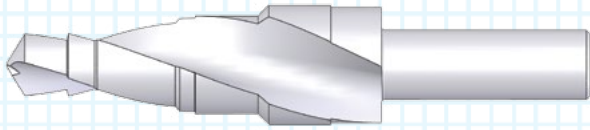
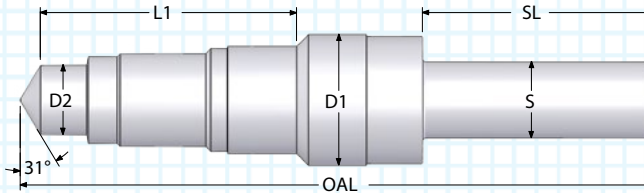


SUN HYDRAULIC CARTRIDGE VALVE TOOLS HIGH SPEED STEEL ROUGHING STEP DRILLS



- Precision ground for maximum concentricity
- Prepares cavity for finish tool

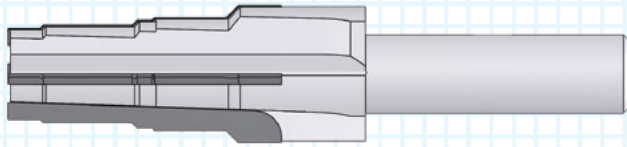


This illustration shows the largest and smallest diameter.
Visit website www.sct-usa.com for more details.

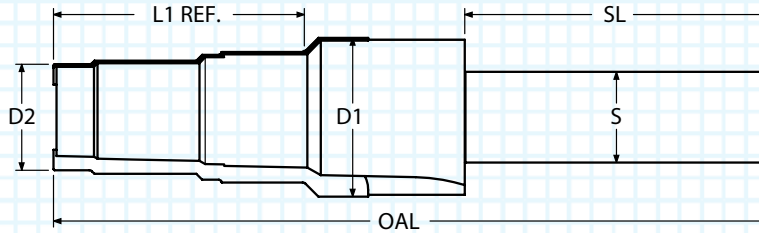
D1	D2	L1	S	SL	OAL	FLUTES	THREAD	ORDER #	
								UNCOATED	COATED
1.285	0.686	2.517	0.750	2.400	6.40	2	1.0-14UNS-2B	T-2A-DRILL	T-2A-DRILL-A
1.312	0.876	2.382	0.750	2.400	6.40	2	1.0-14UNS-2B	T-3A-DRILL	T-3A-DRILL-A
1.312	0.876	2.147	0.750	2.400	6.40	2	1.0-14UNS-2B	T-5A-DRILL	T-5A-DRILL-A
0.980	0.688	2.018	0.750	2.400	6.40	2	M20X1.5-6H	T-10A-DRILL	T-10A-DRILL-A
0.980	0.688	2.322	0.750	2.400	6.40	2	M20X1.5-6H	T-11A-DRILL	T-11A-DRILL-A
0.980	0.688	1.858	0.750	2.400	6.40	2	M20X1.5-6H	T-13A-DRILL	T-13A-DRILL-A
1.500	1.251	2.377	0.750	2.400	6.50	2	M36X2.0-6H	T-16A-DRILL	T-16A-DRILL-A
0.978	0.529	2.780	0.750	2.400	6.80	2	M20X1.5-6H	T-21A-DRILL	T-21A-DRILL-A
1.125	0.405	1.804	0.750	2.400	6.40	2	M16X1.5-6H	T-162A-DRILL	T-162A-DRILL-A
1.125	0.405	2.143	0.750	2.400	6.40	2	M16X1.5-6H	T-163A-DRILL	T-163A-DRILL-A

SUN HYDRAULIC CARTRIDGE VALVE TOOLS

4 FLUTE FINISHER - CARBIDE TIPPED



- ALTiN+ coating for higher cutting speed
- Polished flute face for optimum performance
- Precision ground for maximum concentricity



This illustration shows the largest and smallest diameter.
Visit website www.sct-usa.com for more details.

D1	D2	L1	S	SL	OAL	FLUTES	THREAD	ORDER #	
								UNCOATED	COATED
1.312	0.876	2.073	0.750	2.50	5.88	4	1.0-14UNS-2B	T-2A-FINISH	T-2A-FINISH-A
1.079	0.876	1.885	0.750	2.25	5.38	4	1.0-14UNS-2B	T-3A-FINISH	T-3A-FINISH-A
1.079	0.876	1.635	0.750	2.25	5.13	4	1.0-14UNS-2B	T-5A-FINISH	T-5A-FINISH-A
0.704	0.438	0.752	0.500	2.00	4.00	4	M16X1.5-6H	T-8A-FINISH	T-8A-FINISH-A
1.000	0.688	1.726	0.750	2.25	5.25	4	M20X1.5-6H	T-10A-FINISH	T-10A-FINISH-A
1.000	0.688	2.036	0.750	2.25	5.50	4	M20X1.5-6H	T-11A-FINISH	T-11A-FINISH-A
1.000	0.688	1.539	0.750	2.25	5.00	4	M20X1.5-6H	T-13A-FINISH	T-13A-FINISH-A
1.563	1.251	2.448	1.000	2.25	6.00	4	M36X2.0-6H	T-16A-FINISH	T-16A-FINISH-A
1.750	1.251	2.697	1.000	2.50	6.50	4	M36X2.0-6H	T-17A-FINISH	T-17A-FINISH-A
1.000	0.688	2.539	0.750	2.25	6.00	4	M20X1.5-6H	T-21A-FINISH	T-21A-FINISH-A
0.938	0.516	1.377	0.750	2.25	4.88	4	M16X1.5-6H	T-162A-FINISH	T-162A-FINISH-A
0.938	0.516	1.800	0.750	2.25	5.25	4	M16X1.5-6H	T-163A-FINISH	T-163A-FINISH-A

THREAD MILLS

SINGLE POINT

INDEXABLE TOOLS

Cavity Tools

SPECIALTY

PORT AND CAVITY TOOL TECHNICAL INFORMATION

MATERIAL	HB/Rc	SPEED (SFM)		CUTTING CONDITIONS	
		UNCOATED	ALTiN+	INFEEED PER FLUTE REAM	INFEEED PER FLUTE SPOT FACE
CAST IRON	130 HB	75-210	200-450	.001-.0025	.0008-.0020
CARBON STEEL	18 Rc	125-190	190-400	.001-.0030	.001-.0020
ALLOY STEEL	20 Rc	70-135	130-350	.001-.0030	.0008-.0020
TOOL STEEL	25 Rc	75-100	100-220	.001-.0025	.0005-.0020
300 STAINLESS STEEL	150 HB	90-100	100-230	.001-.0020	.0007-.0015
400 STAINLESS STEEL	195 HB	90-135	135-300	.001-.0020	.0005-.0015
HIGH TEMP ALLOY (NICKEL & COBALT BASE)	20 Rc	30-125	100-150	.0008-.0015	.0005-.0010
TITANIUM	25 Rc	50-100	100-140	.001-.0020	.0005-.0010
HEAT TREATED ALLOYS (38-45Rc)	40 Rc	50-75	75-130	.0008-.0015	.0005-.0010
ALUMINUM	100 HB	850-1000	800-1500	.002-.0040	.0010-.0030
BRASS, ZINC	80 HB	750-950	800-1200	.002-.0040	.0010-.0030

SFM = Surface Feet per Minute
 RPM = SFM x 3.82 divided by tool diameter

Starting parameters only. Setup and machine rigidity may affect performance.

PROBLEM	CAUSE	SOLUTION
RAPID FLANK WEAR	CUTTING CONDITIONS	Check for excessive speed and feed - see chart.
	TOOL	Select a coated tool.
	PROGRAM	Remove dwell from program at end of cut.
BUILT-UP EDGE	TOOL	Select a coated tool. The coating will resist built-up edges.
	HEAT	Use coolant through port tool. If coolant is not available, use shop air and a coated tool.
SURFACE TORN	TOOL	Use a coated tool. On most carbon steels, an uncoated tool will not produce an acceptable finish.
CHATTER	TOOL	Hone cutting edge of spot face. Use Coated Tool. Increase chip load.
LIGHT CHATTER	PROGRAM	Increase speed by 15-20%. A faster speed reduces forces. A dwell typically will not remove chatter.
POOR TOOL LIFE	AMOUNT OF STOCK	Rough port to 0.97 inch of finish size.
	PART	Make sure prior operation did not work harden the material.

SAMPLE PROGRAM FOR MAXIMUM PRODUCTIVITY

N51 (Sample Port Tool Program: MS33649-4RA (ALTiN+) cutting Carbon Steel

T51 M06	Select Tool
S2916 M03	SFM = 300 ; RPM = 300 x 3.82 / Reamer Diameter
G00 G90 G54 X0. Y0.	RPM = 300 X 3.82 / 0.393
G43 H51 Z0.1 M08	RPM = 2916
G01 Z-0.6 F23.3	Feed Rate = RPM x 0.002 x 4 (Number of Flutes)
S1290 M03	RPM = 300 x 3.82 / 0.888 (Spot Face Diameter)
G04 P1.	Dwell to slow down spindle
G01 Z-.73 F10.3	Feed rate = RPM x 0.002 x 4 (Number of Flutes)
G00 Z5. M09	