281</b>	11.500	3.000	.9995/.9980	8.500	.875	8
		1.2811 to 1.4060	<b>CRC1406</b>	12.000	3.250	.9995/.9980	8.750	.875	8
		1.4061 to 1.5310	<b>CRC1531</b>	12.500	3.500	.9995/.9980	9.000	.875	8

All dimensions shown in inches.

Diameter Tolerance:  $\pm 0.0001$

# Chucking Coolant-Feed Reamers

## High Speed Steel

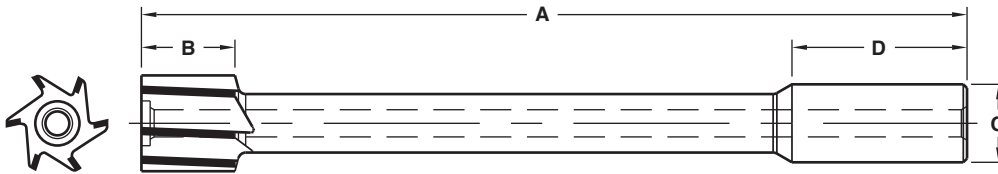


	Diameter	Part Number	A	B	C	D	Number of Flutes
Coolant Feed	.2500-.3120	<b>COF-0312</b>	5.500	.500	.312	1.500	6
	.3121-.3750	<b>COF-0375</b>	5.500	.500	.625	1.500	6
	.3751-.5000	<b>COF-0500</b>	8.000	.625	.625	1.500	6
	.5001-.6250	<b>COF-0625</b>	8.000	.625	.625	1.500	6
	.6251-.7500	<b>COF-0750</b>	8.000	.750	.625	1.500	6
	.7501-.8750	<b>COF-0875</b>	10.000	.875	1.000	2.500	6
	.8751-1.0000	<b>COF-1000</b>	10.000	1.000	1.000	2.500	8
	1.0001-1.1250	<b>COF-1125</b>	10.000	1.000	1.000	2.500	8

All dimensions shown in inches.

Diameter Tolerance:  $\pm .0001$

## Carbide



	Diameter	Part Number	A	B	C	D	Number of Flutes
Coolant Feed	.2500-.3120	<b>COFC-0312</b>	5.500	.500	.312	1.500	6
	.3121-.3750	<b>COFC-0375</b>	5.500	.500	.625	1.500	6
	.3751-.5000	<b>COFC-0500</b>	8.000	.625	.625	1.500	6
	.5001-.6250	<b>COFC-0625</b>	8.000	.625	.625	1.500	6
	.6251-.7500	<b>COFC-0750</b>	8.000	.750	.625	1.500	6
	.7501-.8750	<b>COFC-0875</b>	10.000	.875	1.000	2.500	6
	.8751-1.0000	<b>COFC-1000</b>	10.000	1.000	1.000	2.500	8
	1.0001-1.1250	<b>COFC-1125</b>	10.000	1.000	1.000	2.500	8
1.1251-1.2500	<b>COFC-1250</b>	10.000	1.000	1.000	2.500	8	
1.2501-1.5000	<b>COFC-1500</b>	10.000	1.000	1.000	2.500	8	

All dimensions shown in inches.

Diameter Tolerance:  $\pm .0001$

# Application Information

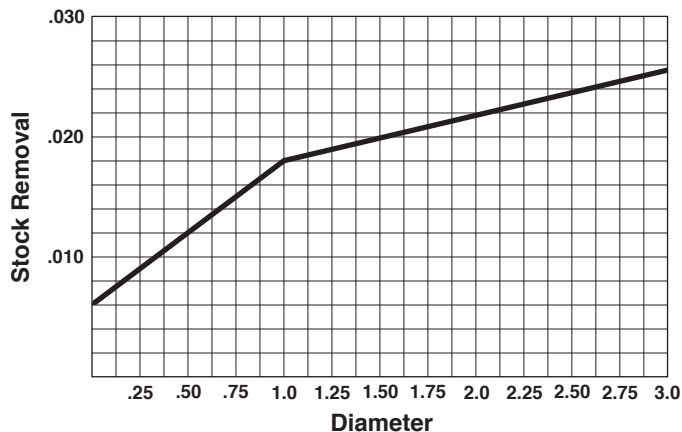
## Recommended Feed & Speed Rates for Reamers

Material	TCT Speed (SFM)	TCT Reamers				HSS Speed (SFM)	HSS Reamers			
		Recommended Starting Feed Rate in ( IPR )					Recommended Starting Feed Rate in ( IPR )			
		4-Flute Below .1875"	6-Flute .1875"-.875"	8-Flute .875"-1.5"	10-Flute 1.5"-2"		4-Flute Below .1875"	6-Flute .1875"-.5625"	8-Flute .5625"-1.5"	10-Flute 1.5"-2"
Aluminum	160	.006	.012	.016	.020	100	.006	.012	.016	.020
	180	.012	.018	.024	.030	150	.012	.018	.024	.030
Brass	70	.006	.012	.016	.020	45	.006	.012	.016	.020
	90	.012	.018	.024	.030	65	.012	.018	.024	.030
Bronze	50	.006	.012	.016	.020	40	.006	.012	.016	.020
	70	.012	.018	.024	.030	60	.012	.018	.024	.030
Grey Cast Iron	55	.006	.012	.016	.020	40	.006	.012	.016	.020
	75	.012	.018	.024	.030	60	.012	.018	.024	.030
Ductile Cast Iron	45	.006	.012	.016	.020	35	.006	.012	.016	.020
	65	.012	.018	.024	.030	55	.012	.018	.024	.030
Malleable Cast Iron	60	.006	.012	.016	.020	40	.006	.012	.016	.020
	80	.012	.018	.024	.030	60	.012	.018	.024	.030
Inconel	20	.004	.010	.016	.020	10	.004	.010	.016	.020
	30	.010	.014	.020	.030	15	.010	.014	.020	.030
Low Carbon Steel	60	.006	.012	.016	.020	40	.006	.012	.016	.020
	80	.012	.018	.024	.030	60	.012	.018	.024	.030
Med. Carbon Steel	50	.006	.012	.016	.020	30	.006	.012	.016	.020
	70	.012	.018	.024	.030	50	.012	.018	.024	.030
High Carbon Steel	35	.006	.012	.016	.020	30	.006	.012	.016	.020
	55	.012	.018	.024	.030	50	.012	.018	.024	.030
Alloy Steel	35	.006	.012	.016	.020	25	.006	.012	.016	.020
	55	.012	.018	.024	.030	40	.012	.018	.024	.030
Monel	35	.006	.012	.016	.020	25	.006	.012	.016	.020
	45	.012	.018	.024	.030	35	.012	.018	.024	.030
Stainless Steel	50	.004	.010	.016	.020	30	.004	.010	.016	.025
	70	.010	.014	.020	.025	40	.010	.014	.020	.025
Titanium	40	.004	.010	.016	.020	30	.004	.010	.016	.020
	60	.010	.014	.020	.025	40	.010	.014	.020	.025

METCUT coated reamers should be run at 10-25% faster speeds.

### Stock Removal

Stock removal depends on work piece material and finish required. This graph shows starting points for various diameters.





# Application Information

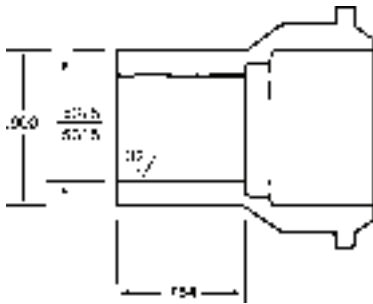
## Troubleshooting Guide

Problem	Cause	Solution
<b>Bell Mouth</b>	1. Misalignment; Reamer axis angular to work piece axis.	A. Reset alignment B. Use floating holder.
<b>Chatter</b>	1. Not enough material being removed by reamer.	A. Leave more stock in hole from preceding operation. B. Increase feed rate.
	2. Speed too high and/or feed rate too low.	A. See Recommended Feed & Speed Rates and Stock Removal, page 34.
	3. Set-up not rigid enough.	A. Reset. Eliminate any looseness that allows vibration during operation. B. Check operations occurring at same time as reaming for harmonics.
	4. Lead-in on work piece too blunt.	A. Chamfer I.D. of work piece bore entrance. B. Reamer may require long lead in chamfers or front pilot.
	5. Excessive clearance in primary land of reamer.	A. Contact METCUT application engineers.
<b>Oversized</b>	1. Reamer too big.	A. Replace with correct size reamer. B. Return to METCUT for resharping to proper diameter.
	2. Chatter.	A. See problem: "Chatter."
	3. Reamer axis not centered with work piece axis.	A. Reset alignment.
	4. Excessive chuck pressure.	A. Reset chuck, or change jaws.
	5. Bottoming out reamer.	A. Reset stroke length. B. Have leads of reamer shortened.
<b>Undersized (Tight Hole)</b>	1. Reamer too small.	A. Replace with correct size reamer. B. Return to METCUT for correction.
	2. Thermal contraction of bore.	A. Check coolant flow and mix. B. Check feeds, speeds and stock allowance.
	3. Misalignment.	A. Reset.
<b>Lobing</b>	1. Incorrect clearance.	A. Contact METCUT application engineers.
<b>Rough Finish</b>	1. Too much material being removed.	A. Leave less stock in hole from preceding operation.
	2. Too little material being removed.	A. Increase stock in hole from preceding operation. B. Check for marks in bore left from preceding operation that are too deep for reamer to clean.
	3. Build-up of material on reamer.	A. Check stock allowance, feed, speed, coolant mix and additives. B. May need surface treatment on reamer. C. Reamer dull.
	4. Misalignment.	A. Reset alignment. B. Use floating holder.
	5. Chatter.	A. See problem: "Chatter."
	6. Dull Reamer.	A. Return to METCUT for resharping or retipping.
	7. Feed rate and/or speed settings improper.	A. Reset.
	8. Improper sharpening or wrong axial profile on reamer.	A. Contact METCUT application engineers. Be sure to specify finish required when ordering reamer.
<b>Reverse Bell Mouth (Bottom of Hole)</b>	1. Misalignment.	A. Reset.
	2. Straight portions of reamer went past end of part. Reamer dropped into its back taper prior to retraction.	A. Reset stroke length.
	3. Chips packing in flutes.	A. Check stock allowance for reamer. B. Reduce/increase stock allowance. C. Increase coolant amount and pressure. D. Wrong profile on reamer. Contact METCUT application engineers.
<b>Tapered Bore</b>	1. Misalignment.	A. Reset.
	2. Leads of reamer not put completely through work piece.	A. Reset stroke length. Taper will only be at bottom of bore.
	3. Reamer straight portions ground with front taper.	A. Check tool on comparator. Contact METCUT application engineers.
	4. Not enough back taper.	A. Contact METCUT application engineers.

# Application Information

## Application Histories

### METCUT Reamers in Use – Actual Application Histories



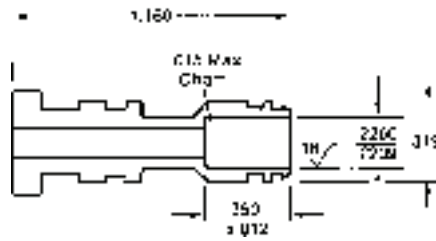
**Material: Ledloy Ax**

**Machining**

Feed: .008/Rev.  
 Speed: 652 RPM, 95 SFM  
 Life: 50,000 Low/100,000 High  
 Model 62 New Britain

**Reamer**

OF 567 (.532 Dia.)  
 .00004/.00010 Clearance  
 #18 Profile  
 .006/Inch B.T.



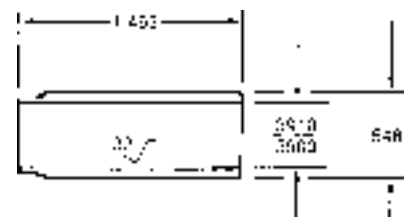
**Material: M354 Brass**

**Machining**

Feed: .0024/Rev.  
 Speed: 2534 RPM, 268 SFM  
 Life: 5000 Test Pieces  
 Cycle: 7.1 Sec. (507/Hr.)  
 Wickman 1-8 Stopper

**Reamer**

OFC 255 (.233 Dia.)  
 .00000/.00004 Clearance  
 End Cutting  
 #54 Profile  
 Replaced Roller Burnish Operation



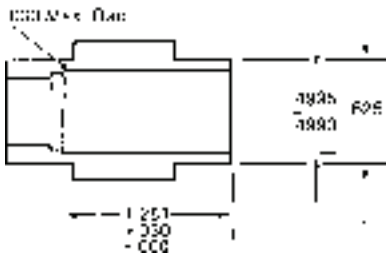
**Material: C 12L14 CDS**

**Machining**

Feed: .010/Rev.  
 Speed: 165 SFM  
 Life: 100,000+ Pieces/Rmr.  
 Model 51 New Britain

**Reamer**

OF 436 (.3910 Dia.)  
 .00004/.00010 Clearance  
 #57 Profile  
 .012/Inch B.T.



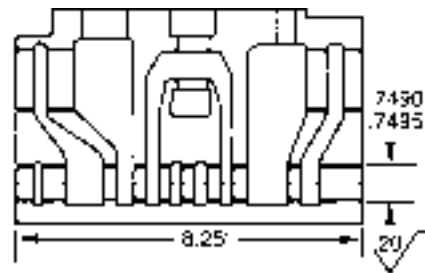
**Material: Lasalle Stress-Proof**

**Machining**

Feed: .0077/Rev.  
 Speed: 60 SFM  
 Life: 1500  
 Acme-Gridley

**Reamer**

OFC 505 (.4993 Dia.)  
 .00000/.00004 Clearance  
 #18 Profile  
 .006/Inch B.T.  
 .020±.005 Chamfer



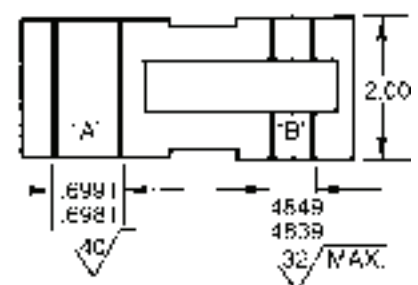
**Material: Meehanite Cast Iron**

**Machining**

Feed: .010/Rev.  
 Speed: 75 SFM  
 Life: 280 Spool Bores  
 Stock Allowance: .015/.020 on Dia.  
 Special Gun Drilling Machine/  
 CNC Horizontal Boring Machine

**Reamer**

Coolant-Feed, Carbide Tipped  
 .7492/.7493 Diameter  
 .00003/.00008 Primary Clearance  
 #18 Profile  
 Replaced Honing Operation



**Material: Malleable Iron**

**Machining**

Feed: .010/Rev.  
 Speed: 191 SFM  
 Life: 4000 Holes Per Sharpening  
 Stock Allowance: .012 on Dia.  
 Bore Depth: A = 1.375  
 B = 1.375 with .625 wide interruption  
 Kingsbury Transfer Machine

**Reamer**

Coolant-Feed, Carbide Tipped  
 Rear Pilot for Guide Bushing  
 .6986/.6988 Diameter A  
 .4844/.4846 Diameter B  
 .00004/.00010 Primary Clearance  
 #18 Profile  
 Finished Hole Cost Savings: 50%

# Reamer Reconditioning & Special Designs

## Reamer Reconditioning

All METCUT reamers can be returned for reconditioning. We offer three basic services, all of which result in re-establishment of the original, precisely controlled cutting edge.

For high speed steel, solid carbide, and carbide-tipped tools that are not badly worn, a lead sharpening is a very economical way to regain the fine finish and precise sizing these tools provide. If the reamer is badly worn or is undersize, we can resize it to a smaller diameter within its range; or, for carbide tipped reamers, we can replace the carbide and size the reamer to its original diameter.

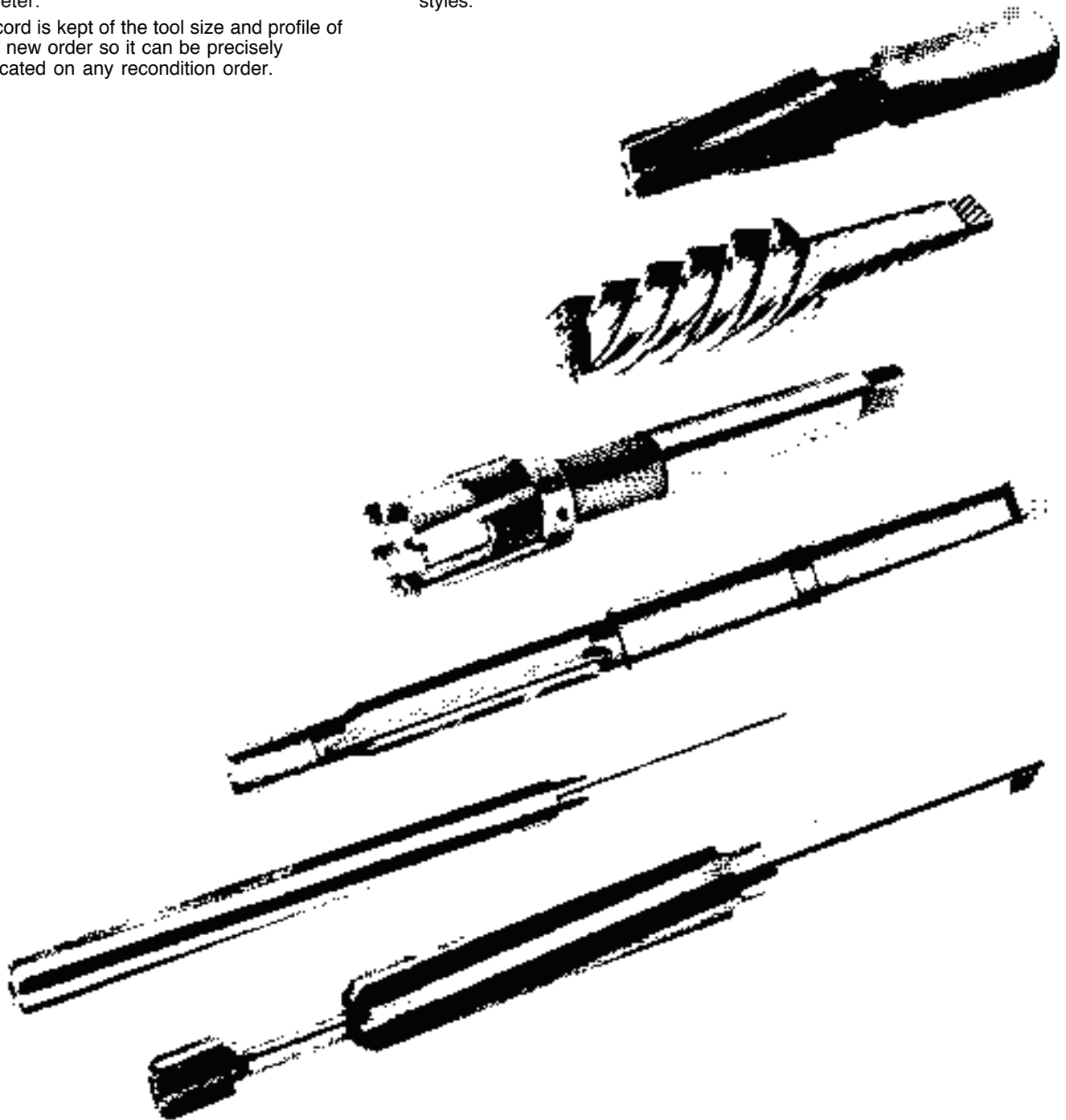
A record is kept of the tool size and profile of each new order so it can be precisely duplicated on any recondition order.

## Special Designs

In addition to the standard reamers listed in this catalog, special designs can be furnished while still utilizing our special features.

Upon inquiry and/or submission of part data, our engineering department will quote your special application, whether it be a "stub" type reamer, extra length shank, taper design, or larger diameter than offered within our stock line.

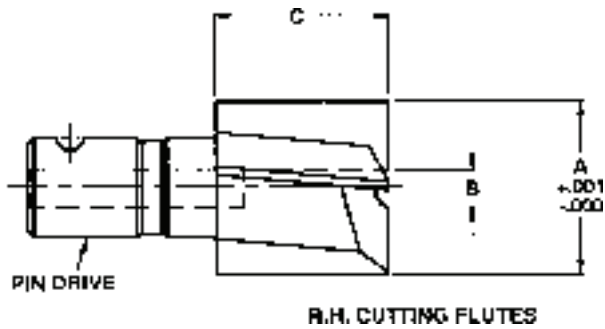
Inserted blade reamers are also available by special order, as are multi-diameter, front-piloted, rear-piloted and jig bore styles.





# Counterbores – Pin Drive (can be used as a straight shank counterbore)

## High Speed Steel



Use with 400 Series Pilots (Pages 48–49) and 300 & 303 Series Holders (Page 45)

A Cutter Diameter	Part Number	Pin Drive No.	B Pilot Hole	No. of Flutes	C Head Length
.2500	100-0025	0	.0937	4	1.125
.3125	100-0031	0	.1250	4	1.125
.3438	100-0034	0	.1250	4	1.125
.3750	100-0037	0	.1250	4	1.125
.4063	100-0040	0	.1250	4	1.125
.4375	100-0043	0	.1250	4	1.125
.4375	100-1043	1	.1875	4	1.375
.4688	100-1046	1	.1875	4	1.375
.5000	100-1050	1	.1875	4	1.375
.5313	100-1053	1	.1875	4	1.375
.5625	100-1056	1	.1875	4	1.375
.5938	100-1059	1	.1875	4	1.375
.6250	100-1062	1	.1875	4	1.375
.6563	100-1065	1	.1875	4	1.375
.6875	100-1068	1	.2500	4	1.375
.7188	100-1071	1	.2500	4	1.375
.7500	100-1075	1	.2500	4	1.375
.7813	100-1078	1	.2500	4	1.375
.8125	100-1081	1	.2500	4	1.375
.8750	100-1087	1	.2500	4	1.375
.9375	100-1093	1	.2500	4	1.375
1.0000	100-1100	1	.2500	4	1.375
1.0625	100-1106	1	.2500	4	1.375
1.1250	100-1112	1	.2500	4	1.375
1.0625	100-2106	2	.3125	4	1.375
1.1250	100-2112	2	.3125	4	1.375
1.1875	100-2118	2	.3125	4	1.375
1.2500	100-2125	2	.3125	4	1.375
1.3125	100-2131	2	.3125	4	1.375
1.3750	100-2137	2	.3125	4	1.375
1.4375	100-2143	2	.3125	4	1.375

All dimensions shown in inches.

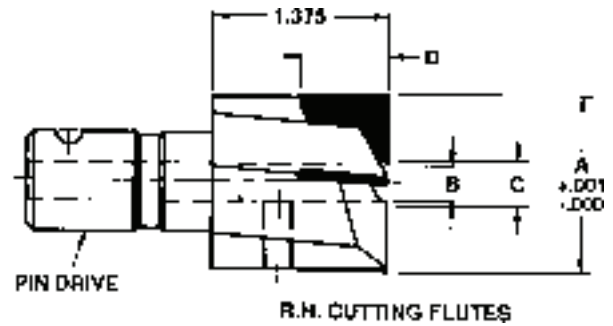
A Cutter Diameter	Part Number	Pin Drive No.	B Pilot Hole	No. of Flutes	C Head Length
1.5000	100-2150	2	.3125	4	1.375
1.5625	100-2156	2	.3125	4	1.375
1.6250	100-2162	2	.3125	4	1.375
1.6875	100-2168	2	.3125	4	1.375
1.7500	100-2175	2	.3125	4	1.375
1.6875	100-3168	3	.4375	6	1.375
1.7500	100-3175	3	.4375	6	1.375
1.8125	100-3181	3	.4375	6	1.375
1.8750	100-3187	3	.4375	6	1.375
2.0000	100-3200	3	.4375	6	1.375
2.1250	100-3212	3	.4375	6	1.375
2.2500	100-3225	3	.4375	6	1.375
2.3750	100-3237	3	.4375	6	1.375
2.5000	100-3250	3	.5000	6	1.375
2.6250	100-3262	3	.5000	6	1.375
2.7500	100-3275	3	.5000	6	1.375
2.8750	100-3287	3	.5000	6	1.375
3.0000	100-3300	3	.5000	6	1.375
3.1250	100-3312	3	.5000	6	1.375
3.0000	100-4300	4	.7500	6	1.375
3.1250	*100-4312	4	.7500	6	1.375
3.2500	100-4325	4	.7500	6	1.375
3.3750	*100-4337	4	.7500	6	1.375
3.5000	100-4350	4	.7500	6	1.375
3.6250	*100-4362	4	.7500	6	1.375
3.7500	100-4375	4	.7500	6	1.375
3.8750	*100-4387	4	.7500	6	1.375
4.0000	100-4400	4	.7500	6	1.375

All dimensions shown in inches.

\*Non-stocked.

# Counterbores – Pin Drive (can be used as a straight shank counterbore)

## Tungsten Carbide Tipped



Use with 400 & 410 Series Pilots (Pages 48–50) and 300 & 303 Series Holders (Page 45)

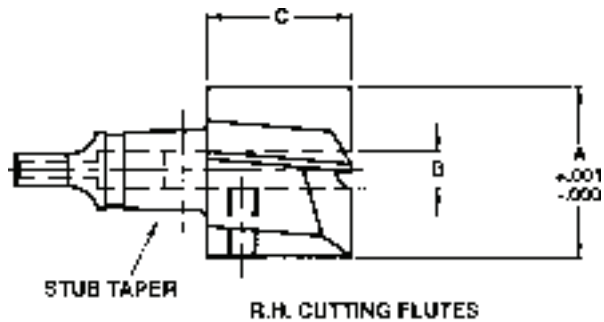
A Cutter Diameter	Part Number	Pin Drive Number	B Pilot Hole	Number of Flutes	D Length of Carbide	C Minimum Cutting Diameter
.5000	200-1050	1	.1875	3	.750	.219
.5625	200-1056	1	.1875	3	.750	.219
.6250	200-1062	1	.1875	3	.750	.219
.6875	200-1068	1	.2500	4	.750	.313
.7500	200-1075	1	.2500	4	.750	.313
.8125	200-1081	1	.2500	4	.750	.313
.8750	200-1087	1	.2500	4	.750	.313
.9375	200-1093	1	.2500	4	.750	.313
1.0000	200-1100	1	.2500	4	.750	.313
1.0625	200-1106	1	.2500	4	.750	.313
1.1250	200-1112	1	.2500	4	.750	.313
1.0625	200-2106	2	.3125	4	.750	.375
1.1250	200-2112	2	.3125	4	.750	.375
1.1875	200-2118	2	.3125	4	.750	.375
1.2500	200-2125	2	.3125	4	.750	.375
1.3125	200-2131	2	.3125	4	.750	.375
1.3750	200-2137	2	.3125	4	.750	.375
1.4375	200-2143	2	.3125	4	.500	.375
1.5000	200-2150	2	.3125	4	.500	.375
1.5625	*200-2156	2	.3125	4	.500	.375
1.6250	200-2162	2	.3125	4	.500	.375
1.6875	200-2168	2	.3125	4	.500	.375
1.7500	200-2175	2	.3125	4	.500	.375
1.7500	200-3175	3	.4375	6	.500	.500
1.8750	200-3187	3	.4375	6	.500	.500
2.0000	200-3200	3	.4375	6	.500	.500
2.1250	200-3212	3	.4375	6	.500	.500
2.2500	200-3225	3	.4375	6	.500	.500
2.3750	200-3237	3	.4375	6	.500	.500
2.5000	200-3250	3	.5000	6	.500	.563
2.7500	200-3275	3	.5000	6	.500	.563
3.0000	200-3300	3	.5000	6	.500	.563

All dimensions shown in inches.  
\*Non-stocked.



# Counterbores – Stub Taper

## High Speed Steel

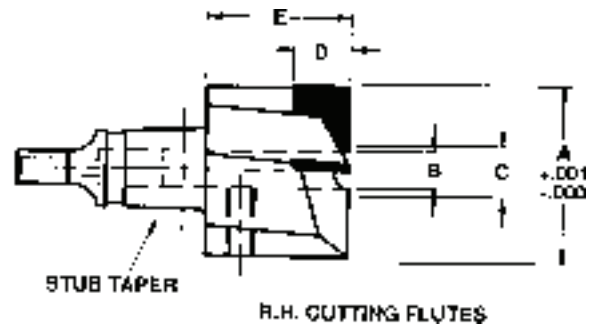


Use with 410 Series Pilots (Page 50) & 310 Series Holders (Page 46)

A Cutter Diameter	Part Number	Stub Taper Drive No.	B Pilot Hole	Number of Flutes	C Head Length
.4375	110-1043	1	.1875	4	1.250
.5000	110-1050	1	.1875	4	1.250
.5625	110-1056	1	.1875	4	1.250
.6250	110-1062	1	.1875	4	1.250
.6875	110-1068	1	.1875	4	1.250
.7500	110-2075	2	.2500	4	1.250
.8125	110-2081	2	.2500	4	1.250
.8750	110-2087	2	.2500	4	1.250
.9375	110-2093	2	.2500	4	1.250
1.0000	110-2100	2	.3125	4	1.250
1.0625	110-2106	2	.3125	4	1.250
1.1250	110-2112	2	.3125	4	1.250
1.1875	110-2118	2	.3125	4	1.250
1.2500	110-2125	2	.3125	4	1.250
1.3125	110-2131	2	.3125	4	1.250
1.3750	110-2137	2	.3125	4	1.250
1.4375	110-2143	2	.3125	4	1.250
1.5000	110-2150	2	.3125	4	1.250
1.5625	110-3156	3	.4375	6	1.250
1.6250	110-3162	3	.4375	6	1.250
1.6875	110-3168	3	.4375	6	1.250
1.7500	110-3175	3	.4375	6	1.250
1.8125	110-3181	3	.4375	6	1.250
1.8750	110-3187	3	.4375	6	1.250
1.9375	110-3193	3	.4375	6	1.250
2.0000	110-4200	4	.5000	6	1.500
2.1250	110-4212	4	.5000	6	1.500
2.2500	110-4225	4	.5000	6	1.500
2.3750	110-4237	4	.5000	6	1.500
2.5000	110-4250	4	.5000	6	1.500
2.7500	110-4275	4	.5000	6	1.500
3.0000	110-4300	4	.5000	6	1.500

All dimensions shown in inches.

# Counterbores – Stub Taper Tungsten Carbide Tipped

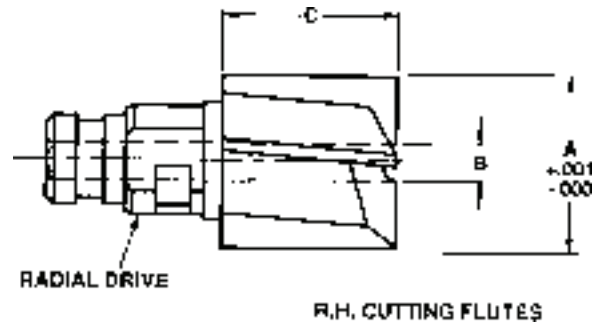


**Use with 410 Series Pilots (Page 50) & 310 Series Holders (Page 46)**

A Cutter Diameter	Part Number	Stub Taper Drive No.	B Pilot Hole	Number of Flutes	D Length of Carbide	C Minimum Cutting Diameter	E Head Length
.5000	<b>210-1050</b>	1	.1875	3	.750	.219	1.250
.5625	<b>210-1056</b>	1	.1875	3	.750	.219	1.250
.6250	<b>210-1062</b>	1	.1875	3	.750	.219	1.250
.6875	<b>210-1068</b>	1	.1875	4	.750	.219	1.250
.7500	<b>210-2075</b>	2	.2500	4	.750	.313	1.250
.8125	<b>210-2081</b>	2	.2500	4	.750	.313	1.250
.8750	<b>210-2087</b>	2	.2500	4	.750	.313	1.250
.9375	<b>210-2093</b>	2	.2500	4	.750	.313	1.250
1.0000	<b>210-2100</b>	2	.3125	4	.750	.375	1.250
1.0625	<b>210-2106</b>	2	.3125	4	.750	.375	1.250
1.1250	<b>210-2112</b>	2	.3125	4	.750	.375	1.250
1.1875	<b>210-2118</b>	2	.3125	4	.750	.375	1.250
1.2500	<b>210-2125</b>	2	.3125	4	.750	.375	1.250
1.3125	<b>210-2131</b>	2	.3125	4	.750	.375	1.250
1.3750	<b>210-2137</b>	2	.3125	4	.750	.375	1.250
1.4375	<b>210-2143</b>	2	.3125	4	.500	.375	1.250
1.5000	<b>210-2150</b>	2	.3125	4	.500	.375	1.250
1.5625	<b>210-3156</b>	3	.4375	6	.500	.500	1.250
1.6250	<b>210-3162</b>	3	.4375	6	.500	.500	1.250
1.6875	<b>210-3168</b>	3	.4375	6	.500	.500	1.250
1.7500	<b>210-3175</b>	3	.4375	6	.500	.500	1.250
1.8125	<b>210-3181</b>	3	.4375	6	.500	.500	1.250
1.8750	<b>210-3187</b>	3	.4375	6	.500	.500	1.250
1.9375	<b>210-3193</b>	3	.4375	6	.500	.500	1.250
2.0000	<b>210-4200</b>	4	.5000	6	.500	.563	1.500
2.1250	<b>210-4212</b>	4	.5000	6	.500	.563	1.500
2.2500	<b>210-4225</b>	4	.5000	6	.500	.563	1.500
2.3750	<b>210-4237</b>	4	.5000	6	.500	.563	1.500
2.5000	<b>210-4250</b>	4	.5000	6	.500	.563	1.500
2.7500	<b>210-4275</b>	4	.5000	6	.500	.563	1.500
3.0000	<b>210-4300</b>	4	.5000	6	.500	.563	1.500

All dimensions shown in inches.

# Counterbores – Radial Drive High Speed Steel



**Use with 400 Series Pilots (Pages 48–49) and 320, 321 & 323 Series Holders (Pages 46–47)**

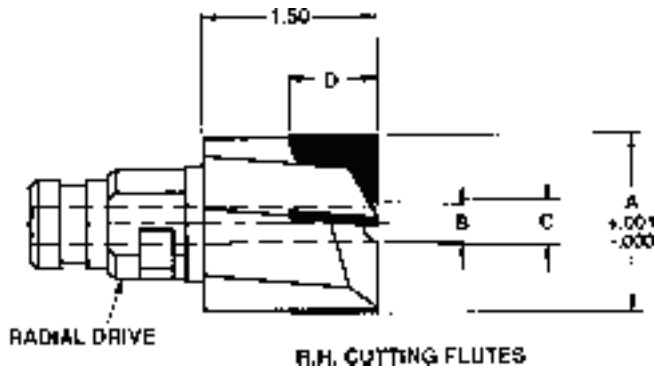
A Cutter Diameter	Part Number	Radial Drive No.	B Pilot Hole	No. of Flutes	C Head Length
.2500	120-1025	RA	.0937	4	1.250
.3125	120-1031	RA	.1250	4	1.250
.3438	120-1034	RA	.1250	4	1.250
.3750	120-1037	RA	.1250	4	1.250
.4063	120-1040	RA	.1250	4	1.250
.4375	120-1043	RA	.1250	4	1.250
.4375	120-2043	RB	.1875	4	1.500
.4688	120-2046	RB	.1875	4	1.500
.5000	120-2050	RB	.1875	4	1.500
.5313	120-2053	RB	.1875	4	1.500
.5625	120-2056	RB	.1875	4	1.500
.5938	120-2059	RB	.1875	4	1.500
.6250	120-2062	RB	.1875	4	1.500
.6563	120-2065	RB	.1875	4	1.500
.6875	120-2068	RB	.2500	4	1.500
.7188	120-2071	RB	.2500	4	1.500
.7500	120-2075	RB	.2500	4	1.500
.7813	120-2078	RB	.2500	4	1.500
.8125	120-2081	RB	.2500	4	1.500
.8750	120-2087	RB	.2500	4	1.500
.9375	120-2093	RB	.2500	4	1.500
1.0000	120-2100	RB	.2500	4	1.500
.9375	120-3093	RC	.3125	4	1.500
1.0000	120-3100	RC	.3125	4	1.500
1.0625	120-3106	RC	.3125	4	1.500
1.1250	120-3112	RC	.3125	4	1.500
1.1875	120-3118	RC	.3125	4	1.500
1.2500	120-3125	RC	.3125	4	1.500
1.3125	120-3131	RC	.3125	4	1.500
1.3750	120-3137	RC	.3125	4	1.500
1.3125	120-4131	RE	.3125	4	1.500
1.3750	120-4137	RE	.3125	4	1.500
1.4375	120-4143	RE	.3125	4	1.500
1.5000	120-4150	RE	.3125	4	1.500

A Cutter Diameter	Part Number	Radial Drive No.	B Pilot Hole	No. of Flutes	C Head Length
1.5625	120-4156	RE	.3125	4	1.500
1.6250	120-4162	RE	.3125	4	1.500
1.5000	120-5150	RF	.4375	4	1.500
1.5625	120-5156	RF	.4375	4	1.500
1.6250	120-5162	RF	.4375	4	1.500
1.6875	120-5168	RF	.4375	6	1.500
1.7500	120-5175	RF	.4375	6	1.500
1.8125	120-5181	RF	.4375	6	1.500
1.8750	120-5187	RF	.4375	6	1.500
1.9375	120-5193	RF	.4375	6	1.500
2.0000	120-5200	RF	.4375	6	1.500
2.0000	120-6200	RJ	.5000	6	1.500
2.0625	120-6206	RJ	.5000	6	1.500
2.1250	120-6212	RJ	.5000	6	1.500
2.2500	120-6225	RJ	.5000	6	1.500
2.3750	120-6237	RJ	.5000	6	1.500
2.5000	120-6250	RJ	.5000	6	1.500
2.6250	120-6262	RJ	.5000	6	1.500
2.7500	120-7275	RS	.7500	6	1.500
2.8750	120-7287	RS	.7500	6	1.500
3.0000	120-7300	RS	.7500	6	1.500
3.1250	120-7312	RS	.7500	6	1.500
3.2500	120-7325	RS	.7500	6	1.500
3.3750	120-7337	RS	.7500	6	1.500
3.5000	120-7350	RS	.7500	6	1.500
3.6250	120-7362	RS	.7500	6	1.500
3.7500	120-7375	RS	.7500	6	1.500
4.0000	120-7400	RS	.7500	6	1.500

All dimensions shown in inches.

# Counterbores – Radial Drive

## Tungsten Carbide Tipped



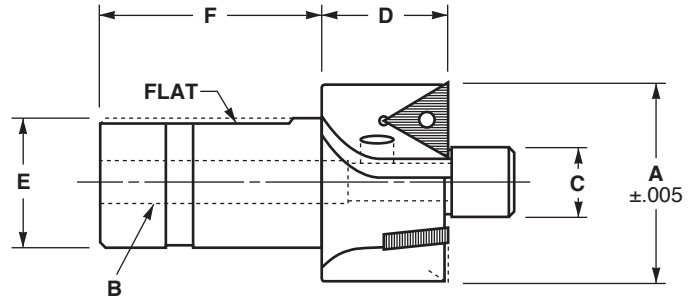
Use with 400 Series Pilots (Pages 48–49) and 320, 321 & 323 Series Holders (Pages 46–47)

A Cutter Diameter	Part Number	Radial Drive Number	B Pilot Hole	Number of Flutes	D Length of Carbide	C Minimum Cutting Diameter
.5000	220-2050	RB	.1875	3	.750	.219
.5625	220-2056	RB	.1875	3	.750	.219
.6250	220-2062	RB	.1875	3	.750	.219
.6875	220-2068	RB	.2500	4	.750	.313
.7500	220-2075	RB	.2500	4	.750	.313
.8125	220-2081	RB	.2500	4	.750	.313
.8750	220-2087	RB	.2500	4	.750	.313
.9375	220-2093	RB	.2500	4	.750	.313
1.0000	220-2100	RB	.2500	4	.750	.313
1.0000	220-3100	RC	.3125	4	.750	.375
1.0625	220-3106	RC	.3125	4	.750	.375
1.1250	220-3112	RC	.3125	4	.750	.375
1.1875	220-3118	RC	.3125	4	.750	.375
1.2500	220-3125	RC	.3125	4	.750	.375
1.3125	220-3131	RC	.3125	4	.750	.375
1.3750	220-3137	RC	.3125	4	.750	.375
1.3750	220-4137	RE	.3125	4	.750	.375
1.5000	220-4150	RE	.3125	4	.500	.375
1.6250	220-4162	RE	.3125	4	.500	.375
1.5000	220-5150	RF	.4375	4	.500	.500
1.6250	220-5162	RF	.4375	4	.500	.500
1.7500	220-5175	RF	.4375	6	.500	.500
1.8750	220-5187	RF	.4375	6	.500	.500
2.0000	220-5200	RF	.4375	6	.500	.500
2.0000	220-6200	RJ	.5000	6	.500	.563
2.1250	220-6212	RJ	.5000	6	.500	.563
2.2500	220-6225	RJ	.5000	6	.500	.563
2.3750	220-6237	RJ	.5000	6	.500	.563
2.5000	220-6250	RJ	.5000	6	.500	.563
2.6250	220-6262	RJ	.5000	6	.500	.563
2.7500	220-7275	RS	.5000	6	.500	.563
2.8750	220-7287	RS	.5000	6	.500	.563
3.0000	220-7300	RS	.5000	6	.500	.563

All dimensions shown in inches.

# Counterbores – Straight Shank

**Indexable**



(3) R.H. CUTTING FLUTES

Use with 410 Series Pilots (Page 50)

A Cutting Diameter	Part Number	B Pilot Hole Diameter	C Minimum Pilot Diameter	D Head Length	E Shank Diameter	F Shank Length	Standard Insert Number	Lock Pin Number
*.7500	<b>7810-0048</b>	.1875	.310	1.250	.750	2.375	F-156-BD	056-1010
*.8120	<b>7810-0052</b>	.1875	.340	1.250	.750	2.375	F-156-BD	056-1010
*.8750	<b>7810-0056</b>	.1875	.310	1.250	.750	2.375	F-218-BD	056-1012
*.9380	<b>7810-0060</b>	.1875	.340	1.250	.750	2.375	F-218-BD	056-1012
*1.000	<b>7810-0100</b>	.1875	.400	1.250	.750	2.375	F-218-BD	056-1012
1.0625	<b>7810-0104</b>	.1875	.335	1.250	.750	2.375	G-250-BD	053-0231
1.1250	<b>7810-0108</b>	.1875	.385	1.250	.750	2.375	G-250-BD	053-0231
1.1875	<b>7810-0112</b>	.1875	.440	1.250	.750	2.375	G-250-BD	053-0231
1.2500	<b>7810-0116</b>	.3125	.500	1.250	.750	2.375	G-250-BD	053-0231
1.3125	<b>7810-0120</b>	.3125	.555	1.250	.750	2.375	G-250-BD	053-0231
1.3750	<b>7810-0124</b>	.3125	.615	1.250	.750	2.375	G-250-BD	053-0231
1.4375	<b>7810-0128</b>	.3125	.675	1.250	.750	2.375	G-250-BD	053-0231
1.5000	<b>7810-0132</b>	.3125	.735	1.250	.750	2.375	G-250-BD	053-0231
1.5625	<b>7810-0136</b>	.3125	.795	1.250	.750	2.375	G-250-BD	053-0231
1.6250	<b>7810-0140</b>	.3125	.540	1.250	1.000	2.375	G-375-BD	053-0331
1.6875	<b>7810-0144</b>	.3125	.595	1.250	1.000	2.375	G-375-BD	053-0331
1.7500	<b>7810-0148</b>	.4375	.650	1.750	1.000	2.375	G-375-BD	053-0331
1.8125	<b>7810-0152</b>	.4375	.710	1.750	1.000	2.375	G-375-BD	053-0331
1.8750	<b>7810-0156</b>	.4375	.770	1.750	1.000	2.375	G-375-BD	053-0331
1.9375	<b>7810-0160</b>	.4375	.830	1.750	1.000	2.375	G-375-BD	053-0331
2.0000	<b>7810-0200</b>	.4375	.890	1.750	1.000	2.375	G-375-BD	053-0331
2.0625	<b>7810-0204</b>	.4375	.950	1.750	1.000	2.375	G-375-BD	053-0331
2.1250	<b>7810-0208</b>	.5000	1.010	1.750	1.250	2.625	G-375-BD	053-0331
2.1875	<b>7810-0212</b>	.5000	1.070	1.750	1.250	2.625	G-375-BD	053-0331
2.2500	<b>7810-0216</b>	.5000	.720	1.750	1.250	2.625	G-500-BD	053-0440
2.3125	<b>7810-0220</b>	.5000	.780	1.750	1.250	2.625	G-500-BD	053-0440
2.3750	<b>7810-0224</b>	.5000	.835	1.750	1.250	2.625	G-500-BD	053-0440
2.4375	<b>7810-0228</b>	.5000	.895	1.750	1.250	2.625	G-500-BD	053-0440
2.5000	<b>7810-0232</b>	.5000	.955	1.750	1.250	2.625	G-500-BD	053-0440
2.5625	<b>7810-0236</b>	.5000	1.015	1.750	1.250	2.625	G-500-BD	053-0440
2.6250	<b>7810-0240</b>	.5000	1.075	1.750	1.250	2.625	G-500-BD	053-0440
2.6875	<b>7810-0244</b>	.5000	1.140	1.750	1.250	2.625	G-500-BD	053-0440
2.7500	<b>7810-0248</b>	.5000	.940	1.750	1.250	2.625	G-625-BD	053-0541
2.8125	<b>7810-0252</b>	.5000	1.000	1.750	1.250	2.625	G-625-BD	053-0541
2.8750	<b>7810-0256</b>	.5000	1.060	1.750	2.000	3.250	G-625-BD	053-0541
2.9375	<b>7810-0260</b>	.5000	1.120	1.750	2.000	3.250	G-625-BD	053-0541
3.0000	<b>7810-0300</b>	.5000	1.180	1.750	2.000	3.250	G-625-BD	053-0541

All dimensions shown in inches.

\*These sizes use Positive Rake Inserts.

Note: Inserts must be ordered separately.

-CVD Tri-phase TiCN/TiC/TiN Coated Inserts

# Counterbores Application Information

## Counterboring—Surface Feet Per Minute (SFPM)

**Converting SFPM to Revolutions Per Minute (RPM):** 
$$\text{RPM} = \frac{3.82 \times \text{SFPM}}{\text{Cutter Diameter}}$$

The table below lists starting SFPM rates for certain materials using carbide or high speed steel cutters. These speeds are starting recommendations only. There are many variables, such as machine and spindle condition, available power, fixturing, tool holding, spindle deflection, tooling and production expectations, etc. Some adjustments may be required for your specific operation. METCUT's experienced sales engineers will be happy to help you attain the highest efficiency possible in your application.

Since counterboring is often a secondary operation, it is sometimes performed on machines that are quite worn, with excessive run-out and insufficient power. When trouble is encountered, the condition of the machine, as well as the cutter, should be considered.

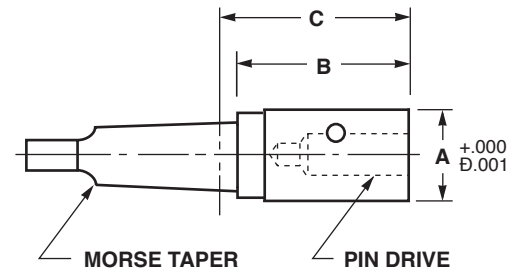
Material		Carbide	HSS
<b>Aluminum</b>		1000	600
<b>Alloy Steels</b> (Chrome–Molybdenum)	Soft	250	60
	Hard	180	45
<b>Brass</b>		500	250
<b>Carbon Steel</b>	Soft	400	110
	Hard	270	70
<b>Cast Iron</b>	Soft	400	100
	Hard	300	70
<b>Forgings</b> (Heat Treated)	200 Brinnell	220	55
	300 Brinnell	180	40
	350 Brinnell	240	30
<b>Magnesium</b>		1400	600
<b>Malleable Iron</b>		300	70
<b>Monel</b>		160	30
<b>Stainless Steel</b>		200	40
<b>Tool Steel</b> (Annealed)		160	40

Feed on 4-Fluted Counterbores is approximately .008— .012 FPR (Feed Per Revolution).



# Holders for Counterbores & Countersinks

## Pin Drive Holders with Taper Shank

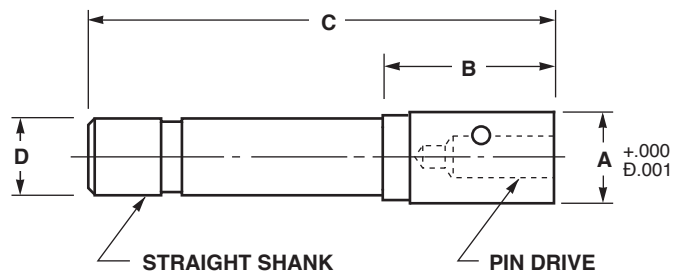


Use with 100 & 200 Series Cutters (Pages 37–38)

Cutter Range	Part Number	Pin Drive	Morse Taper	A Body Diameter	B Head Length	C Projection
.3125 to .4375	<b>300-0107</b>	0	1	.7500	2.250	2.375
.3125 to .4375	<b>300-0207</b>	0	2	.7500	2.250	2.437
.4375 to 1.1250	<b>300-1110</b>	1	1	1.0625	3.000	3.375
.4375 to 1.1250	<b>300-1210</b>	1	2	1.0625	3.000	3.187
.4375 to 1.1250	<b>300-1310</b>	1	3	1.0625	3.000	3.187
1.0625 to 1.7500	<b>300-2215</b>	2	2	1.5000	3.250	3.437
1.0625 to 1.7500	<b>300-2315</b>	2	3	1.5000	3.000	3.187
1.0625 to 1.7500	<b>300-2415</b>	2	4	1.5000	3.000	3.250
1.6875 to 3.1250	<b>300-3320</b>	3	3	2.0000	3.313	3.500
1.6875 to 3.1250	<b>300-3420</b>	3	4	2.0000	3.000	3.250
1.6875 to 3.1250	<b>300-3520</b>	3	5	2.0000	3.000	3.250
3.0000 to 4.0000	<b>300-4430</b>	4	4	3.0000	3.500	3.750
3.0000 to 4.0000	<b>300-4530</b>	4	5	3.0000	3.000	3.250

All dimensions shown in inches.

## Pin Drive Holders with Straight Shank



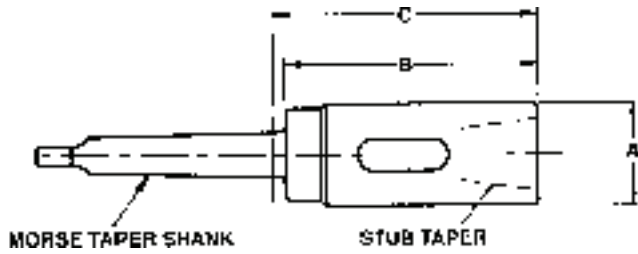
Use with 100 & 200 Series Cutters (Pages 37–38)

Cutter Range	Part Number	Pin Drive	A Body Diameter	B Head Length	C Overall Length	D Shank Diameter
.2500 to .4375	<b>303-0007</b>	0	.7500	2.250	5.250	.500
.4375 to 1.1250	<b>303-1010</b>	1	1.0625	3.000	6.000	.500
.4375 to 1.1250	<b>303-1110</b>	1	1.0625	3.000	6.000	.750
1.0625 to 1.7500	<b>303-2115</b>	2	1.5000	3.000	7.000	.750
1.0625 to 1.7500	<b>303-2215</b>	2	1.5000	3.000	7.000	1.000
1.6875 to 3.1250	<b>303-3220</b>	3	2.0000	3.000	7.000	1.000
1.6875 to 3.1250	<b>303-3320</b>	3	2.0000	3.000	7.000	1.250
1.6875 to 3.1250	<b>303-3423</b>	3	2.3750	3.000	7.000	1.500
3.0000 to 4.0000	<b>303-4530</b>	4	3.0000	3.000	7.500	2.000

All dimensions shown in inches.

# Holders for Counterbores & Countersinks

## Stub Taper with Taper Shank

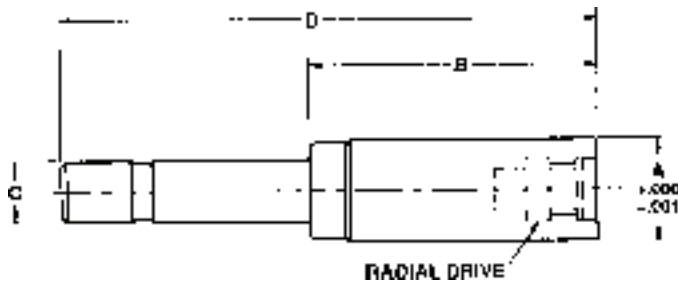


Use with 110 & 210 Series Cutters (Pages 39–40)

Cutter Range	Part Number	Stub Taper	Morse Taper	A Body Diameter	B Body Length	C Projection
.4375 to .6875	310-1208	1	2	.8750	1.750	1.938
.7500 to 1.5625	310-2211	2	2	1.1875	2.188	2.375
.7500 to 1.5625	310-2311	2	3	1.1875	2.188	2.375
.7500 to 1.5625	310-2411	2	4	1.1875	2.188	2.438
1.5625 to 2.0625	310-3214	3	2	1.4375	2.563	2.750
1.5625 to 2.0625	310-3314	3	3	1.4375	2.563	2.750
1.5625 to 2.0625	310-3414	3	4	1.4375	2.563	2.813
2.0000 to 3.0000	310-4318	4	3	1.8750	3.000	3.188
2.0000 to 3.0000	310-4418	4	4	1.8750	3.000	3.250
2.0000 to 3.0000	310-4518	4	5	1.8750	3.000	3.250
2.8750 to 3.0000	310-5527	5	5	2.7500	3.750	4.000

All dimensions shown in inches.

## Radial Drive with Straight Shank



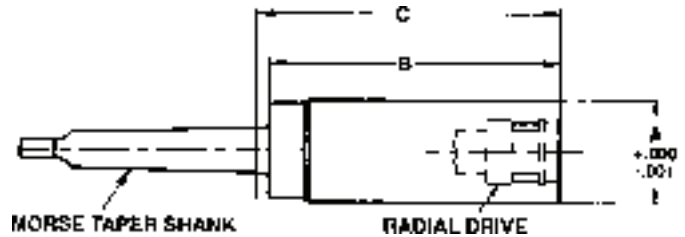
Use with 120 & 220 Series Cutters (Pages 41–42)

Cutter Range	Part Number	Radial Drive	A Body Dia.	B Body Length	C Shank Dia.	D Overall Length
.2500 to .4375	323-1107	RA	.7500	2.250	.5000	5.25
.4375 to 1.0000	323-2210	RB	1.0625	3.000	.6250	6.00
.9375 to 1.1250	323-3310	RC	1.0625	3.000	.7500	6.00
.9375 to 1.3750	323-3410	RC	1.0625	3.000	1.0000	7.00
1.3125 to 1.6250	323-4415	RE	1.5000	3.000	1.0000	7.00
1.5000 to 2.0000	323-5515	RF	1.5000	3.000	1.2500	7.00
1.5000 to 2.0000	323-5615	RF	1.5000	3.000	1.5000	7.50
2.0000 to 2.6875	323-6620	RJ	2.0000	3.000	1.5000	7.50
2.7500 to 4.5000	323-7727	RS	2.7500	3.000	2.0000	7.50

All dimensions shown in inches.

# Holders for Counterbores & Countersinks

## Radial Drive with Morse Taper Shank

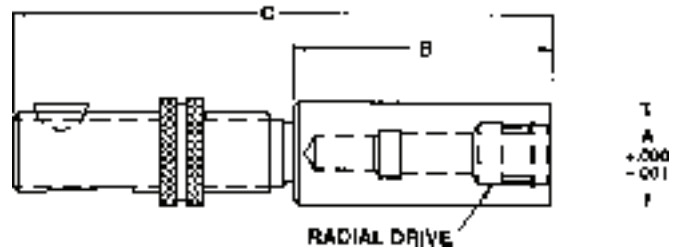


Use with 120, 160, 220 & 260 Series Cutters (Pages 41–42, 58, 60)

Cutter Range	Part Number	Radial Drive	Morse Taper	A Body Diameter	B Body Length	C Projection
.2500 to .4375	320-1107	RA	1	.7500	2.250	2.375
.2500 to .4375	320-1207	RA	2	.7500	2.250	2.438
.4375 to 1.0000	320-2108	RB	1	1.0625	3.000	3.125
.4375 to 1.0000	320-2208	RB	2	1.0625	3.000	3.188
.9375 to 1.3750	320-3210	RC	2	1.0625	3.000	3.188
.9375 to 1.3750	320-3310	RC	3	1.0625	3.000	3.188
1.3125 to 1.6250	320-4313	RE	3	1.5000	3.000	3.188
1.3125 to 1.6250	320-4413	RE	4	1.5000	3.000	3.250
1.5000 to 2.0000	320-5315	RF	3	1.5000	3.000	3.188
1.5000 to 2.0000	320-5415	RF	4	1.5000	3.000	3.250
2.0000 to 2.6250	320-6320	RJ	3	2.0000	3.000	3.188
2.0000 to 2.6250	320-6420	RJ	4	2.0000	3.000	3.250
2.0000 to 2.6250	320-6520	RJ	5	2.0000	3.000	3.250
2.7500 to 4.5000	320-7427	RS	4	2.7500	3.000	3.250
2.7500 to 4.5000	320-7527	RS	5	2.7500	3.000	3.250

All dimensions shown in inches.

## Radial Drive with Acme Threaded Shank



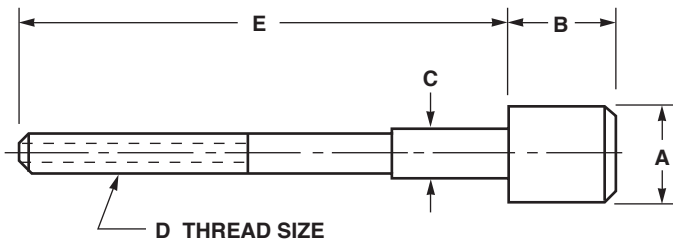
Use with 120, 160, 220 & 260 Series Cutters (Pages 41–42, 58, 60)

Cutter Range	Part Number	Radial Drive	Acme Shank	A Body Diameter	B Body Length	C Overall Length
.4375 to 1.0000	321-2109	RB	5/8–16	.9375	3.000	6.000
.4375 to 1.0000	321-2309	RB	7/8–12	.9375	3.000	6.630
.9375 to 1.3750	321-3310	RC	7/8–12	1.0625	3.000	6.630
.9375 to 1.3750	321-3510	RC	1-1/16–12	1.0625	3.000	6.630
.9375 to 1.3750	321-3610	RC	1-3/8–12	1.0625	3.000	7.630
1.3125 to 1.6250	321-4313	RE	7/8–12	1.3750	3.000	6.630
1.3125 to 1.6250	321-4513	RE	1-1/16–12	1.3750	3.000	6.630
1.5000 to 2.0000	321-5615	RF	1-3/8–12	1.5000	3.000	7.630

All dimensions shown in inches.

# Pilots for Counterbores & Countersinks

## Long Pilots for Pin Drive & Radial Drive



A Head Diameter	Shank Diameter & Part Number						
	.0938 Shank	.1250 Shank	.1875 Shank	.2500 Shank	.3125 Shank	.4375 Shank	.5000 Shank
.1250 .1563	400-0012 400-0015	400-1015					
.1719 .1875 .2031	400-0018 400-0020	400-1017 400-1018 400-1020	400-2020				
.2188 .2344 .2500	400-0021  400-0025	400-1021 400-1023 400-1025	400-2021 400-2023 400-2025				
.2656 .2813 .2969		400-1026 400-1028	400-2026 400-2028 400-2029	400-3026 400-3028 400-3029			
.3125 .3281 .3438		400-1031 400-1032 400-1034	400-2031 400-2032 400-2034	400-3031 400-3032 400-3034	400-4032 400-4034		
.3594 .3750 .3906		400-1037	400-2035 400-2037 400-2039	400-3035 400-3037 400-3039	400-4035 400-4037 400-4039		
.4063 .4219 .4375			400-2040 400-2042 400-2043	400-3040 400-3042 400-3043	400-4040 400-4042 400-4043		
.4531 .4688 .4844			400-2045 400-2046 400-2048	400-3045 400-3046 400-3048	400-4045 400-4046 400-4048		
.5000 .5156 .5313			400-2050 400-2051 400-2053	400-3050 400-3051 400-3053	400-4050 400-4051 400-4053	400-5050  400-5053	
.5469 .5625 .5781			400-2056	400-3054 400-3056 400-3057	400-4054 400-4056 400-4057	400-5056	400-6056
.5938 .6094 .6250				400-3059 400-3060 400-3062	400-4059 400-4060 400-4062	400-5059  400-5062	400-6059  400-6062
.6406 .6563 .6719				400-3064 400-3065 400-3067	400-4064 400-4065 400-4067	400-5064 400-5065 400-5067	400-6065
.6875 .7031 .7188				400-3068  400-3071	400-4068 400-4070 400-4071	400-5068 400-5070 400-5071	400-6068  400-6071
.7344 .7500				400-3075	400-4073 400-4075	400-5075	400-6075

All dimensions shown in inches.

### Head Dimension

A	A Less	B
.125-.1875 .2031-.2500 .2656-.2813	.002	.25 .25 .38
.2969-.3750 .3906-.4375 .4531-.5625 .5781-.6875 .7031-.8750	.004	.38 .44 .62 .62 .75
.8906-1.2500	.006	.75
1.3125-2.0000 2.1250-2.6250	.007	1.00 1.25

### Shank Dimension

C	D	E
.0938 .1250 .1875 .2500	#3-48 #5-40 10-24 1/4-20	2.31 2.31 3.19 3.19
.3125 .4375 .5000 .7500	5/16-18 7/16-14 1/2-13 3/4-10	3.38 3.44 3.44 3.62

All dimensions shown in inches.

# Pilots for Counterbores & Countersinks

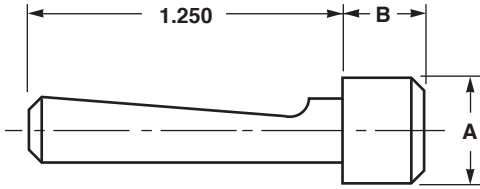
## Long Pilots – Continued

A Head Diameter	Shank Diameter & Part Number				
	.2500 Shank	.3125 Shank	.4375 Shank	.5000 Shank	.7500 Shank
.7656 .7813 .7969	400-3078	400-4076 400-4078 400-4079	400-5076 400-5078 400-5079	400-6078	
.8125 .8281 .8438	400-3081	400-4081 400-4082 400-4084	400-5081 400-5082 400-5084	400-6081 400-6084	
.8594 .8750 .8906	400-3087	400-4085 400-4087 400-4089	400-5085 400-5087 400-5089	400-6087	
.9063 .9219 .9375	400-3093	400-4090 400-4092 400-4093	400-5090 400-5092 400-5093	400-6090 400-6093	
.9531 .9688 .9845		400-4095 400-4096 400-4098	400-5095 400-5096 400-5098	400-6096	
1.0000 1.0625 1.1250	400-3100	400-4100 400-4106 400-4112	400-5100 400-5106 400-5112	400-6100 400-6106 400-6112	
1.1875 1.2500 1.3125		400-4118 400-4125 400-4131	400-5118 400-5125 400-5131	400-6118 400-6125 400-6131	400-7125 400-7131
1.3750 1.4375 1.5000		400-4137 400-4143	400-5137 400-5143 400-5150	400-6137 400-6143 400-6150	400-7137 400-7143 400-7150
1.5625 1.6250 1.6875			400-5156 400-5162 400-5168	400-6156 400-6162 400-6168	400-7156 400-7162 400-7168
1.7500 1.8125 1.8750			400-5175 400-5181 400-5187	400-6175 400-6181 400-6187	400-7175 400-7181 400-7187
1.9375 2.0000 2.1250				400-6193 400-6200 400-6212	400-7193 400-7200 400-7212
2.2500 2.3750 2.5000				400-6225	400-7225 400-7237 400-7250
2.6250					400-7262

All dimensions shown in inches.

# Pilots for Counterbores & Countersinks

## Short Pilots for Stub Taper, Indexable, & TCT Pin Drive, & Piloted Counterbores



A Head Diameter	Shank Diameter & Part Number				
	.1875 Shank	.2500 Shank	.3125 Shank	.4375 Shank	.5000 Shank
.2500 .2813 .3125	410-2025 410-2028 410-2031	410-3028 410-3031			
.3438 .3750 .4063	410-2034 410-2037 410-2040	410-3034 410-3037 410-3040	410-4034 410-4037 410-4040		
.4375 .4688 .5000	410-2043 410-2046 410-2050	410-3043 410-3046 410-3050	410-4043 410-4046 410-4050	410-5050	
.5313 .5625 .5938	410-2053 410-2056	410-3053 410-3056 410-3059	410-4053 410-4056 410-4059	410-5053 410-5056 410-5059	410-6056 410-6059
.6250 .6406 .6563		410-3062 410-3065	410-4062 410-4064 410-4065	410-5062	
.6875 .7188 .7500		410-3068	410-4068 410-4071 410-4075	410-5068 410-5071 410-5075	410-6071 410-6075
.7656 .7813 .8125		410-3081	410-4076 410-4078 410-4081	410-5078 410-5081	410-6078 410-6081
.8750 .9375 .9687		410-3087	410-4087 410-4093 410-4096	410-5087 410-5093	410-6087 410-6093
1.0000 1.0625 1.1250			410-4100 410-4106 410-4112	410-5100 410-5106 410-5112	410-6100 410-6106 410-6112
1.1875 1.2500 1.3125				410-5118 410-5125	410-6118 410-6125 410-6131
1.3750 1.4375 1.5000				410-5143	410-6137 410-6143 410-6150
1.5625 1.6250 1.6875					410-6156 410-6162 410-6168
1.7500 1.8750					410-6175 410-6187

All dimensions shown in inches.

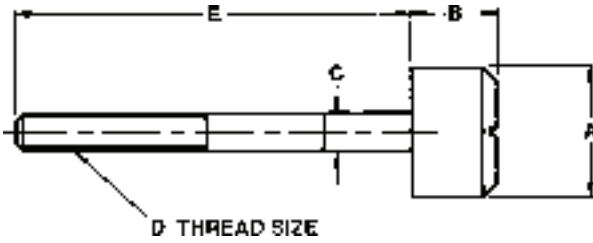
A Head Diameter	A Less	B Length
.2500-.2813	.002	.438
.3125-.3750 .4063-.4375 .4688-.5625 .5938-.6875 .7188-.8750	.004	.438 .438 .620 .656 .750
.9375-1.2500	.006	.750
1.3125-1.8750	.007	1.000

All dimensions shown in inches.



# Pilots for Counterbores

## for HEX Drive Type C HSS Counterbores



A Head Diameter	Shank Diameter & Part Number				
	#5-40 Shank	1/4-20 Shank	5/16-18 Shank	7/16-14 Shank	5/8-11 Shank
.1563 .1875 .2188	5021-0010 5021-0012 5021-0014				
.2500 .2813 .3125	5021-0016 5021-0018 5021-0020	5022-0018 5022-0020			
.3438 .3750 .4063	5021-0022 5021-0024	5022-0022 5022-0024 5022-0026	5023-0022 5023-0024 5023-0026		
.4375 .4688 .5000		5022-0028 5022-0030 5022-0032	5023-0028 5023-0030 5023-0032		
.5625 .6250 .6875		5022-0036 5022-0040 5022-0044	5023-0036 5023-0040 5023-0044	5024-0044	
.7500 .8125 .8750		5022-0048 5022-0056	5023-0048 5023-0052 5023-0056	5024-0048 5024-0052 5024-0056	
.9375 1.0000 1.0625			5023-0060 5023-0100 5023-0104	5024-0060 5024-0100 5024-0104	
1.1250 1.1875 1.2500			5023-0108 5023-0112 5023-0116	5024-0108 5024-0112 5024-0116	
1.3125 1.3750 1.4375				5024-0120 5024-0124 5024-0128	5025-0120 5025-0124 5025-0128
1.5000 1.5625 1.6250				5024-0132 5024-0136	5025-0132 5025-0136 5025-0140
1.6875 1.7500 1.8125					5025-0144 5025-0148
1.8750 1.9375 2.0000					5025-0160 5025-0200

All dimensions shown in inches.

### Head Dimension

A	A Less	B
.1562-.2812	.002	.38
.3125-.3750 .4062-.4375 .4688-.5625 .6250 .6875-.8750	.004	.38 .44 .56 .62 .75
.9375-1.0000 1.0600-1.1875	.006	.75 1.00
1.2500-2.000	.007	1.250

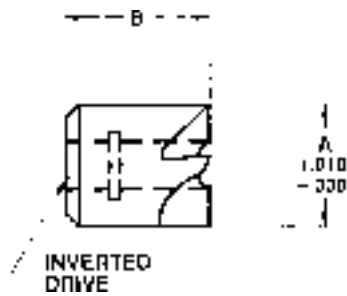
### Shank Dimension

C	D	E	Used On
.1250 .2500 .3125	#5-40 1/4-20 5/16-18	2.625 2.875 3.438	C-11 C-12 C-13
.4375 .6250	7/16-14 5/8-11	4.625 5.688	C-14 C-15

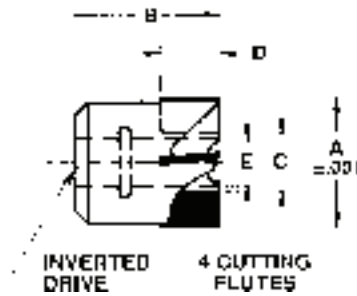
All dimensions shown in inches.

# Back Spotfacers – Balanced Drive

## High Speed Steel



## Tungsten Carbide Tipped



Use with 450 & 453 Series Pilots (Page 54)

A Diameter	Part Number	Drive Size	B Overall Length	No. of Flutes
.500	150-1050	.3125	.750	4
.563	150-1056	.3125	.750	4
.625	150-1062	.3125	.750	4
.688	150-1068	.3125	.750	4
.750	150-1075	.3125	.750	4
.750	150-2075	.3750	.750	4
.813	150-2081	.3750	.750	4
.875	150-2087	.3750	.750	4
.938	150-2093	.3750	.750	4
1.000	150-2100	.3750	.750	4
1.000	150-3100	.5000	.750	4
1.063	150-3106	.5000	.750	4
1.125	150-3112	.5000	.750	4
1.188	150-3118	.5000	.750	4
1.250	150-3125	.5000	.750	4
1.313	150-3131	.5000	.750	4
1.375	150-3137	.5000	.750	4
1.438	150-3143	.5000	.750	4
1.500	150-3150	.5000	.750	4
1.375	150-4137	.7500	.750	6
1.438	150-4143	.7500	.750	6
1.500	150-4150	.7500	.750	6
1.563	150-4156	.7500	.750	6
1.625	150-4162	.7500	.750	6
1.688	150-4168	.7500	.750	6
1.750	150-4175	.7500	.750	6
1.813	150-4181	.7500	.750	6
1.875	150-4187	.7500	.750	6
1.938	150-4193	.7500	.750	6
2.000	150-4200	.7500	.750	6
2.000	150-5200	1.0000	1.000	6
2.063	150-5206	1.0000	1.000	6
2.125	150-5212	1.0000	1.000	6
2.188	150-5218	1.0000	1.000	6
2.250	150-5225	1.0000	1.000	6
2.375	150-5237	1.0000	1.000	6
2.500	150-5250	1.0000	1.000	6
2.625	150-5262	1.0000	1.000	6
2.750	150-5275	1.0000	1.000	6
2.875	150-5287	1.0000	1.000	6
3.000	150-5300	1.0000	1.000	6
3.250	150-5325	1.0000	1.000	6

All dimensions shown in inches.

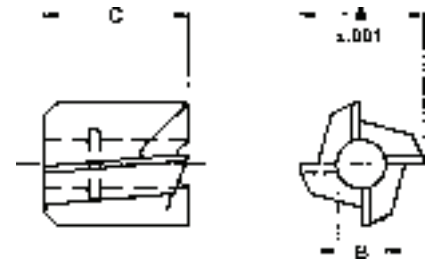
Use with 450 Series & 453 Series Pilots (Page 54)

A Diameter	Part Number	B Overall Length	C Carbide Root Dia.	D Carbide Length	E Drive Size
.625	250-1062	.750	.343	.312	.3125
.688	250-1068	.750	.343	.312	.3125
.750	250-1075	.750	.343	.375	.3125
.750	250-2075	.750	.405	.312	.3750
.813	250-2081	.750	.405	.375	.3750
.875	250-2087	.750	.405	.375	.3750
.938	250-2093	.750	.405	.375	.3750
1.000	250-2100	.750	.405	.375	.3750
1.000	250-3100	.750	.530	.375	.5000
1.063	250-3106	.750	.530	.375	.5000
1.125	250-3112	.750	.530	.375	.5000
1.188	250-3118	.750	.530	.375	.5000
1.250	250-3125	.750	.530	.375	.5000
1.375	250-3137	.750	.530	.375	.5000
1.500	250-3150	.750	.530	.375	.5000
1.375	250-4137	.750	.782	.375	.7500
1.500	250-4150	.750	.782	.375	.7500
1.625	250-4162	.750	.782	.375	.7500
1.750	250-4175	.750	.782	.375	.7500
1.875	250-4187	.750	.782	.375	.7500
2.000	250-4200	.750	.782	.375	.7500

All dimensions shown in inches.

NOTE: For 250 Series Back Spotfacers, the pilot diameter must be greater than the carbide root diameter.

# Back Counterbores – Balanced Drive High Speed Steel



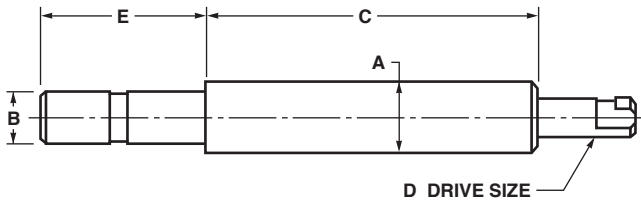
Use with 450 & 453 Series Pilots (Page 54)

A Diameter	Part Number	B Drive Size	C Overall Length	Number of Flutes
.750 .813 .875	<b>151-1075</b> <b>151-1081</b> <b>151-1087</b>	.313 .313 .313	.750 .750 .750	4 4 4
.938 1.000	<b>151-1093</b> <b>151-2093</b> <b>151-2100</b>	.313 .375 .375	.750 .750 .750	4 4 4
1.063 1.125 1.188	<b>151-2106</b> <b>151-2112</b> <b>151-2118</b>	.375 .375 .375	.750 .750 .750	4 4 4
1.125 1.187 1.250	<b>151-3112</b> <b>151-3118</b> <b>151-3125</b>	.500 .500 .500	.750 .750 .750	4 4 4
1.313 1.375 1.438	<b>151-3131</b> <b>151-3137</b> <b>151-3143</b>	.500 .500 .500	.750 .750 .750	4 4 4
1.500 1.563 1.625	<b>151-3150</b> <b>151-3156</b> <b>151-3162</b>	.500 .500 .500	.750 .750 .750	4 4 4
1.625 1.688 1.750	<b>151-4162</b> <b>151-4168</b> <b>151-4175</b>	.750 .750 .750	.750 .750 .750	6 6 6
1.813 1.875 1.938	<b>151-4181</b> <b>151-4187</b> <b>151-4193</b>	.750 .750 .750	.750 .750 .750	6 6 6
2.000 2.063 2.000	<b>151-4200</b> <b>151-4206</b> <b>151-5200</b>	.750 .750 1.000	.750 .750 1.000	6 6 6
2.063 2.125 2.250 2.375	<b>151-5206</b> <b>151-5212</b> <b>151-5225</b> <b>151-5237</b>	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	6 6 6 6

All dimensions shown in inches.

# Pilots for Balanced Drive Back Spotfacers & Back Counterbores

## with Straight Shank

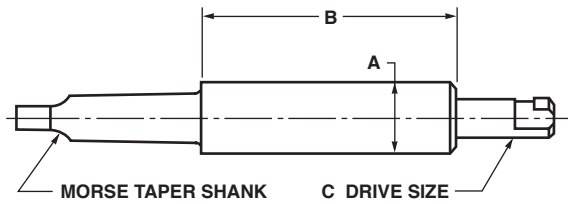


Use with 150 & 250 Series Back Spotfacers (Page 52)  
and 151 Series Back Counterbores (Page 53)

A Pilot Diameter*	Part Number	B Shank Dia.	C Body Length	D Inverted Drive	E Shank Length
.3125	453-1031	.500	2.500	.3125	2.000
.3438	453-1034	.500	2.500	.3125	2.000
.3750	453-1037	.500	2.500	.3125	2.000
.4063	453-1040	.500	2.500	.3125	2.000
.4375	453-1043	.500	2.500	.3125	2.000
.4688	453-1046	.500	2.500	.3125	2.000
.5000	453-1050	.500	2.500	.3125	2.000
.5313	453-1053	.500	2.500	.3125	2.000
.3750	453-2037	.500	2.500	.3750	2.000
.4063	453-2040	.500	2.500	.3750	2.000
.4375	453-2043	.500	2.500	.3750	2.000
.4688	453-2046	.500	2.500	.3750	2.000
.5000	453-2050	.500	2.500	.3750	2.000
.5313	453-2053	.500	2.500	.3750	2.000
.5625	453-2056	.500	2.500	.3750	2.000
.5938	453-2059	.500	2.500	.3750	2.000
.6250	453-2062	.500	2.500	.3750	2.000
.6563	453-2065	.500	2.500	.3750	2.000
.5000	453-3050	.500	2.500	.5000	2.000
.5313	453-3053	.500	2.500	.5000	2.000
.5625	453-3056	.500	2.500	.5000	2.000
.5938	453-3059	.500	2.500	.5000	2.000
.6250	453-3062	.500	2.500	.5000	2.000
.6563	453-3065	.500	2.500	.5000	2.000
.6875	453-3068	.500	2.500	.5000	2.000
.7500	453-3075	.500	2.500	.5000	2.000
.7813	453-3078	.500	2.500	.5000	2.000
.8125	453-3081	.500	3.500	.5000	2.000
.8750	453-3087	.500	3.500	.5000	2.000
.9063	453-3090	.500	3.500	.5000	2.000
1.0313	453-3103	.500	3.500	.5000	2.000
.7500	453-4075	.750	3.500	.7500	2.250
.8125	453-4081	.750	3.500	.7500	2.250
.8750	453-4087	.750	3.500	.7500	2.250
.9375	453-4093	.750	3.500	.7500	2.250
1.0000	453-4100	.750	3.500	.7500	2.250
1.1250	453-4112	.750	3.500	.7500	2.250
1.2500	453-4125	.750	3.500	.7500	2.250
1.3750	453-4137	.750	3.500	.7500	2.250
1.0000	453-5100	1.000	3.500	1.0000	2.500
1.1250	453-5112	1.000	3.500	1.0000	2.500
1.2500	453-5125	1.000	3.500	1.0000	2.500
1.3750	453-5137	1.000	3.500	1.0000	2.500
1.5000	453-5150	1.000	5.000	1.0000	2.500
1.6250	453-5162	1.000	5.000	1.0000	2.500

All dimensions shown in inches.  
\*Finish ground for running fit in nominal size hole.

## with Taper Shank



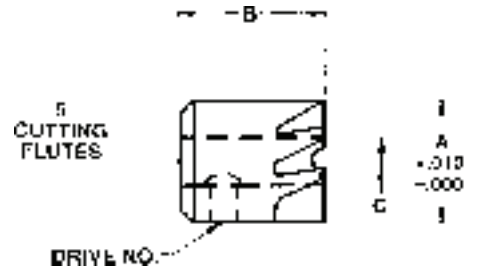
Use with 150 & 250 Series Back Spotfacers (Page 52)  
and 151 Series Back Counterbores (Page 53)

A Pilot Diameter*	Part Number	Morse Taper Shank	B Body Length	C Inverted Drive
.3125	450-1031	2	2.500	.3125
.3438	450-1034	2	2.500	.3125
.3750	450-1037	2	2.500	.3125
.4063	450-1040	2	2.500	.3125
.4375	450-1043	2	2.500	.3125
.4688	450-1046	2	2.500	.3125
.5000	450-1050	2	2.500	.3125
.5313	450-1053	2	2.500	.3125
.3750	450-2037	2	2.500	.3750
.4063	450-2040	2	2.500	.3750
.4375	450-2043	2	2.500	.3750
.4688	450-2046	2	2.500	.3750
.5000	450-2050	2	2.500	.3750
.5313	450-2053	2	2.500	.3750
.5625	450-2056	2	2.500	.3750
.5938	450-2059	2	2.500	.3750
.6250	450-2062	2	2.500	.3750
.6563	450-2065	2	2.500	.3750
.5000	450-3050	2	2.500	.5000
.5313	450-3053	2	2.500	.5000
.5625	450-3056	2	2.500	.5000
.5938	450-3059	2	2.500	.5000
.6250	450-3062	2	2.500	.5000
.6563	450-3065	2	2.500	.5000
.6875	450-3068	2	2.500	.5000
.7500	450-3075	2	2.500	.5000
.7813	450-3078	2	2.500	.5000
.8125	450-3081	2	3.500	.5000
.8750	450-3087	2	3.500	.5000
.9063	450-3090	2	3.500	.5000
1.0313	450-3103	2	3.500	.5000
.7500	450-4075	3	3.500	.7500
.8125	450-4081	3	3.500	.7500
.8750	450-4087	3	3.500	.7500
.9375	450-4093	3	3.500	.7500
1.0000	450-4100	3	3.500	.7500
1.1250	450-4112	3	3.500	.7500
1.2500	450-4125	3	3.500	.7500
1.3750	450-4137	3	3.500	.7500
1.0000	450-5100	4	3.500	1.0000
1.1250	450-5112	4	3.500	1.0000
1.2500	450-5125	4	3.500	1.0000
1.3750	450-5137	4	3.500	1.0000
1.5000	450-5150	4	5.000	1.0000
1.6250	450-5162	4	5.000	1.0000

All dimensions shown in inches.  
\*Finish ground for running fit in nominal size hole.

# Back Spotfacers – Ball Pin Drive, D Style

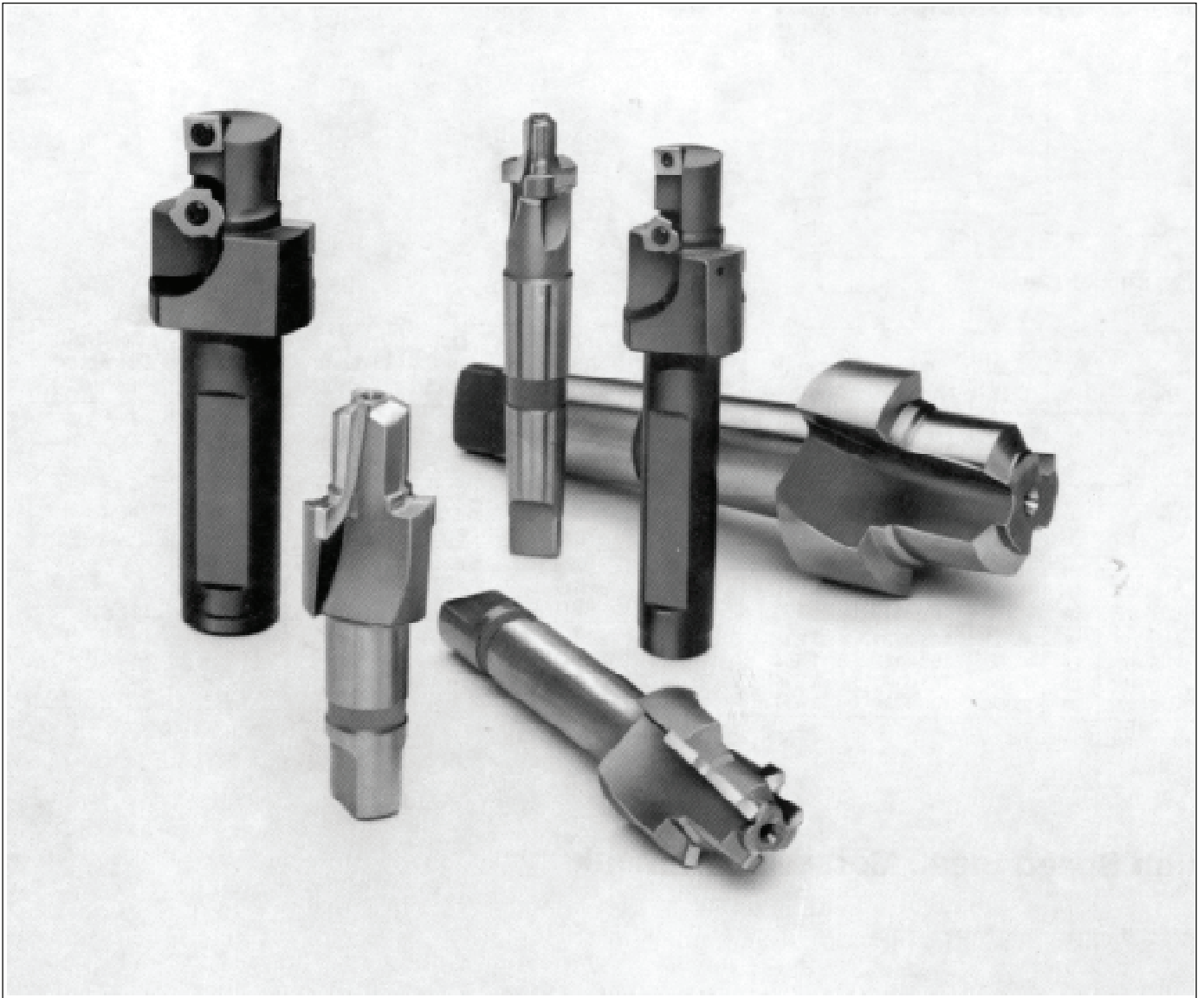
High Speed Steel



Use with 3571, 3572, 3573, 3574, 3575 & 3576 Series Pilots

A Diameter	Part Number	B Overall Length	Drive Number	C Hole I.D.	Drive Pin Number
.5000	3511-0032	.625	D-1	.250	3500-9001
.5625	3511-0036	.625	D-1	.250	3500-9001
.6250	3511-0040	.625	D-1	.250	3500-9001
.6875	3511-0044	.625	D-1	.250	3500-9001
.7500	3511-0048	.625	D-1	.250	3500-9001
.7500	3512-0048	.688	D-2	.375	3500-9002
.8125	3512-0052	.688	D-2	.375	3500-9002
.8750	3512-0056	.688	D-2	.375	3500-9002
.9375	3512-0060	.688	D-2	.375	3500-9002
1.0000	3512-0100	.688	D-2	.375	3500-9002
.9375	3513-0060	.750	D-3	.500	3500-9003
1.0000	3513-0100	.750	D-3	.500	3500-9003
1.0625	3513-0104	.750	D-3	.500	3500-9003
1.1250	3513-0108	.750	D-3	.500	3500-9003
1.1875	3513-0112	.750	D-3	.500	3500-9003
1.2500	3513-0116	.750	D-3	.500	3500-9003
1.1875	3514-0112	.875	D-4	.625	3500-9003
1.2500	3514-0116	.875	D-4	.625	3500-9003
1.3125	3514-0120	.875	D-4	.625	3500-9003
1.3750	3514-0124	.875	D-4	.625	3500-9003
1.4375	3514-0128	.875	D-4	.625	3500-9003
1.5000	3514-0132	.875	D-4	.625	3500-9003
1.5625	3514-0136	.875	D-4	.625	3500-9003
1.6250	3514-0140	.875	D-4	.625	3500-9003
1.4375	3515-0128	1.063	D-5	.750	3500-9004
1.5000	3515-0132	1.063	D-5	.750	3500-9004
1.5625	3515-0136	1.063	D-5	.750	3500-9004
1.6250	3515-0140	1.063	D-5	.750	3500-9004
1.6875	3515-0144	1.063	D-5	.750	3500-9004
1.7500	3515-0148	1.063	D-5	.750	3500-9004
1.8125	3515-0152	1.063	D-5	.750	3500-9004
1.8750	3515-0156	1.063	D-5	.750	3500-9004
1.5625	3516-0136	1.125	D-6	.875	3500-9004
1.6250	3516-0140	1.125	D-6	.875	3500-9004
1.6875	3516-0144	1.125	D-6	.875	3500-9004
1.7500	3516-0148	1.125	D-6	.875	3500-9004
1.8125	3516-0152	1.125	D-6	.875	3500-9004
1.8750	3516-0156	1.125	D-6	.875	3500-9004
2.0000	3516-0200	1.125	D-6	.875	3500-9004
2.1250	3516-0208	1.125	D-6	.875	3500-9004
2.1875	3516-0212	1.125	D-6	.875	3500-9004

All dimensions shown in inches.



### **A Full Range of Porting Tools for SAE, ISO, BSPP/BSPPF & NASA Specifications**

METCUT Port Contour Cutters produce the form and finish required on internal straight thread o-ring ports in a single operation. Straight thread ports usually are required for high-pressure hydraulic fittings, which must be in compliance with automotive, military, aerospace and commercial specifications.

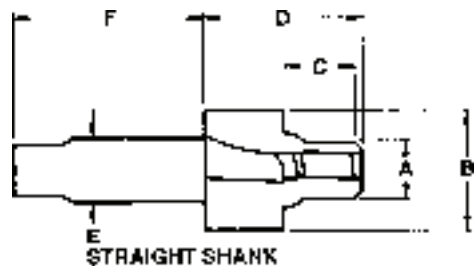
METCUT porting tools are form-relief ground and designed so that a simple face grinding reconditions the tool with no dimensional loss.

METCUT produces the most complete line of Port Contour Cutters in the industry. High speed steel and carbide tipped are standard in all sizes. Straight, morse taper and radial drive shank styles are available on all size tools. Indexable porting tools are available for meeting SAE and military specifications.



# Port Contour Cutters – SAE J1926, MS 16142

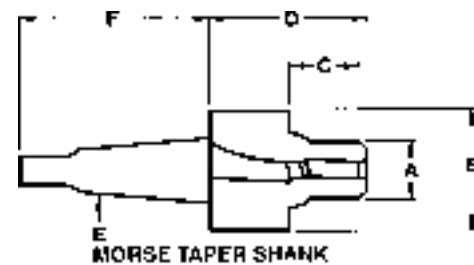
## High Speed Steel, Straight Shank



Thread Size	Tube		Part Number	A Small Diameter	B Spotface	C Bore Length	D Head Length	E Shank Diameter	F Shank Length	Pre-Drill Diameter/Length
	No.	O.D.								
5/16-24	2	.125	163-2031	.272	.682	.473	1.625	.500	3.125	F x .688
3/8-24	3	.187	163-2037	.335	.760	.473	1.625	.500	3.125	O x .688
7/16-20	4	.250	163-2043	.389	.838	.552	1.625	.500	3.125	U x .812
1/2-20	5	.312	163-2050	.452	.916	.552	1.625	.500	3.125	.44 x .812
9/16-18	6	.375	163-2056	.509	.994	.614	1.625	.500	3.125	.48 x .875
3/4-16	8	.500	163-3075	.689	1.198	.693	1.875	.750	3.875	.67 x .937
7/8-14	10	.625	163-3087	.806	1.354	.786	1.875	.750	3.875	.78 x 1.062
1-1/16-12	12	.750	163-3106	.981	1.635	.911	2.125	.750	3.875	.95 x 1.250
1-3/16-12	14	.875	163-3118	1.106	1.775	.911	2.125	.750	3.875	1.09 x 1.250
1-5/16-12	16	1.000	163-3131	1.231	1.939	.911	2.125	.750	3.875	1.21 x 1.250
1-5/8-12	20	1.250	163-4162	1.544	2.280	.911	2.375	1.000	4.875	1.53 x 1.250
1-7/8-12	24	1.500	163-4187	1.794	2.570	.911	2.375	1.000	4.875	1.78 x 1.250
2-1/2-12	32	2.000	163-4250	2.419	3.490	.911	2.375	1.000	4.875	2.41 x 1.250

All dimensions shown in inches.

## High Speed Steel, Morse Taper Shank

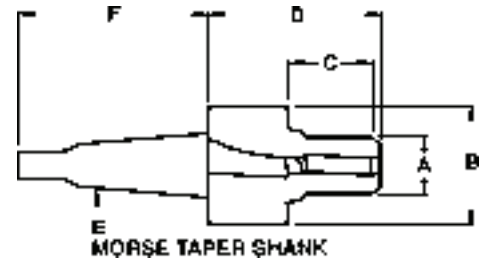


Thread Size	Tube		Part Number	A Small Diameter	B Spotface	C Bore Length	D Head Length	E Shank Diameter	F Shank Length	Pre-Drill Diameter/Length
	No.	O.D.								
5/16-24	2	.125	163-2031	.272	.682	.473	1.625	.500	3.125	F x .688
3/8-24	3	.187	163-2037	.335	.760	.473	1.625	.500	3.125	O x .688
7/16-20	4	.250	163-2043	.389	.838	.552	1.625	.500	3.125	U x .812
1/2-20	5	.312	163-2050	.452	.916	.552	1.625	.500	3.125	.44 x .812
9/16-18	6	.375	163-2056	.509	.994	.614	1.625	.500	3.125	.48 x .875
3/4-16	8	.500	163-3075	.689	1.198	.693	1.875	.750	3.875	.67 x .937
7/8-14	10	.625	163-3087	.806	1.354	.786	1.875	.750	3.875	.78 x 1.062
1-1/16-12	12	.750	163-3106	.981	1.635	.911	2.125	.750	3.875	.95 x 1.250
1-3/16-12	14	.875	163-3118	1.106	1.775	.911	2.125	.750	3.875	1.09 x 1.250
1-5/16-12	16	1.000	163-3131	1.231	1.939	.911	2.125	.750	3.875	1.21 x 1.250
1-5/8-12	20	1.250	163-4162	1.544	2.280	.911	2.375	1.000	4.875	1.53 x 1.250
1-7/8-12	24	1.500	163-4187	1.794	2.570	.911	2.375	1.000	4.875	1.78 x 1.250
2-1/2-12	32	2.000	163-4250	2.419	3.490	.911	2.375	1.000	4.875	2.41 x 1.250

All dimensions shown in inches.

# Port Contour Cutters – SAE J1926, MS 16142

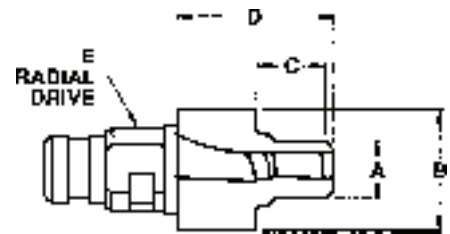
## High Speed Steel, Taper Shank with Extra Length Reamer



Thread Size	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Morse Taper	F Shank Length	Pre-Drill Diameter/Length
	No.	O.D.								
5/16-24	2	.125	<b>161-2031</b>	.272	.682	.580	1.750	2	3.125	F x .812
3/8-24	3	.187	<b>161-2037</b>	.335	.760	.580	1.750	2	3.125	O x .812
7/16-20	4	.250	<b>161-2043</b>	.389	.838	.690	1.750	2	3.125	U x .937
1/2-20	5	.312	<b>161-2050</b>	.452	.916	.690	1.750	2	3.125	.44 x .937
9/16-18	6	.375	<b>161-2056</b>	.509	.979	.750	1.750	2	3.125	.48 x .968
3/4-16	8	.500	<b>161-3075</b>	.689	1.198	.840	2.000	3	3.875	.67 x 1.090
7/8-14	10	.625	<b>161-3087</b>	.806	1.354	.970	2.000	3	3.875	.78 x 1.220
1-1/16-12	12	.750	<b>161-3106</b>	.981	1.635	1.125	2.250	3	3.875	.95 x 1.470
1-3/16-12	14	.875	<b>161-3118</b>	1.106	1.775	1.125	2.250	3	3.875	1.09 x 1.470
1-5/16-12	16	1.000	<b>161-3131</b>	1.231	1.920	1.125	2.250	3	3.875	1.21 x 1.470
1-5/8-12	20	1.250	<b>161-4162</b>	1.544	2.280	1.125	2.250	4	4.875	1.53 x 1.470
1-7/8-12	24	1.500	<b>161-4187</b>	1.794	2.570	1.125	2.250	4	4.875	1.78 x 1.470
2-1/2-12	32	2.000	<b>161-4250</b>	2.419	3.490	1.125	2.250	4	4.875	2.41 x 1.470

All dimensions shown in inches.

## High Speed Steel, Radial Drive

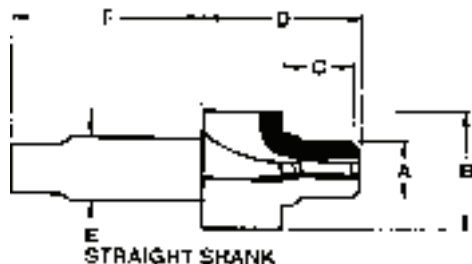


Thread Size	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Radial Drive	Number of Flutes	Pre-Drill Diameter/Length
	No.	O.D.								
5/16-24	2	.125	<b>160-2031</b>	.272	.875	.473	1.50	RB	3	F x .687
3/8-24	3	.188	<b>160-2037</b>	.335	.875	.473	1.50	RB	3	O x .687
7/16-20	4	.250	<b>160-2043</b>	.389	.875	.552	1.50	RB	3	U x .812
1/2-20	5	.313	<b>160-2050</b>	.452	.938	.552	1.50	RB	3	.44 x .812
9/16-18	6	.375	<b>160-2056</b>	.509	1.000	.614	1.63	RB	3	.48 x .875
3/4-16	8	.500	<b>160-3075</b>	.689	1.219	.693	1.63	RC	3	.67 x .937
7/8-14	10	.625	<b>160-3087</b>	.806	1.375	.786	1.75	RC	4	.78 x 1.062
1-1/16-12	12	.750	<b>160-4106</b>	.981	1.656	.911	1.88	RE	4	.95 x 1.250
1-3/16-12	14	.875	<b>160-5118</b>	1.106	1.813	.911	1.88	RF	4	1.09 x 1.250
1-5/16-12	16	1.000	<b>160-5131</b>	1.231	2.000	.911	1.88	RF	4	1.21 x 1.250
1-5/8-12	20	1.250	<b>160-6162</b>	1.544	2.313	.911	1.88	RJ	4	1.53 x 1.250
1-7/8-12	24	1.500	<b>160-6187</b>	1.794	2.563	.911	1.88	RJ	4	1.78 x 1.250

All dimensions shown in inches.

# Port Contour Cutters – SAE J1926, MS 16142

## Tungsten Carbide Tipped, Straight Shank



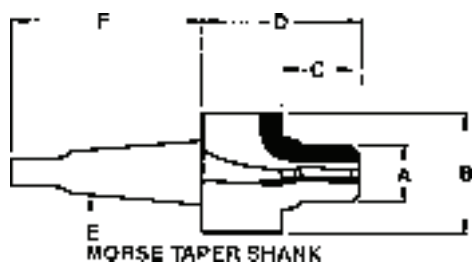
Thread Size	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Diameter	F Shank Length	Pre-Drill Diameter/Length
	No.	O.D.								
5/16-24	2	.125	263-2031	.272	.682	.473	1.625	.500	3.125	F x .688
3/8-24	3	.187	263-2037	.335	.760	.473	1.625	.500	3.125	O x .688
7/16-20	4	.250	263-2043	.389	.838	.552	1.625	.500	3.125	U x .812
1/2-20	5	.312	263-2050	.452	.916	.552	1.625	.500	3.125	.44 x .812
9/16-18	6	.375	263-2056	.509	.994	.614	1.625	.500	3.125	.48 x .875
3/4-16	8	.500	263-3075	.689	1.198	.693	1.875	.750	3.875	.67 x .937
7/8-14	10	.625	263-3087	.806	1.354	.786	1.875	.750	3.875	.78 x 1.062
1-1/16-12	12	.750	263-3106	.981	1.635	.911	2.125	.750	3.875	.95 x 1.250
1-3/16-12	14	.875	263-3118	1.106	1.775	.911	2.125	.750	3.875	1.09 x 1.250
1-5/16-12	16	1.000	263-3131	1.231	1.920	.911	2.125	.750	3.875	1.21 x 1.250
1-5/8-12	20	1.250	263-4162	1.544	2.280	.911	2.125	1.000	4.875	1.53 x 1.250
1-7/8-12	24	1.500	263-4187	1.794	2.570	.911	2.125	1.000	4.875	1.78 x 1.250
2-1/2-12	32	2.000	263-4250	2.419	3.490	.911	2.125	1.000	4.875	2.41 x 1.250

All dimensions shown in inches.

Special carbide grades and coatings available upon request.

Call quotations for price and availability.

## Tungsten Carbide Tipped, Morse Taper Shank



Thread Size	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Morse Taper	F Shank Length	Pre-Drill Diameter/Length
	No.	O.D.								
5/16-24	2	.125	262-2031	.272	.682	.473	1.625	2	3.125	F x .688
3/8-24	3	.187	262-2037	.335	.760	.473	1.625	2	3.125	O x .688
7/16-20	4	.250	262-2043	.389	.838	.552	1.625	2	3.125	U x .812
1/2-20	5	.312	262-2050	.452	.916	.552	1.625	2	3.125	.44 x .812
9/16-18	6	.375	262-2056	.509	.979	.614	1.625	2	3.125	.48 x .875
3/4-16	8	.500	262-3075	.689	1.198	.693	1.875	3	3.875	.67 x .937
7/8-14	10	.625	262-3087	.806	1.354	.786	1.875	3	3.875	.78 x 1.062
1-1/16-12	12	.750	262-3106	.981	1.635	.911	2.125	3	3.875	.95 x 1.250
1-3/16-12	14	.875	262-3118	1.106	1.775	.911	2.125	3	3.875	1.09 x 1.250
1-5/16-12	16	1.000	262-3131	1.231	1.920	.911	2.125	3	3.875	1.21 x 1.250
1-5/8-12	20	1.250	262-4162	1.544	2.280	.911	2.125	4	4.875	1.53 x 1.250
1-7/8-12	24	1.500	262-4187	1.794	2.570	.911	2.125	4	4.875	1.78 x 1.250
2-1/2-12	32	2.000	262-4250	2.419	3.490	.911	2.125	4	4.875	2.41 x 1.250

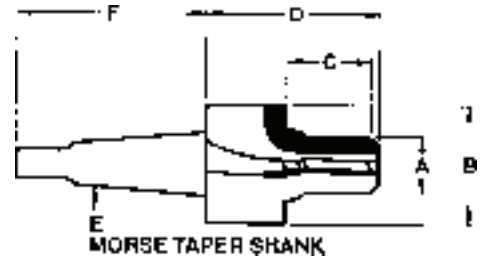
All dimensions shown in inches.

Special carbide grades and coatings available upon request.

Call quotations for price and availability.

# Port Contour Cutters – SAE J1926, MS 16142

## Tungsten Carbide Tipped Taper Shank with Extra Length Reamer

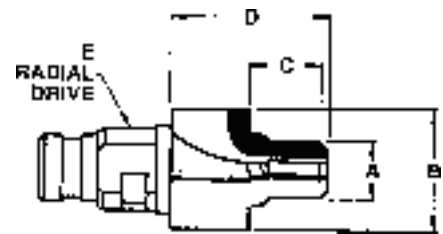


Thread Size	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Morse Taper	F Shank Length	Pre-Drill Diameter/Length
	No.	O.D.								
5/16-24	2	.125	261-2031	.272	.682	.580	1.750	2	3.125	F x .812
3/8-24	3	.187	261-2037	.335	.760	.580	1.750	2	3.125	O x .812
7/16-20	4	.250	261-2043	.389	.838	.690	1.750	2	3.125	U x .937
1/2-20	5	.312	261-2050	.452	.916	.690	1.750	2	3.125	.44 x .937
9/16-18	6	.375	261-2056	.509	.979	.750	1.750	2	3.125	.48 x .968
3/4-16	8	.500	261-3075	.689	1.198	.840	2.000	3	3.875	.67 x 1.090
7/8-14	10	.625	261-3087	.806	1.354	.970	2.000	3	3.875	.78 x 1.220
1-1/16-12	12	.750	261-3106	.981	1.635	1.125	2.250	3	3.875	.95 x 1.470
1-3/16-12	14	.875	261-3118	1.106	1.775	1.125	2.250	3	3.875	1.09 x 1.470
1-5/16-12	16	1.000	261-3131	1.231	1.920	1.125	2.250	3	3.875	1.21 x 1.470
1-5/8-12	20	1.250	261-4162	1.544	2.280	1.125	2.250	4	4.875	1.53 x 1.470

All dimensions shown in inches.  
Special carbide grades and coatings available upon request.

Call quotations for price and availability.

## Tungsten Carbide Tipped, Radial Drive



Use with 320, 321 & 323 Series Holders (Pages 46-47)

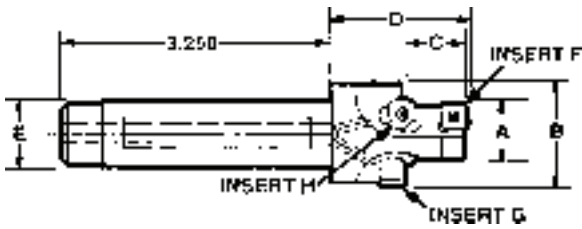
Thread Size	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Radial Drive	Number of Flutes	Pre-Drill Diameter/Length
	No.	O.D.								
5/16-24	2	.125	260-2031	.272	.875	.473	1.50	RB	3	F x .687
3/8-24	3	.188	260-2037	.335	.875	.473	1.50	RB	3	O x .687
7/16-20	4	.250	260-2043	.389	.875	.552	1.50	RB	3	U x .812
1/2-20	5	.313	260-2050	.452	.938	.552	1.50	RB	3	.44 x .812
9/16-18	6	.375	260-2056	.509	1.000	.614	1.63	RB	3	.48 x .875
3/4-16	8	.500	260-3075	.689	1.219	.693	1.63	RC	3	.67 x .937
7/8-14	10	.625	260-3087	.806	1.375	.786	1.75	RC	4	.78 x 1.062
1-1/16-12	12	.750	260-4106	.981	1.656	.911	1.88	RE	4	.95 x 1.250
1-3/16-12	14	.875	260-5118	1.106	1.813	.911	1.88	RF	4	1.09 x 1.250
1-5/16-12	16	1.000	260-5131	1.231	2.000	.911	1.88	RF	4	1.21 x 1.250
1-5/8-12	20	1.250	260-6162	1.544	2.313	.911	1.88	RJ	4	1.53 x 1.250
1-7/8-12	24	1.500	260-6187	1.794	2.563	.911	1.88	RJ	4	1.78 x 1.250
2-1/2-12	32	2.000	260-7250	2.419	3.500	.911	1.88	RS	4	2.41 x 1.250

All dimensions shown in inches.  
Special carbide grades and coatings available upon request.

Call quotations for price and availability.

# Port Contour Cutters – SAE J1926, MS 16142

## Indexable, Straight Shank - Through Coolant



Thread Size	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Diameter	Pre-Drill Diameter/Length
	No.	O.D.							
7/16-20	4	.250	<b>267-3043</b>	.389	.875	.552	1.389	.750	U x .812
1/2-20	5	.312	<b>267-3050</b>	.452	.916	.552	1.389	.750	.44 x .812
9/16-18	6	.375	<b>267-3056</b>	.509	.979	.614	1.819	.750	.48 x .875
3/4-16	8	.500	<b>267-3075</b>	.689	1.198	.693	1.654	.750	.67 x .937
7/8-14	10	.625	<b>267-3087</b>	.806	1.354	.786	1.874	.750	.78 x 1.062
1-1/16-12	12	.750	<b>267-4106</b>	.981	1.635	.911	2.014	1.000	.95 x 1.250
1-3/16-12	14	.875	<b>267-4118</b>	1.106	1.775	.911	2.014	1.000	1.09 x 1.250
1-5/16-12	16	1.000	<b>267-4131</b>	1.231	1.920	.911	2.014	1.000	1.21 x 1.250
1-5/8-12	20	1.250	<b>267-5162</b>	1.544	2.280	.911	2.275	1.250	1.53 x 1.250
1-7/8-12	24	1.500	<b>267-5187</b>	1.794	2.570	.911	2.275	1.250	1.78 x 1.250
2-1/2-12	32	2.000	<b>267-8250</b>	2.419	3.490	.911	2.685	2.000	2.41 x 1.250

All dimensions shown in inches. Inserts included with tool.

## Inserts & Accessories for Indexable, Straight Shank Port Contour Cutters

Tool Number	Insert "F&G"		Torx Screw	Torx Wrench	Insert "H"		Torx Screw	Torx Wrench
	Honed Coated	Unhoned Uncoated			Honed Coated	Unhoned Uncoated		
<b>267-3043</b>	C-250-BD	C-250-CC	056-1017	056-2017 T-7	D-312-GF	D-312-FE	056-1017	056-2017 T-7
<b>267-3050</b>	C-250-BD	C-250-CC	056-1017	056-2017 T-7	D-312-GF	D-312-FE	056-1017	056-2017 T-7
<b>267-3056</b>	C-250-BD	C-250-CC	056-1017	056-2017 T-7	D-312-GF	D-312-FE	056-1017	056-2017 T-7
<b>267-3075</b>	C-312-BD	C-312-CC	056-1020	056-2028 T-8	D-375-GF	D-375-FE	056-1033	056-2033 T-10
<b>267-3087</b>	C-312-BD	C-312-CC	056-1020	056-2028 T-8	D-375-GF	D-375-FE	056-1033	056-2033 T-10
<b>267-4106</b>	C-375-BD	C-375-CC	056-1018	056-2015 T-15	D-500-GF	D-500-FE	056-1018	056-2015 T-15
<b>267-4118</b>	C-375-BD	C-375-CC	056-1018	056-2015 T-15	D-500-GF	D-500-FE	056-1018	056-2015 T-15
<b>267-4131</b>	C-375-BD	C-375-CC	056-1018	056-2015 T-15	D-500-GF	D-500-FE	056-1018	056-2015 T-15
<b>267-5162</b>	C-500-BD	C-500-CC	056-1018	056-2015 T-15	D-500-GF	D-500-FE	056-1018	056-2015 T-15
<b>267-5187</b>	C-500-BD	C-500-CC	056-1018	056-2015 T-15	D-500-GF	D-500-FE	056-1018	056-2015 T-15
<b>267-8250</b>	C-502-BD	C-502-CC	056-1018	056-2015 T-15	D-500-GF	D-500-FE	056-1018	056-2015 T-15

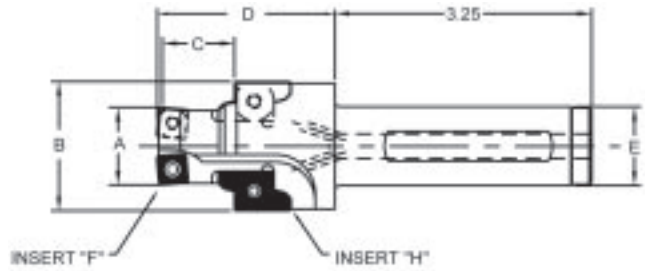
NOTE: Sizes not listed, and special configurations available on request.

NOTE: Insert G is available with 1/64" nose radius (e.g. C-251-BD, C-313-BD, C-376-BD, C-501-BD). Prices on request.

NOTE: Insert H is available with a "HF" chip breaker for long chipping materials such as 300 series stainless steel (e.g., D-375-HF)

# Port Contour Cutters – SAE J1926, MS 16142

## Double Feed Indexable Porting Tools (Two Effective Flutes)



Thread Size	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Diameter	Pre-Drill Diameter/Length
	No.	O.D.							
9/16-18	6	.375	<b>367-3056</b>	.509	.979	.614	2.000	.750	.41 x .875
3/4-16	8	.500	<b>367-3075</b>	.689	1.297	.693	2.250	.750	.53 x .937
7/8-14	10	.625	<b>367-3087</b>	.806	1.348	.786	2.250	.750	.65 x 1.062
1-1/16-12	12	.750	<b>367-4106</b>	.981	1.642	.911	2.500	1.000	.81 x 1.250
1-5/16-12	16	1.000	<b>367-4131</b>	1.231	1.939	.911	2.500	1.000	1.05 x 1.250

Protected under Greenfield Industries US Patent No. 5816753, "Port Cutting Tool with Multiple Function Inserts".

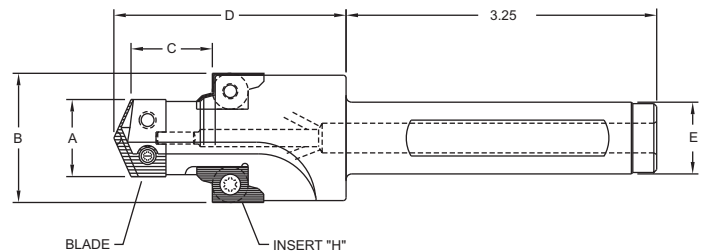
## Inserts & Accessories for Double Feed Indexable Porting Tools

Part Number	Insert "F" Standard	Insert "F" Unhoned	Torx Screw	Torx Wrench	Insert "H" Unhoned Coated	Insert "H" Unhoned Coated	Insert "H" Honed Coated	Torx Screw	Torx Wrench
<b>367-3056</b>	C-187-BD	C-187-CC	056-1115	056-2025 T-5	J-312-FF	J-312-FE	J-312-GF	056-1020	056-2028 T-8
<b>367-3075</b>	C-250-BD	C-250-CC	056-1017	056-2017 T-7	J-375-FF	J-375-FE	J-375-GF	056-1033	056-2033 T-10
<b>367-3087</b>	C-312-BD	C-312-CC	056-1020	056-2028 T-8	J-375-FF	J-375-FE	J-375-GF	056-1033	056-2033 T-10
<b>367-4106</b>	C-375-BD	C-375-CC	056-1018	056-2015 T-15	J-500-FF	J-500-FE	J-500-GF	056-1834	056-2015 T-15
<b>367-4131</b>	C-375-BD	C-375-CC	056-1018	056-2015 T-15	J-501-FF	J-501-FE	J-501-GF	056-1834	056-2015 T-15

Sizes and special configurations not listed call 1-888-434-4370 for price and availability.

Protected under Greenfield Industries US Patent No. 5957633, "Multiple Function Inserts for Port Cutting Tool".

## Double Feed Indexable Porting Tool with Spade Blade Insert



Thread	Tube		Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Diameter
	No.	O.D.						
9/16-18	6	.375	<b>467-3056</b>	.509	.979	.628	2.09	.750
3/4-16	8	.500	<b>467-3075</b>	.689	1.297	.736	2.38	.750
7/8-14	10	.625	<b>467-3087</b>	.806	1.348	.851	2.43	.750
1-1/16-12	12	.750	<b>467-4106</b>	.981	1.642	.954	2.44	1.000
1-5/16-12	16	1.000	<b>467-4131</b>	1.231	1.939	.954	2.75	1.000

Application information can be found on METCUT's Spade Blade Brochure.

## Spade Blades, Inserts & Accessories for Double Feed Indexable Porting

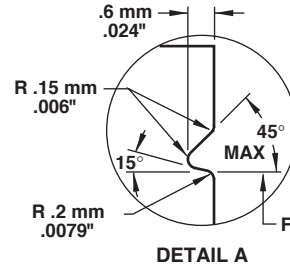
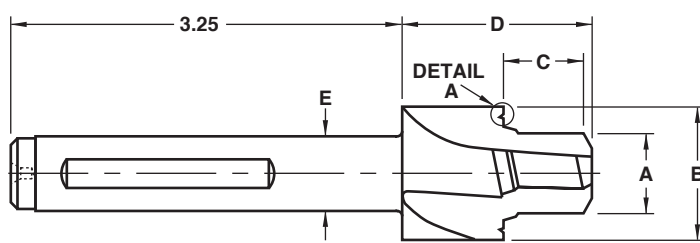
Part Number	Blade		Locating Pin	Torx Screw	Torx Wrench	Seat Insert "H"	Torx Screw	Torx Wrench
	Multi Layer (TiN/TiCN)	TiAlN						
<b>467-3056</b>	7F0-0509G	7F0-0509A	SP-2	056-1014	056-2017 T-7	J312-FF	056-1020	056-2028 T-8
<b>467-3075</b>	7F0-0689G	7F0-0689A	SP-2	056-1014	056-2017 T-7	J375-FF	056-1033	056-2033 T-10
<b>467-3087</b>	7F1-0806G	7F1-0806A	SP-3	056-1020	056-2028 T-8	J375-FF	056-1033	056-2033 T-10
<b>467-4106</b>	7F2-0981G	7F2-0981A	SP-4	056-1018	056-2015 T-15	J500-FF	056-1834	056-2015 T-15
<b>467-4131</b>	7F2-1231G	7F2-1231A	SP-4	056-1018	056-2015 T-15	J501-FF	056-1834	056-2015 T-15

Sizes and special configurations not listed call 1-888-434-4370 for price and availability.

Protected under Greenfield Industries US Patent No. 5957633, "Multiple Function Inserts for Port Cutting Tool".

# Port Contour Cutters in Metric Sizes – ISO 6149-1, SAE J2244/1

## High Speed Steel, Straight Shank, *With Groove*



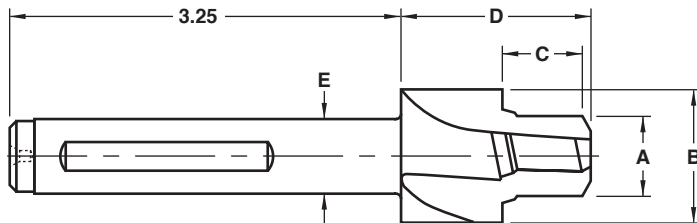
**Metric Sizes**

Thread Size	Part Number	A Small Diameter	B Spotface Diameter*	C Bore Length	D Head Length	E Shank Dia.	F Groove Diameter	Pre-Drill Diameter/Length
M 8 x 1	<b>169-0008</b>	7.035 (.277)	17 (.669)	11.5 (.4528)	44.45 (1.75)	12.7 (.500)	14 (.551)	(D x .589)
M 10 x 1	<b>169-0010</b>	9.042 (.356)	20 (.787)	11.5 (.4528)	44.45 (1.75)	19.05 (.750)	16 (.6299)	(P x .589)
M 12 x 1.5	<b>169-0012</b>	10.541 (.415)	23 (.9055)	14 (.5512)	44.45 (1.75)	19.05 (.750)	19 (.748)	(W x .681)
M 14 x 1.5	<b>169-0014</b>	12.522 (.493)	25 (.9843)	14 (.5512)	44.45 (1.75)	19.05 (.750)	21 (.8268)	(.45 x .681)
M 16 x 1.5	<b>169-0016</b>	14.528 (.572)	28 (1.1024)	15.5 (.6102)	50.8 (2.00)	19.05 (.750)	24 (.9449)	(.54 x .740)
M 18 x 1.5	<b>169-0018</b>	16.535 (.651)	30 (1.1811)	17 (.6693)	50.8 (2.00)	19.05 (.750)	26 (1.0236)	(.62 x .809)
M 22 x 1.5	<b>169-0022</b>	20.523 (.808)	34 (1.3386)	18 (.7087)	50.8 (2.00)	19.05 (.750)	29 (1.1417)	(.78 x .849)
M 27 x 2	<b>169-0027</b>	25.019 (.985)	40 (1.578)	22 (.8661)	57.15 (2.25)	25.4 (1.00)	34 (1.3386)	(.95 x 1.01)
M 33 x 2	<b>169-0033</b>	31.013 (1.221)	49 (1.9291)	22 (.8661)	57.15 (2.25)	25.4 (1.00)	43 (1.6929)	(1.17 x 1.01)
M 42 x 2	<b>169-0042</b>	40.030 (1.576)	60 (2.3622)	22.5 (.8858)	57.15 (2.25)	31.75 (1.25)	52 (2.0472)	(1.54 x 1.03)
M 48 x 2	<b>169-0048</b>	46.025 (1.812)	66 (2.5984)	25 (.9843)	57.15 (2.25)	31.75 (1.25)	57 (2.2441)	(1.78 x 1.13)

Inches are shown in parentheses; all other dimensions are in millimeters.

\* Includes groove.

## High Speed Steel, Straight Shank, without Groove



**Metric Sizes**

Thread Size	Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Dia.	Pre-Drill Diameter/Length
M 8 x 1	<b>169-1008</b>	7.035 (.277)	14 (.5512)	11.5 (.4528)	44.45 (1.75)	12.7 (.500)	(D x .589)
M 10 x 1	<b>169-1010</b>	9.042 (.356)	16 (.6299)	11.5 (.4528)	44.45 (1.75)	19.05 (.750)	(P x .589)
M 12 x 1.5	<b>169-1012</b>	10.541 (.415)	19 (.748)	14 (.5512)	44.45 (1.75)	19.05 (.750)	(W x .681)
M 14 x 1.5	<b>169-1014</b>	12.522 (.493)	21 (.8268)	14 (.5512)	44.45 (1.75)	19.05 (.750)	(.45 x .681)
M 16 x 1.5	<b>169-1016</b>	14.528 (.572)	24 (.9449)	15.5 (.6102)	50.8 (2.00)	19.05 (.750)	(.54 x .740)
M 18 x 1.5	<b>169-1018</b>	16.535 (.651)	26 (1.0236)	17 (.6693)	50.8 (2.00)	19.05 (.750)	(.62 x .809)
M 22 x 1.5	<b>169-1022</b>	20.523 (.808)	29 (1.1417)	18 (.7087)	50.8 (2.00)	19.05 (.750)	(.78 x .849)
M 27 x 2	<b>169-1027</b>	25.019 (.985)	34 (1.3386)	22 (.8661)	57.15 (2.25)	25.4 (1.00)	(.95 x 1.01)
M 33 x 2	<b>169-1033</b>	31.013 (1.221)	43 (1.6929)	22 (.8661)	57.15 (2.25)	25.4 (1.00)	(1.17 x 1.01)
M 42 x 2	<b>169-1042</b>	40.030 (1.576)	52 (2.0472)	22.5 (.8858)	57.15 (2.25)	31.75 (1.25)	(1.54 x 1.03)
M 48 x 2	<b>169-1048</b>	46.025 (1.812)	57 (2.2441)	25 (.9843)	57.15 (2.25)	31.75 (1.25)	(1.78 x 1.13)

Inches are shown in parentheses; all other dimensions are in millimeters.

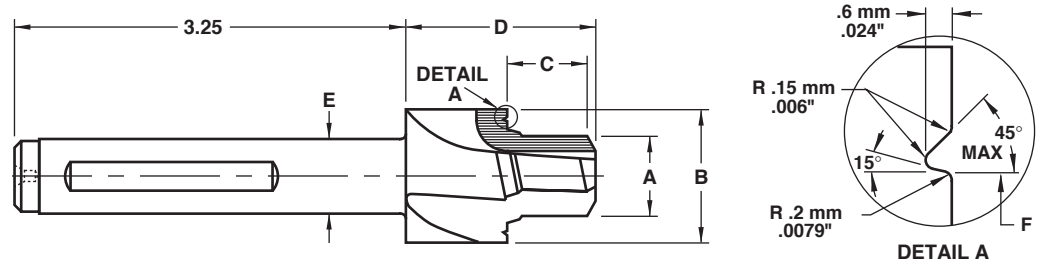
**Metric Indexable models are available price on application (POA)**  
**ISO-6149 & SAE J2444 (1980-1993) Specifications available as (POA)**



# Port Contour Cutters in Metric Sizes – ISO 6149-1, SAE J2244/1

## Tungsten Carbide Tipped, Straight Shank, *With Groove*

**Metric Sizes**



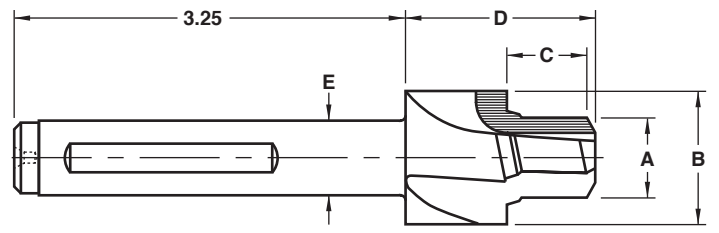
Thread Size	Part Number	A Small Diameter	B Spotface Diameter*	C Bore Length	D Head Length	E Shank Dia.	F Groove Diameter	Pre-Drill Diameter/Length
M 8 x 1	<b>269-0008</b>	7.035 (.277)	17 (.669)	11.5 (.4528)	44.45 (1.75)	12.7 (.500)	14 (.5512)	(D x .589)
M 10 x 1	<b>269-0010</b>	9.042 (.356)	20 (.787)	11.5 (.4528)	44.45 (1.75)	19.05 (.750)	16 (.6299)	(P x .589)
M 12 x 1.5	<b>269-0012</b>	10.541 (.415)	23 (.9055)	14 (.5512)	44.45 (1.75)	19.05 (.750)	19 (.7480)	(W x .681)
M 14 x 1.5	<b>269-0014</b>	12.522 (.493)	25 (.9843)	14 (.5512)	44.45 (1.75)	19.05 (.750)	21 (.8268)	(.45 x .681)
M 16 x 1.5	<b>269-0016</b>	14.528 (.572)	28 (1.1024)	15.5 (.6102)	50.8 (2.00)	19.05 (.750)	24 (.9449)	(.54 x .740)
M 18 x 1.5	<b>269-0018</b>	16.535 (.651)	30 (1.1811)	17 (.6693)	50.8 (2.00)	19.05 (.750)	26 (1.0236)	(.62 x .809)
M 22 x 1.5	<b>269-0022</b>	20.523 (.808)	34 (1.3386)	18 (.7087)	50.8 (2.00)	19.05 (.750)	29 (1.1417)	(.78 x .849)
M 27 x 2	<b>269-0027</b>	25.019 (.985)	40 (1.578)	22 (.8661)	57.15 (2.25)	25.4 (1.00)	34 (1.3386)	(.95 x 1.01)
M 33 x 2	<b>269-0033</b>	31.013 (1.221)	49 (1.9291)	22 (.8661)	57.15 (2.25)	25.4 (1.00)	43 (1.6929)	(1.17 x 1.01)
M 42 x 2	<b>269-0042</b>	40.030 (1.576)	60 (2.3622)	22.5 (.8858)	57.15 (2.25)	31.75 (1.25)	52 (2.0472)	(1.54 x 1.03)
M 48 x 2	<b>269-0048</b>	46.025 (1.812)	66 (2.5984)	25 (.9843)	57.15 (2.25)	31.75 (1.25)	57 (2.2441)	(1.78 x 1.13)
M 60 x 2	<b>269-0060</b>	58.013 (2.284)	79 (2.9921)	27.5 (1.0827)	57.15 (2.25)	38.1 (1.50)	67 (2.6378)	(2.25 x 1.22)

Inches are shown in parentheses; all other dimensions are in millimeters.

\* Includes groove.

## Tungsten Carbide Tipped, Straight Shank, *Without Groove*

**Metric Sizes**



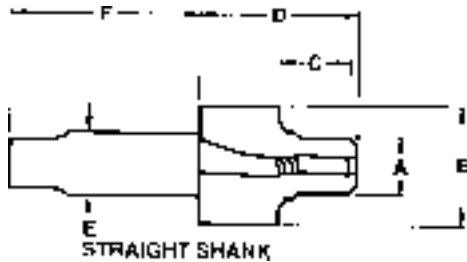
Thread Size	Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Dia.	Pre-Drill Diameter/Length
M 8 x 1	<b>269-1008</b>	7.035 (.277)	14 (.5512)	11.5 (.4528)	44.45 (1.75)	12.7 (.500)	(D x .589)
M 10 x 1	<b>269-1010</b>	9.042 (.356)	16 (.6299)	11.5 (.4528)	44.45 (1.75)	19.05 (.750)	(P x .589)
M 12 x 1.5	<b>269-1012</b>	10.541 (.415)	19 (.748)	14 (.5512)	44.45 (1.75)	19.05 (.750)	(W x .681)
M 14 x 1.5	<b>269-1014</b>	12.522 (.493)	21 (.8268)	14 (.5512)	44.45 (1.75)	19.05 (.750)	(.45 x .681)
M 16 x 1.5	<b>269-1016</b>	14.528 (.572)	24 (.9449)	15.5 (.6102)	50.8 (2.00)	19.05 (.750)	(.54 x .740)
M 18 x 1.5	<b>269-1018</b>	16.535 (.651)	26 (1.0236)	17 (.6693)	50.8 (2.00)	19.05 (.750)	(.62 x .809)
M 22 x 1.5	<b>269-1022</b>	20.523 (.808)	29 (1.1417)	18 (.7087)	50.8 (2.00)	19.05 (.750)	(.78 x .849)
M 27 x 2	<b>269-1027</b>	25.019 (.985)	34 (1.3386)	22 (.8661)	57.15 (2.25)	25.4 (1.00)	(.95 x 1.01)
M 33 x 2	<b>269-1033</b>	31.013 (1.221)	43 (1.6929)	22 (.8661)	57.15 (2.25)	25.4 (1.00)	(1.17 x 1.01)
M 42 x 2	<b>269-1042</b>	40.030 (1.576)	52 (2.0472)	22.5 (.8858)	57.15 (2.25)	31.75 (1.25)	(1.54 x 1.03)
M 48 x 2	<b>269-1048</b>	46.025 (1.812)	57 (2.2441)	25 (.9843)	57.15 (2.25)	31.75 (1.25)	(1.78 x 1.13)
M 60 x 2	<b>269-1060</b>	58.013 (2.284)	67 (2.6378)	27.5 (1.0827)	57.15 (2.25)	38.1 (1.50)	(2.25 x 1.22)

Inches shown in parentheses; all other dimensions are in millimeters.

**Metric Indexable models are available price on application (POA)  
ISO-6149 & SAE J2244 (1980-1993) Specifications available as (POA)**

# Port Contour Cutters – MS 33649, NASA MC 240

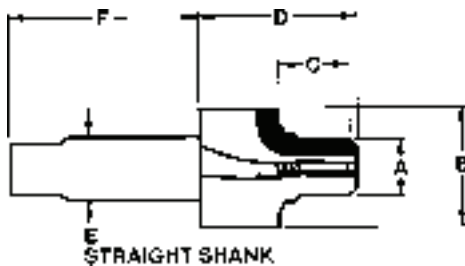
## High Speed Steel, Straight Shank



Thread Size	Tube		Part Number	A** Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Diameter	F Shank Length	Pre-Drill Diameter/ Length
	No.	O.D.								
5/16 - 24	2	.125	164-0031	.276	.682	.582	1.750	.500	2.00	F x .812
3/8 - 24	3	.187	164-0037	.338	.760	.588	1.750	.500	2.00	O x .812
7/16 - 20	4	.250	164-0043	.393	.838	.661	1.750	.500	2.00	U x .937
1/2 - 20	5	.312	164-0050	.455	.916	.661	1.750	.500	2.00	.44 x .937
9/16 - 18	6	.375	164-0056	.513	.979	.714	1.750	.500	2.00	.48 x .968
5/8 - 18	7	.438	164-0062	.575	1.105	.745	1.750	.500	2.00	.55 x 1.030
3/4 - 16	8	.500	164-0075	.693	1.198	.839	2.000	.750	2.00	.67 x 1.090
7/8 - 14	10	.625	164-0087	.810	1.354	.935	2.000	.750	2.00	.78 x 1.220
1 - 12	11	.688	164-0100	.924	1.500	1.080	2.000	.750	2.00	.90 x 1.410
1 1/16 - 12	12	.750	164-0106	.986	1.635	1.069	2.250	.750	2.00	.95 x 1.410
1 3/16 - 12	14	.875	164-0118	1.111	1.790	1.080	2.250	.750	2.00	1.09 x 1.410
1 5/16 - 12	16	1.000	164-0131	1.236	1.920	1.069	2.250	.750	2.00	1.22 x 1.410
1 5/8 - 12	20	1.250	164-0162	1.549	2.280	1.121	2.250	1.000	2.25	1.53 x 1.470
1 7/8 - 12	24	1.500	164-0187	1.799	2.570	1.132	2.250	1.000	2.25	1.78 x 1.470

All dimensions shown in inches.  
\*\*MIL-S-8879C UNJF Class 3B

## Tungsten Carbide Tipped, Straight Shank

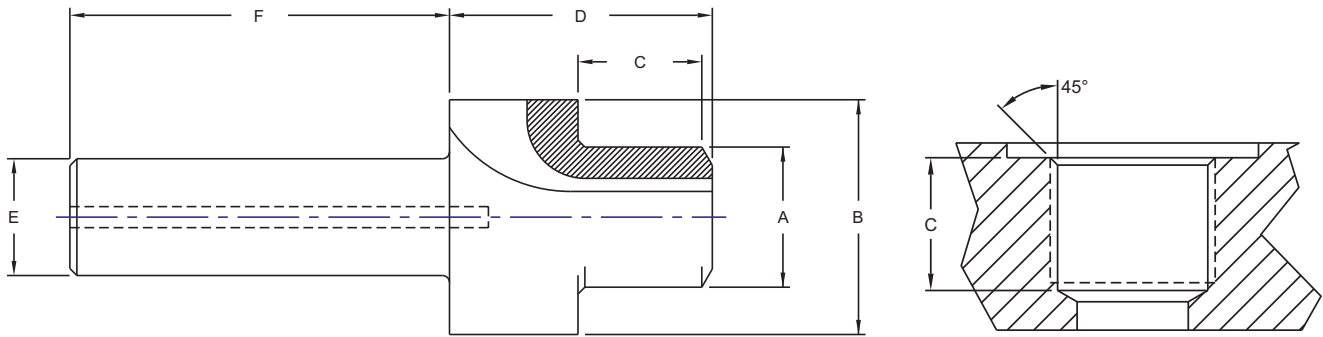


Thread Size	Tube		Part Number	A** Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Diameter	F Shank Length	Pre-Drill Diameter/ Length
	No.	O.D.								
5/16 - 24	2	.125	264-0031	.276	.682	.582	1.750	.500	2.00	F x .812
3/8 - 24	3	.187	264-0037	.338	.760	.588	1.750	.500	2.00	O x .812
7/16 - 20	4	.250	264-0043	.393	.838	.661	1.750	.500	2.00	U x .937
1/2 - 20	5	.312	264-0050	.455	.916	.661	1.750	.500	2.00	.44 x .937
9/16 - 18	6	.375	264-0056	.513	.979	.714	1.750	.500	2.00	.48 x .968
5/8 - 18	7	.438	264-0062	.575	1.105	.745	1.750	.500	2.00	.55 x 1.030
3/4 - 16	8	.500	264-0075	.693	1.198	.839	2.000	.750	2.00	.67 x 1.090
7/8 - 14	10	.625	264-0087	.810	1.354	.935	2.000	.750	2.00	.78 x 1.220
1 - 12	11	.688	264-0100	.924	1.500	1.080	2.000	.750	2.00	.90 x 1.410
1 1/16 - 12	12	.750	264-0106	.985	1.635	1.069	2.250	.750	2.00	.95 x 1.410
1 3/16 - 12	14	.875	264-0118	1.111	1.790	1.080	2.250	.750	2.00	1.09 x 1.410
1 5/16 - 12	16	1.000	264-0131	1.236	1.920	1.069	2.250	.750	2.00	1.22 x 1.410
1 5/8 - 12	20	1.250	264-0162	1.549	2.280	1.121	2.250	1.000	2.25	1.53 x 1.470
1 7/8 - 12	24	1.500	264-0187	1.799	2.570	1.132	2.250	1.000	2.25	1.78 x 1.470

All dimensions shown in inches.  
\*\*MIL-S-8879C UNJF Class 3B

# BSPP/BSPF (Rp) BSI BS21

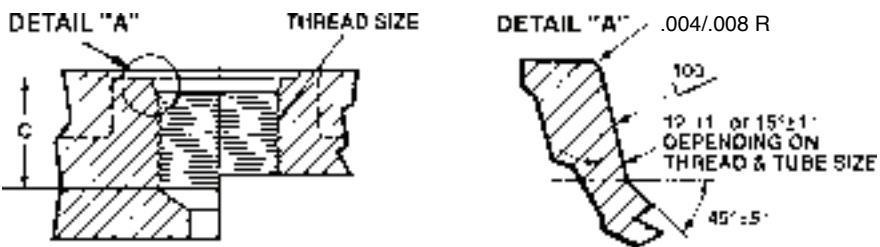
## Tungsten Carbide Tipped, Straight Shank



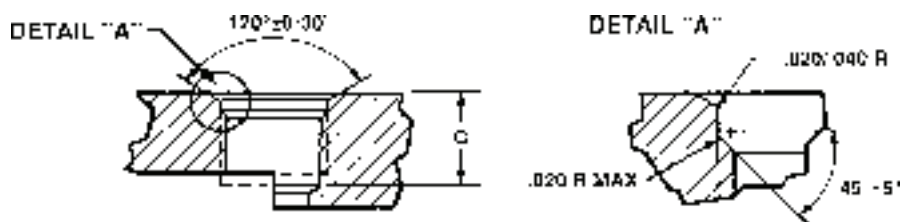
Thread Size	Part Number	A Small Diameter	B Spotface Diameter	C Bore Length	D Head Length	E Shank Diameter	F Shank Length
1/8-28	265-2012	.346	.694	.625	1.750	.500	2.500
1/4-19	265-2025	.465	.891	.830	1.750	.500	2.500
3/8-19	265-2037	.600	1.009	.880	2.000	.500	2.500
1/2-14	265-3050	.748	1.186	1.066	2.250	.750	2.500
3/4-14	265-3075	.964	1.452	1.066	2.250	.750	3.000
1-11	265-3100	1.210	1.820	1.255	2.750	.750	3.000
1-1/4-11	265-4125	1.554	2.249	1.375	3.000	1.000	3.000
1-1/2-11	265-4150	1.771	2.505	1.375	3.000	1.000	3.000
2-11	265-4200	2.249	3.000	1.567	3.250	1.000	3.000
2-1/2-11	265-4250	2.874	3.500	1.849	3.500	1.000	3.250

## Port Details

### SAE J1926, MS 16142 & ISO 6149 (Metric) Port Detail



### MS 33649, NASA MC 240 Port Detail



# Port Contour Cutters Application Information

## Surface Feet Per Minute and Feet Per Revolution

HSS Cutters			TCT Cutters		
Material	SFM*	IPR**	Material	SFM*	IPR**
Aluminum	200	.009-.012	Aluminum	400	.009-.012
Cast Iron	60	.009-.012	Cast Iron	150	.009-.012
Mild Steel	50	.006-.009	Mild Steel	140	.006-.009

\* Based on Small Diameter.    \*\* Based on 3-fluted tool.  
All feed and speeds based on uncoated tools.

### Recommended Speeds and Feeds For 267 and 268 Series Indexable Port Contour Cutters

The following speed and feed table should be used only as a starting point. Ultimate speeds and feeds depend upon the machine, the set-up, and material conditions

Note: All indexable tooling should be run on rigid spindle machines.

Part Number	Size	Mild Steel		300 Series Stainless Steel		Cast Iron		Aluminum	
		RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR
267-3043 268-3043	7/16 – 20	2900-3100	.003-.005	2600-2700	.003-.004	2900-3100	.003-.005	4900-5100	.003-.005
267-3050 268-3050	1/2 – 20	2900-3100	.003-.005	2600-2700	.003-.004	2900-3100	.003-.005	4900-5100	.003-.005
267-3056 268-3056	9/16 – 18	2900-3100	.003-.005	2600-2700	.003-.004	2900-3100	.003-.005	4900-5100	.003-.005
267-3075 268-3075	3/4 – 16	2100-2300	.003-.005	1900-2000	.003-.004	1900-2100	.004-.006	4900-5100	.003-.005
267-3087 268-3087	7/8 – 14	1700-1900	.003-.005	1500-1600	.003-.004	1500-1700	.004-.006	4400-4600	.003-.005
267-4106 268-4106	1-1/16 – 12	1500-1700	.004-.006	1350-1450	.004-.005	1300-1500	.005-.007	3700-3900	.004-.006
267-4118 268-4118	1-3/16 – 12	1300-1500	.004-.006	1150-1250	.004-.005	1100-1300	.005-.007	3300-3500	.004-.006
267-4131 268-4131	1-5/16 – 12	1100-1300	.004-.006	1000-1100	.004-.005	900-1100	.005-.007	2900-3100	.004-.006
267-5162 268-5162	1-5/8 – 12	900-1100	.005-.007	800-900	.005-.006	700-900	.006-.008	2400-2600	.005-.007
267-5187 268-5187	1-7/8 – 12	700-900	.005-.007	600-700	.005-.006	500-700	.007-.009	1900-2100	.005-.007
267-8250 268-8225	2-1/2 – 12	500-700	.005-.007	450-550	.005-.006	400-600	.007-.009	1500-1700	.005-.007

### For 367 Series Double Feed Indexable Porting Tools

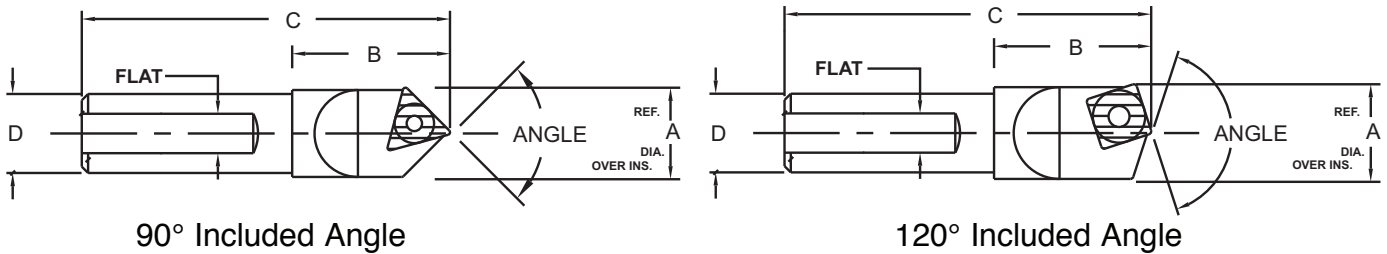
Part Number	Size	Mild Steel		Cast Iron		Aluminum	
		RPM	IPR	RPM	IPR	RPM	IPR
367-3056	9/16 – 18	2900-3100	.006-.010	2900-3100	.006-.010	4900-5100	.006-.010
367-3075	3/4 – 16	2100-2300	.006-.010	1900-2100	.008-.012	4900-5100	.006-.010
367-3087	7/8 – 14	1700-1900	.006-.010	1500-1700	.008-.012	4400-4600	.006-.010
367-4106	1 1/16 – 12	1500-1700	.008-.012	1300-1500	.010-.014	3700-3900	.008-.012
367-4118	1 3/16 – 12	1300-1500	.008-.012	1100-1300	.010-.014	3300-3500	.008-.012

### For 467 Series Porting Tools

**Please refer to the above 367 series chart for specifying the feed only.  
Please refer to the application chart in the Spade Blade Brochure for the speed only.**

# Spot and Chamfer Drills

## Indexable



Part Number	Included Angle	A Maximum Diameter	B Extension Length	C Overall Length	D Shank Diameter	Effective Inserts	Insert Number		Torx Screw Part No.	Torx Wrench Part No.
284-0900	90°	.625	1.50	3.50	.750	1	T-375-HM	T-375-HL	056-1020	056-2028 T-8
284-1200	120°	.812	1.50	3.50	.750	1	S-500-BM	S-500-BL	056-1834	056-2015 T-15

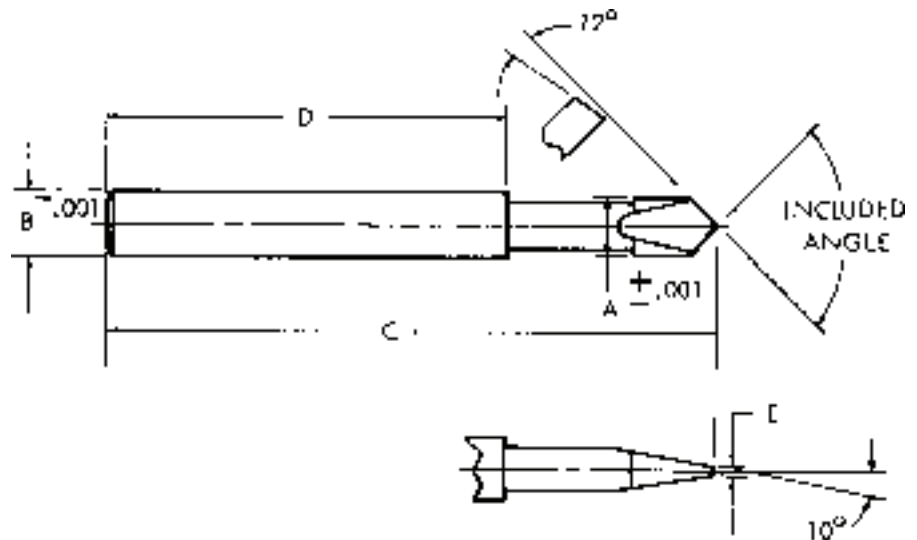
### Carbide Grade Descriptions:

**M** A CVD tri-phase coated tough carbide grade for steels, stainless steel and high temp alloys (HM, BM inserts).

**L** A PVD coated micrograin carbide for cast iron, nonferrous metals, nonmetals, austenitic stainless steels and titanium (HL, BL inserts).

NOTE: Inserts available in a 'H' grade - a PVD coated micrograin carbide for abrasive nonferrous alloys (HH, BH inserts). Prices on request.

## High Speed Steel



Part Numbers		Dimensions				
90° Included Angle	118° Included Angle	A	B	C	D	E
184-3037	184-2037	.375	.500	7.800	6.500	.031
184-3050	184-2050	.500	.500	7.800	—	.031
184-3075	184-2075	.750	.750	7.800	—	.063
184-3100	184-2100	1.000	1.000	7.800	—	.063

All dimensions shown in inches.

# Technical Reference

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## Decimal & Metric Equivalents

Fraction		Inches	mm
	1/64	.0156	0.397
	1/32	.0313	0.794
	3/64	.0469	1.191
1/16		.0625	1.588
	5/64	.0781	1.984
	3/32	.0938	2.381
	7/64	.1094	2.778
1/8		.1250	3.175
	9/64	.1406	3.572
	5/32	.1563	3.979
	11/64	.1719	4.366
3/16		.1875	4.763
	13/64	.2031	5.159
	7/32	.2188	5.556
	15/64	.2344	5.953
1/4		.2500	6.350
	17/64	.2656	6.747
	9/32	.2813	7.144
	19/64	.2969	7.541
5/16		.3125	7.938
	21/64	.3281	8.334
	11/32	.3438	8.731
	23/64	.3594	9.128
3/8		.3750	9.525
	25/64	.3906	9.922
	13/32	.4063	10.319
	27/64	.4219	10.716
7/16		.4375	11.113
	29/64	.4531	11.509
	15/32	.4688	11.906
	31/64	.4844	12.303
1/2		.5000	12.700

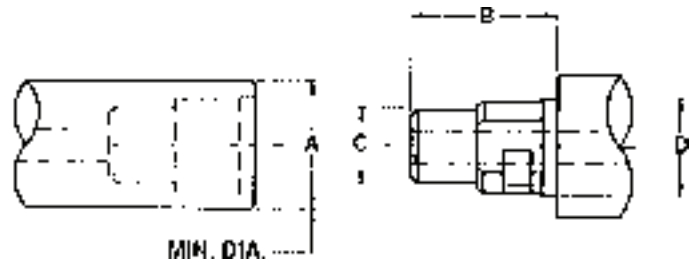
Fraction		Inches	mm
	33/64	.5156	13.097
	17/32	.5313	13.494
	35/64	.5469	13.891
9/16		.5625	14.288
	37/64	.5781	14.684
	19/32	.5938	15.081
	39/64	.6094	15.478
5/8		.6250	15.875
	41/64	.6406	16.272
	21/32	.6563	16.669
	43/64	.6719	17.066
11/16		.6875	17.463
	45/64	.7031	17.859
	23/32	.7188	18.256
	47/64	.7344	18.653
3/4		.7500	19.050
	49/64	.7656	19.447
	25/32	.7813	19.844
	51/64	.7969	20.241
13/16		.8125	20.638
	53/64	.8281	21.034
	27/32	.8438	21.431
	55/64	.8594	21.838
7/8		.8750	22.225
	57/64	.8906	22.622
	29/32	.9063	23.019
	59/64	.9219	23.416
15/16		.9375	23.813
	61/64	.9531	23.852
	31/32	.9688	24.606
	63/64	.9844	25.003
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# Technical Reference

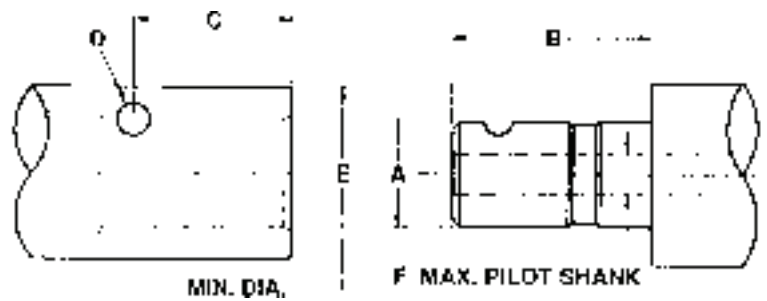
## Shank Details

### Radial Drive

Drive No.	A	B	C	D
RA	.7500	.938	.3750	.5000
RB	.8750	1.375	.4375	.6250
RC	1.0625	1.375	.5625	.7500
RE	1.3750	1.500	.7500	1.0000
RF	1.5000	1.563	.8125	1.1250
RJ	2.0000	1.563	1.0000	1.3750
RS	2.7500	1.625	1.3750	1.7500



### Pin Drive

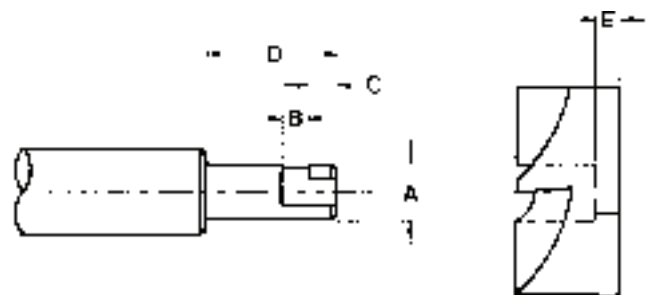


Pin Drive	A	B	C	D	E	F
0	.3750	.938	.7500	.1250	.7500	.1250
0A	.4375	1.500	1.2500	.1250	.8750	.1875
1	.5625	1.500	1.2500	.1875	1.0625	.2500
1C	.6250	1.625	1.2500	.2188	1.1250	.2500
1A	.6875	1.625	1.2500	.2500	1.2500	.3125
1B	.7500	1.625	1.2500	.2500	1.3750	.3125
2	.8750	1.625	1.2500	.2500	1.5000	.3125
2A	1.0000	1.625	1.2500	.3125	1.7500	.3125
3	1.2500	1.688	1.2500	.3125	2.0000	.5000
4	1.7500	1.750	1.2500	.3750	3.0000	.3750

Note: Can be used as a straight shank counterbore.

### Inverted Drive

Drive No.	A	B	C	D	E
.3125	.3125	.197	.250	1.063	.177
.3750	.3750	.197	.250	1.063	.177
.5000	.5000	.197	.250	1.063	.177
.7500	.7500	.260	.313	1.125	.240
1.0000	1.0000	.260	.375	1.438	.240

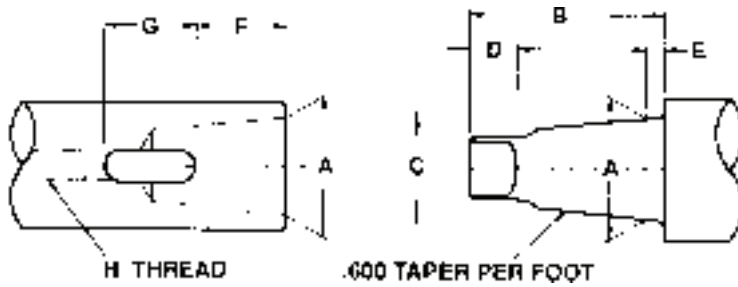




# Technical Reference

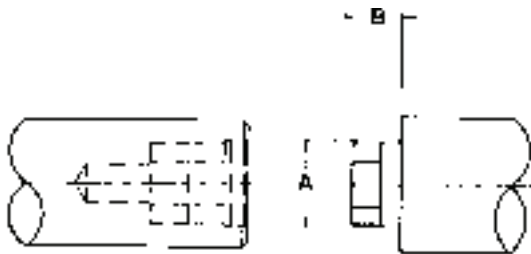
## Shank Details

### Square Drive



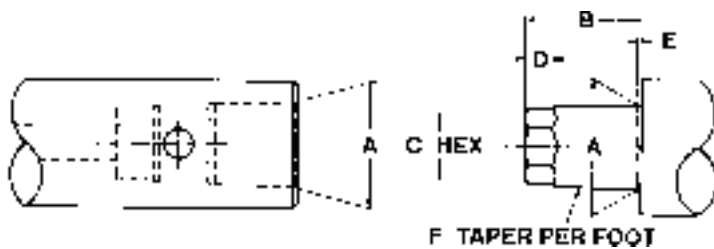
Square Drive	A	B	C	D	E	F	G	H
53	.7500	1.625	.469	.406	.0625	1.375	.688	#10-24
61	.9375	1.625	.672	.500	.0625	1.375	.750	1/4-20
71	1.1250	1.688	.781	.531	.0625	1.375	.875	1/4-20
87	1.3125	1.875	.906	.563	.0625	1.563	.875	5/16-18
92	1.5000	2.000	1.031	.625	.0625	1.625	.875	5/16-18
112	2.0000	2.750	1.344	.750	.0938	2.313	1.000	5/16-18

### HEX Drive Type A



HEX Drive	A	B	HEX Size
A-1	.3750	.410	.306
A-2	.5625	.470	.495
A-3	.8750	.530	.718
A-4	1.2500	.720	1.110

### HEX Drive Type C

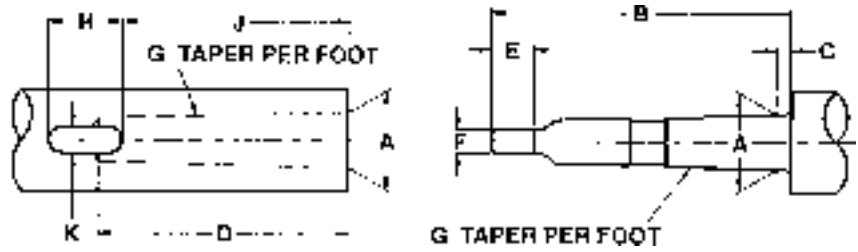


HEX Drive	A	B	C	D	E	F
C-11	.4375	.781	.306	.280	.060	.600
C-12	.5938	.906	.495	.280	.060	.600
C-13	.9063	1.313	.745	.340	.060	.623
C-14	1.2500	1.719	.988	.410	.060	.623
C-15	1.8125	2.469	1.488	.560	.090	.630

# Technical Reference

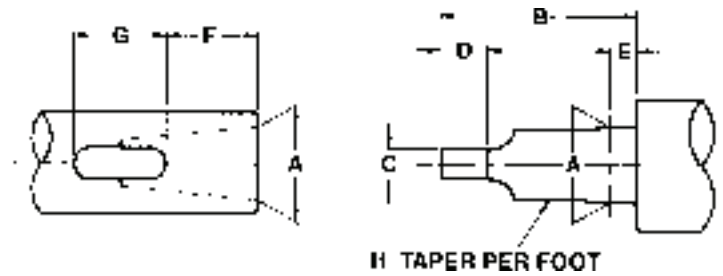
## Shank Details

### Morse Taper



Morse Taper No.	A	B	C	D	E	F	G	H	J	K
0	.356	2.344	.125	2.031	.250	.156	.624	.563	1.938	.160
1	.475	2.563	.125	2.188	.375	.203	.599	.750	2.063	.213
2	.700	3.125	.188	2.625	.438	.250	.599	.875	2.500	.260
3	.938	3.875	.188	3.250	.563	.313	.602	1.188	3.063	.322
4	1.231	4.875	.250	4.125	.625	.469	.623	1.250	3.875	.478
5	1.748	6.125	.250	5.250	.750	.625	.632	1.500	4.938	.635
6	2.494	8.563	.313	7.375	1.125	.750	.626	1.750	7.000	.760

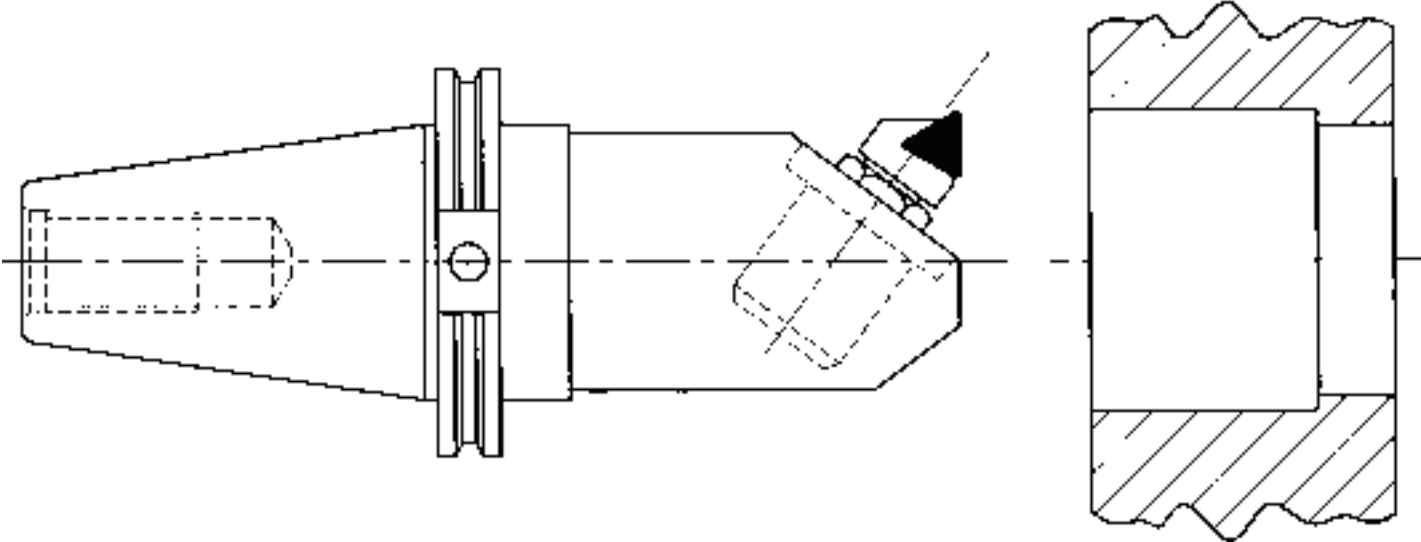
### Stub Taper



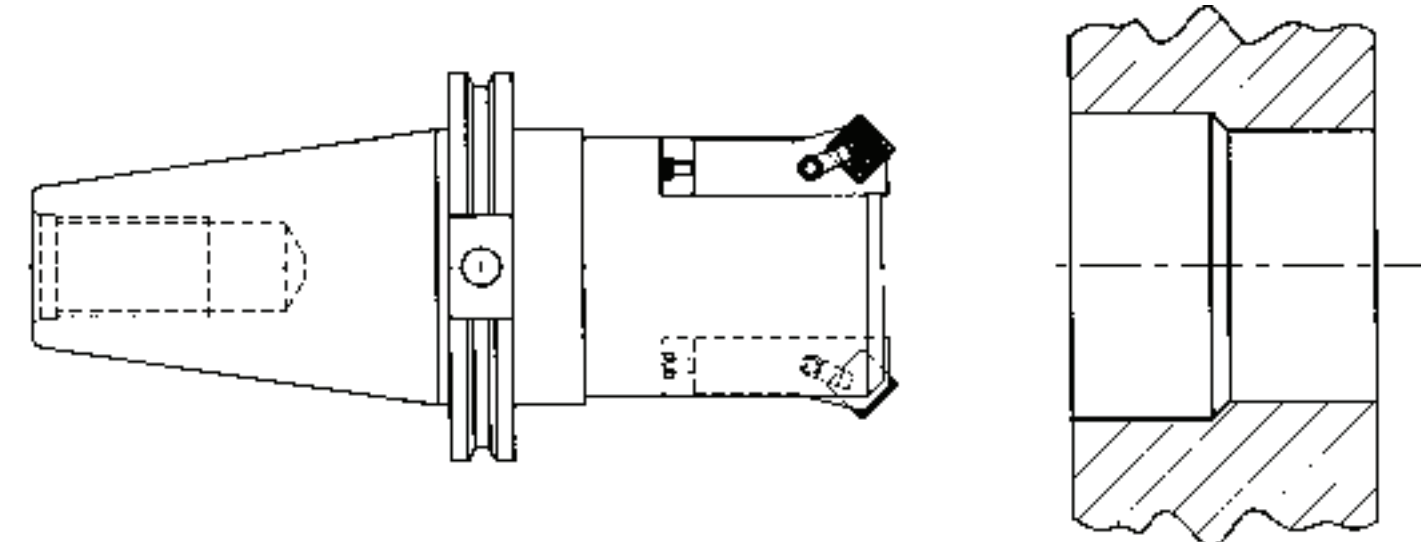
Stub Taper No.	A	B	C	D	E	F	G	H
0	.375	1.156	.156	.250	.188	.656	.594	.600
1	.475	1.313	.201	.313	.188	.781	.719	.600
2	.700	1.625	.294	.438	.188	.938	.938	.602
3	.938	1.938	.388	.563	.188	1.063	1.125	.602
4	1.231	2.250	.513	.688	.188	1.188	1.375	.623
4, 5	1.500	2.688	.641	.813	.313	1.313	1.563	.623
5	1.748	3.000	.750	.938	.313	1.438	1.750	.630

**Examples of Special Boring Tools**

**V Flange Shank Boring Bar with Precision Boring Unit**

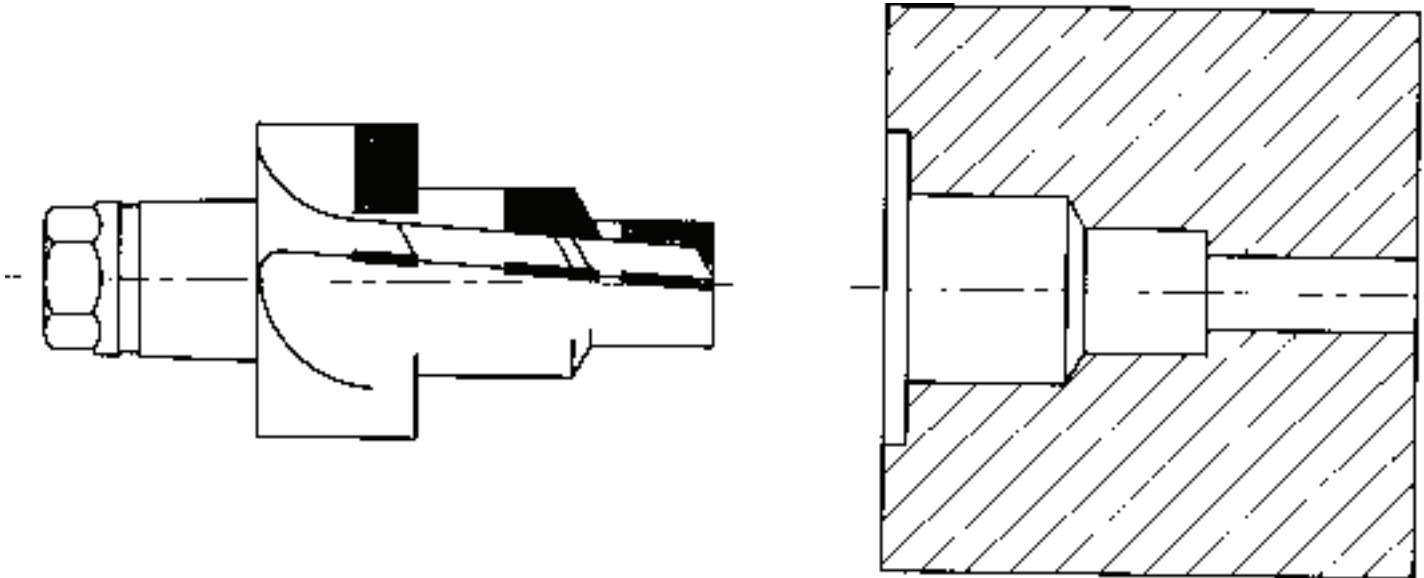


**V Flange Shank Cartridge Bar with Adjustable Boring Cartridges**



**Examples of Special Boring Tools**

**Carbide-Tipped, Stepped Multi-Diameter Boring Tool**

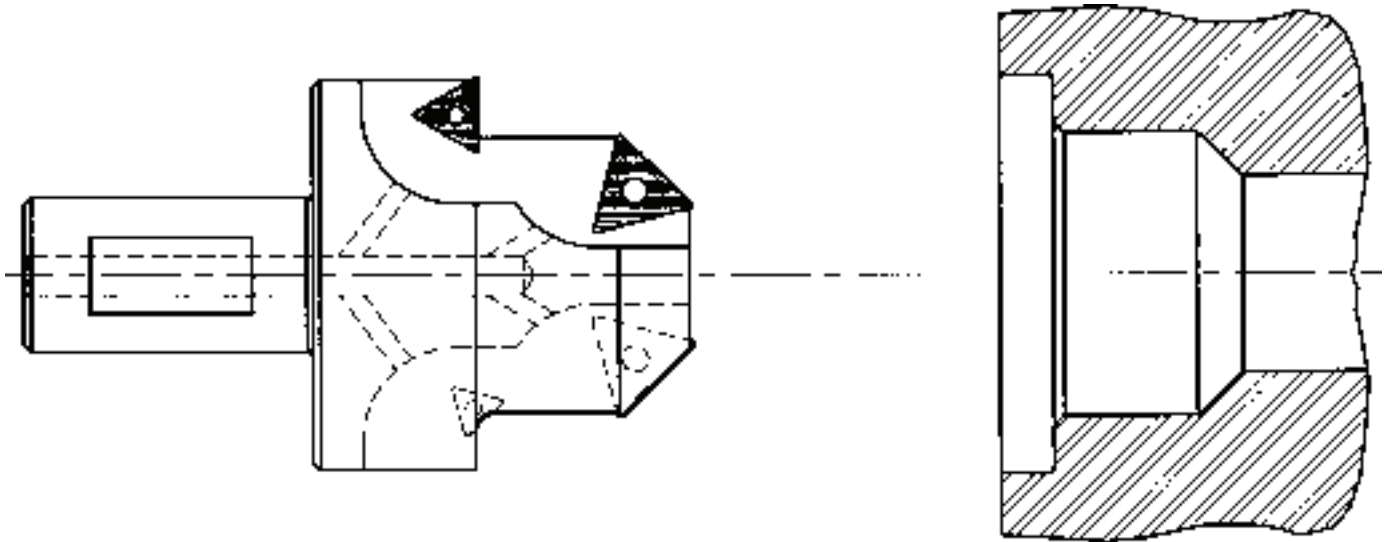


**Solid Carbide Head Multi-Diameter Boring Tool**

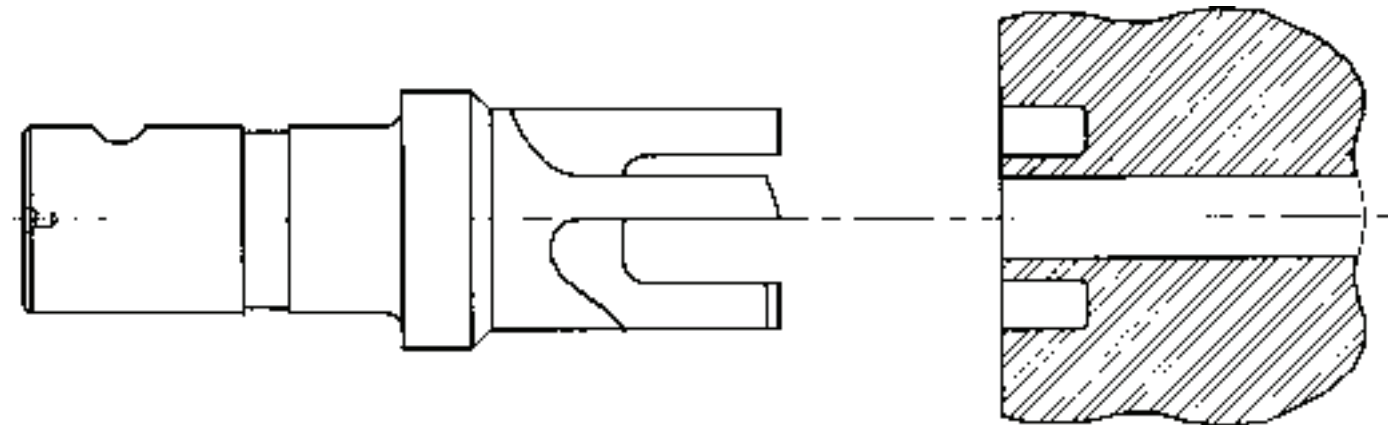


**Examples of Special Boring, Spotface, Trepanning & Ball Nose Tools**

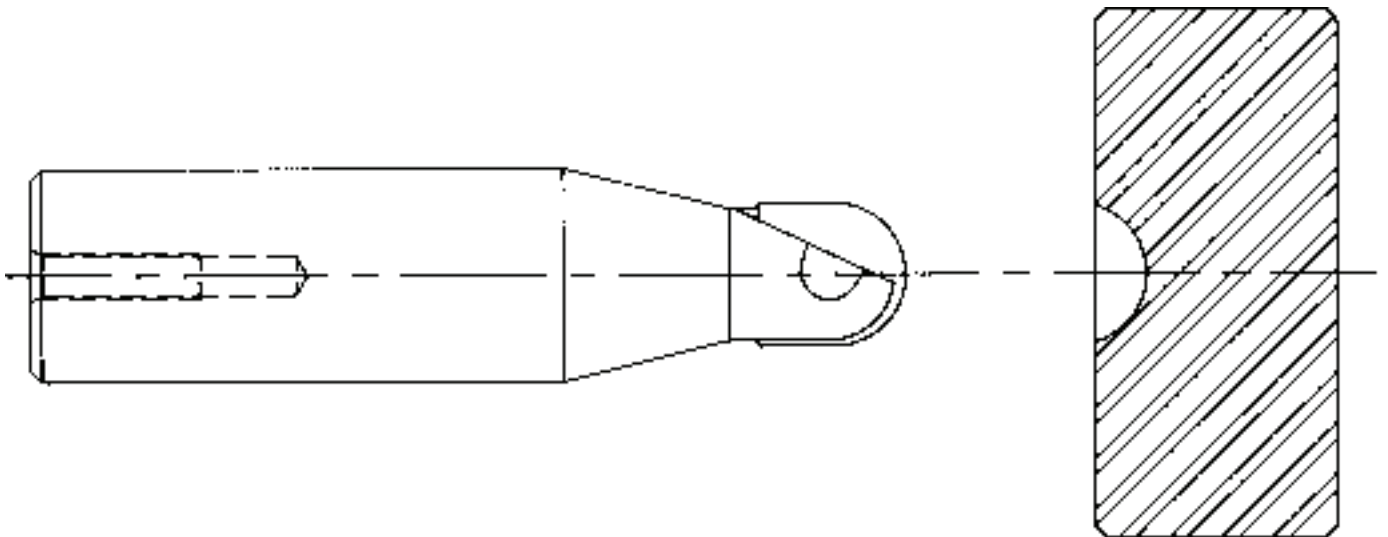
**Body Mount Insert Tool: Bore, Chamfer and Spotface**



**HSS Trepanning Tool**

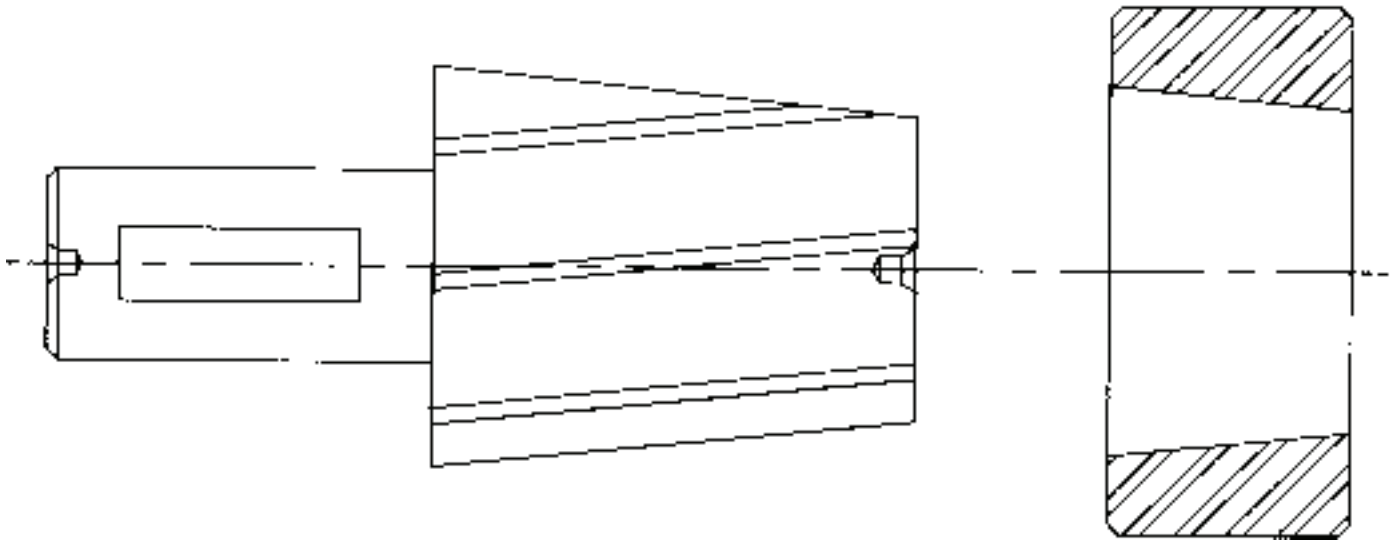


**Ball Nose**

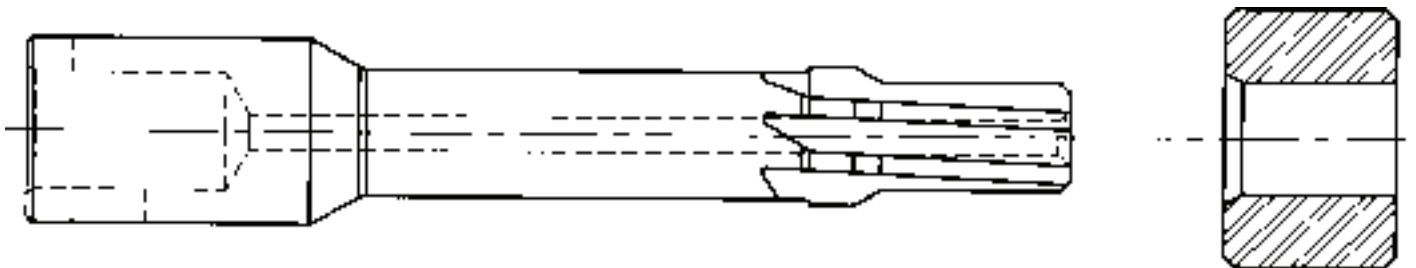


**Examples of Special Reaming Tools**

**Shank Type Taper Reamer**



**HSS Reamer and Chamfer Tool**



**HSS Coolant-Feed Step Reamer**



# ***Metalcutting Safety***

## **IMPORTANT SAFETY INSTRUCTIONS**

**Read before using the tools in this catalog!**

### **Projectile and Fragmentation Hazards**

Modern metalcutting operations involve high spindle and cutter speeds and high temperatures and cutting forces. Hot metal chips may fly off the workpiece during metalcutting. Although cutting tools are designed and manufactured to withstand high cutting forces and temperatures, they can sometimes fragment, particularly if they are subjected to over-stress, severe impact, or other abuse.

#### **To avoid injury:**

- Always wear appropriate personal protective equipment, including safety goggles, when operating metalcutting machines or working nearby.
- Always make sure all machine guards are in place.

### **Breathing and Skin Contact Hazards:**

Grinding carbide or other advanced cutting tool materials produce dust or mist containing metallic particles. Breathing this dust or mist — especially over an extended period — can cause temporary or permanent lung disease or make existing medical conditions worse. Contact with this dust or mist can irritate eyes, skin, and mucous membranes and may make existing skin conditions worse.

#### **To avoid injury:**

- Always wear breathing protection and safety goggles when grinding.
- Provide ventilation control and collect and properly dispose of dust, mist, or sludge from grinding.
- Avoid skin contact with dust or mist.

For more information, read the applicable Material Safety Data Sheet provided by Kennametal and consult General Industry Safety and Health Regulations, Part 1910, Title 29 of the Code of Federal Regulations.

These safety instructions are general guidelines. Many variables affect machining operations. It is impossible to cover every specific situation. The technical information included in this catalog and recommendations on machining practices may not apply to your particular operation. For more information, consult Kennametal's Metalcutting Safety booklet, available free from Kennametal at 724.539.5747 or fax 724.539.5439. For specific product safety and environmental questions, contact our Corporate Environmental Health and Safety Office at 724.539.5066 or fax 724.539.5372.

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