

METAL CUTTING TOOLS



FORM RELIEF TOOL CO., INC.
WWW.FORMRELIEF.COM



FORM RELIEF TOOL CO., INC.

COMPANY INFORMATION

Form Relief Tool Co., Inc. was established in 1986 and is a one family owned business with over 35 years of experience with Cam Relieved Port Contour Cutters and Form Tools. We have a knowledgeable and dedicated employee team with low turnover. Manufacturing Quality Metal Cutting Tools to consistently tight tool tolerances.

Quality:

All cutting tools are manufactured to print specifications and customer requirements. The tools are inspected against those specifications. Quality Control sheets documenting the specifications, tolerances and the actual dimensions of the tool are filled out in the final inspection and a copy is sent out with each tool.

Ordering Information:

The only requirement to order a standard tool is the catalog tool number and a brief description of the tool. Simply call 1-800-450-2773 or online at www.formrelief.com

Terms of Payment: All first time orders are C.O.D., VISA or MASTER CARD. A 30 day net account can be set up with a credit application and three credit references.

Shipping:

Our normal procedure is to ship all customer orders by UPS unless otherwise specified. All orders are shipped insured accept freight collect orders.

Resharpener Tool

Proper resharpener will maximize the life and value of the tool.

Implementing a resharpener schedule will increase the tools productivity and reduce costly down time.

Form relieved or cam-ground tools can be resharpener

- Index face grind the face of the tool to remove any wear lands and maintain proper and consistent lip height.
- Cam relieve grind form back to the original factory specifications to remove any wear lands and maintain proper clearance angles.
- Return to Form Relief Tool Company for resharpener and reconditioning.

Coolant Fed Tools

Form Relief Tool Co., Inc. stocks standard coolant fed Port Contour cutters coolant fed solid carbide Port Contour drills, coolant fed Cartridge Valve cutters and coolant fed step drills.

Stock Status

Form Relief Tool Co., Inc. stocks a full line of porting tools, with and without coolant.

SAE 16142 -J1926, J514. M7-HSS; Carbide Tipped and Solid Carbide

MS33649 M7-HSS and Carbide Tipped

ISO 6149-1, J2244 Metric. M7-HSS and Carbide Tipped with and without I.D. Groove.

JDS-G173 Metric Port Cutters

BSPP M7-HSS and Carbide Tipped

Pipe Tap Reamers M7-HSS and Carbide Tipped

Cartridge Valve Cutters

Roughing Step Drills, M7-HSS and Solid Carbide

Finish Form Tools, M7-HSS and Carbide Tipped

Hydraforce

Integrated Hydraulics

Wandfluh

Danfoss (Compact Controls)

Sterling Hydraulics

Vickers

Deltrol Fluid Power

Command Controls

Sun Hydraulics

Delta

Parker Hannifin

Hydac

FORM RELIEF TOOL CO., INC.

2 SAE MS16142 J514; J1926 PORT CONTOUR CUTTER HSS SS
3 SAE MS16142 J514; J1926 PORT CONTOUR CUTTER TCT SS
4 SAE MS16142 J514; J1926 PORT CONTOUR CUTTER HSS TS
5 SAE MS16142 J514; J1926 PORT CONTOUR CUTTER TCT TS
6 SAE MS16142 J514; J1926 PORT CONTOUR CUTTER-EXTRA LONG REAMER HSS TS
7 SAE MS16142 J514; J1926 PORT CONTOUR CUTTER-EXTRA LONG REAMER TCT TS
8 SAE SHORT PORT MS16142 J514; J1926 PORT CONTOUR CUTTER HSS SS
9 SAE SHORT PORT MS16142 J514; J1926 PORT CONTOUR CUTTER TCT SS

10 SAE ROLL THREAD MS16142 J514; J1926 PORT CONTOUR CUTTER TCT SS

11 SAE MS16142 J514; J1926 PORT CONTOUR DRILL SOLID CARBIDE, COOLANT THRU SS
12 TREPAN CUTTER "O" RING GROOVE TOOL TCT SS
13 ISO-6149 JDS/G173 METRIC PORT CONTOUR CUTTER LONG REAMER TCT TS
14 ISO-6149 SAE J2244 METRIC PORT CONTOUR CUTTER HSS SS
15 ISO-6149 SAE J2244 METRIC PORT CONTOUR CUTTER TCT SS
16 ISO-6149 SAE J2244 METRIC PORT CONTOUR CUTTER TCT W/ID GROOVE SS

18 MS33649/SAEAS5202 PORT CONTOUR CUTTER HSS SS
19 MS33649/SAEAS5202 PORT CONTOUR CUTTER TCT SS
20 AND 10050 PORT CONTOUR CUTTER HSS SS
21 AND 10050 PORT CONTOUR CUTTER TCT SS

22 TAPER PIPE REAMER NPFT (DRYSEAL) OR NPT HSS SS
23 TAPER PIPE REAMER NPFT (DRYSEAL) OR NPT TCT SS
24 TAPER PIPE REAMER NPFT (DRYSEAL) OR NPT HSS MORSE TAPER SHANK
25 TAPER PIPE REAMER NPFT (DRYSEAL) OR NPT TCT MORESE TAPER SHANK

26 BRITISH STANDARD PARALLEL PIPE BSPP HSS SS
27 BRITISH STANDARD PARALLEL PIPE BSPP TCT SS
28 BRITISH STANDARD PARALLEL PIPE "G" STYLE BSPP, SERIES TYPE O, TYPE E, HSS SS
29 BRITISH STANDARD PARALLEL PIPE "G" STYLE BSPP, SERIES TYPE O, TYPE E, TCT SS

30 CARTRIDGE VALVE CUTTER SERIES #8 CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS ROUGHING DRILLS
31 CARTRIDGE VALVE CUTTER SERIES #8, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS OR TCT
32 CARTRIDGE VALVE CUTTER SERIES #10 CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS ROUGHING DRILLS
33 CARTRIDGE VALVE CUTTER SERIES #10, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS OR TCT
34 CARTRIDGE VALVE CUTTER SERIES #12 CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS ROUGHING DRILLS
35 CARTRIDGE VALVE CUTTER SERIES #12, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS OR TCT
36 CARTRIDGE VALVE CUTTER SERIES #16 CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS ROUGHING DRILLS
37 CARTRIDGE VALVE CUTTER SERIES #16, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS OR TCT
38 CARTRIDGE VALVE CUTTER SERIES #20 CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS ROUGHING DRILLS
39 CARTRIDGE VALVE CUTTER SERIES #20, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES HSS OR TCT

40 OTHER SHANK STYLES

41 WARRANTY

HSS=HIGH SPEED STEEL SS=STRAIGHT SHANK TCT=CARBIDE TIPPED TS=Taper Shank

MISSION STATEMENT

To continue to provide the cutting tool user industry with the highest level of quality and dedication to customer service that others will want to model themselves after. We will continue to meet the customer demands that are demanded daily and be their Number One supplier in the metal cutting tool industry.



SAE PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

HIGH SPEED STEEL STRAIGHT SHANK

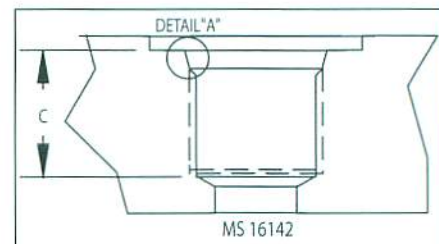
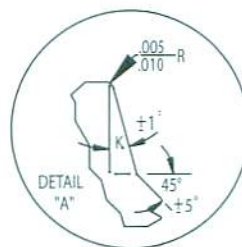
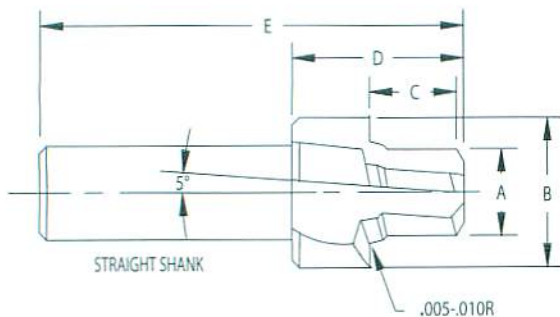
MS16142 / J514 / J1926



Reamer pilot series porting tools profile the MS16142/J514F/J1926 contour. The reamer pilot also sizes the minor diameter per class 2B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTiN
MICRO BLUE COATING



COOLANT THRU AVAILABLE

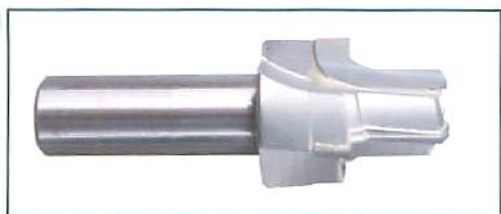
TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	K ANGLE	SHANK DIMENSIONS	
										SHANK DIA.	SHANK LENGTH
SAE-02H	2	1/8	5/16-24	.272	.682	.473	1-1/8	3-1/8	12	.500	2
SAE-03H	3	3/16	3/8-24	.335	.760	.473	1-1/4	3-1/4	12	.500	2
SAE-04H	4	1/4	7/16-20	.389	.838	.552	1-1/4	3-1/4	12	.500	2
SAE-05H	5	5/16	1/2-20	.452	.916	.552	1-1/4	3-1/4	12	.500	2
SAE-06H	6	3/8	9/16-18	.509	.979	.614	1-1/4	3-1/4	12	.500	2
SAE-08H	8	1/2	3/4-16	.689	1.198	.693	1-3/8	3-3/8	15	.750	2
SAE-10H	10	5/8	7/8-14	.806	1.354	.786	1-5/8	3-5/8	15	.750	2
SAE-12H	12	3/4	1-1/16-12	.981	1.635	.911	1-7/8	4-1/8	15	.750	2-1/4
SAE-14H	14	7/8	1-3/16-12	1.106	1.775	.911	1-7/8	4-1/8	15	.750	2-1/4
SAE-16H	16	1"	1-5/16-12	1.231	1.920	.911	1-7/8	4-1/8	15	.750	2-1/4
SAE-20H	20	1-1/4	1-5/8-12	1.544	2.280	.911	2	4-1/4	15	1.000	2-1/4
SAE-24H	24	1-1/2	1-7/8-12	1.794	2.570	.911	2	4-1/4	15	1.000	2-1/4
SAE-32H	32	2	2-1/2-12	2.419	3.490	.911	2-1/4	4-1/2	15	1.000	2-1/4



SAE PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

**CARBIDE TIPPED
STRAIGHT SHANK**

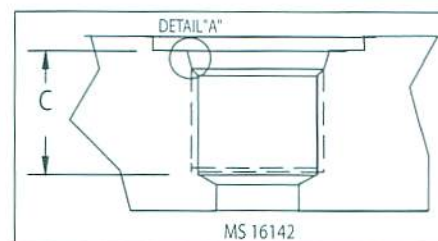
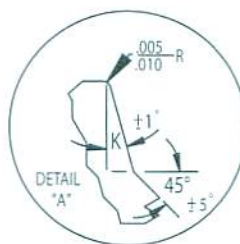
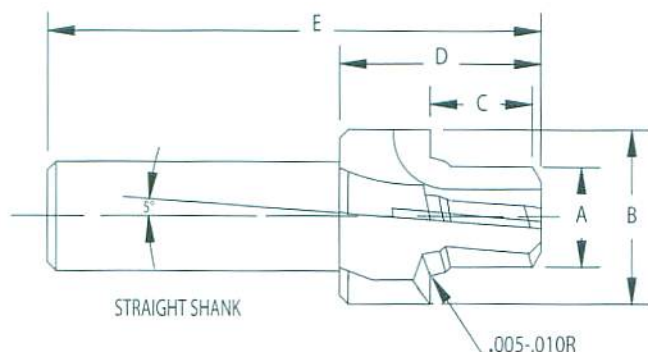
MS16142 / J514 / J1926



Reamer pilot series porting tools profile the MS16142/J514F/J1926 contour. The reamer pilot also sizes the minor diameter per class 2B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

**TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING**



COOLANT THRU AVAILABLE

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	K ANGLE	SHANK DIMENSIONS	
										SHANK DIA.	SHANK LENGTH
SAE-02T	2	1/8	5/16-24	.272	.682	.473	1-1/8	3-1/8	12	.500	2
SAE-03T	3	3/16	3/8-24	.335	.760	.473	1-1/4	3-1/4	12	.500	2
SAE-04T	4	1/4	7/16-20	.389	.838	.552	1-1/4	3-1/4	12	.500	2
SAE-05T	5	5/16	1/2-20	.452	.916	.552	1-1/4	3-1/4	12	.500	2
SAE-06T	6	3/8	9/16-18	.509	.979	.614	1-1/4	3-1/4	12	.500	2
SAE-08T	8	1/2	3/4-16	.689	1.198	.693	1-3/8	3-3/8	15	.750	2
SAE-10T	10	5/8	7/8-14	.806	1.354	.786	1-5/8	3-5/8	15	.750	2
SAE-12T	12	3/4	1-1/16-12	.981	1.635	.911	1-7/8	4-1/8	15	.750	2-1/4
SAE-14T	14	7/8	1-3/16-12	1.106	1.775	.911	1-7/8	4-1/8	15	.750	2-1/4
SAE-16T	16	1"	1-5/16-12	1.231	1.920	.911	1-7/8	4-1/8	15	.750	2-1/4
SAE-20T	20	1-1/4	1-5/8-12	1.544	2.280	.911	2	4-1/4	15	1.000	2-1/4
SAE-24T	24	1-1/2	1-7/8-12	1.794	2.570	.911	2	4-1/4	15	1.000	2-1/4
SAE-32T	32	2	2-1/2-12	2.419	3.490	.911	2-1/4	4-1/2	15	1.000	2-1/4



SAE PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

HIGH SPEED STEEL
TAPER SHANK

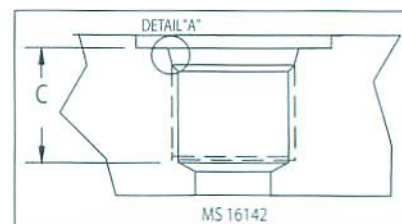
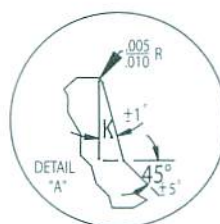
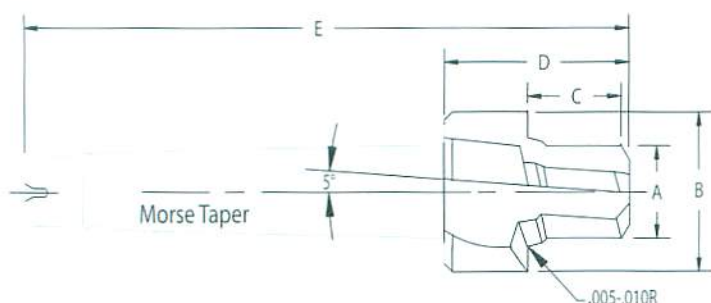
MS16142 / J514 / J1926



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COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



COOLANT THRU AVAILABLE

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	K ANGLE	SHANK DIMENSIONS	
										MORSE TAPER NO.	SHANK LENGTH
TSAE-02H	2	1/8	5/16-24	.272	.682	.473	1-5/8	4-3/4	12	2MT	3-1/8
TSAE-03H	3	3/16	3/8-24	.335	.760	.473	1-5/8	4-3/4	12	2MT	3-1/8
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TSAE-08H	8	1/2	3/4-16	.689	1.198	.693	1-3/4	5-5/8	15	3MT	3-7/8
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TSAE-16H	16	1"	1-5/16-12	1.231	1.920	.911	2	5-7/8	15	3MT	3-7/8
TSAE-20H	20	1-1/4	1-5/8-12	1.544	2.280	.911	2-1/4	7-1/8	15	4MT	4-7/8
TSAE-24H	24	1-1/2	1-7/8-12	1.794	2.570	.911	2-1/4	7-1/8	15	4MT	4-7/8
TSAE-32H	32	2	2-1/2-12	2.419	3.490	.911	2-1/4	7-1/8	15	4MT	4-7/8



SAE PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

**CARBIDE TIPPED
TAPER SHANK**

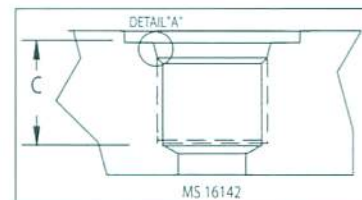
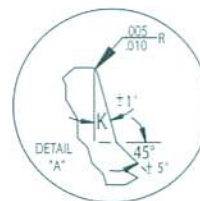
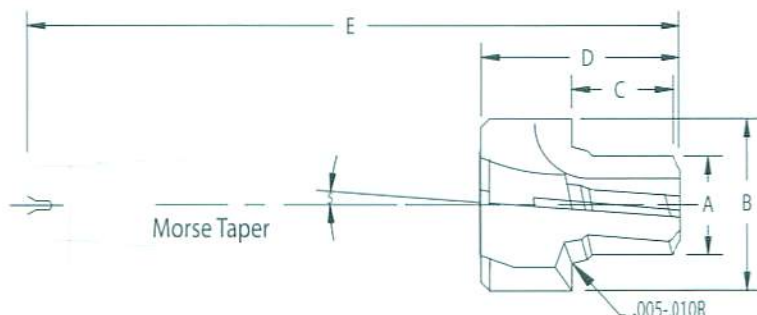
MS16142/J514/J1926



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COATINGS AVAILABLE

**TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING**



COOLANT THRU AVAILABLE

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	K ANGLE	SHANK DIMENSIONS	
										MORSE TAPER NO.	SHANK LENGTH
TSAE-02T	2	1/8	5/16-24	.272	.682	.473	1-5/8	4-3/4	12	2MT	3-1/8
TSAE-03T	3	3/16	3/8-24	.335	.760	.473	1-5/8	4-3/4	12	2MT	3-1/8
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TSAE-14T	14	7/8	1-3/16-12	1.106	1.775	.911	2	5-7/8	15	3MT	3-7/8
TSAE-16T	16	1"	1-5/16-12	1.231	1.920	.911	2	5-7/8	15	3MT	3-7/8
TSAE-20T	20	1-1/4	1-5/8-12	1.544	2.280	.911	2-1/4	7-1/8	15	4MT	4-7/8
TSAE-24T	24	1-1/2	1-7/8-12	1.794	2.570	.911	2-1/4	7-1/8	15	4MT	4-7/8
TSAE-32T	32	2	2-1/2-12	2.419	3.490	.911	2-1/4	7-1/8	15	4MT	4-7/8



SAE PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

HIGH SPEED STEEL
EXTRA LONG REAMER
TAPER SHANK

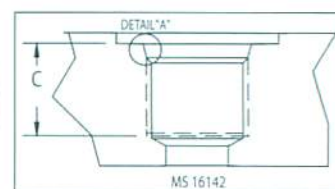
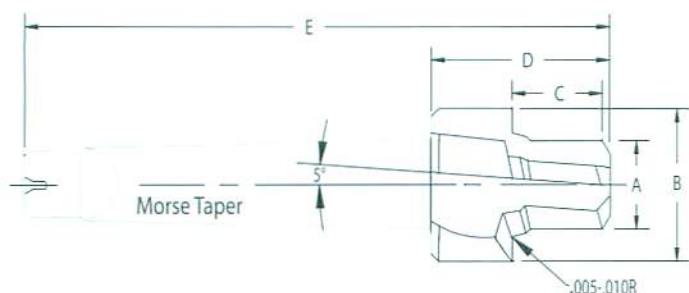
MS16142 / J514 / J1926



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COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TiCN
TITANIUM ALUMINUM NITRIDE-TiAlN
AL TITANIUM NITRIDE-ALTiN
MICRO BLUE COATING



COOLANT THRU AVAILABLE

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	K ANGLE	SHANK DIMENSIONS	
										MORSE TAPER NO.	SHANK LENGTH
TSAE-02HL	2	1/8	5/16-24	.272	.682	.580	1-3/4	4-7/8	12	2MT	3-1/8
TSAE-03HL	3	3/16	3/8-24	.335	.760	.580	1-3/4	4-7/8	12	2MT	3-1/8
TSAE-04HL	4	1/4	7/16-20	.389	.838	.690	1-3/4	4-7/8	12	2MT	3-1/8
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TSAE-12HL	12	3/4	1-1/16-12	.981	1.635	1.125	2-1/4	6-1/8	15	3MT	3-7/8
TSAE-14HL	14	7/8	1-3/16-12	1.106	1.775	1.125	2-1/4	6-1/8	15	3MT	3-7/8
TSAE-16HL	16	1"	1-5/16-12	1.231	1.920	1.125	2-1/4	6-1/8	15	3MT	3-7/8
TSAE-20HL	20	1-1/4	1-5/8-12	1.544	2.280	1.125	2-1/2	7-3/8	15	4MT	4-7/8
TSAE-24HL	24	1-1/2	1-7/8-12	1.794	2.570	1.125	2-1/2	7-3/8	15	4MT	4-7/8
TSAE-32HL	32	2	2-1/2-12	2.419	3.490	1.125	2-1/2	7-3/8	15	4MT	4-7/8



SAE PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

**CARBIDE TIPPED
EXTRA LONG REAMER
TAPER SHANK**

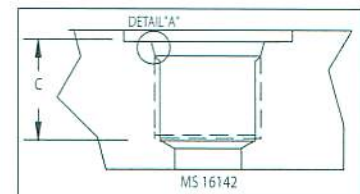
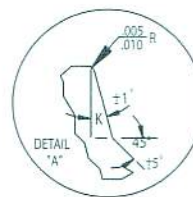
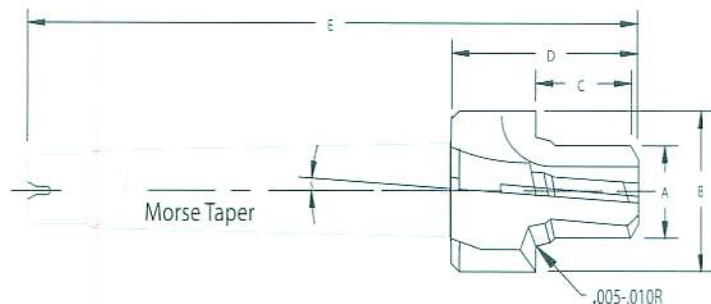
MS16142/J514/J1926



Reamer pilot series porting tools profile the MS16142/J514F/J1926 contour. The reamer pilot also sizes the minor diameter per class 2B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

**TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING**



COOLANT THRU AVAILABLE

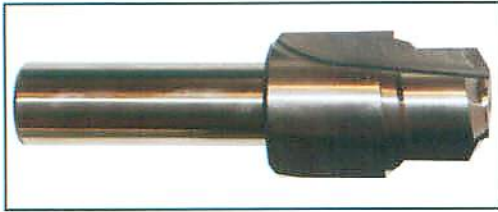
TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	K ANGLE	SHANK DIMENSIONS	
										MORSE TAPER NO.	SHANK LENGTH
TSAE-02TL	2	1/8	5/16-24	.272	.682	.580	1-3/4	4-7/8	12	2MT	3-1/8
TSAE-03TL	3	3/16	3/8-24	.335	.760	.580	1-3/4	4-7/8	12	2MT	3-1/8
TSAE-04TL	4	1/4	7/16-20	.389	.838	.690	1-3/4	4-7/8	12	2MT	3-1/8
TSAE-05TL	5	5/16	1/2-20	.452	.916	.690	1-3/4	4-7/8	12	2MT	3-1/8
TSAE-06TL	6	3/8	9/16-18	.509	.979	.750	1-3/4	4-7/8	12	2MT	3-1/8
TSAE-08TL	8	1/2	3/4-16	.689	1.198	.840	2-0	5-7/8	15	3MT	3-7/8
TSAE-10TL	10	5/8	7/8-14	.806	1.354	.970	2-0	5-7/8	15	3MT	3-7/8
TSAE-12TL	12	3/4	1-1/16-12	.981	1.635	1.125	2-1/4	6-1/8	15	3MT	3-7/8
TSAE-14TL	14	7/8	1-3/16-12	1.106	1.775	1.125	2-1/4	6-1/8	15	3MT	3-7/8
TSAE-16TL	16	1"	1-5/16-12	1.231	1.920	1.125	2-1/4	6-1/8	15	3MT	3-7/8
TSAE-20TL	20	1-1/4	1-5/8-12	1.544	2.280	1.125	2-1/2	7-3/8	15	4MT	4-7/8
TSAE-24TL	24	1-1/2	1-7/8-12	1.794	2.570	1.125	2-1/2	7-3/8	15	4MT	4-7/8
TSAE-32TL	32	2	2-1/2-12	2.419	3.490	1.125	2-1/2	7-3/8	15	4MT	4-7/8



SAE SHORT PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

**HIGH SPEED STEEL
STRAIGHT SHANK**

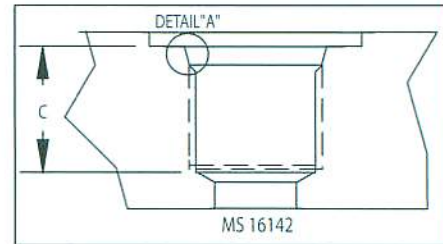
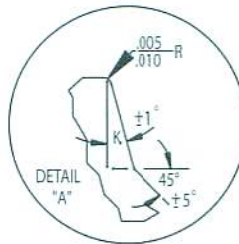
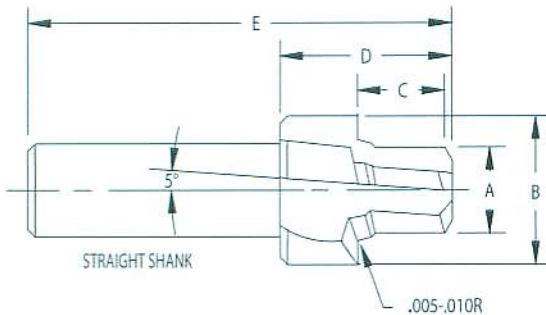
MS16142 / J514 / J1926



Reamer pilot series porting tools profile the MS16142/J514F/J1926 contour with a reduced spotface diameter. The reamer pilot also sizes the minor diameter per class 2B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

**TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING**



COOLANT THRU AVAILABLE • All diameters and dimensions can be altered to meet your requirements

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS	
									SHANK DIA.	SHANK LENGTH
SP-02H	2	1/8	5/16-24	.272	.469	.473	1-1/8	3-1/8	.500	2
SP-03H	3	3/16	3/8-24	.335	.531	.473	1-1/4	3-1/4	.500	2
SP-04H	4	1/4	7/16-24	.389	.594	.552	1-1/4	3-1/4	.500	2
SP-05H	5	5/16	1/2-24	.452	.656	.552	1-1/4	3-1/4	.500	2
SP-06H	6	3/8	9/16-18	.509	.719	.614	1-1/4	3-1/4	.500	2
SP-08H	8	1/2	3/4-16	.689	.906	.693	1-3/8	3-3/8	.750	2
SP-10H	10	5/8	7/8-14	.806	1.031	.786	1-5/8	3-5/8	.750	2
SP-12H	12	3/4	1-1/16-12	.981	1.281	.911	1-7/8	4-1/8	.750	2-1/4
SP-14H	14	7/8	1-3/16-12	1.106	1.423	.911	1-7/8	4-1/8	.750	2-1/4
SP-16H	16	1"	1-5/16-12	1.231	1.562	.911	1-7/8	4-1/8	.750	2-1/4
SP-20H	20	1-1/4	1-5/8-12	1.544	1.910	.911	2	4-1/4	1.000	2-1/4
SP-24H	24	1-1/2	1-7/8-12	1.794	2.172	.911	2	4-1/4	1.000	2-1/4
SP-32H	32	2	2-1/2-12	2.419	2.797	.911	2-1/4	4-1/2	1.000	2-1/4



SAE SHORT PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

**CARBIDE TIPPED
STRAIGHT SHANK**

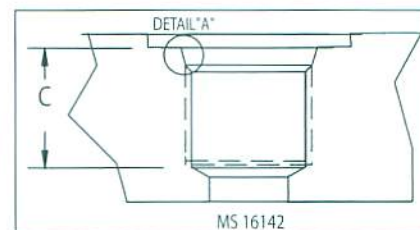
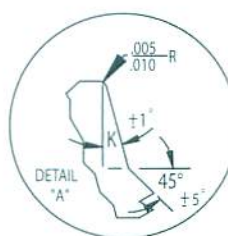
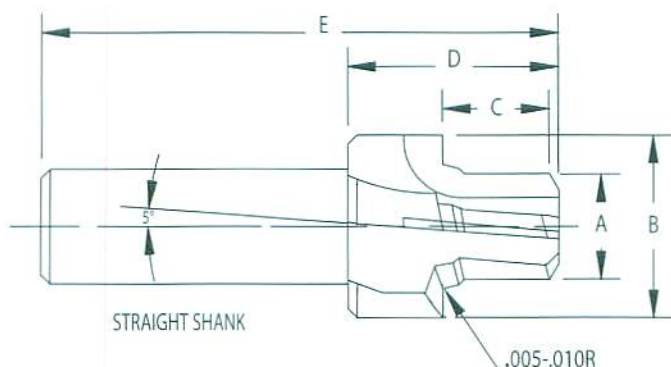
MS16142 / J514 / J1926



Plug Port series porting tools profile the MS16142/J514F/J1926 contour with a reduced spotface diameter. The reamer pilot also sizes the minor diameter per class 2B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



COOLANT THRU AVAILABLE • All diameters and dimensions can be altered to meet your requirements

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS	
									SHANK DIA.	SHANK LENGTH
SP-02T	2	1/8	5/16-24	.272	.469	.473	1-1/8	3-1/8	.500	2
SP-03T	3	3/16	3/8-24	.335	.531	.473	1-1/4	3-1/4	.500	2
SP-04T	4	1/4	7/16-24	.389	.594	.552	1-1/4	3-1/4	.500	2
SP-05T	5	5/16	1/2-24	.452	.656	.552	1-1/4	3-1/4	.500	2
SP-06T	6	3/8	9/16-18	.509	.719	.614	1-1/4	3-1/4	.500	2
SP-08T	8	1/2	3/4-16	.689	.906	.693	1-3/8	3-3/8	.750	2
SP-10T	10	5/8	7/8-14	.806	1.031	.786	1-5/8	3-5/8	.750	2
SP-12T	12	3/4	1-1/16-12	.981	1.281	.911	1-7/8	4-1/8	.750	2-1/4
SP-14T	14	7/8	1-3/16-12	1.106	1.423	.911	1-7/8	4-1/8	.750	2-1/4
SP-16T	16	1"	1-5/16-12	1.231	1.562	.911	1-7/8	4-1/8	.750	2-1/4
SP-20T	20	1-1/4	1-5/8-12	1.544	1.910	.911	2	4-1/4	1.000	2-1/4
SP-24T	24	1-1/2	1-7/8-12	1.794	2.172	.911	2	4-1/4	1.000	2-1/4
SP-32T	32	2	2-1/2-12	2.419	2.797	.911	2-1/4	4-1/2	1.000	2-1/4



ROLL THREADING PORT CUTTERS SAE PORT CONTOUR CUTTERS FOR ROLL THREADS INTERNAL STRAIGHT THREAD O-RING BOSS

CARBIDE TIPPED
STRAIGHT SHANK

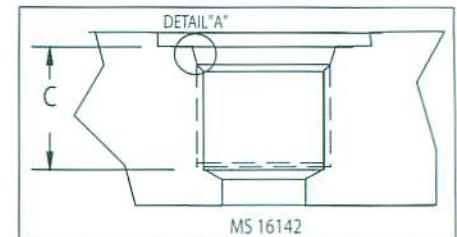
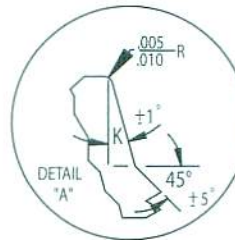
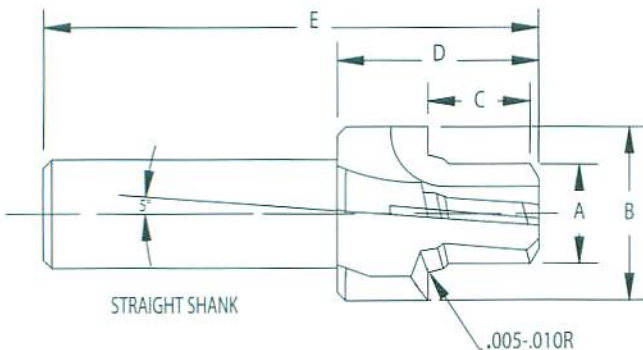
MS16142 / J514 / J1926



Reamer pilot series porting tools profiles the MS16142 / J514F / J1926 contour. The reamer pilot also sizes the minor diameter for one of three thread percentages 75%, 65% and 55% depending on the thread percentage required. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



COOLANT THRU AVAILABLE • All diameters and dimensions can be altered to meet your requirements

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	REAMER DIA. REQ'D FOR			B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS	
				75% THREAD	65% THREAD	55% THREAD					SHANK DIA.	SHANK LENGTH
SAE-02T	2	1/8	5/16-24	.292	.294	.297	.682	.473	1-1/8	3-1/8	.500	2
SAE-03T	3	3/16	3/8-24	.355	.356	.359	.760	.473	1-1/4	3-1/4	.500	2
SAE-04T	4	1/4	7-16-20	.414	.416	.418	.838	.552	1-1/4	3-1/4	.500	2
SAE-05T	5	5/16	1/2-20	.475	.477	.480	.916	.552	1-1/4	3-1/4	.500	2
SAE-06T	6	3/8	9/16-18	.536	.537	.540	.979	.614	1-1/4	3-1/4	.500	2
SAE-08T	8	1/2	3/4-16	.720	.723	.726	1.198	.693	1-3/8	3-3/8	.750	2
SAE-10T	10	5/8	7/8-14	.839	.843	.845	1.354	.786	1-5/8	3-5/8	.750	2



SAE PORT CONTOUR DRILL INTERNAL STRAIGHT THREAD O-RING BOSS

**SOLID CARBIDE
STRAIGHT SHANK
COOLANT THRU**

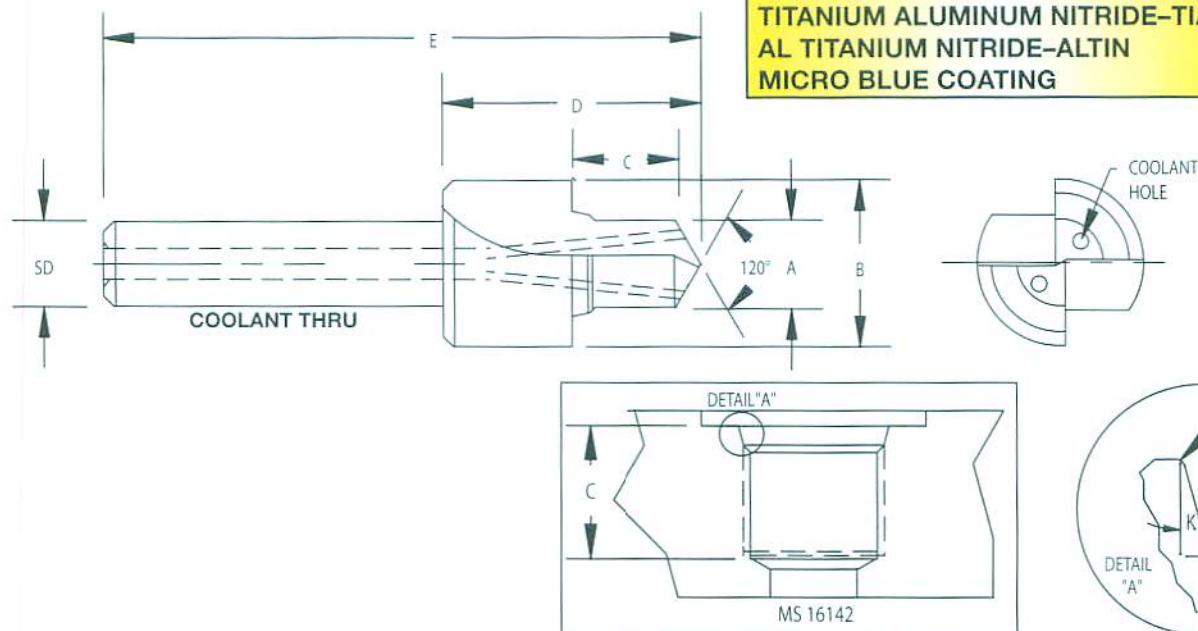
MS16142/J514/J1926



Drill series porting tools drills from solid, profiles the MS16142/J514F/J1926 contour, sizes the minor diameter in one pass per class 2B thread specification. Cutters are solid carbide with coolant thru. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



COOLANT THRU AVAILABLE

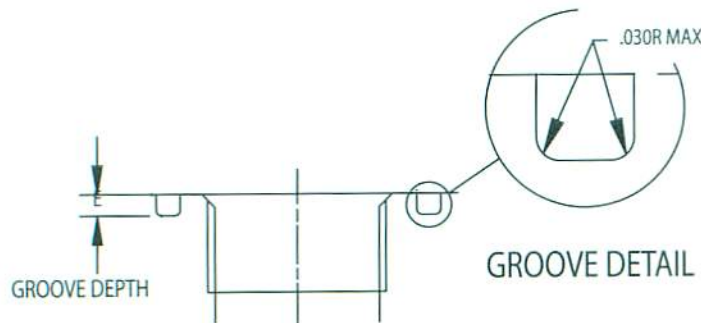
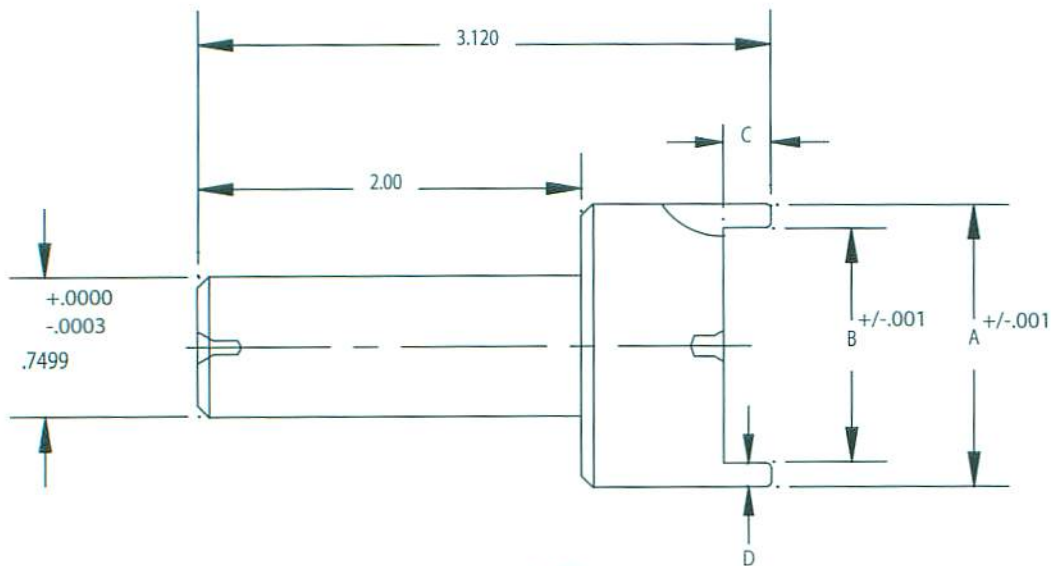
TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	K ANGLE	SHANK DIMENSIONS	
										SHANK DIA.	SHANK LENGTH
SAE-02SCD	2	1/8	5/16-24	.272	.682	.473	1-1/8	3-1/8	12	.500	2
SAE-03SCD	3	3/16	3/8-24	.335	.760	.473	1-1/4	3-1/4	12	.500	2
SAE-04SCD	4	1/4	7/16-20	.389	.838	.552	1-1/4	3-1/4	12	.500	2
SAE-05SCD	5	5/16	1/2-20	.452	.916	.552	1-1/4	3-1/4	12	.500	2
SAE-06SCD	6	3/8	9/16-18	.509	.979	.614	1-1/4	3-1/4	12	.500	2
SAE-08SCD	8	1/2	3/4-16	.689	1.198	.693	1-3/8	3-3/8	15	.750	2
SAE-10SCD	10	5/8	7/8-14	.806	1.354	.786	1-5/8	3-5/8	15	.750	2



TREPAN CUTTER "O" RING GROOVE TOOL

CARBIDE TIPPED STRAIGHT SHANK

Cutters are manufactured as carbide tipped only, 4 straight flutes with a 3/4" or 1" straight shank, depending on main cutter diameter.



A = LARGE DIAMETER
B = INSIDE DIAMETER
C = DEPTH OF CUT
SPECIFY SHANK DIAMETER

TO RECEIVE A QUOTE, FILL IN THE INFORMATION
BELOW AND FAX (815-393-3143) TO
FORM RELIEF TOOL CO., INC

_____ A=LARGE DIAMETER
_____ B=INSIDE DIAMETER
_____ C=CARBIDE DEPTH
_____ D=GROOVE WIDTH
_____ E=GROOVE DEPTH

COATINGS AVAILABLE

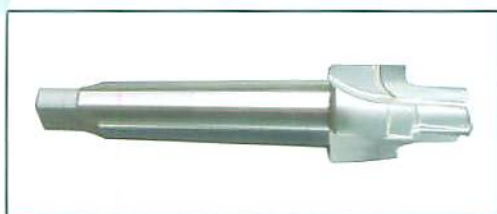
TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



METRIC PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

CARBIDE TIPPED
EXTRA LONG REAMER
TAPER SHANK

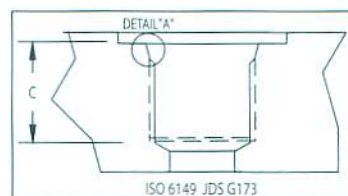
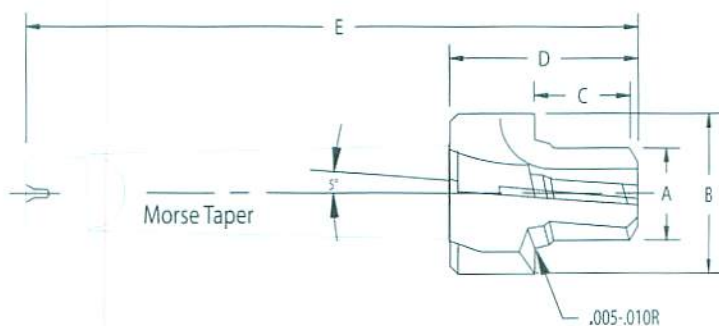
ISO 6149-1 JDS G173



Reamer pilot series porting tools profile the ISO 6149 JDS G173 contour. The reamer pilot also sizes the minor diameter per class 6H thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS		K ANGLE	NO. OF FLUTES
							MORSE TAPER NO.	SHANK LENGTH		
M-08T	M 8X1	.277	.669	.551	1-3/4	4-7/8	2MT	3-1/8	12	3
M-10T	M 10X1	.356	.787	.551	1-3/4	4-7/8	2MT	3-1/8	12	3
M-12T	M 12X1.5	.415	.866	.661	1-3/4	4-7/8	2MT	3-1/8	15	3
M-14T	M 14X1.5	.493	.984	.720	1-3/4	4-7/8	2MT	3-1/8	15	3
M-16T	M 16X1.5	.572	1.063	.720	1-3/4	4-7/8	2MT	3-1/8	15	3
M-18T	M 18X1.5	.651	1.142	.811	1-7/8	5-3/4	3MT	3-7/8	15	3
M-20T	M 20X1.5	.730	1.260	.689	2	5-7/8	3MT	3-7/8	15	3
M-22T	M 22X1.5	.808	1.339	.937	2	5-7/8	3MT	3-7/8	15	3
M-27T	M 27X2	.985	1.575	1.094	2-1/8	6	3MT	3-7/8	15	3
M-33T	M 33X2	1.221	1.811	1.094	2-1/8	6	3MT	3-7/8	15	3
M-42T	M 42X2	1.576	2.205	1.094	2-1/8	6	3MT	3-7/8	15	3
M-50T	M 50X2	1.891	2.598	1.094	2-1/8	7	4MT	4-7/8	15	4
M-60T	M 60X2	2.284	2.992	1.094	2-1/8	7	4MT	4-7/8	15	4



METRIC PORT CONTOUR CUTTER INTERNAL STRAIGHT THREAD O-RING BOSS

HIGH SPEED STEEL
STRAIGHT SHANK

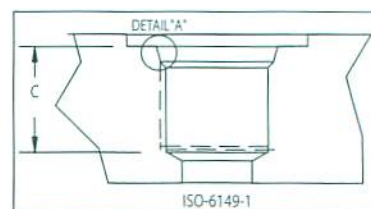
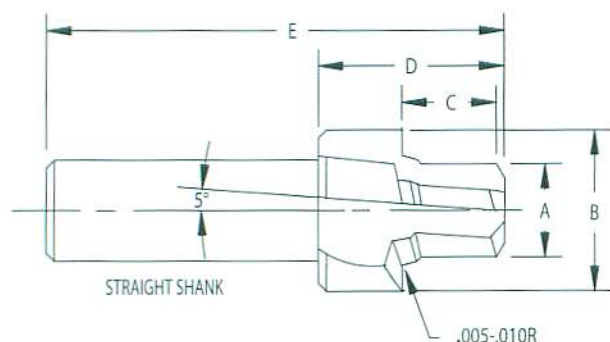
ISO 6149-1, SAE J2244 W/O ID GROOVE



Reamer pilot series porting tools profile the ISO 6149-1 contour. The reamer pilot also sizes the minor diameter per class 6H thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable ISO Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



COOLANT THRU AVAILABLE

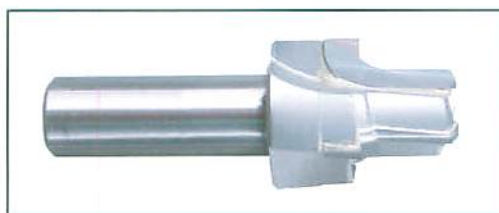
TOOL NUMBER	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS		K ANGLE	NO. OF FLUTES
							SHANK DIA.	SHANK LENGTH		
M1-08H	M 8X1	.277	.669	.453	1-1/8	3-1/8	.500	2	12	3
M1-10H	M 10X1	.356	.787	.453	1-1/4	3-1/4	.500	2	12	3
M1-12H	M 12X1.5	.415	.906	.551	1-1/4	3-1/4	.500	2	15	3
M1-14H	M 14X1.5	.493	.984	.551	1-1/4	3-1/4	.500	2	15	3
M1-16H	M 16X1.5	.572	1.102	.610	1-1/4	3-1/4	.500	2	15	3
M1-18H	M 18X1.5	.651	1.181	.669	1-3/8	3-3/8	.750	2	15	3
M1-20H	M 20X1.5	.730	1.260	.689	1-3/8	3-3/8	.750	2	15	3
M1-22H	M 22X1.5	.808	1.339	.709	1-5/8	3-5/8	.750	2	15	3
M1-27H	M 27X2	.985	1.575	.866	1-7/8	4-1/8	.750	2-1/4	15	3
M1-33H	M 33X2	1.221	1.929	.866	1-7/8	4-1/8	.750	2-1/4	15	3
M1-42H	M 42X2	1.576	2.362	.886	1-7/8	4-1/8	1.000	2-1/4	15	3
M1-48H	M 48X2	1.812	2.598	.984	2	4-1/4	1.000	2-1/4	15	4
M1-60H	M 60X2	2.284	2.992	1.083	2	4-1/4	1.000	2-1/4	15	4



METRIC PORT CONTOUR CUTTER INTERNAL STRAIGHT THREAD O-RING BOSS

CARBIDE TIPPED
STRAIGHT SHANK

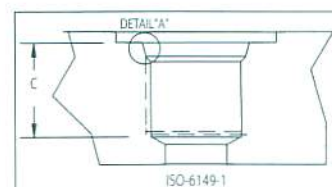
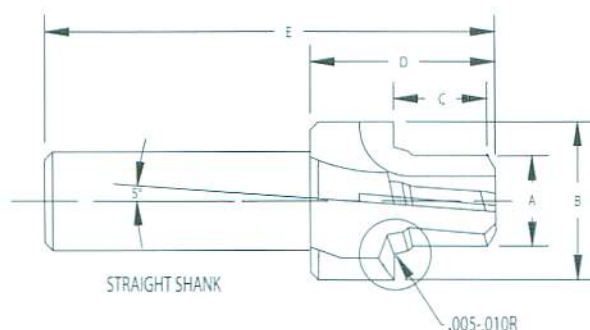
ISO 6149-1, SAE J2244 W/O ID GROOVE



Reamer pilot series porting tools profile the ISO 6149-1 contour. The reamer pilot also sizes the minor diameter per class 6H thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable ISO Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



COOLANT THRU AVAILABLE

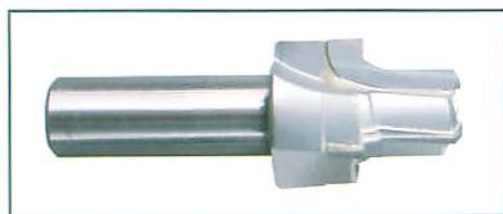
TOOL NUMBER	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS		K ANGLE	NO. OF FLUTES
							SHANK DIA.	SHANK LENGTH		
M1-08T	M 8X1	.277	.669	.453	1-1/8	3-1/8	.500	2	12	3
M1-10T	M 10X1	.356	.787	.453	1-1/4	3-1/4	.500	2	12	3
M1-12T	M 12X1.5	.415	.906	.551	1-1/4	3-1/4	.500	2	15	3
M1-14T	M 14X1.5	.493	.984	.551	1-1/4	3-1/4	.500	2	15	3
M1-16T	M 16X1.5	.572	1.102	.610	1-1/4	3-1/4	.500	2	15	3
M1-18T	M 18X1.5	.651	1.181	.669	1-3/8	3-3/8	.750	2	15	3
M1-20T	M 20X1.5	.730	1.260	.689	1-3/8	3-3/8	.750	2	15	3
M1-22T	M 22X1.5	.808	1.339	.709	1-5/8	3-5/8	.750	2	15	3
M1-27T	M 27X2	.985	1.575	.866	1-7/8	4-1/8	.750	2-1/4	15	3
M1-33T	M 33X2	1.221	1.929	.866	1-7/8	4-1/8	.750	2-1/4	15	3
M1-42T	M 42X2	1.576	2.362	.886	1-7/8	4-1/8	1.000	2-1/4	15	3
M1-48T	M 48X2	1.812	2.598	.984	2	4-1/4	1.000	2-1/4	15	4
M1-60T	M 60X2	2.284	2.992	1.083	2	4-1/4	1.000	2-1/4	15	4



METRIC PORT CONTOUR CUTTER INTERNAL STRAIGHT THREAD O-RING BOSS

CARBIDE TIPPED
STRAIGHT SHANK
W/ID GROOVE

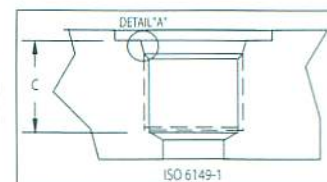
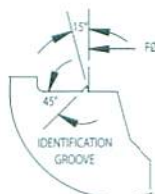
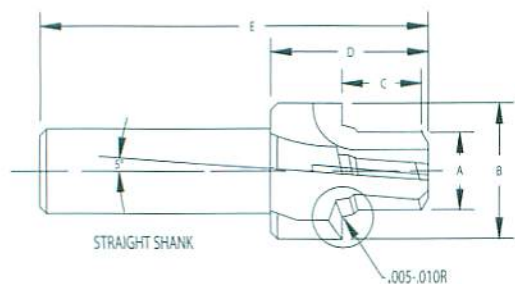
ISO 6149-1, SAE J2244 WITH ID GROOVE



Reamer pilot series porting tools profile the ISO 6149-1 contour and ID groove. The reamer also sizes the minor diameter per class 6H thread specification. Cutters are heat treated for toughness and durability all tolerances are held within applicable ISO Specs. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

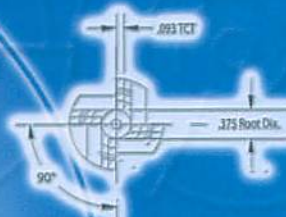
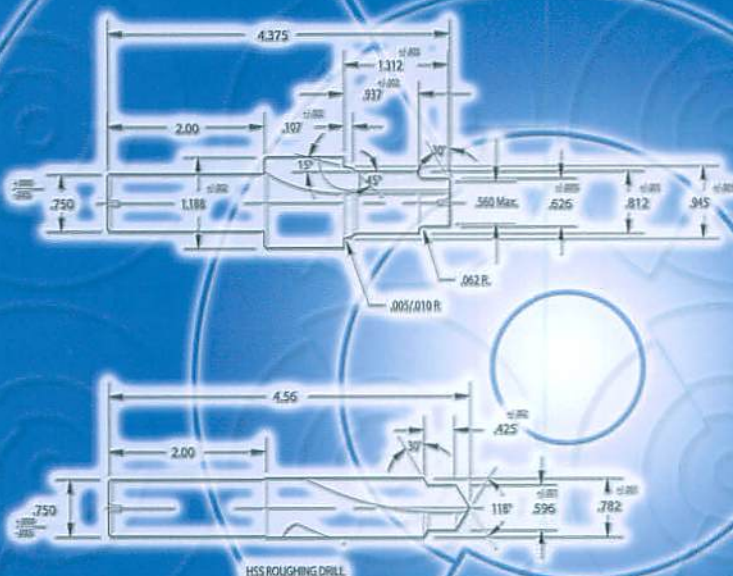


COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	F RIDGE DIA.	SHANK DIMENSIONS		K ANGLE	NO. OF FLUTES
								SHANK DIA.	SHANK LENGTH		
M1-08TG	M 8X1	.277	.669	.453	1-1/8	3-1/8	.551	.500	2	12	3
M1-10TG	M 10X1	.356	.787	.453	1-1/4	3-1/4	.630	.500	2	12	3
M1-12TG	M 12X1.5	.415	.906	.551	1-1/4	3-1/4	.748	.500	2	15	3
M1-14TG	M 14X1.5	.493	.984	.551	1-1/4	3-1/4	.826	.500	2	15	3
M1-16TG	M 16X1.5	.572	1.102	.610	1-1/4	3-1/4	.945	.500	2	15	3
M1-18TG	M 18X1.5	.651	1.181	.669	1-3/8	3-3/8	1.024	.750	2	15	3
M1-20TG	M 20X1.5	.730	1.260	.689	1-3/8	3-3/8	1.063	.750	2	15	3
M1-22TG	M 22X1.5	.808	1.339	.709	1-5/8	3-5/8	1.142	.750	2	15	3
M1-27TG	M 27X2	.985	1.575	.866	1-7/8	4-1/8	1.338	.750	2-1/4	15	3
M1-33TG	M 33X2	1.221	1.929	.866	1-7/8	4-1/8	1.693	.750	2-1/4	15	3
M1-42TG	M 42X2	1.576	2.362	.886	1-7/8	4-1/8	2.047	1.000	2-1/4	15	3
M1-48TG	M 48X2	1.812	2.598	.984	2	4-1/4	2.244	1.000	2-1/4	15	4
M1-60TG	M 60X2	2.284	2.992	1.083	2	4-1/4	2.638	1.000	2-1/4	15	4



PH10-2 R/F



4 Equally Spaced R.H. Cutting Flutes
Carbide Tipped

Form Relief Tool Co.

15629 E. Eddy Road
Monroe Center, IL 61052
815-393-4263, Fax 815-393-3143

AVAILABLE TOOLING

ROUGHING TIME

ENGLISH

DISCUSSION SUMMARY

SCALE:

11

TCL-

DATE: 9/7/20

CHILD

100

COVER

FORM TDCR FS-30010-7

COSTS

PARNER HYDRAULICS
TECH NO:

PH10-2



FORM RELIEF TOOL CO., INC.
WWW.FORMRELIEF.COM

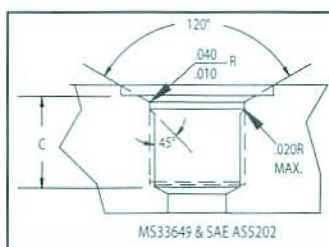
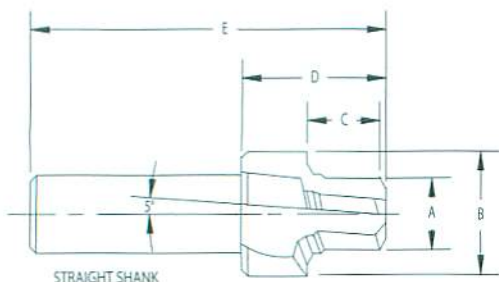
PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

HIGH SPEED STEEL
STRAIGHT SHANK

MS33649/SAEAS5202



Reamer pilot series porting tools profiles the MS33649 contour. The reamer pilot also sizes the minor diameter per class 3B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TiCN
TITANIUM ALUMINUM NITRIDE-TiAlN
AL TITANIUM NITRIDE-ALTiN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

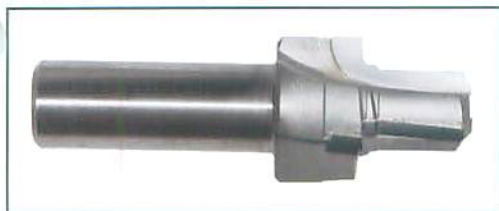
TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS	
									SHANK DIA.	SHANK LENGTH
MS49R-01H	1	1/16	1/4-28	.215	.650	.407	1-0	3-0	.500	2-0
MS49R-02H	2	1/8	5/16-24	.275	.742	.582	1-1/8	3-1/8	.500	2-0
MS49R-03H	3	3/16	3/8-24	.339	.805	.588	1-1/4	3-1/4	.500	2-0
MS49R-04H	4	1/4	7/16-20	.393	.888	.661	1-1/4	3-1/4	.500	2-0
MS49R-05H	5	5/16	1/2-20	.455	.950	.661	1-1/4	3-1/4	.500	2-0
MS49R-06H	6	3/8	9/16-18	.512	1.012	.714	1-1/2	3-1/2	.500	2-0
MS49R-07H	7	7/16	5/8-18	.575	1.105	.730	1-1/2	3-1/2	.500	2-0
MS49R-08H	8	1/2	3/4-16	.693	1.240	.839	1-5/8	3-5/8	.750	2-0
MS49R-09H	9	9/16	13/16-16	.756	1.302	.855	1-5/8	3-5/8	.750	2-0
MS49R-10H	10	5/8	7/8-14	.810	1.415	.935	1-7/8	4-1/8	.750	2-1/4
MS49R-11H	11	11/16	1-12	.925	1.602	1.069	2-1/8	4-3/8	.750	2-1/4
MS49R-12H	12	3/4	1-1/16-12	.987	1.665	1.069	2-1/8	4-3/8	.750	2-1/4
MS49R-14H	14	7/8	1-3/16-12	1.112	1.790	1.069	2-1/8	4-3/8	.750	2-1/4
MS49R-16H	16	1-0	1-5/16-12	1.237	1.965	1.069	2-1/8	4-3/8	.750	2-1/4
MS49R-18H	18	1-1/8	1-1/2-12	1.425	2.090	1.121	2-1/4	4-1/2	.750	2-1/4
MS49R-20H	20	1-1/4	1-5/8-12	1.550	2.310	1.121	2-1/4	4-1/2	1.000	2-1/4
MS49R-24H	24	1-1/2	1-7/8-12	1.800	2.600	1.132	2-1/4	4-1/2	1.000	2-1/4
MS49R-28H	28	1-3/4	2-1/4-12	2.175	3.050	1.248	2-1/4	4-1/2	1.000	2-1/4
MS49R-32H	32	2-0	2-1/2-12	2.425	3.520	1.373	2-1/2	5-0	1.000	2-1/2



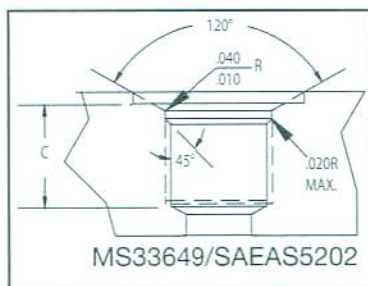
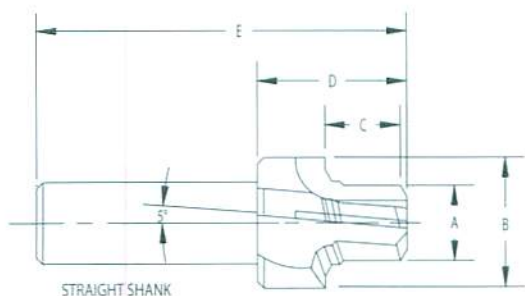
PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

CARBIDE TIPPED
STRAIGHT SHANK

MS33649/SAEAS5202



Reamer pilot series porting tools profile the MS33649 contour. The reamer pilot also sizes the minor diameter per class 3B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS	
									SHANK DIA.	SHANK LENGTH
MS49R-01T	1	1/16	1/4-28	.215	.650	.407	1-0	3-0	.500	2-0
MS49R-02T	2	1/8	5/16-24	.275	.742	.582	1-1/8	3-1/8	.500	2-0
MS49R-03T	3	3/16	3/8-24	.339	.805	.588	1-1/4	3-1/4	.500	2-0
MS49R-04T	4	1/4	7/16-20	.393	.888	.661	1-1/4	3-1/4	.500	2-0
MS49R-05T	5	5/16	1/2-20	.455	.950	.661	1-1/4	3-1/4	.500	2-0
MS49R-06T	6	3/8	9/16-18	.512	1.012	.714	1-1/2	3-1/2	.500	2-0
MS49R-07T	7	7/16	5/8-18	.575	1.105	.730	1-1/2	3-1/2	.500	2-0
MS49R-08T	8	1/2	3/4-16	.693	1.240	.839	1-5/8	3-5/8	.750	2-0
MS49R-09T	9	9/16	13/16-16	.756	1.302	.855	1-5/8	3-5/8	.750	2-0
MS49R-10T	10	5/8	7/8-14	.810	1.415	.935	1-7/8	4-1/8	.750	2-1/4
MS49R-11T	11	11/16	1-12	.925	1.602	1.069	2-1/8	4-3/8	.750	2-1/4
MS49R-12T	12	3/4	1-1/16-12	.987	1.665	1.069	2-1/8	4-3/8	.750	2-1/4
MS49R-14T	14	7/8	1-3/16-12	1.112	1.790	1.069	2-1/8	4-3/8	.750	2-1/4
MS49R-16T	16	1-0	1-5/16-12	1.237	1.965	1.069	2-1/8	4-3/8	.750	2-1/4
MS49R-18T	18	1-1/8	1-1/2-12	1.425	2.090	1.121	2-1/4	4-1/2	.750	2-1/4
MS49R-20T	20	1-1/4	1-5/8-12	1.550	2.310	1.121	2-1/4	4-1/2	1.000	2-1/4
MS49R-24T	24	1-1/2	1-7/8-12	1.800	2.600	1.132	2-1/4	4-1/2	1.000	2-1/4
MS49R-28T	28	1-3/4	2-1/4-12	2.175	3.050	1.248	2-1/4	4-1/2	1.000	2-1/4
MS49R-32T	32	2-0	2-1/2-12	2.425	3.520	1.373	2-1/2	5-0	1.000	2-1/2



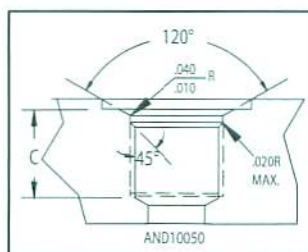
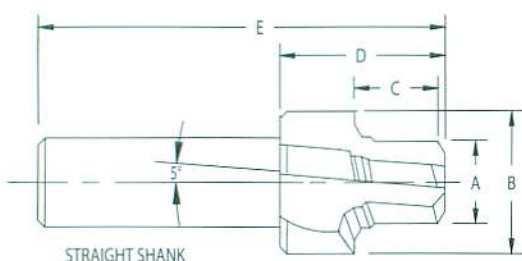
PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

HIGH SPEED STEEL
STRAIGHT SHANK

AND10050



Reamer pilot series porting tools profile the AND10050 contour in one pass. The reamer pilot also sizes the minor diameter per class 3B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS	
									SHANK DIA.	SHANK LENGTH
ANR01-H	1	1/16	1/4-28	.211	.650	.450	1-0	3-0	.500	2-0
ANR02-H	2	1/8	5/16-24	.271	.742	.609	1-1/8	3-1/8	.500	2-0
ANR03-H	3	3/16	3/8-24	.333	.805	.609	1-1/4	3-1/4	.500	2-0
ANR04-H	4	1/4	7/16-20	.386	.888	.687	1-1/4	3-1/4	.500	2-0
ANR05-H	5	5/16	1/2-20	.449	.950	.687	1-1/4	3-1/4	.500	2-0
ANR06-H	6	3/8	9/16-18	.506	1.012	.734	1-1/2	3-1/2	.500	2-0
ANR08-H	8	1/2	3/4-16	.687	1.240	.859	1-5/8	3-5/8	.750	2-0
ANR10-H	10	5/8	7/8-14	.802	1.415	.953	1-7/8	4-1/8	.750	2-1/4
ANR12-H	12	3/4	1-1/16-12	.976	1.665	1.093	2-1/8	4-3/8	.750	2-1/4
ANR16-H	16	1-0	1-5/16-12	1.226	1.965	1.093	2-1/8	4-3/8	.750	2-1/4
ANR20-H	20	1-1/4	1-5/8-12	1.538	2.310	1.140	2-1/4	4-1/2	1.000	2-1/4
ANR24-H	24	1-1/2	1-7/8-12	1.788	2.600	1.140	2-1/4	4-1/2	1.000	2-1/4
ANR28-H	28	1-3/4	1-1/4-12	2.163	3.050	1.265	2-1/4	4-1/2	1.000	2-1/4
ANR32-H	32	2-0	2-1/2-12	2.414	3.520	1.390	2-1/2	5-00	1.000	2-1/2



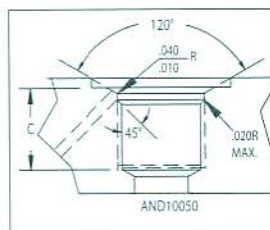
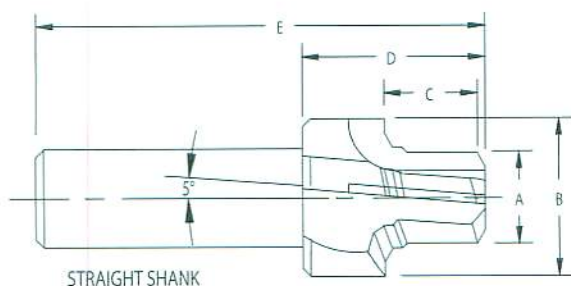
PORT CONTOUR CUTTERS INTERNAL STRAIGHT THREAD O-RING BOSS

**CARBIDE TIPPED
STRAIGHT SHANK**

AND10050



Reamer pilot series porting tools profile the AND10050 contour in one pass. The reamer pilot also sizes the minor diameter per class 3B thread specification. Cutters are heat treated for toughness and durability. All tolerances are held within applicable Mil Specs. All grinding is done between centers to insure concentricity.



COATINGS AVAILABLE

**TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING**

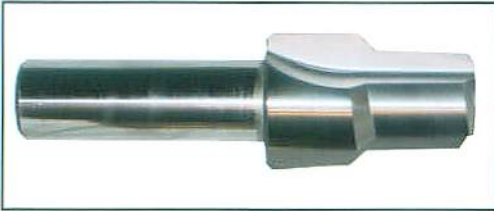
COOLANT THRU AVAILABLE

TOOL NUMBER	TUBE NO.	TUBE SIZE	THREAD SIZE	A REAMER DIA.	B SPOTFACE DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL LENGTH	SHANK DIMENSIONS	
									SHANK DIA.	SHANK LENGTH
ANR01-T	1	1/16	1/4-28	.211	.650	.450	1-0	3-0	.500	2-0
ANR02-T	2	1/8	5/16-24	.271	.742	.609	1-1/8	3-1/8	.500	2-0
ANR03-T	3	3/16	3/8-24	.333	.805	.609	1-1/4	3-1/4	.500	2-0
ANR04-T	4	1/4	7/16-20	.386	.888	.687	1-1/4	3-1/4	.500	2-0
ANR05-T	5	5/16	1/2-20	.449	.950	.687	1-1/4	3-1/4	.500	2-0
ANR06-T	6	3/8	9/16-18	.506	1.012	.734	1-1/2	3-1/2	.500	2-0
ANR08-T	8	1/2	3/4-16	.687	1.240	.859	1-5/8	3-5/8	.750	2-0
ANR10-T	10	5/8	7/8-14	.802	1.415	.953	1-7/8	4-1/8	.750	2-1/4
ANR12-T	12	3/4	1-1/16-12	.976	1.665	1.093	2-1/8	4-3/8	.750	2-1/4
ANR16-T	16	1-0	1-5/16-12	1.226	1.965	1.093	2-1/8	4-3/8	.750	2-1/4
ANR20-T	20	1-1/4	1-5/8-12	1.538	2.310	1.140	2-1/4	4-1/2	1.000	2-1/4
ANR24-T	24	1-1/2	1-7/8-12	1.788	2.600	1.140	2-1/4	4-1/2	1.000	2-1/4
ANR28-T	28	1-3/4	1-1/4-12	2.163	3.050	1.265	2-1/4	4-1/2	1.000	2-1/4
ANR32-T	32	2-0	2-1/2-12	2.414	3.520	1.390	2-1/2	5-00	1.000	2-1/2

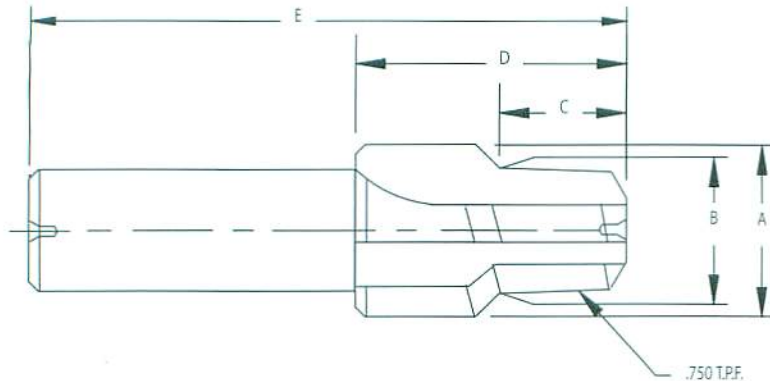


TAPER PIPE REAMERS NPFT (DRYSEAL) OR NPT

HIGH SPEED STEEL STRAIGHT SHANK



Pipe Tap Cutters will form in one pass a taper reamed and chamfered hole that mates with a tapered pipe thread tap. (For use in pre-drilled tubing or precast holes.) Substantially reduces premature tap wear and breakage. Cutter is completely form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

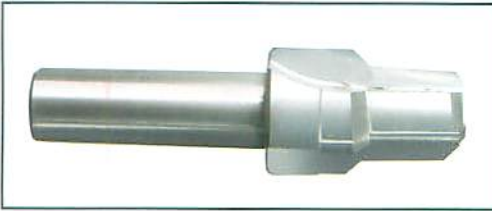
COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A DIA.	B DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL	SHANK DIMENSIONS		NO. OF FLUTES
							DIAMETER	LENGTH	
PR-00H	1-16-27	5/8	.254	15/32	1-1/4	3-1/2	.750	2-1/4	3
PR-01H	1/8-27	5/8	.347	15/32	1-1/4	3-1/2	.750	2-1/4	3
PR-02H	1/4-18	3/4	.450	21/32	1-3/8	3-5/8	.750	2-1/4	3
PR-03H	3/8-18	7/8	.586	11/16	1-1/2	3-3/4	.750	2-1/4	3
PR-04H	1/2-14	1	.725	7/8	1-7/8	4-1/8	.750	2-1/4	3
PR-05H	3/4-14	1-1/4	.937	7/8	1-7/8	4-1/8	.750	2-1/4	3
PR-06H	1-11-1/2	1-1/2	1.173	1-1/16	2-1/8	4-5/8	1.000	2-1/2	3
PR-07H	1-1/4-11-1/2	1-7/8	1.518	1-1/8	2-1/4	4-3/4	1.000	2-1/2	3
PR-08H	1-1/2-11-1/2	2-1/8	1.757	1-1/8	2-1/2	5	1.000	2-1/2	4
PR-09H	2-11-1/2	2-5/8	2.230	1-7/32	2-3/4	5-1/4	1.000	2-1/2	4
PR-10H	2-1/2-8	3-1/8	2.670	1-3/4	3-1/8	5-5/8	1.000	2-1/2	4
PR-11H	3-8	3-1/4	3.296	1-7/8	3-1/2	7	1.000	2-1/2	4

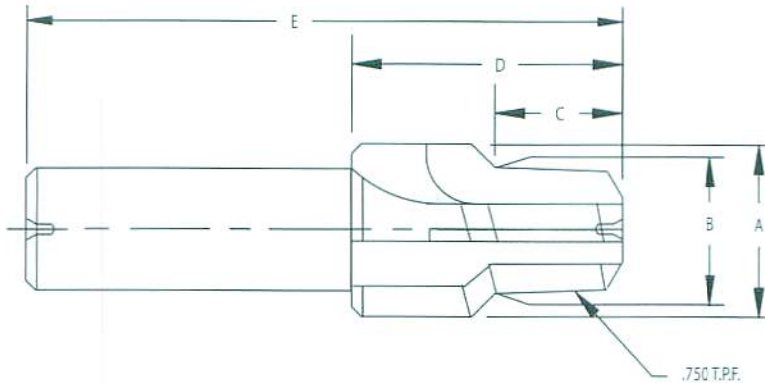


TAPER PIPE REAMERS NPFT (DRYSEAL) OR NPT

CARBIDE TIPPED STRAIGHT SHANK



Pipe Tap Cutters will form in one pass a taper reamed and chamfered hole that mates with a tapered pipe thread tap. (For use in pre-drilled tubing or precast holes.) Substantially reduces premature tap wear and breakage. Cutter is completely form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A DIA.	B DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL	SHANK DIMENSIONS		NO. OF FLUTES
							DIAMETER	LENGTH	
PR-00T	1-16-27	5/8	.254	15/32	1-1/4	3-1/2	.750	2-1/4	3
PR-01T	1/8-27	5/8	.347	15/32	1-1/4	3-1/2	.750	2-1/4	3
PR-02T	1/4-18	3/4	.450	21/32	1-3/8	3-5/8	.750	2-1/4	3
PR-03T	3/8-18	7/8	.586	11/16	1-1/2	3-3/4	.750	2-1/4	3
PR-04T	1/2-14	1	.725	7/8	1-7/8	4-1/8	.750	2-1/4	3
PR-05T	3/4-14	1-1/4	.937	7/8	1-7/8	4-1/8	.750	2-1/4	3
PR-06T	1-11-1/2	1-1/2	1.173	1-1/16	2-1/8	4-5/8	1.000	2-1/2	3
PR-07T	1-1/4-11-1/2	1-7/8	1.518	1-1/8	2-1/4	4-3/4	1.000	2-1/2	3
PR-08T	1-1/2-11-1/2	2-1/8	1.757	1-1/8	2-1/2	5	1.000	2-1/2	4
PR-09T	2-11-1/2	2-5/8	2.230	1-7/32	2-3/4	5-1/4	1.000	2-1/2	4
PR-10T	2-1/2-8	3-1/8	2.670	1-3/4	3-1/8	5-5/8	1.000	2-1/2	4
PR-11T	3-8	3-1/4	3.296	1-7/8	3-1/2	7	1.000	2-1/2	4

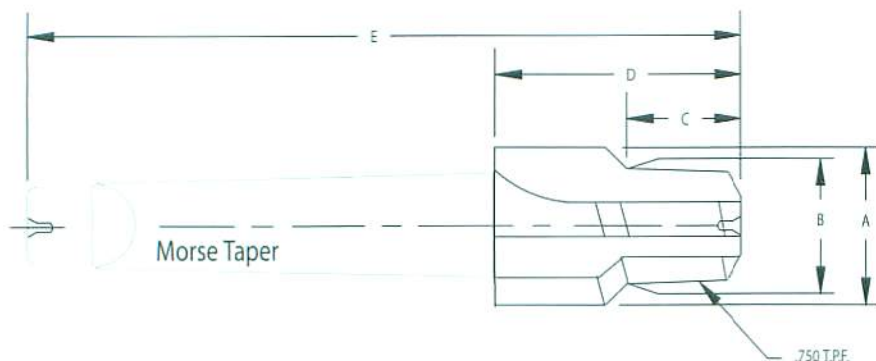


TAPER PIPE REAMERS NPFT (DRYSEAL) OR NPT

HIGH SPEED STEEL MORSE TAPER SHANK



Pipe Tap Cutters will form in one pass a taper reamed and chamfered hole that mates with a tapered pipe thread tap. (For use in pre-drilled tubing or precast holes.) Substantially reduces premature tap wear and breakage. Cutter is completely form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A DIA.	B DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL	SHANK DIMENSIONS		NO. OF FLUTES
							MORSE TAPER NO.	SHANK LENGTH	
PR-00HT	1-16-27	5/8	.254	15/32	1-1/4	4-3/8	2	3-1/8	3
PR-01HT	1/8-27	5/8	.347	15/32	1-1/4	4-3/8	2	3-1/8	3
PR-02HT	1/4-18	3/4	.450	21/32	1-3/8	4-1/2	2	3-1/8	3
PR-03HT	3/8-18	7/8	.586	11/16	1-1/2	4-5/8	2	3-1/8	3
PR-04HT	1/2-14	1	.725	7/8	1-7/8	5	2	3-1/8	3
PR-05HT	3/4-14	1-1/4	.937	7/8	1-7/8	5-3/4	3	3-7/8	3
PR-06HT	1-11-1/2	1-1/2	1.173	1-1/16	2-1/8	6	3	3-7/8	3
PR-07HT	1-1/4-11-1/2	1-7/8	1.518	1-1/8	2-1/4	6-1/8	3	3-7/8	3
PR-08HT	1-1/2-11-1/2	2-1/8	1.757	1-1/8	2-1/2	6-3/8	3	3-7/8	4
PR-09HT	2-11-1/2	2-5/8	2.230	1-7/32	2-3/4	7-5/8	4	4-7/8	4
PR-10HT	2-1/2-8	3-1/8	2.670	1-3/4	3-1/8	8	4	4-7/8	4
PR-11HT	3-8	3-1/4	3.296	1-7/8	3-1/2	8-3/8	4	4-7/8	4

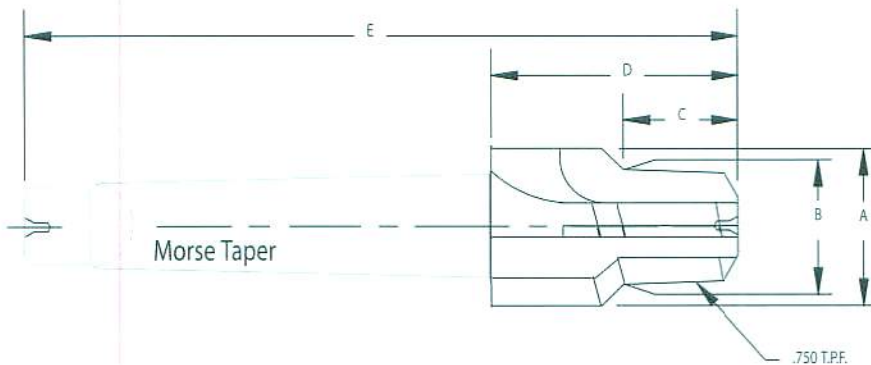


TAPER PIPE REAMERS NPFT (DRYSEAL) OR NPT

CARBIDE TIPPED MORSE TAPER SHANK



Pipe Tap Cutters will form in one pass a taper reamed and chamfered hole that mates with a tapered pipe thread tap. (For use in pre-drilled tubing or precast holes.) Substantially reduces premature tap wear and breakage. Cutter is completely form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TiCN
TITANIUM ALUMINUM NITRIDE-TiAlN
AL TITANIUM NITRIDE-ALTiN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

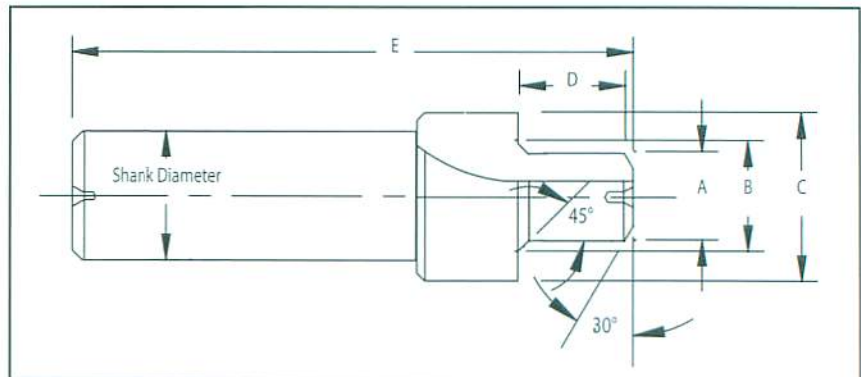
TOOL NUMBER	THREAD SIZE	A DIA.	B DIA.	C REAMER LENGTH	D HEAD LENGTH	E OAL	SHANK DIMENSIONS		NO. OF FLUTES
							MORSE TAPER NO.	SHANK LENGTH	
PR-00TS	1-16-27	5/8	.254	15/32	1-1/4	4-3/8	2	3-1/8	3
PR-01TS	1/8-27	5/8	.347	15/32	1-1/4	4-3/8	2	3-1/8	3
PR-02TS	1/4-18	3/4	.450	21/32	1-3/8	4-1/2	2	3-1/8	3
PR-03TS	3/8-18	7/8	.586	11/16	1-1/2	4-5/8	2	3-1/8	3
PR-04TS	1/2-14	1	.725	7/8	1-7/8	5	2	3-1/8	3
PR-05TS	3/4-14	1-1/4	.937	7/8	1-7/8	5-3/4	3	3-7/8	3
PR-06TS	1-11-1/2	1-1/2	1.173	1-1/16	2-1/8	6	3	3-7/8	3
PR-07TS	1-1/4-11-1/2	1-7/8	1.518	1-1/8	2-1/4	6-1/8	3	3-7/8	3
PR-08TS	1-1/2-11-1/2	2-1/8	1.757	1-1/8	2-1/2	6-3/8	3	3-7/8	4
PR-09TS	2-11-1/2	2-5/8	2.230	1-7/32	2-3/4	7-5/8	4	4-7/8	4
PR-10TS	2-1/2-8	3-1/8	2.670	1-3/4	3-1/8	8	4	4-7/8	4
PR-11TS	3-8	3-1/4	3.296	1-7/8	3-1/2	8-3/8	4	4-7/8	4



BSPP Cutters will ream and chamfer in one pass in a pre-drilled or pre-cast hole for a parallel pipe thread. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



STANDARD REAMER LENGTH—HIGH SPEED STEEL COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A SMALL DIA.	B CHAMFER DIA.	C SPOTFACE DIA.	D REAMER LENGTH	E OAL LENGTH	SHANK DIMENSIONS		NO. OF FLUTES
							DIAMETER	LENGTH	
BS012-H	1/8-28	.343	.400	.656	.536	3-3/16	.500	2.0	3
BS025-H	1/4-19	.460	.535	.827	.762	3-1/2	.500	2.0	3
BS037-H	3/8-19	.598	.676	1.000	.762	3-1/2	.500	2.0	3
BS050-H	1/2-14	.745	.845	1.188	.916	3-11/16	.750	2.0	3
BS075-H	3/4-14	.962	1.065	1.438	.995	4-1/4	.750	2.0	3
BS100-H	1-11	1.206	1.335	1.812	1.151	4-1/4	.750	2.0	3
BS125-H	1-1/4-11	1.547	1.675	2.086	1.230	5	1.000	2.5	4
BS150-H	1-1/2-11	1.779	1.906	2.323	1.310	5-1/8	1.000	2.5	4

SHORT REAMER LENGTH—HIGH SPEED STEEL COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A SMALL DIA.	B CHAMFER DIA.	C SPOTFACE DIA.	D REAMER LENGTH	E OAL LENGTH	SHANK DIMENSIONS		NO. OF FLUTES
							DIAMETER	LENGTH	
BS012-SH	1/8-28	.343	.400	.656	.372	3-3/16	.500	2.0	3
BS025-SH	1/4-19	.460	.535	.827	.516	3-1/2	.500	2.0	3
BS037-SH	3/8-19	.598	.676	1.000	.516	3-1/2	.500	2.0	3
BS050-SH	1/2-14	.745	.845	1.188	.660	3-11/16	.750	2.0	3
BS075-SH	3/4-14	.962	1.065	1.438	.756	4-1/4	.750	2.0	3
BS100-SH	1-11	1.206	1.335	1.812	.900	4-1/4	.750	2.0	3
BS125-SH	1-1/4-11	1.547	1.675	2.086	.996	5	1.000	2.5	4
BS150-SH	1-1/2-11	1.779	1.906	2.323	.996	5-1/8	1.000	2.5	4

Cutters can be altered to meet your requirements.



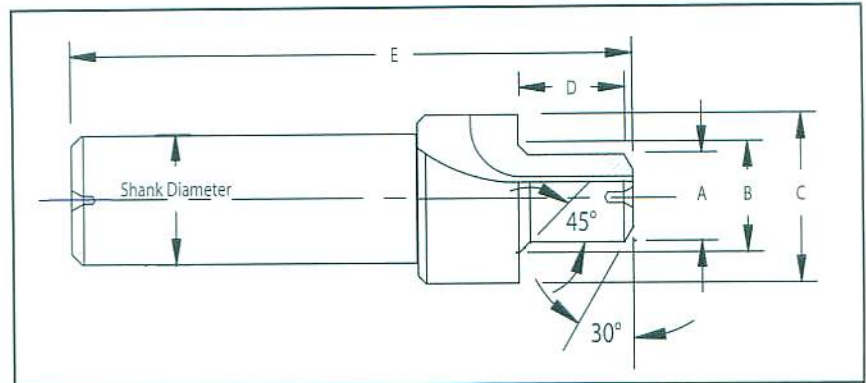
BRITISH STANDARD PARALLEL PIPE BSPP

CARBIDE TIPPED STRAIGHT SHANK

BSPP Cutters will ream and chamfer in one pass in a pre-drilled or pre-cast hole for a parallel pipe thread. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



STANDARD REAMER LENGTH—CARBIDE TIPPED COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A SMALL DIA.	B CHAMFER DIA.	C SPOTFACE DIA.	D REAMER LENGTH	E OAL LENGTH	SHANK DIMENSIONS		NO. OF FLUTES
							DIAMETER	LENGTH	
BS012-T	1/8-28	.343	.400	.656	.536	3-3/16	.500	2.0	3
BS025-T	1/4-19	.460	.535	.827	.762	3-1/2	.500	2.0	3
BS037-T	3/8-19	.598	.676	1.000	.762	3-1/2	.500	2.0	3
BS050-T	1/2-14	.745	.845	1.188	.916	3-11/16	.750	2.0	3
BS075-T	3/4-14	.962	1.065	1.438	.995	4-1/4	.750	2.0	3
BS0100-T	1-11	1.206	1.335	1.812	1.151	4-1/4	.750	2.0	3
BS125-T	1-1/4-11	1.547	1.675	2.086	1.230	5	1.000	2.5	4
BS150-T	1-1/2-11	1.779	1.906	2.323	1.310	5-1/8	1.000	2.5	4

SHORT REAMER LENGTH—CARBIDE TIPPED COOLANT THRU AVAILABLE

TOOL NUMBER	THREAD SIZE	A SMALL DIA.	B CHAMFER DIA.	C SPOTFACE DIA.	D REAMER LENGTH	E OAL LENGTH	SHANK DIMENSIONS		NO. OF FLUTES
							DIAMETER	LENGTH	
BS012-ST	1/8-28	.343	.400	.656	.372	3-3/16	.500	2.0	3
BS025-ST	1/4-19	.460	.535	.827	.516	3-1/2	.500	2.0	3
BS037-ST	3/8-19	.598	.676	1.000	.516	3-1/2	.500	2.0	3
BS050-ST	1/2-14	.745	.845	1.188	.660	3-11/16	.750	2.0	3
BS075-ST	3/4-14	.962	1.065	1.438	.756	4-1/4	.750	2.0	3
BS100-ST	1-11	1.206	1.335	1.812	.900	4-1/4	.750	2.0	3
BS125-ST	1-1/4-11	1.547	1.675	2.086	.996	5	1.000	2.5	4
BS150-ST	1-1/2-11	1.779	1.906	2.323	.996	5-1/8	1.000	2.5	4

Cutters can be altered to meet your requirements.



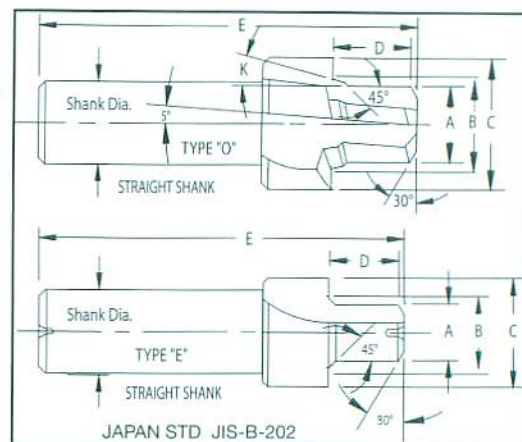
BRITISH STANDARD PARALLEL PIPE "G" STYLE BSPP

HIGH SPEED STEEL STRAIGHT SHANK

BSPP Cutters will ream and chamfer in a pre-drilled or pre-cast hole for thread "G", and form in one pass the contour of Type "O" or Type "E" depending on the application and seal method selected. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



"G" STYLE BSPP • TYPE "O" • O RING SEAL METHOD • HIGH SPEED STEEL COOLANT THRU AVAILABLE

TOOL NUMBER	NOMINAL SIZE G	A SMALL DIA.	B CHAMFER DIA.	C SPOTFACE DIA.	D REAMER LENGTH	E OAL LENGTH	SHANK DIMENSIONS		K ANGLE
							DIAMETER	LENGTH	
BS012-HG0	1/8	.343	.459	.709	.590	3-3/16	.500	2.0	12
BS025-HG0	1/4	.460	.616	.945	.708	3-1/2	.500	2.0	12
BS037-HG0	3/8	.598	.734	1.102	.708	3-1/2	.500	2.0	12
BS050-HG0	1/2	.745	.890	1.339	.945	3-11/16	.750	2.0	15
BS075-HG0	3/4	.962	1.175	1.716	.984	4-1/4	.750	2.0	15
BS100-HG0	1	1.206	1.411	2.008	1.181	4-1/4	.750	2.0	15
BS125-HG0	1-1/4	1.547	1.766	2.441	1.181	5	1.000	2.5	15
BS150-HG0	1-1/2	1.779	2.002	2.677	1.181	5-1/8	1.000	2.5	15

"G" STYLE BSPP • TYPE "E" • EDGE SEAL METHOD • HIGH SPEED STEEL COOLANT THRU AVAILABLE

TOOL NUMBER	NOMINAL SIZE G	A SMALL DIA.	B CHAMFER DIA.	C SPOTFACE DIA.	D REAMER LENGTH	E OAL LENGTH	SHANK DIMENSIONS		NO. OF FLUTES
							DIAMETER	LENGTH	
BS012-HGE	1/8	.343	.400	.591	.590	3-3/16	.500	2.0	3
BS025-HGE	1/4	.460	.535	.748	.708	3-1/2	.500	2.0	3
BS037-HGE	3/8	.598	.676	.906	.708	3-1/2	.500	2.0	3
BS050-HGE	1/2	.745	.845	1.063	.945	3-11/16	.750	2.0	3
BS075-HGE	3/4	.962	1.065	1.299	.984	4-1/4	.750	2.0	3
BS100-HGE	1	1.206	1.335	1.575	1.181	4-1/4	.750	2.0	3
BS125-HGE	1-1/4	1.547	1.675	1.968	1.181	5	1.000	2.5	4
BS150-HGE	1-1/2	1.779	1.906	2.205	1.181	5-1/8	1.000	2.5	4

Cutters can be altered to meet your requirements.



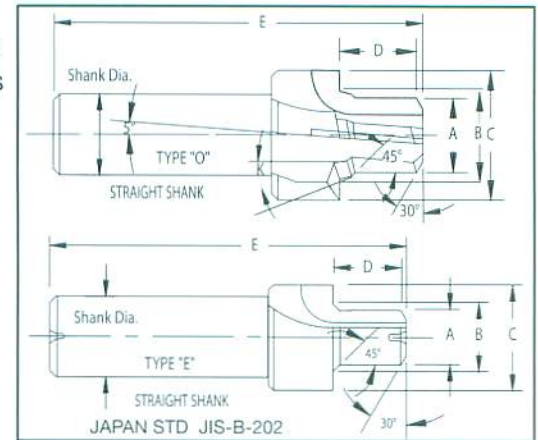
BRITISH STANDARD PARALLEL PIPE "G" STYLE BSPP

CARBIDE TIPPED STRAIGHT SHANK

BSPP Cutters will ream and chamfer in a pre-drilled or pre-cast hole for thread "G", and form in one pass the contour of Type "O" or Type "E" depending on the application and seal method selected. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING



"G" STYLE BSPP • TYPE "O" • O RING SEAL METHOD • CARBIDE TIPPED COOLANT THRU AVAILABLE

TOOL NUMBER	NOMINAL SIZE G	A SMALL DIA.	B CHAMFER DIA.	C SPOTFACE DIA.	D REAMER LENGTH	E OAL LENGTH	SHANK DIMENSIONS		K ANGLE
							DIAMETER	LENGTH	
BS012-TG0	1/8	.343	.459	.709	.590	3-3/16	.500	2.0	12
BS025-TG0	1/4	.460	.616	.945	.708	3-1/2	.500	2.0	12
BS037-TG0	3/8	.598	.734	1.102	.708	3-1/2	.500	2.0	12
BS050-TG0	1/2	.745	.890	1.339	.945	3-11/16	.750	2.0	15
BS075-TG0	3/4	.962	1.175	1.716	.984	4-1/4	.750	2.0	15
BS100-TG0	1	1.206	1.411	2.008	1.181	4-1/4	.750	2.0	15
BS125-TG0	1-1/4	1.547	1.766	2.441	1.181	5	1.000	2.5	15
BS150-TG0	1-1/2	1.779	2.002	2.677	1.181	5-1/8	1.000	2.5	15

"G" STYLE BSPP • TYPE "E" • EDGE SEAL METHOD • CARBIDE TIPPED COOLANT THRU AVAILABLE

TOOL NUMBER	NOMINAL SIZE G	A SMALL DIA.	B CHAMFER DIA.	C SPOTFACE DIA.	D REAMER LENGTH	E OAL LENGTH	SHANK DIMENSIONS		NO. OF FLUTES
							DIAMETER	LENGTH	
BS012-TGE	1/8	.343	.400	.591	.590	3-3/16	.500	2.0	3
BS025-TGE	1/4	.460	.535	.748	.708	3-1/2	.500	2.0	3
BS037-TGE	3/8	.598	.676	.906	.708	3-1/2	.500	2.0	3
BS050-TGE	1/2	.745	.845	1.063	.945	3-11/16	.750	2.0	3
BS075-TGE	3/4	.962	1.065	1.299	.984	4-1/4	.750	2.0	3
BS100-TGE	1	1.206	1.335	1.575	1.181	4-1/4	.750	2.0	3
BS125-TGE	1-1/4	1.547	1.675	1.968	1.181	5	1.000	2.5	4
BS150-TGE	1-1/2	1.779	1.906	2.205	1.181	5-1/8	1.000	2.5	4

Cutters can be altered to meet your requirements.

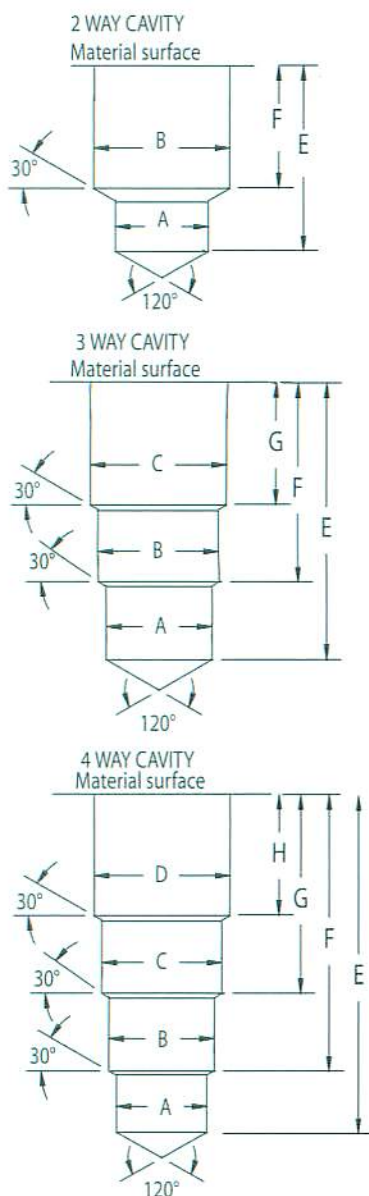


CARTRIDGE VALVE CUTTERS

#8 CAVITIES

2 WAY, 3 WAY, AND 4 WAY CAVITIES

**HIGH SPEED STEEL
ROUGHING DRILLS**



2 Way, 3 Way, and 4 Way rough drills rough the complete cavity in one pass from solid or in pre-drilled or pre-cast holes leaving .030 stock on diameters and steps for finishing tool. Cutters are heat-treated for toughness and durability. All grinding is done between centers to insure concentricity. Cutters are full form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

SERIES #08 CAVITY TOOLING				
3/4-16 UNF-2B THREAD				
DIAMETER TOLERANCES +/- .001				
2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.471	E 1.156	HSS Rough Drill	CT08-2R
Dia. B	.658	F .720		
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.533	E 1.708	HSS Rough Drill	CT08-3R
Dia. B	.596	F 1.240		
Dia. C	.658	G .688		
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.471	E 2.210	HSS Rough Drill	CT08-4R
Dia. B	.533	F 1.800		
Dia. C	.596	G 1.240		
Dia. D	.658	H .688		
All Diameters are .030 Under Finish Sizes				
Cutters are manufactured with a .625 Dia. shank, 2 long				



SERIES #08, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL or
CARBIDE TIPPED

Cartridge valve cutters



2 Way, 3 Way and 4 Way Port Cutters finish the complete cavity form in one pass in pre-drilled or precast holes. Sizes the minor thread diameter per Class 2B thread specifications. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity and are full form relieved for ease of sharpening. Cutters are available in High Speed Steel or Carbide Tipped. Metric sizes available upon request.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

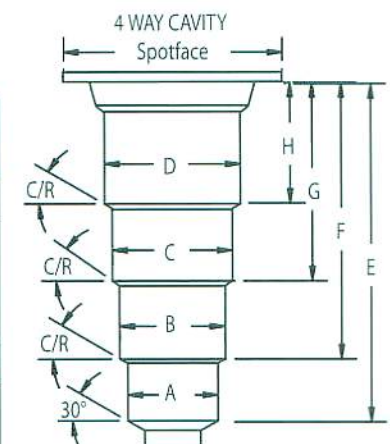
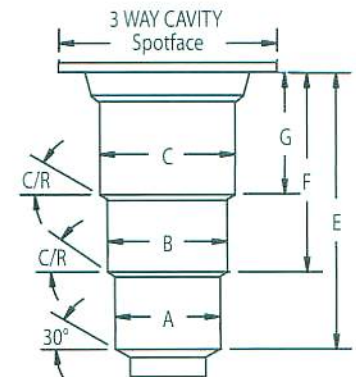
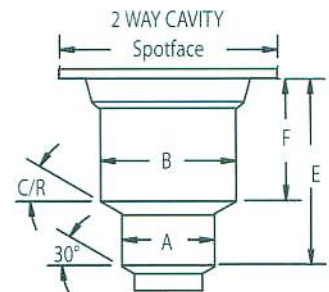
SERIES #08 CAVITY TOOLING 3/4-16 UNF-2B THREAD

DIAMETER TOLERANCES +/- .0005

2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.501	E 1.156	HSS Form Tool	CT08-2H
Dia. B	.688	F .750	TCT Form Tool	CT08-2T
SF Dia	1.188		HSS Rough Drill	CT08-2R
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.563	E 1.708	HSS Form Tool	CT08-3H
Dia. B	.626	F 1.270	TCT Form Tool	CT08-3T
Dia. C	.688	G .718	HSS Rough Drill	CT08-3R
SF Dia	1.188			
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.501	E 2.210	HSS Form Tool	CT08-4H
Dia. B	.563	F 1.830	TCT Form Tool	CT08-4T
Dia. C	.626	G 1.270	HSS Rough Drill	CT08-4R
Dia. D	.688	H .718		
SF Dia.	1.188			

M7-HSS Roughing Drills Available—See page 26

Cutters are manufactured with a .750 Dia. shank, 2-3/4 long

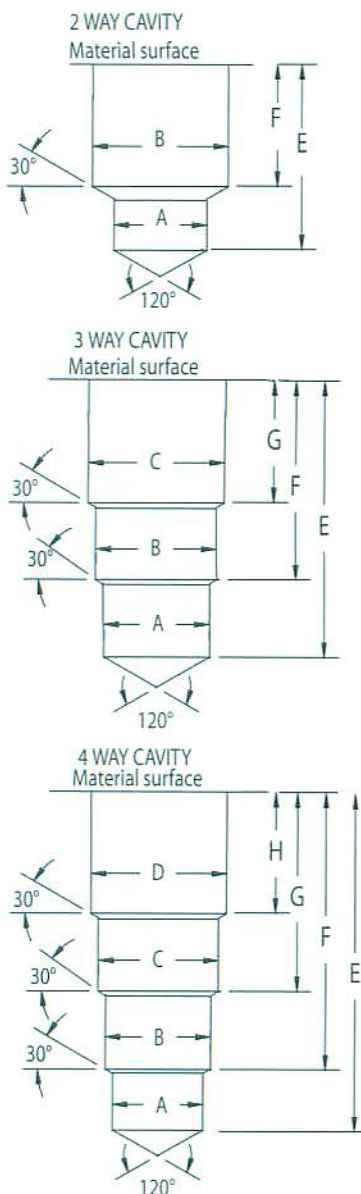


CARTRIDGE VALVE CUTTERS

#10 CAVITIES

2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL
ROUGHING DRILLS



2 Way, 3 Way, and 4 Way rough drills rough the complete cavity in one pass from solid or in pre-drilled or pre-cast holes leaving .030 stock on diameters and steps for finishing tool. Cutters are heat-treated for toughness and durability. All grinding is done between centers to insure concentricity. Cutters are full form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

SERIES #10 CAVITY TOOLING ROUGHING DRILL				
7/8-14 UNF-2B THREAD			DIAMETER TOLERANCES +/- .001	
2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.596	E 1.312	HSS Rough Drill	CT10-2R
Dia. B	.782	F .902		
S 3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.659	E 1.875	HSS Rough Drill	CT10-S3R
Dia. B	.720	F 1.485		
Dia. C	.782	G .620		
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.596	E 1.875	HSS Rough Drill	CT10-3R
Dia. B	.659	F 1.470		
Dia. C	.782	G .830		
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.596	E 2.500	HSS Rough Drill	CT10-4R
Dia. B	.659	F 2.095		
Dia. C	.721	G 1.470		
Dia. D	.782	H .840		

All Diameters are .030 Under Finish Sizes
Cutters are manufactured with a .750 Dia. shank, 2 long



CARTRIDGE VALVE CUTTERS SERIES #10, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL or
CARBIDE TIPPED



2 Way, 3 Way and 4 Way Port Cutters finish the complete cavity form in one pass in pre-drilled or precast holes. Sizes the minor thread diameter per Class 2B thread specifications. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity and are full form relieved for ease of sharpening. Cutters are available in High Speed Steel or Carbide Tipped. Metric sizes available upon request.

COATINGS AVAILABLE

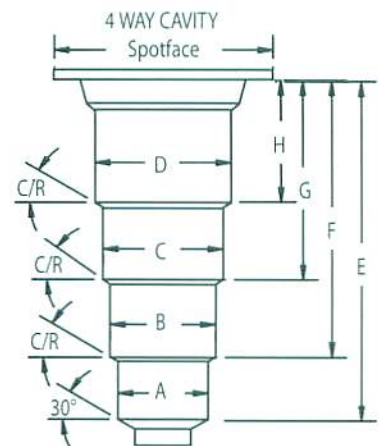
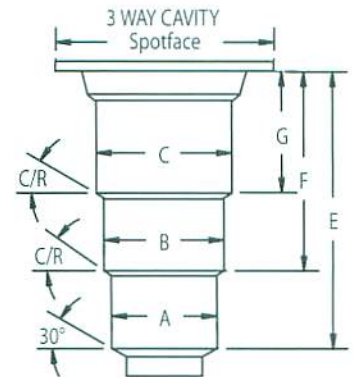
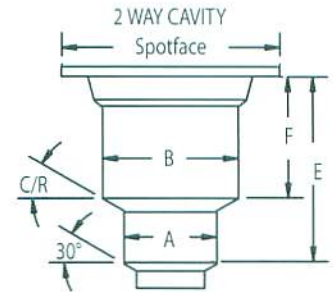
TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

SERIES #10 CAVITY TOOLING 7/8-14 UNF-2B THREAD				
DIAMETER TOLERANCES +/- .0005				
2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.626	E 1.312	HSS Form Tool	CT10-2H
Dia. B	.812	F .932	TCT Form Tool	CT10-2T
SF Dia.	1.188		HSS Rough Drill	CT10-2R
S 3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.688	E 1.875	HSS Form Tool	CT10-S3-H
Dia. B	.750	F 1.515	TCT Form Tool	CT10-S3-T
Dia. C	.812	G .650	HSS Rough Drill	CT10-S3-R
SF Dia.	1.188			
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.626	E 1.875	HSS Form Tool	CT10-3H
Dia. B	.688	F 1.500	TCT Form Tool	CT10-3T
Dia. C	.812	G .860	HSS Rough Drill	CT10-3R
SF Dia.	1.188			
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.626	E 2.500	HSS Form Tool	CT10-4H
Dia. B	.688	F 2.125	TCT Form Tool	CT10-4T
Dia. C	.751	G 1.500	HSS Rough Drill	CT10-4R
Dia. D	.812	H .870		
SF Dia.	1.188			

M7-HSS Roughing Drills Available-See page 28

Cutters are manufactured with a .750 Dia. shank, 2-3/4 long

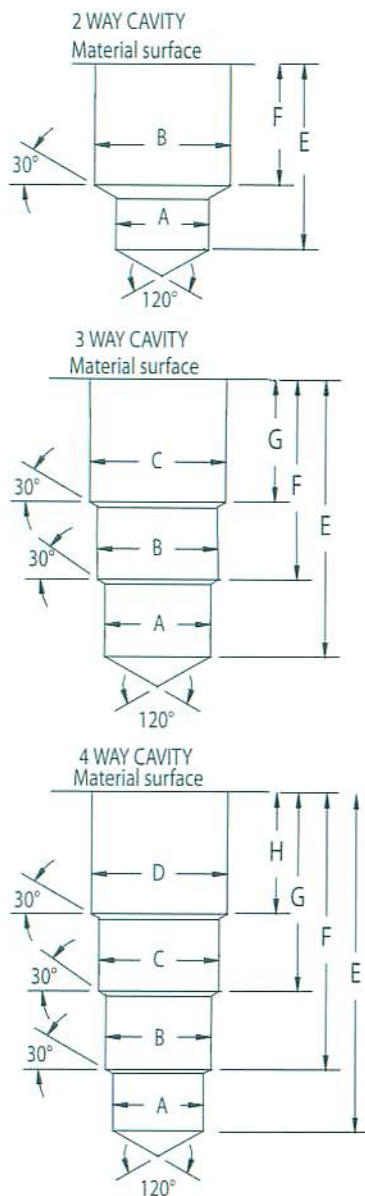


CARTRIDGE VALVE CUTTERS

#12 CAVITIES

2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL ROUGHING DRILLS



2 Way, 3 Way, and 4 Way rough drills rough the complete cavity in one pass from solid or in pre-drilled or pre-cast holes leaving .030 stock on diameters and steps for finishing tool. Cutters are heat-treated for toughness and durability. All grinding is done between centers to insure concentricity. Cutters are full form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

SERIES #12 CAVITY TOOLING ROUGHING DRILL				
1-1/16-12 UNF-2B THREAD			DIAMETER TOLERANCES +/- .001	
2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.846	E 1.920	HSS Rough Drill	CT12-2R
Dia. B	.945	F 1.370		
S 3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.797	E 2.447	HSS Rough Drill	CT12-S3R
Dia. B	.876	F 1.988		
Dia. C	.945	G 1.020		
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.846	E 2.890	HSS Rough Drill	CT12-3R
Dia. B	.908	F 2.340		
Dia. C	.945	G 1.370		
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.783	E 3.860	HSS Rough Drill	CT12-4R
Dia. B	.846	F 3.300		
Dia. C	.908	G 2.340		
Dia. D	.945	H 1.370		
All Diameters are .030 Under Finish Sizes				
Cutters are manufactured with a .750 Dia. shank, 2 long				



CARTRIDGE VALVE CUTTERS SERIES #12, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL or
CARBIDE TIPPED



2 Way, 3 Way and 4 Way Port Cutters finish the complete cavity form in one pass in pre-drilled or precast holes. Sizes the minor thread diameter per Class 2B thread specifications. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity and are full form relieved for ease of sharpening. Cutters are available in High Speed Steel or Carbide Tipped. Metric sizes available upon request.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

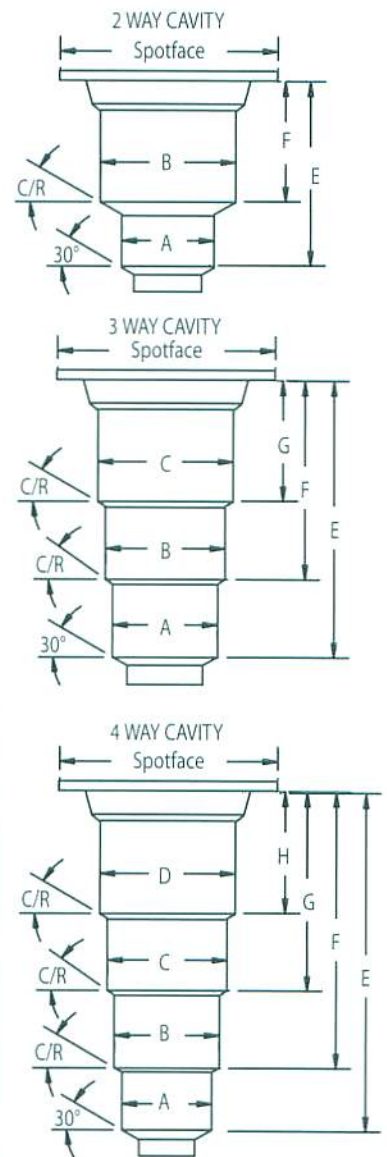
SERIES #12 CAVITY TOOLING 1-1/16-12 UNF-2B THREAD

DIAMETER TOLERANCES +/- .0005

2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.876	E 1.920	HSS Form Tool	CT12-2H
Dia. B	.975	F 1.400	TCT Form Tool	CT12-2T
SF Dia.	1.500		HSS Rough Drill	CT12-2R
S 3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.827	2.446	HSS Form Tool	CT12-S3H
Dia. B	.906	2.015	TCT Form Tool	CT12-S3T
Dia. C	.975	1.050	HSS Rough Drill	CT12-S3R
SF Dia.	1.500			
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.876	E 2.890	HSS Form Tool	CT12-3H
Dia. B	.938	F 2.370	TCT Form Tool	CT12-3T
Dia. C	.975	G 1.400	HSS Rough Drill	CT12-3R
SF Dia.	1.500			
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.813	E 3.860	HSS Form Tool	CT12-4H
Dia. B	.876	F 3.330	TCT Form Tool	CT12-4T
Dia. C	.938	G 2.370	HSS Rough Drill	CT12-4R
Dia. D	.975	H 1.400		
SF Dia.	1.500			

M7-HSS Roughing Drills Available-See page 30

Cutters are manufactured with a .750 Dia. shank, 2-3/4 long



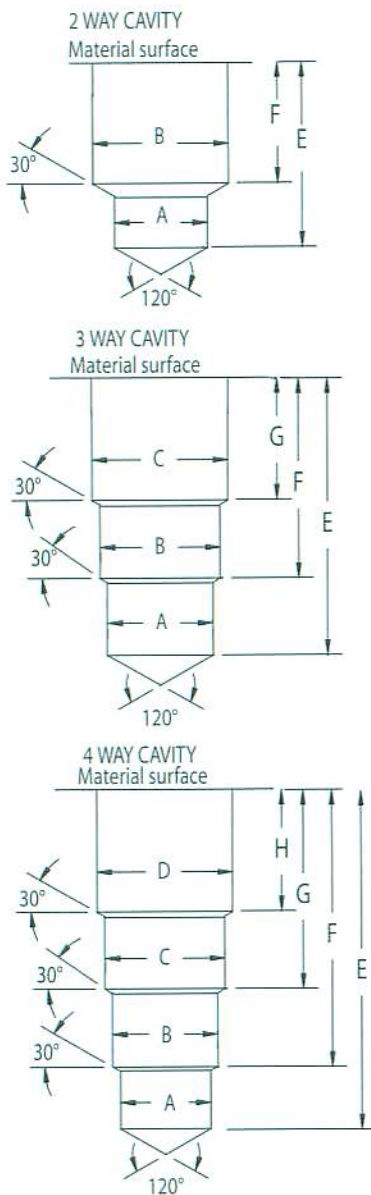
CARTRIDGE VALVE CUTTERS

#16 CAVITIES

2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL

ROUGHING DRILLS



2 Way, 3 Way, and 4 Way rough drills rough the complete cavity in one pass from solid or in pre-drilled or pre-cast holes leaving .030 stock on diameters and steps for finishing tool. Cutters are heat-treated for toughness and durability. All grinding is done between centers to insure concentricity. Cutters are full form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

SERIES #16 CAVITY TOOLING ROUGHING DRILL

1-5/16-12 UNF-2B THREAD

DIAMETER TOLERANCES +/- .001

2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.097	E 1.844	HSS Rough Drill	CT16-2R
Dia. B	1.204	F 1.314		
S 3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.971	E 2.188	HSS Rough Drill	CT16-S3R
Dia. B	1.096	F 1.782		
Dia. C	1.204	G .782		
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.033	E 2.968	HSS Rough Drill	CT16-3R
Dia. B	1.097	F 2.439		
Dia. C	1.204	G 1.314		
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	.972	E 4.094	HSS Rough Drill	CT16-4R
Dia. B	1.034	F 3.564		
Dia. C	1.097	G 2.439		
Dia. D	1.204	H 1.314		

All Diameters are .030 Under Finish Sizes

Cutters are manufactured with a .750 Dia. shank, 2 long



CARTRIDGE VALVE CUTTERS SERIES #16, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL or
CARBIDE TIPPED



2 Way, 3 Way and 4 Way Port Cutters finish the complete cavity form in one pass in pre-drilled or precast holes. Sizes the minor thread diameter per Class 2B thread specifications. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity and are full form relieved for ease of sharpening. Cutters are available in High Speed Steel or Carbide Tipped. Metric sizes available upon request.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

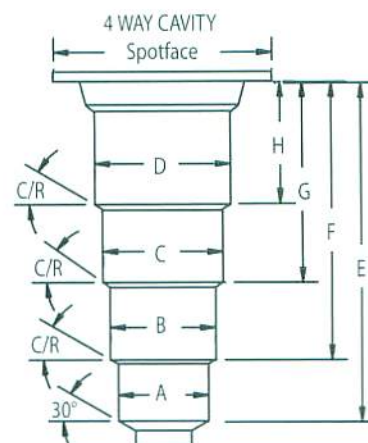
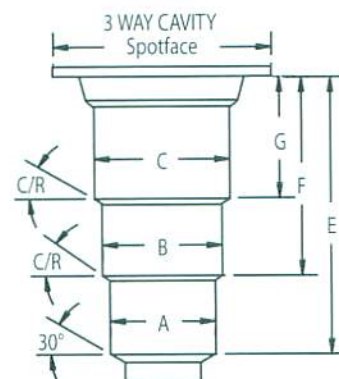
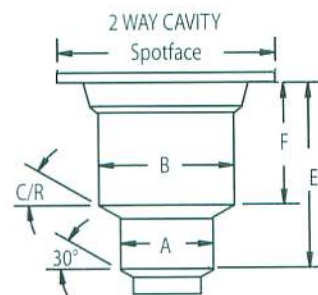
SERIES #16 CAVITY TOOLING 1-5/16-12 UNF-2B THREAD

DIAMETER TOLERANCES +/- .0005

2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.126	E 1.844	HSS Form Tool	CT16-2H
Dia. B	1.234	F 1.344	TCT Form Tool	CT16-2T
SF Dia.	1.750		HSS Rough Drill	CT16-2R
S 3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.001	E 2.188	HSS Form Tool	CT16-S3H
Dia. B	1.126	F 1.812	TCT Form Tool	CT16-S3T
Dia. C	1.234	G .812	HSS Rough Drill	CT16-S3R
SF Dia.	1.750			
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.063	E 2.968	HSS Form Tool	CT16-3H
Dia. B	1.126	F 2.469	TCT Form Tool	CT16-3T
Dia. C	1.234	G 1.344	HSS Rough Drill	CT16-3R
SF Dia.	1.750			
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.001	E 4.094	HSS Form Tool	CT16-4H
Dia. B	1.063	F 3.594	TCT Form Tool	CT16-4T
Dia. C	1.126	G 2.469	HSS Rough Drill	CT16-4R
Dia. D	1.234	H 1.344		
SF Dia.	1.750			

M7-HSS Roughing Drills Available-See page 32

Cutters are manufactured with a .750 Dia. shank, 2-3/4 long

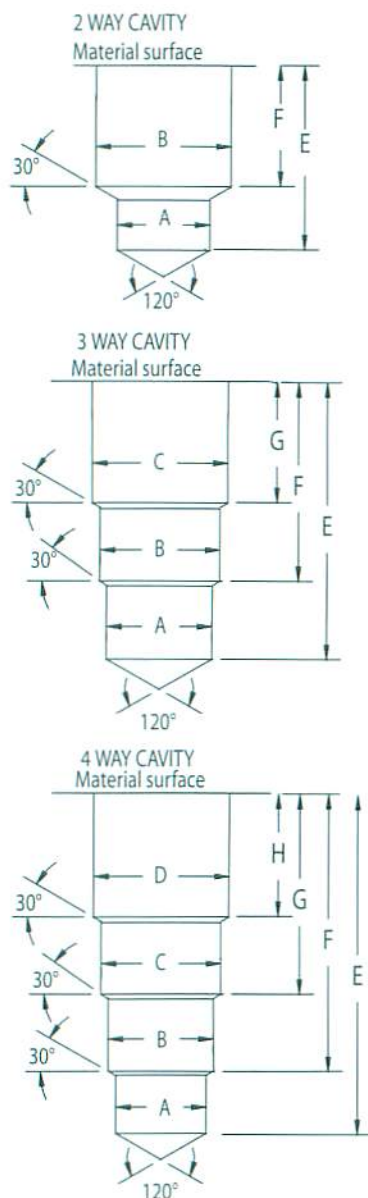


CARTRIDGE VALVE CUTTERS

#20 CAVITIES

2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL
ROUGHING DRILLS



2 Way, 3 Way, and 4 Way rough drills rough the complete cavity in one pass from solid or in pre-drilled or pre-cast holes leaving .030 stock on diameters and steps for finishing tool. Cutters are heat-treated for toughness and durability. All grinding is done between centers to insure concentricity. Cutters are full form relieved for ease of sharpening.



COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTIN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

SERIES #20 CAVITY TOOLING ROUGHING DRILL

1-5/8-12 UNF-2B THREAD

DIAMETER TOLERANCES +/- .001

2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.409	E 2.312	HSS Rough Drill	CT20-2R
Dia. B	1.510	F 1.720		
S 3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.283	E 3.062	HSS Rough Drill	CT20-S3R
Dia. B	1.408	F 2.501		
Dia. C	1.510	G .938		
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.284	E 3.938	HSS Rough Drill	CT20-3R
Dia. B	1.409	F 3.345		
Dia. C	1.510	G 1.720		
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.221	E 5.562	HSS Rough Drill	CT20-4R
Dia. B	1.284	F 4.970		
Dia. C	1.409	G 3.345		
Dia. D	1.510	H 1.720		

All Diameters are .030 Under Finish Sizes

Cutters are manufactured with a 1.000 Dia. shank, 2-1/2 long



CARTRIDGE VALVE CUTTERS SERIES #20, CAVITIES 2 WAY, 3 WAY, AND 4 WAY CAVITIES

HIGH SPEED STEEL or
CARBIDE TIPPED



2 Way, 3 Way and 4 Way Port Cutters finish the complete cavity form in one pass in pre-drilled or precast holes. Sizes the minor thread diameter per Class 2B thread specifications. Cutters are heat treated for toughness and durability. All grinding is done between centers to insure concentricity and are full form relieved for ease of sharpening. Cutters are available in High Speed Steel or Carbide Tipped. Metric sizes available upon request.

COATINGS AVAILABLE

TITANIUM NITRIDE-TIN
TITANIUM CARBONITRIDE-TICN
TITANIUM ALUMINUM NITRIDE-TIALN
AL TITANIUM NITRIDE-ALTiN
MICRO BLUE COATING

COOLANT THRU AVAILABLE

SERIES #20 CAVITY TOOLING

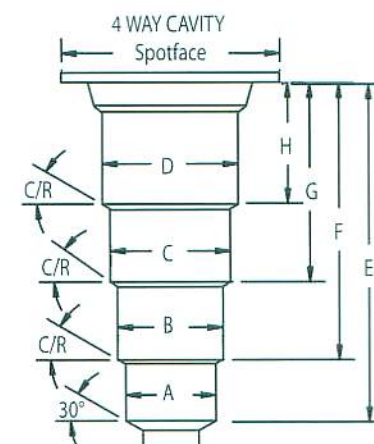
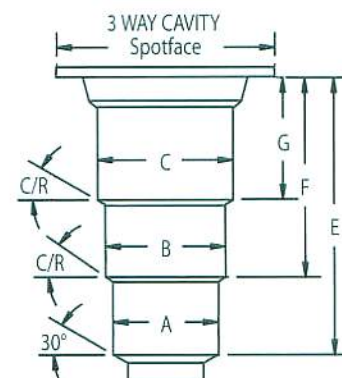
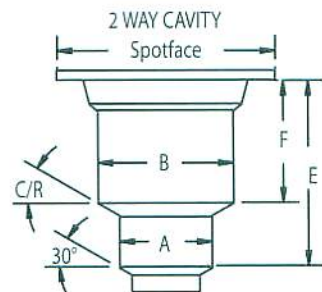
1-5/8-12 UNF-2B THREAD

DIAMETER TOLERANCES +/- .0005

2 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.439	E 2.312	HSS Form Tool	CT20-2H
Dia. B	1.540	F 1.750	TCT Form Tool	CT20-2T
SF Dia.	2.270		HSS Rough Drill	CT20-2R
S 3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.313	E 3.062	HSS Form Tool	CT20-S3H
Dia. B	1.438	F 2.531	TCT Form Tool	CT20-S3T
Dia. C	1.540	G .938	HSS Rough Drill	CT20-S3R
SF Dia.	2.270			
3 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.314	E 3.938	HSS Form Tool	CT20-3H
Dia. B	1.439	F 3.375	TCT Form Tool	CT20-3T
Dia. C	1.540	G 1.750	HSS Rough Drill	CT20-3R
SF Dia.	2.270			
4 WAY	DIA.	LENGTH	DESCRIPTION	TOOL NUMBER
Dia. A	1.251	E 5.562	HSS Form Tool	CT20-4H
Dia. B	1.314	F 5.000	TCT Form Tool	CT20-4T
Dia. C	1.439	G 3.375	HSS Rough Drill	CT20-4R
Dia. D	1.540	H 1.750		
SF Dia.	2.270			

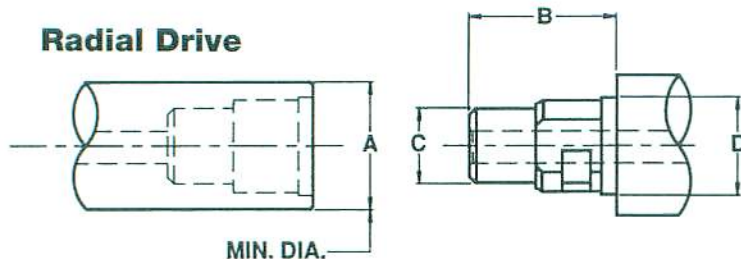
M7-HSS Roughing Drills Available—See page 34

Cutters are manufactured with a 1.00 Dia. shank, 2-3/4 long



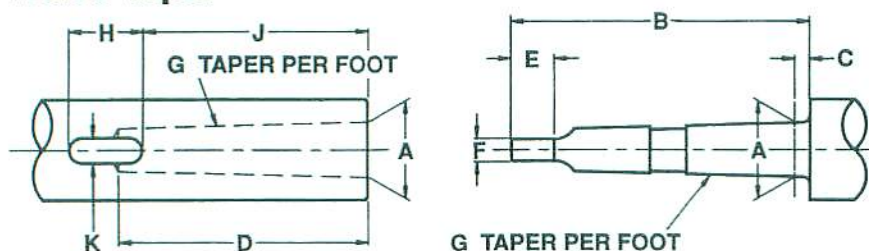
OTHER SHANK STYLES

Radial Drive



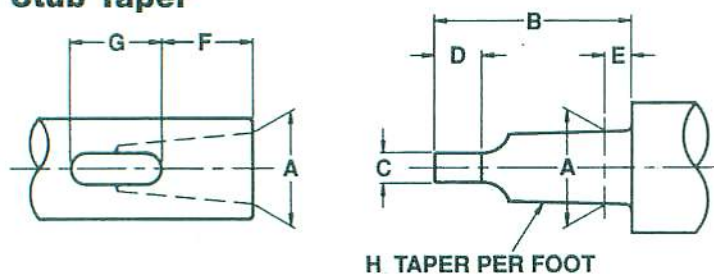
Drive No.	A	B	C	D
RA	.7500	.938	.3750	.5000
RB	.8750	1.375	.4375	.6250
RC	1.0625	1.375	.5625	.7500
RE	1.3750	1.500	.7500	1.0000
RF	1.5000	1.563	.8125	1.1250
RJ	2.0000	1.563	1.0000	1.3750
RS	2.7500	1.625	1.3750	1.7500

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

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



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Form Relief Tool Co., Inc. does not give any warranty on any of its products, except as follows: Form Relief Tool Co. Inc., warrants each new product manufactured and sold by Form Relief Tool Co., Inc. or one of our authorized distributors against defective materials and workmanship. Form Relief Tool Co., Inc.'s only obligation is limited to the repair or replacement of a defective product, without extra charge. At our discretion, we may refund the purchase price of a defective product which shall within one year from date of sale by Form Relief Tool Co., Inc. be returned freight prepaid, to Form Relief Tool Co., Inc. and which upon inspection is determined by Form Relief Tool Co., Inc. to be defective in materials or workmanship. This warranty does not cover products that are damaged as a result of negligence or misuse including improper operating conditions and machine set-up or application of cutting fluid or any items that have been repaired or altered. This warranty excludes all other warranties, expressed or implied, including any implied warranties of merchant ability or fitness for a particular purpose. Form Relief Tool Co., Inc., shall have no liability or responsibility on any claim of any kind, whether in contract, tort or otherwise, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery or use of any product sold hereunder, in excess of the cost of replacement or repair provided herein. In no event shall Form Relief Tool Co., Inc. be liable for any special incidental or consequential damages of any nature. No other warranty, either expressed or implied, exists beyond that included above.

James L. Mary

Owner-Form Relief Tool Co., Inc.

RETURN POLICY

Returned products must be accompanied by a Form Relief Tool Co., Inc. authorized Returned Goods Authorization number (RGA). Warranty claims should be made through the distributor from whom the product was purchased. Distributors may call Form Relief Tool Co., Inc. for an RGA number. Returned goods may be subject to a restocking fee. Special, modified, non-catalog or altered tools are not acceptable for return.

WARNING: Because cutting tools may shatter or break, government regulations require the use of safety glasses and other safety equipment at all times in the vicinity of cutting tool use. Grinding of carbide tipped tools will produce carbide and braze dust that may be hazardous to your health. Use adequate ventilation and read the applicable "Material Safety Data Sheets". Cutting tools have sharp edges. Use caution while handling cutting tools to avoid injury.



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