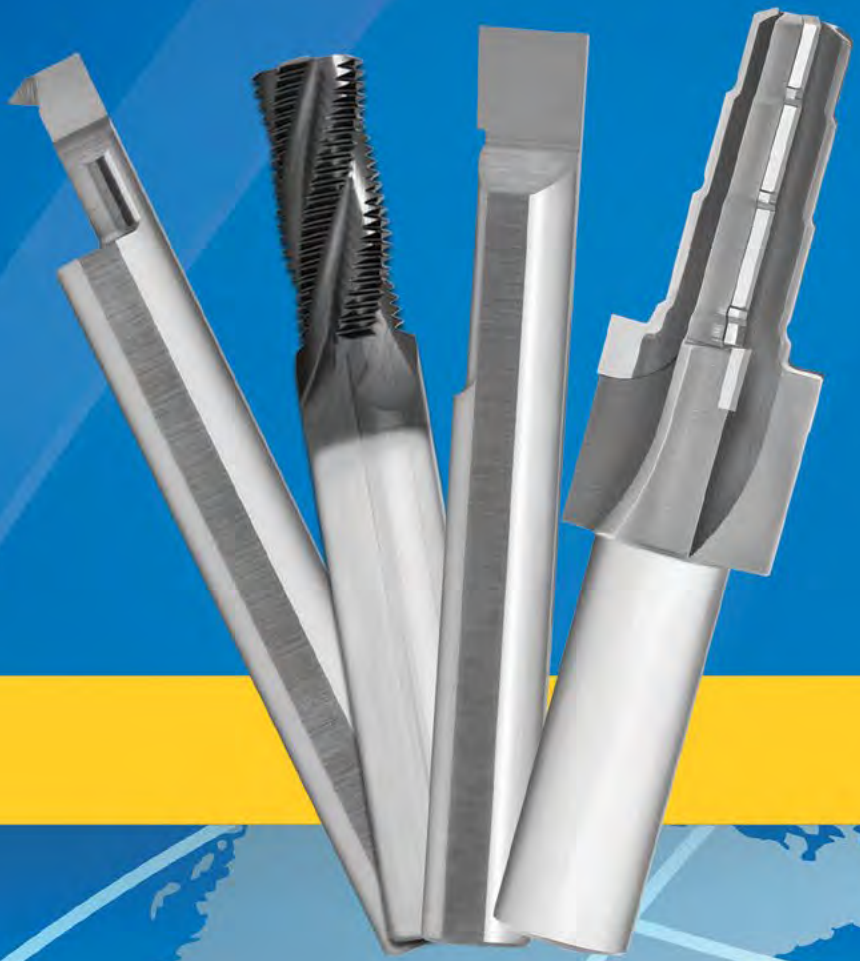
SCT

SCIENTIFIC CUTTING TOOLS

THE CUTTING EDGE



FEATURING
NEW COOLANT THROUGH AND CAVITY TOOLS

A Legacy of Excellence

People Making the Difference

Scientific Cutting Tools, Inc. was established as an innovative cutting tool manufacturer based upon the simple marketing concept of providing customers with superior products, competitive prices, and uncompromising customer service. SCT entered the cutting tool manufacturing field with innovative cutting tool design, an inspired ambition to succeed, and one driving goal—to deliver unprecedented value to our customers.

Over the years, SCT has developed new tool lines and refined existing product groups. Through aggressive research and development, SCT has the capability of developing specialized tools for specific customer projects, as well as the ability to modify existing stock tools to meet individual customer needs.

Although 53 years have passed since SCT first opened its doors, our fundamental reasons for being in business have remained the same as those originally established by company founder Stan Christopher. Our commitment to quality control, unparalleled craftsmanship, and customer satisfaction continue to set us above the competition.

Adopting a company philosophy of "pride in our people means pride in workmanship," has proven to be the spark to ignite our ability to provide the best value in the industry. SCT's team of specially trained machinists, operators, engineers, and even our customer service team all take pride in dedication to their craft and producing the highest quality goods for our customers. SCT has an excellent reputation as a manufacturer of an extensive line of cutting tools including thread mills, port tools, cavity tools, indexable and solid carbide boring bars, threading tools, grooving tools, and more. We stock coated (ALTiN+) and uncoated versions of our products and all carbide used in our processes must pass stringent quality tests. Despite its higher cost, SCT purchases exclusively premium grade submicron carbide because it produces a tough, long-lasting surface that resists chipping and cracking while maintaining superior abrasion resistance. SCT's commitment to only working with the latest CNC tool and cutter grinders, vertical machining centers, and turning centers as well as dedicated employees using forward-thinking technology has allowed us to produce top-end cutting tools using quality materials at competitive market prices.

Scientific Cutting Tools will continue to position itself to be the cutting edge of tomorrow's product design while still offering competitively priced products. The goal of delivering superior quality tools backed by 100% customer satisfaction is SCT's guarantee.

Press Here to Search

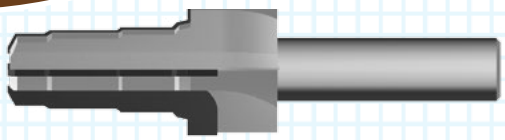
Table of Contents

Our tool sections are color coded for your convenience.

Our new and improved catalog features brand new products, extended sizes, and helpful technical charts. See next page for new products.

NEW PRODUCT AND SIZES OVERVIEW

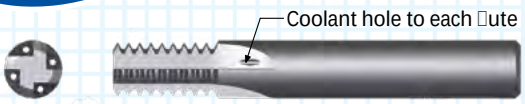
New Product: Parker Common Cavity Port Tool



Parker Common Cavity Tool (Page 123)

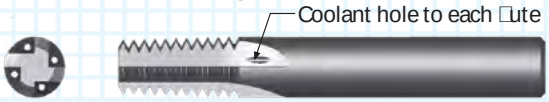
- Available in 2, 3, and 4 way cavities
- Carbide tipped roughing tools
- Carbide tipped finishing tools

New Coolant Through



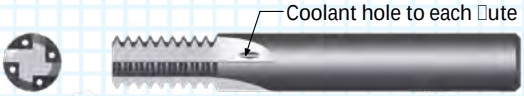
Straight Flute Thread Mills UN (Pages 14-15)

- Available in a large variety of sizes
- Crest cutting for internal tools



NPT Thread Mill (Page 20)

- Straight, helical, and staggered tooth designs
- For internal and external threads



Straight Flute Thread Mills Metric (Page 30)

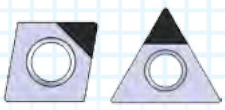
- Available in a large variety of sizes
- Crest cutting for internal tools

New 3/8 Indexable Bar

3/8 Bar for Diamond-Shaped Insert (Page 92)

- Available for left or right hand bars
- PCD and CBN insert options

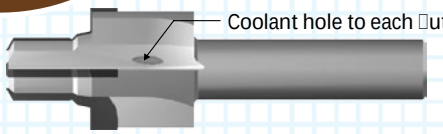
New Insert Options



CBN and PCD Tipped Inserts (Pages 87-97)

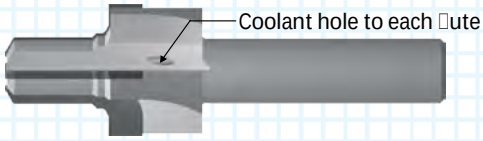
- PCD for abrasive non-ferrous materials
- CBN for hardened steels over 45RC

New Coolant Through



MS16142-R Port Tool (Page 106)

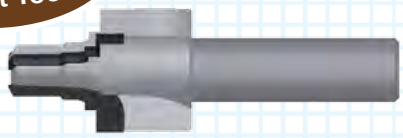
- Also called O-Ring Boss, or SAE (dash number)
- Cuts minor-thread diameter



MS33649-R Port Tool (Page 109)

- Also called AS5202.
- Cuts the minor-thread diameter

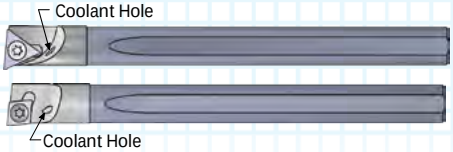
New RPTF Port Tool



RFPT Rosan Cavity Port Tool (Page 117)

- Meets requirements of PS10035 and AS1300
- Meets requirements of AS4201 and 6M152

New Coolant Through



Indexable Insert Bars (Pages 87-97)

- Available for left or right hand bars
- For both diamond and triangle bars

New Online Tool

Details on the SCT Thread Mill Code Generator can be found on page 7. Visit WWW.SCT-USA.COM to try the new feature.

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www.sct-usa.com sales@sct-usa.com
(805) 584-9495 Fax: (805) 584-9629
(800) 383-2244 Fax: (888) 728-3295

SCT

THREAD MILLS

Helical Flute
TMLR
SPTM
Straight Flute
Staggered Tooth
Coolant Through

THREAD MILLS - PRODUCT OVERVIEW

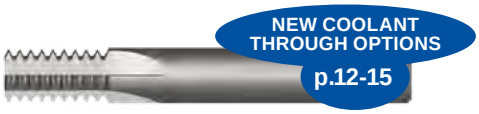
Thread mills cut a thread using helical interpolation. Helical interpolation involves moving three axes simultaneously. The X and Y axes move in a circular motion while the Z axis moves in a linear motion. This allows the same thread mill to cut both right and left-hand threads and to produce a variety of thread sizes of the same pitch. All thread mills are made from premium submicron carbide and are stocked with and without an ALTiN+ coating. They are ground on state-of-the-art CNC tool-and-cutter grinders and have been engineered for high performance. Programming assistance is available. Technical information available on pages 34-42.

SPTM - UN

Single profile thread mills cut internal and external threads in a range of thread sizes with minimum side cutting pressure.

TMLR - UN

Long reach thread mills have three teeth and a helical flute that excel in internal deep threads and hard-to-cut materials.



STRAIGHT FLUTE - UN

Straight flute thread mills come in a large variety of sizes and are crest cutting for internal threads only.

EXTERNAL - UNJ

These straight flute thread mills have the root radius that is required for the external "UNJ" thread.

STAGGERED TOOTH - UN

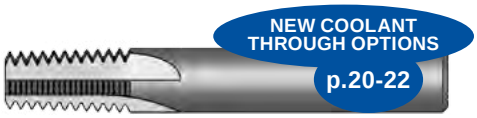
Staggered tooth thread mills cut internal and external threads. Every other tooth is removed in a staggered pattern for reduced side cutting pressure.

15º HELICAL FLUTE - UN

15° helical flute thread mills are non-crest cutting for internal threads only. The helical flutes distribute the side cutting pressure.

30º HELICAL FLUTE - UN

The 30° helical flute thread mills cut internal and external threads. The helical flutes distribute the side cutting pressure.



NPT / NPTF

NPT thread mills come in straight, helical and staggered tooth design. They cut both internal and external threads. NPTF are for dryseal applications.

BSPP / BSPT

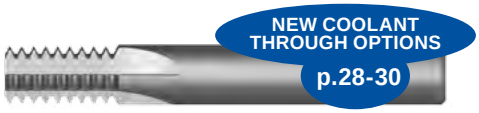
These straight flute thread mills have a 55° thread profile and cut the British Standard Pipe Parallel (BSPP) and the British Standard Pipe Taper (BSPT).

SPTM - METRIC

Single profile thread mills cut internal and external threads in a range of thread sizes with minimum side cutting pressure.

TMLR - METRIC

Long reach thread mills have three teeth and a helical flute that excel in internal deep threads and hard to cut materials.



STRAIGHT FLUTE - METRIC

Straight flute thread mills come in a large variety of sizes and are crest cutting for internal threads only.

15º HELICAL FLUTE - METRIC

15° helical flute thread mills are non-crest cutting for internal threads only. The helical flute distributes the side cutting pressure.

30º HELICAL FLUTE - METRIC

30° helical flute thread mills cut internal and external threads. The helical flute distributes side cutting pressure.

SPTM - ACME / STUB ACME

Acme thread mills come in both acme and stub acme configurations. Different tools are available to cut the internal and external threads.

THREAD MILL LOCATO.R CHART PAGES 34-39 THREAD MILL TECH INFORMATION PAGES 40-42

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www.sct-usa.com sales@sct-usa.com
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THREAD MILL CODE GENERATOR
FOR SCT THREAD MILLS

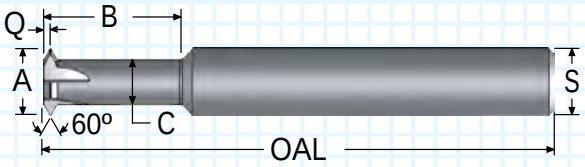
Save time with this convenient code generator!

- EASY TO USE
- QUICK INPUT FIELDS
- CONVENIENT FOR GENERATING CODES
- SPECIFICALLY CREATED FOR SCT TOOLS
- FANUC AND FANUC COMPATIBLE CONTROLS
- GENERATES CODES FOR ID AND OD THREADS

AVAILABLE NOW AT THE SCT WEBSITE

WWW.SCT-USA.COM

UN THREAD MILLS
SINGLE PROFILE (SPTM) - SOLID CARBIDE



Fine and coarse threads ranging from #00 to 1¼ + can be milled using the 19 varieties of these single profile thread mills.

Min ID THREAD*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	RECOM-MENDED TPI	FLUTES	ORDER #	
									UNCOATED	ALTiN+
									INTERNAL OR EXTERNAL THREADS	
#00	0.032	0.060	0.018	0.005	0.125	1.50	85 to 120	2	SPTM032	SPTM032A
#00	0.032	0.100	0.018	0.005	0.125	1.50	85 to 120	2	SPTM032L	SPTM032LA
#0	0.040	0.090	0.022	0.006	0.125	1.50	72 to 90	2	SPTM040	SPTM040A
#0	0.040	0.109	0.022	0.006	0.125	1.50	72 to 90	2	SPTM040ML	SPTM040MLA
#0	0.040	0.125	0.022	0.006	0.125	1.50	72 to 90	2	SPTM040L	SPTM040LA
#1	0.050	0.100	0.028	0.007	0.125	1.50	64 to 80	3	SPTM050	SPTM050A
#1	0.050	0.125	0.028	0.007	0.125	1.50	64 to 80	3	SPTM050ML	SPTM050MLA
#1	0.050	0.150	0.028	0.007	0.125	1.50	64 to 80	3	SPTM050L	SPTM050LA
#2	0.059	0.125	0.034	0.008	0.125	1.50	56 to 80	3	SPTM059	SPTM059A
#2	0.059	0.165	0.034	0.008	0.125	1.50	56 to 80	3	SPTM059ML	SPTM059MLA
#2	0.059	0.200	0.034	0.008	0.125	1.50	56 to 80	3	SPTM059L	SPTM059LA
#2	0.060	0.125	0.034	0.009	0.1875	2.00	56 to 80	3	SPTM060	SPTM060A
#2	0.060	0.165	0.034	0.009	0.1875	2.00	56 to 80	3	SPTM060ML	SPTM060MLA
#2	0.060	0.200	0.034	0.009	0.1875	2.00	56 to 80	3	SPTM060L	SPTM060LA
#3	0.072	0.150	0.040	0.010	0.1875	2.00	48 to 72	3	SPTM072	SPTM072A
#3	0.072	0.250	0.040	0.010	0.1875	2.00	48 to 72	3	SPTM072L	SPTM072LA
#4	0.080	0.190	0.045	0.011	0.1875	2.00	40 to 64	3	SPTM080	SPTM080A
#4	0.080	0.250	0.045	0.011	0.1875	2.00	40 to 64	3	SPTM080ML	SPTM080MLA
#4	0.080	0.300	0.045	0.011	0.1875	2.00	40 to 64	3	SPTM080L	SPTM080LA
#6	0.098	0.250	0.049	0.015	0.1875	2.00	32 to 64	3	SPTM098	SPTM098A
#6	0.098	0.330	0.049	0.015	0.1875	2.00	32 to 64	3	SPTM098ML	SPTM098MLA
#6	0.098	0.400	0.049	0.015	0.1875	2.00	32 to 64	3	SPTM098L	SPTM098LA
#8	0.120	0.300	0.070	0.016	0.1875	2.00	32 to 56	3	SPTM120	SPTM120A
#8	0.120	0.400	0.070	0.016	0.1875	2.00	32 to 56	3	SPTM120ML	SPTM120MLA
#8	0.120	0.500	0.070	0.016	0.1875	2.00	32 to 56	3	SPTM120L	SPTM120LA
#10	0.138	0.400	0.075	0.020	0.1875	2.00	24 to 56	3	SPTM138	SPTM138A
#10	0.138	0.500	0.075	0.020	0.1875	2.00	24 to 56	3	SPTM138ML	SPTM138MLA
#10	0.138	0.600	0.075	0.020	0.1875	2.00	24 to 56	3	SPTM138L	SPTM138LA
#12	0.160	0.400	0.080	0.025	0.1875	2.00	24 to 56	3	SPTM160	SPTM160A
#12	0.160	0.650	0.080	0.025	0.1875	2.00	24 to 56	3	SPTM160L	SPTM160LA

TPI = Threads Per Inch

***Single profile thread mills can cut any larger size internal thread within the recommended TPI**

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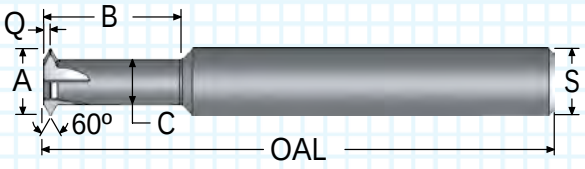
UN THREAD MILLS
SINGLE PROFILE (SPTM) - SOLID CARBIDE



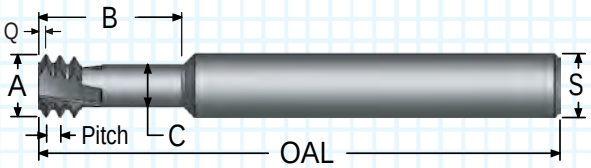
- Solid carbide provides maximum tool rigidity
- Long reach tools are available from stock
- Cuts UNC, UNF, UNEF, and UNS threads
- Cuts UNJ threads (internal only)

Min ID THREAD*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	RECOM-MENDED TPI	FLUTES	ORDER #	
									UNCOATED	ALTiN+
									INTERNAL OR EXTERNAL THREADS	
1/4	0.182	0.400	0.104	0.025	0.250	2.50	18 to 56	4	SPTM182	SPTM182A
1/4	0.182	0.530	0.104	0.025	0.250	2.50	18 to 56	4	SPTM182ML	SPTM182MLA
1/4	0.182	0.650	0.104	0.025	0.250	2.50	18 to 56	4	SPTM182L	SPTM182LA
5/16	0.240	0.500	0.153	0.028	0.250	2.50	16 to 48	4	SPTM240	SPTM240A
5/16	0.240	0.800	0.153	0.028	0.250	2.50	16 to 48	4	SPTM240L	SPTM240LA
3/8	0.290	0.600	0.192	0.031	0.375	3.00	14 to 40	4	SPTM290	SPTM290A
3/8	0.290	1.000	0.192	0.031	0.375	3.00	14 to 40	4	SPTM290L	SPTM290LA
1/2	0.372	0.750	0.240	0.041	0.375	3.00	12 to 32	4	SPTM372	SPTM372A
1/2	0.372	1.200	0.240	0.041	0.375	3.00	12 to 32	4	SPTM372L	SPTM372LA
5/8	0.488	0.850	0.340	0.046	0.500	3.50	11 to 32	5	SPTM488	SPTM488A
5/8	0.488	1.350	0.340	0.046	0.500	3.50	11 to 32	5	SPTM488L	SPTM488LA
3/4	0.595	1.250	0.430	0.051	0.625	4.00	10 to 32	6	SPTM595	SPTM595A
3/4	0.595	2.000	0.430	0.051	0.625	4.00	10 to 32	6	SPTM595L	SPTM595LA
7/8	0.695	1.500	0.490	0.063	0.750	5.00	8 to 24	6	SPTM695	SPTM695A
7/8	0.695	2.500	0.490	0.063	0.750	5.00	8 to 24	6	SPTM695L	SPTM695LA
1¼	0.745	1.500	0.400	0.107	0.750	5.00	4 to 8	6	SPTM745	SPTM745A
1¼	0.745	2.500	0.400	0.107	0.750	5.00	4 to 8	6	SPTM745L	SPTM745LA

TPI = Threads Per Inch

***Single profile thread mills can cut any larger size internal thread within the recommended TPI**

UN THREAD MILLS
LONG REACH (TMLR) - SOLID CARBIDE
FULL PROFILE



- Small thread milling is made easy with TMLR tools
- Economical cost per hole
- Minimal cutting pressure
- ALTiN+ coating for higher Surface Feet per Minute

MIN ID THREAD /PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
								UNCOATED	ALTiN+
								INTERNAL THREADS ONLY	
2-56	0.065	0.150	0.039	0.009	0.250	2.50	3	TMLR065-56	TMLR065-56A
2-56	0.065	0.200	0.039	0.009	0.250	2.50	3	TMLR065-56EL	TMLR065-56ELA
4-40	0.082	0.225	0.046	0.013	0.250	2.50	3	TMLR082-40	TMLR082-40A
4-40	0.082	0.300	0.046	0.013	0.250	2.50	3	TMLR082-40EL	TMLR082-40ELA
6-32	0.100	0.260	0.056	0.016	0.250	2.50	3	TMLR100-32	TMLR100-32A
6-32	0.100	0.400	0.056	0.016	0.250	2.50	3	TMLR100-32EL	TMLR100-32ELA
6-40	0.100	0.260	0.065	0.013	0.250	2.50	3	TMLR100-40	TMLR100-40A
6-40	0.100	0.400	0.065	0.013	0.250	2.50	3	TMLR100-40EL	TMLR100-40ELA
8-32	0.126	0.300	0.080	0.016	0.250	2.50	3	TMLR126-32	TMLR126-32A
8-32	0.126	0.500	0.080	0.016	0.250	2.50	3	TMLR126-32EL	TMLR126-32ELA
8-36	0.126	0.300	0.085	0.014	0.250	2.50	3	TMLR126-36	TMLR126-36A
8-36	0.126	0.500	0.085	0.014	0.250	2.50	3	TMLR126-36EL	TMLR126-36ELA
10-24	0.139	0.400	0.080	0.021	0.250	2.50	3	TMLR139-24	TMLR139-24A
10-24	0.139	0.600	0.080	0.021	0.250	2.50	3	TMLR139-24EL	TMLR139-24ELA
10-32	0.139	0.400	0.093	0.016	0.250	2.50	3	TMLR139-32	TMLR139-32A
10-32	0.139	0.600	0.093	0.016	0.250	2.50	3	TMLR139-32EL	TMLR139-32ELA
10-48	0.139	0.400	0.106	0.010	0.250	2.50	3	TMLR139-48	TMLR139-48A
10-48	0.139	0.600	0.106	0.010	0.250	2.50	3	TMLR139-48EL	TMLR139-48ELA
1/4-20	0.186	0.500	0.112	0.025	0.250	2.50	3	TMLR186-20	TMLR186-20A
1/4-20	0.186	0.700	0.112	0.025	0.250	2.50	3	TMLR186-20EL	TMLR186-20ELA
1/4-28	0.186	0.500	0.130	0.018	0.250	2.50	3	TMLR186-28	TMLR186-28A
1/4-28	0.186	0.700	0.130	0.018	0.250	2.50	3	TMLR186-28EL	TMLR186-28ELA
1/4-32	0.186	0.500	0.140	0.016	0.250	2.50	3	TMLR186-32	TMLR186-32A
1/4-32	0.186	0.700	0.140	0.016	0.250	2.50	3	TMLR186-32EL	TMLR186-32ELA
5/16-18	0.234	0.600	0.156	0.028	0.250	2.50	3	TMLR234-18	TMLR234-18A
5/16-18	0.234	0.850	0.156	0.028	0.250	2.50	3	TMLR234-18EL	TMLR234-18ELA
5/16-24	0.234	0.600	0.176	0.021	0.250	2.50	3	TMLR234-24	TMLR234-24A
5/16-24	0.234	0.850	0.176	0.021	0.250	2.50	3	TMLR234-24EL	TMLR234-24ELA
5/16-28	0.234	0.600	0.180	0.018	0.250	2.50	3	TMLR234-28	TMLR234-28A
5/16-28	0.234	0.850	0.180	0.018	0.250	2.50	3	TMLR234-28EL	TMLR234-28ELA
5/16-32	0.234	0.600	0.188	0.016	0.250	2.50	3	TMLR234-32	TMLR234-32A
5/16-32	0.234	0.850	0.188	0.016	0.250	2.50	3	TMLR234-32EL	TMLR234-32ELA
5/16-40	0.234	0.600	0.194	0.013	0.250	2.50	3	TMLR234-40	TMLR234-40A
5/16-40	0.234	0.850	0.194	0.013	0.250	2.50	3	TMLR234-40EL	TMLR234-40ELA

***Thread mills can cut any larger size internal thread of the same pitch**

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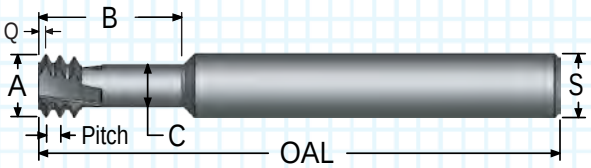
(800) 383-2244 Fax: (888) 728-3295

UN THREAD MILLS
LONG REACH (TMLR) - SOLID CARBIDE
FULL PROFILE

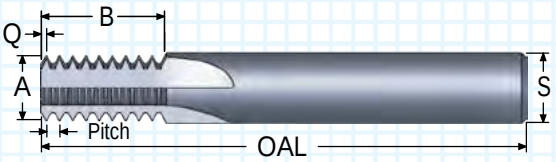


- Cuts UNC, UNF, UNEF, and UNS threads
- Cuts UNJ threads (internal only)
- Excels in difficult-to-thread materials
- ALTiN+ coating extends tool life

MIN ID THREAD /PITCH *	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
								UNCOATED	ALTiN+
								INTERNAL THREADS ONLY	
3/8-16	0.285	0.750	0.191	0.031	0.375	3.50	3	TMLR285-16	TMLR285-16A
3/8-16	0.285	1.000	0.191	0.031	0.375	3.50	3	TMLR285-16EL	TMLR285-16ELA
3/8-24	0.285	0.750	0.222	0.021	0.375	3.50	3	TMLR285-24	TMLR285-24A
3/8-24	0.285	1.000	0.222	0.021	0.375	3.50	3	TMLR285-24EL	TMLR285-24ELA
3/8-32	0.285	0.750	0.235	0.016	0.375	3.50	3	TMLR285-32	TMLR285-32A
3/8-32	0.285	1.000	0.235	0.016	0.375	3.50	3	TMLR285-32EL	TMLR285-32ELA
7/16-14	0.340	0.800	0.235	0.036	0.375	3.50	3	TMLR340-14	TMLR340-14A
7/16-14	0.340	1.200	0.235	0.036	0.375	3.50	3	TMLR340-14EL	TMLR340-14ELA
7/16-18	0.340	0.800	0.258	0.028	0.375	3.50	3	TMLR340-18	TMLR340-18A
7/16-18	0.340	1.200	0.258	0.028	0.375	3.50	3	TMLR340-18EL	TMLR340-18ELA
7/16-20	0.340	0.800	0.265	0.025	0.375	3.50	3	TMLR340-20	TMLR340-20A
7/16-20	0.340	1.200	0.265	0.025	0.375	3.50	3	TMLR340-20EL	TMLR340-20ELA
1/2-12	0.370	0.800	0.245	0.042	0.375	3.50	3	TMLR370-12	TMLR370-12A
1/2-12	0.370	1.200	0.245	0.042	0.375	3.50	3	TMLR370-12EL	TMLR370-12ELA
1/2-13	0.370	0.800	0.255	0.038	0.375	3.50	3	TMLR370-13	TMLR370-13A
1/2-13	0.370	1.200	0.255	0.038	0.375	3.50	3	TMLR370-13EL	TMLR370-13ELA
1/2-18	0.370	0.800	0.287	0.028	0.375	3.50	3	TMLR370-18	TMLR370-18A
1/2-18	0.370	1.200	0.287	0.028	0.375	3.50	3	TMLR370-18EL	TMLR370-18ELA
1/2-20	0.370	0.800	0.295	0.025	0.375	3.50	3	TMLR370-20	TMLR370-20A
1/2-20	0.370	1.200	0.295	0.025	0.375	3.50	3	TMLR370-20EL	TMLR370-20ELA
1/2-32	0.370	0.800	0.315	0.016	0.375	3.50	3	TMLR370-32	TMLR370-32A
1/2-32	0.370	1.200	0.315	0.016	0.375	3.50	3	TMLR370-32EL	TMLR370-32ELA
5/8-11	0.470	1.200	0.335	0.045	0.500	4.00	4	TMLR470-11	TMLR470-11A
5/8-11	0.470	1.750	0.335	0.045	0.500	4.00	4	TMLR470-11EL	TMLR470-11ELA
3/4-10	0.495	1.200	0.345	0.050	0.500	4.00	4	TMLR495-10	TMLR495-10A
3/4-10	0.495	1.750	0.345	0.050	0.500	4.00	4	TMLR495-10EL	TMLR495-10ELA
3/4-12	0.495	1.200	0.370	0.042	0.500	4.00	4	TMLR495-12	TMLR495-12A
3/4-12	0.495	1.750	0.370	0.042	0.500	4.00	4	TMLR495-12EL	TMLR495-12ELA
3/4-16	0.495	1.200	0.395	0.031	0.500	4.00	4	TMLR495-16	TMLR495-16A
3/4-16	0.495	1.750	0.395	0.031	0.500	4.00	4	TMLR495-16EL	TMLR495-16ELA

***Thread mills can cut any larger size internal thread of the same pitch**

UN THREAD MILLS
STRAIGHT FLUTE - SOLID CARBIDE
FULL PROFILE



- Optional short length-of-cut for ideal length-to-diameter ratio
- Cuts UNC, UNF, UNEF, UNS, and UNJ (internal only)
- Internal crest cutting design provides strongest possible tool

MIN ID THREAD/ PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL THREADS ONLY	
4-40	0.080	0.210	0.011	0.250	2.50	3	TM080-40	TM080-40A
4-40	0.080	0.136	0.011	0.250	2.50	3	TM080-40S	TM080-40SA
6-32	0.098	0.263	0.013	0.250	2.50	3	TM098-32	TM098-32A
6-32	0.098	0.201	0.013	0.250	2.50	3	TM098-32S	TM098-32SA
6-40	0.098	0.260	0.011	0.250	2.50	3	TM098-40	TM098-40A
6-40	0.098	0.186	0.011	0.250	2.50	3	TM098-40S	TM098-40SA
8-32	0.110	0.325	0.013	0.250	2.50	3	TM110-32	TM110-32A
8-32	0.110	0.232	0.013	0.250	2.50	3	TM110-32S	TM110-32SA
8-36	0.110	0.345	0.012	0.250	2.50	3	TM110-36	TM110-36A
8-36	0.110	0.234	0.012	0.250	2.50	3	TM110-36S	TM110-36SA
8-24	0.125	0.350	0.017	0.250	2.50	3	TM125-24	TM125-24A
8-24	0.125	0.226	0.017	0.250	2.50	3	TM125-24S	TM125-24SA
8-32	0.125	0.355	0.013	0.250	2.50	3	TM125-32	TM125-32A
8-32	0.125	0.232	0.013	0.250	2.50	3	TM125-32S	TM125-32SA
10-24	0.140	0.392	0.017	0.250	2.50	3	TM140-24	TM140-24A
10-24	0.140	0.268	0.017	0.250	2.50	3	TM140-24S	TM140-24SA
10-28	0.140	0.409	0.015	0.250	2.50	3	TM140-28	TM140-28A
10-28	0.140	0.265	0.015	0.250	2.50	3	TM140-28S	TM140-28SA
10-32	0.140	0.388	0.013	0.250	2.50	3	TM140-32	TM140-32A
10-32	0.140	0.263	0.013	0.250	2.50	3	TM140-32S	TM140-32SA
10-48	0.140	0.383	0.009	0.250	2.50	3	TM140-48	TM140-48A
10-48	0.140	0.259	0.009	0.250	2.50	3	TM140-48S	TM140-48SA
1/4-20	0.170	0.570	0.021	0.250	2.50	3	TM170-20	TM170-20A
1/4-20	0.170	0.371	0.021	0.250	2.50	3	TM170-20S	TM170-20SA
1/4-24	0.170	0.559	0.017	0.250	2.50	3	TM170-24	TM170-24A
1/4-24	0.170	0.393	0.017	0.250	2.50	3	TM170-24S	TM170-24SA
1/4-28	0.170	0.552	0.015	0.250	2.50	3	TM170-28	TM170-28A
1/4-28	0.170	0.372	0.015	0.250	2.50	3	TM170-28S	TM170-28SA
1/4-32	0.170	0.545	0.013	0.250	2.50	3	TM170-32	TM170-32A
1/4-32	0.170	0.388	0.013	0.250	2.50	3	TM170-32S	TM170-32SA
1/4-36	0.170	0.540	0.012	0.250	2.50	3	TM170-36	TM170-36A
1/4-36	0.170	0.373	0.012	0.250	2.50	3	TM170-36S	TM170-36SA
1/4-20	0.187	0.570	0.021	0.250	2.50	3	TM187-20	TM187-20A
1/4-20	0.187	0.371	0.021	0.250	2.50	3	TM187-20S	TM187-20SA
1/4-24	0.187	0.559	0.017	0.250	2.50	3	TM187-24	TM187-24A
1/4-24	0.187	0.393	0.017	0.250	2.50	3	TM187-24S	TM187-24SA
1/4-28	0.187	0.551	0.015	0.250	2.50	3	TM187-28	TM187-28A
1/4-28	0.187	0.372	0.015	0.250	2.50	3	TM187-28S	TM187-28SA

***Thread mills can cut any larger size internal thread of the same pitch**

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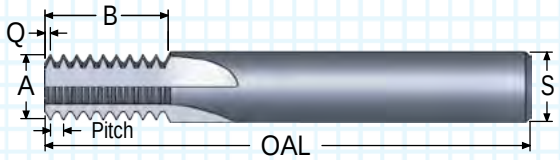
UN THREAD MILLS
STRAIGHT FLUTE - SOLID CARBIDE

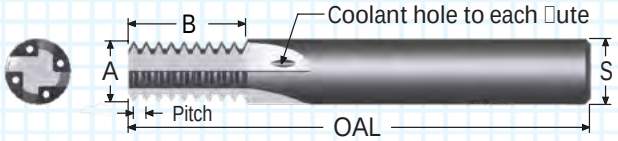


- ALTiN+ coating extends tool life
- Internal threads only
- Full Profile

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL THREADS ONLY	
1/4-32	0.187	0.545	0.013	0.250	2.50	3	TM187-32	TM187-32A
1/4-32	0.187	0.388	0.013	0.250	2.50	3	TM187-32S	TM187-32SA
1/4-36	0.187	0.540	0.012	0.250	2.50	3	TM187-36	TM187-36A
1/4-36	0.187	0.373	0.012	0.250	2.50	3	TM187-36S	TM187-36SA
1/4-40	0.187	0.560	0.011	0.250	2.50	3	TM187-40	TM187-40A
1/4-40	0.187	0.386	0.011	0.250	2.50	3	TM187-40S	TM187-40SA
1/4-48	0.187	0.551	0.009	0.250	2.50	3	TM187-48	TM187-48A
1/4-48	0.187	0.384	0.009	0.250	2.50	3	TM187-48S	TM187-48SA
5/16-18	0.235	0.689	0.023	0.250	2.50	3	TM235-18	TM235-18A
5/16-20	0.235	0.670	0.021	0.250	2.50	3	TM235-20	TM235-20A
5/16-24	0.235	0.684	0.017	0.250	2.50	3	TM235-24	TM235-24A
5/16-28	0.235	0.657	0.015	0.250	2.50	3	TM235-28	TM235-28A
5/16-32	0.235	0.669	0.013	0.250	2.50	3	TM235-32	TM235-32A
5/16-40	0.235	0.660	0.011	0.250	2.50	3	TM235-40	TM235-40A
3/8-16	0.290	0.775	0.026	0.3125	3.50	4	TM290-16	TM290-16A
3/8-20	0.290	0.820	0.021	0.3125	3.50	4	TM290-20	TM290-20A
3/8-24	0.290	0.809	0.017	0.3125	3.50	4	TM290-24	TM290-24A
3/8-27	0.290	0.794	0.015	0.3125	3.50	4	TM290-27	TM290-27A
3/8-32	0.290	0.794	0.013	0.3125	3.50	4	TM290-32	TM290-32A
7/16-14	0.345	0.816	0.030	0.375	3.50	4	TM345-14	TM345-14A
7/16-18	0.345	0.800	0.023	0.375	3.50	4	TM345-18	TM345-18A
7/16-20	0.345	0.821	0.021	0.375	3.50	4	TM345-20	TM345-20A
7/16-24	0.345	0.809	0.017	0.375	3.50	4	TM345-24	TM345-24A
7/16-28	0.345	0.800	0.015	0.375	3.50	4	TM345-28	TM345-28A
9/16-12	0.400	1.117	0.035	0.500	3.50	4	TM400-12	TM400-12A
1/2-13	0.400	1.108	0.032	0.500	3.50	4	TM400-13	TM400-13A
1/2-16	0.400	1.087	0.026	0.500	3.50	4	TM400-16	TM400-16A
1/2-20	0.400	1.120	0.021	0.500	3.50	4	TM400-20	TM400-20A
1/2-24	0.400	1.100	0.017	0.500	3.50	4	TM400-24	TM400-24A
1/2-28	0.400	1.087	0.015	0.500	3.50	4	TM400-28	TM400-28A
1/2-32	0.400	1.106	0.013	0.500	3.50	4	TM400-32	TM400-32A
3/4-10	0.450	1.140	0.042	0.500	3.50	4	TM450-10	TM450-10A
5/8-11	0.450	1.127	0.039	0.500	3.50	4	TM450-11	TM450-11A
5/8-12	0.450	1.117	0.035	0.500	3.50	4	TM450-12	TM450-12A
9/16-16	0.450	1.087	0.026	0.500	3.50	4	TM450-16	TM450-16A
9/16-18	0.450	1.134	0.023	0.500	3.50	4	TM450-18	TM450-18A
9/16-20	0.450	1.120	0.021	0.500	3.50	4	TM450-20	TM450-20A
3/4-12	0.490	1.117	0.035	0.500	3.50	6	TM490-12	TM490-12A
5/8-14	0.490	1.100	0.030	0.500	3.50	6	TM490-14	TM490-14A
5/8-16	0.490	1.087	0.026	0.500	3.50	6	TM490-16	TM490-16A
1.0-8	0.620	1.177	0.052	0.625	3.50	6	TM620-8	TM620-8A
7/8-9	0.620	1.157	0.046	0.625	3.50	6	TM620-9	TM620-9A
7/8-12	0.620	1.117	0.035	0.625	3.50	6	TM620-12	TM620-12A
7/8-14	0.620	1.100	0.030	0.625	3.50	6	TM620-14	TM620-14A
7/8-16	0.620	1.087	0.026	0.625	3.50	6	TM620-16	TM620-16A

***Thread mills can cut any larger size internal thread of the same pitch**

UN THREAD MILLS
COOLANT THROUGH - SOLID CARBIDE
FULL PROFILE



- ALTiN+ coating for higher cutting speed
- Coolant to each flute
- Cuts UNC, UNF, UNEF, and UNS threads
- Cuts UNJ threads (internal only)

MIN ID THREAD /PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTE	ORDER #	
							UNCOATED	COATED
							INTERNAL THREADS ONLY	
4-40	0.080	0.210	0.011	0.250	2.50	3	TMC080-40	TMC080-40A
6-32	0.098	0.263	0.013	0.250	2.50	3	TMC098-32	TMC098-32A
6-40	0.098	0.260	0.011	0.250	2.50	3	TMC098-40	TMC098-40A
8-32	0.125	0.355	0.013	0.250	2.50	3	TMC125-32	TMC125-32A
10-24	0.140	0.392	0.017	0.250	2.50	3	TMC140-24	TMC140-24A
10-28	0.140	0.409	0.015	0.250	2.50	3	TMC140-28	TMC140-28A
10-32	0.140	0.388	0.013	0.250	2.50	3	TMC140-32	TMC140-32A
10-48	0.140	0.383	0.009	0.250	2.50	3	TMC140-48	TMC140-48A
1/4-20	0.170	0.570	0.021	0.250	2.50	3	TMC170-20	TMC170-20A
1/4-28	0.170	0.552	0.015	0.250	2.50	3	TMC170-28	TMC170-28A
1/4-32	0.170	0.545	0.013	0.250	2.50	3	TMC170-32	TMC170-32A
1/4-36	0.170	0.540	0.012	0.250	2.50	3	TMC170-36	TMC170-36A
5/16-18	0.235	0.689	0.023	0.250	2.50	3	TMC235-18	TMC235-18A
5/16-20	0.235	0.670	0.021	0.250	2.50	3	TMC235-20	TMC235-20A
5/16-24	0.235	0.684	0.017	0.250	2.50	3	TMC235-24	TMC235-24A
5/16-28	0.235	0.657	0.015	0.250	2.50	3	TMC235-28	TMC235-28A
5/16-32	0.235	0.669	0.013	0.250	2.50	3	TMC235-32	TMC235-32A
5/16-40	0.235	0.660	0.011	0.250	2.50	3	TMC235-40	TMC235-40A
3/8-16	0.290	0.775	0.026	0.3125	3.50	4	TMC290-16	TMC290-16A
3/8-20	0.290	0.820	0.021	0.3125	3.50	4	TMC290-20	TMC290-20A
3/8-24	0.290	0.809	0.017	0.3125	3.50	4	TMC290-24	TMC290-24A
7/16-14	0.345	0.816	0.030	0.375	3.50	4	TMC345-14	TMC345-14A
7/16-18	0.345	0.800	0.023	0.375	3.50	4	TMC345-18	TMC345-18A
7/16-20	0.345	0.821	0.021	0.375	3.50	4	TMC345-20	TMC345-20A
7/16-28	0.345	0.800	0.015	0.375	3.50	4	TMC345-28	TMC345-28A
1/2-13	0.400	1.108	0.032	0.500	3.50	4	TMC400-13	TMC400-13A
1/2-20	0.400	1.120	0.021	0.500	3.50	4	TMC400-20	TMC400-20A
1/2-28	0.400	1.087	0.015	0.500	3.50	4	TMC400-28	TMC400-28A
1/2-32	0.400	1.106	0.013	0.500	3.50	4	TMC400-32	TMC400-32A

***Thread mills can cut any larger size internal thread of the same pitch**

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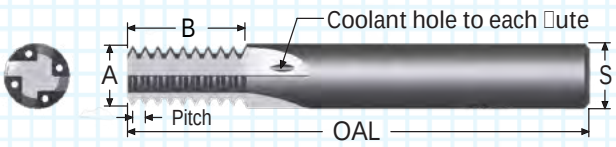
UN THREAD MILLS
COOLANT THROUGH - SOLID CARBIDE
FULL PROFILE

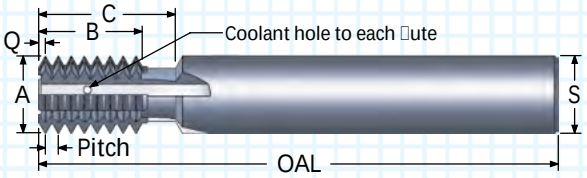


- ALTiN+ coating for higher cutting speed
- Coolant to each flute
- Cuts UNC, UNF, UNEF, and UNS threads
- Cuts UNJ threads (internal only)

MIN ID THREAD /PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTE	ORDER #	
							UNCOATED	COATED
							INTERNAL THREADS ONLY	
3/4-10	0.450	1.140	0.042	0.500	3.50	4	TMC450-10	TMC450-10A
5/8-11	0.450	1.127	0.039	0.500	3.50	4	TMC450-11	TMC450-11A
5/8-12	0.450	1.117	0.035	0.500	3.50	4	TMC450-12	TMC450-12A
9/16-16	0.450	1.087	0.026	0.500	3.50	4	TMC450-16	TMC450-16A
9/16-18	0.450	1.134	0.023	0.500	3.50	4	TMC450-18	TMC450-18A
9/16-20	0.450	1.120	0.021	0.500	3.50	4	TMC450-20	TMC450-20A
7/8-12	0.620	1.117	0.035	0.625	3.50	6	TMC620-12	TMC620-12A
7/8-14	0.620	1.100	0.030	0.625	3.50	6	TMC620-14	TMC620-14A
7/8-16	0.620	1.087	0.026	0.625	3.50	6	TMC620-16	TMC620-16A

***Thread mills can cut any larger size internal thread of the same pitch**

UN THREAD MILLS
COOLANT THROUGH - CARBIDE TIPPED

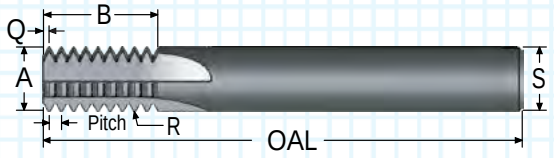


- ALTiN+ coating for higher cutting speed
- Coolant to each flute
- Cuts UNC, UNF, UNEF, and UNS threads
- Cuts UNJ threads (internal only)

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" TOOL REACH	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
								UNCOATED	ALTiN+
								INTERNAL OR EXTERNAL THREADS	
1¼-7	0.740	1.130	1.370	0.065	0.750	6.00	4	TMC740-7	TMC740-7A
1-8	0.740	1.122	1.370	0.057	0.750	6.00	4	TMC740-8	TMC740-8A
1-12	0.740	1.076	1.370	0.038	0.750	6.00	4	TMC740-12	TMC740-12A
1-14	0.740	1.135	1.370	0.032	0.750	6.00	4	TMC740-14	TMC740-14A
1-16	0.740	1.119	1.370	0.028	0.750	6.00	4	TMC740-16	TMC740-16A
1-20	0.740	1.096	1.370	0.023	0.750	6.00	4	TMC740-20	TMC740-20A
1½-6	0.990	1.152	2.000	0.076	1.000	6.00	6	TMC990-6	TMC990-6A
1½-8	0.990	1.122	2.000	0.061	1.000	6.00	6	TMC990-8	TMC990-8A
1½-12	0.990	1.166	2.000	0.041	1.000	6.00	6	TMC990-12	TMC990-12A
1½-16	0.990	1.122	2.000	0.029	1.000	6.00	6	TMC990-16	TMC990-16A

***Thread mills can cut any larger size internal thread of the same pitch**

THREAD MILLS - EXJ - SOLID CARBIDE
(EXTERNAL UNJ THREAD)
FULL PROFILE



- ALTiN+ coating extends tool life
- Precision ground for maximum concentricity
- Made with premium submicron carbide

EXT. THREAD / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"R" ROOT RADIUS	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
								UNCOATED	ALTiN+
								EXTERNAL THREADS ONLY	
UNJ-32	0.245	0.668	0.0051	0.016	0.250	2.50	4	TM245-32EXJ	TM245-32EXJ-A
UNJ-28	0.245	0.657	0.0059	0.018	0.250	2.50	4	TM245-28EXJ	TM245-28EXJ-A
UNJ-24	0.245	0.683	0.0069	0.020	0.250	2.50	4	TM245-24EXJ	TM245-24EXJ-A
UNJ-20	0.370	0.773	0.0082	0.024	0.375	3.50	5	TM370-20EXJ	TM370-20EXJ-A
UNJ-18	0.370	0.800	0.0091	0.026	0.375	3.50	5	TM370-18EXJ	TM370-18EXJ-A
UNJ-16	0.370	0.774	0.0103	0.029	0.375	3.50	5	TM370-16EXJ	TM370-16EXJ-A
UNJ-14	0.495	1.027	0.0118	0.033	0.500	3.50	6	TM495-14EXJ	TM495-14EXJ-A
UNJ-12	0.495	1.031	0.0137	0.038	0.500	3.50	6	TM495-12EXJ	TM495-12EXJ-A
UNJ-10	0.495	1.037	0.0165	0.046	0.500	3.50	6	TM495-10EXJ	TM495-10EXJ-A
UNJ-8	0.495	1.046	0.0207	0.057	0.500	3.50	6	TM495-8EXJ	TM495-8EXJ-A

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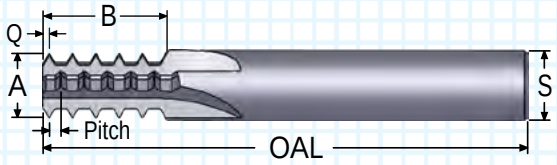
UN THREAD MILLS - STAGGERED TOOTH

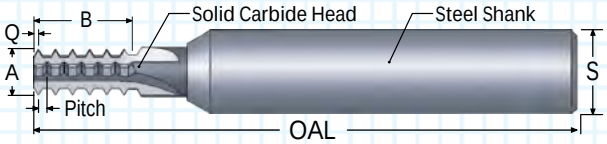


- Staggered tooth design reduces tool pressure
- Non-crest cutting for max thread size adjustability

STRAIGHT FLUTE - STAGGERED TOOTH - SOLID CARBIDE

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
3/8-20	0.250	0.675	0.027	0.250	2.50	4	TM250-20	TM250-20A
3/8-24	0.250	0.687	0.024	0.250	2.50	4	TM250-24	TM250-24A
3/8-28	0.250	0.661	0.020	0.250	2.50	4	TM250-28	TM250-28A
3/8-32	0.250	0.672	0.017	0.250	2.50	4	TM250-32	TM250-32A
3/8-36	0.250	0.682	0.016	0.250	2.50	4	TM250-36	TM250-36A
3/8-40	0.250	0.662	0.014	0.250	2.50	4	TM250-40	TM250-40A

***Thread mills can cut any larger size internal thread of the same pitch**

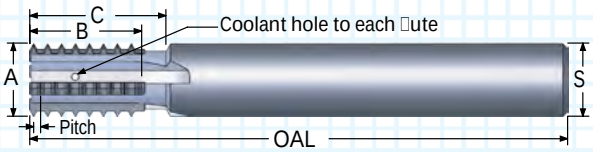


- Cuts UNC, UNF, UNEF, and UNS threads
- Cuts UNJ threads (internal only)
- Non-crest cutting design cuts internal and external threads

STRAIGHT FLUTE - STAGGERED TOOTH - CARBIDE HEAD

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
7/16-16	0.350	0.783	0.036	0.750	6.00	4	TM350-16	TM350-16A
7/16-18	0.350	0.807	0.032	0.750	6.00	4	TM350-18	TM350-18A
7/16-20	0.350	0.823	0.027	0.750	6.00	4	TM350-20	TM350-20A
7/16-24	0.350	0.856	0.024	0.750	6.00	4	TM350-24	TM350-24A
5/8-12	0.500	1.042	0.046	0.750	6.00	4	TM500-12	TM500-12A
5/8-14	0.500	1.037	0.040	0.750	6.00	4	TM500-14	TM500-14A
5/8-16	0.500	1.033	0.036	0.750	6.00	4	TM500-16	TM500-16A

***Thread mills can cut any larger size internal thread of the same pitch**



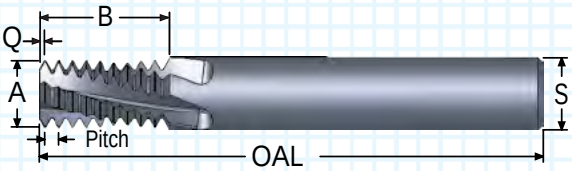
- ALTiN+ coating extends tool life
- Ideal for plated thread applications

COOLANT THROUGH THREAD MILLS
STRAIGHT FLUTE - STAGGERED TOOTH - CARBIDE TIPPED

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" TOOL REACH	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
								UNCOATED	ALTiN+
								INTERNAL OR EXTERNAL THREADS	
1-12	0.750	1.176	1.370	0.048	0.750	6.00	4	TMC750-12	TMC750-12A
1-14	0.750	1.152	1.370	0.042	0.750	6.00	4	TMC750-14	TMC750-14A
1-18	0.750	1.117	1.370	0.032	0.750	6.00	4	TMC750-18	TMC750-18A
1-20	0.750	1.106	1.370	0.029	0.750	6.00	4	TMC750-20	TMC750-20A
1½-12	1.000	1.176	2.000	0.047	1.000	6.00	6	TMC1000-12	TMC1000-12A
1½-16	1.000	1.196	2.000	0.037	1.000	6.00	6	TMC1000-16	TMC1000-16A

***Thread mills can cut any larger size internal thread of the same pitch**

UN THREAD MILLS
15° HELICAL FLUTE SOLID CARBIDE



- Cuts UNC, UNF, UNEF, UNS and UNJ (internal only)
- Non-crest cutting allows maximum flexibility for plated and non-standard threads
- Long length-of-cut

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL THREADS ONLY	
4-40	0.079	0.185	0.011	0.250	2.50	2	TMI079-40H	TMI079-40HA
6-32	0.100	0.263	0.014	0.250	2.50	3	TMI100-32H	TMI100-32HA
8-32	0.115	0.263	0.014	0.250	2.50	3	TMI115-32H	TMI115-32HA
10-24	0.120	0.351	0.019	0.250	2.50	3	TMI120-24H	TMI120-24HA
10-28	0.120	0.336	0.016	0.250	2.50	3	TMI120-28H	TMI120-28HA
10-32	0.120	0.326	0.014	0.250	2.50	3	TMI120-32H	TMI120-32HA
1/4-20	0.180	0.521	0.023	0.250	2.50	3	TMI180-20H	TMI180-20HA
1/4-28	0.180	0.515	0.016	0.250	2.50	3	TMI180-28H	TMI180-28HA
5/16-18	0.234	0.632	0.025	0.250	2.50	3	TMI234-18H	TMI234-18HA
5/16-24	0.234	0.641	0.019	0.250	2.50	3	TMI234-24H	TMI234-24HA
5/16-32	0.234	0.638	0.014	0.250	2.50	3	TMI234-32H	TMI234-32HA
5/16-40	0.234	0.635	0.011	0.250	2.50	3	TMI234-40H	TMI234-40HA
3/8-16	0.285	0.775	0.028	0.3125	3.00	4	TMI285-16H	TMI285-16HA
3/8-20	0.285	0.770	0.023	0.3125	3.00	4	TMI285-20H	TMI285-20HA
3/8-24	0.285	0.766	0.019	0.3125	3.00	4	TMI285-24H	TMI285-24HA
3/8-32	0.285	0.763	0.014	0.3125	3.00	4	TMI285-32H	TMI285-32HA
7/16-14	0.305	0.886	0.032	0.3125	3.00	4	TMI305-14H	TMI305-14HA
7/16-18	0.335	0.888	0.025	0.375	3.00	4	TMI335-18H	TMI335-18HA
7/16-20	0.335	0.870	0.023	0.375	3.00	4	TMI335-20H	TMI335-20HA
1/2-13	0.350	0.877	0.035	0.375	3.00	4	TMI350-13H	TMI350-13HA
9/16-12	0.370	0.867	0.038	0.375	3.00	4	TMI370-12H	TMI370-12HA
9/16-18	0.370	0.911	0.025	0.375	3.00	4	TMI370-18H	TMI370-18HA
9/16-32	0.370	0.888	0.014	0.375	3.00	4	TMI370-32H	TMI370-32HA
5/8-11	0.470	1.309	0.041	0.500	4.00	4	TMI470-11H	TMI470-11HA
3/4-10	0.495	1.340	0.045	0.500	4.00	4	TMI495-10H	TMI495-10HA
3/4-12	0.495	1.283	0.038	0.500	4.00	4	TMI495-12H	TMI495-12HA
3/4-14	0.495	1.314	0.032	0.500	4.00	4	TMI495-14H	TMI495-14HA
3/4-16	0.495	1.338	0.028	0.500	4.00	4	TMI495-16H	TMI495-16HA
3/4-18	0.495	1.300	0.025	0.500	4.00	4	TMI495-18H	TMI495-18HA
3/4-20	0.495	1.320	0.023	0.500	4.00	4	TMI495-20H	TMI495-20HA
3/4-32	0.495	1.325	0.014	0.500	4.00	4	TMI495-32H	TMI495-32HA
7/8-9	0.620	1.489	0.049	0.625	4.00	4	TMI620-9H	TMI620-9HA
1.0-8	0.620	1.550	0.056	0.625	4.00	4	TMI620-8H	TMI620-8HA
1.0-12	0.620	1.534	0.038	0.625	4.00	4	TMI620-12H	TMI620-12HA
1.0-14	0.620	1.529	0.032	0.625	4.00	4	TMI620-14H	TMI620-14HA
1.0-16	0.620	1.525	0.028	0.625	4.00	4	TMI620-16H	TMI620-16HA

***Thread mills can cut any larger size internal thread of the same pitch**

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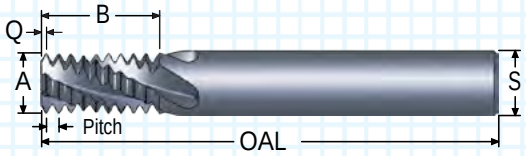
UN THREAD MILLS
30° HELICAL FLUTE SOLID CARBIDE

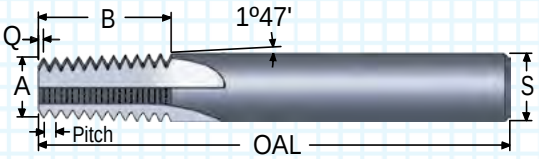


- Helical flute for reduced side cutting pressure
- Non-crest cutting on the internal thread allows maximum flexibility for plated and non-standard threads

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
10-24	0.125	0.350	0.019	0.250	2.50	3	TM125-24H	TM125-24HA
10-24	0.140	0.392	0.019	0.250	2.50	3	TM140-24H	TM140-24HA
10-28	0.140	0.407	0.016	0.250	2.50	3	TM140-28H	TM140-28HA
10-32	0.140	0.388	0.014	0.250	2.50	3	TM140-32H	TM140-32HA
10-48	0.140	0.383	0.009	0.250	2.50	3	TM140-48H	TM140-48HA
1/4-20	0.170	0.520	0.023	0.250	2.50	3	TM170-20H	TM170-20HA
1/4-24	0.170	0.517	0.019	0.250	2.50	3	TM170-24H	TM170-24HA
1/4-28	0.170	0.514	0.016	0.250	2.50	3	TM170-28H	TM170-28HA
1/4-32	0.170	0.513	0.014	0.250	2.50	3	TM170-32H	TM170-32HA
1/4-36	0.170	0.511	0.013	0.250	2.50	3	TM170-36H	TM170-36HA
1/4-20	0.187	0.520	0.023	0.250	2.50	3	TM187-20H	TM187-20HA
1/4-24	0.187	0.517	0.019	0.250	2.50	3	TM187-24H	TM187-24HA
1/4-28	0.187	0.514	0.016	0.250	2.50	3	TM187-28H	TM187-28HA
1/4-32	0.187	0.513	0.014	0.250	2.50	3	TM187-32H	TM187-32HA
1/4-36	0.187	0.511	0.013	0.250	2.50	3	TM187-36H	TM187-36HA
1/4-40	0.187	0.511	0.011	0.250	2.50	3	TM187-40H	TM187-40HA
5/16-18	0.235	0.689	0.025	0.250	2.50	3	TM235-18H	TM235-18HA
5/16-20	0.235	0.670	0.023	0.250	2.50	3	TM235-20H	TM235-20HA
5/16-24	0.235	0.684	0.019	0.250	2.50	3	TM235-24H	TM235-24HA
5/16-28	0.235	0.657	0.016	0.250	2.50	3	TM235-28H	TM235-28HA
5/16-32	0.235	0.669	0.014	0.250	2.50	3	TM235-32H	TM235-32HA
5/16-40	0.235	0.660	0.011	0.250	2.50	3	TM235-40H	TM235-40HA
3/8-16	0.290	0.775	0.028	0.3125	3.50	4	TM290-16H	TM290-16HA
3/8-20	0.290	0.820	0.023	0.3125	3.50	4	TM290-20H	TM290-20HA
3/8-24	0.290	0.808	0.019	0.3125	3.50	4	TM290-24H	TM290-24HA
3/8-27	0.290	0.793	0.017	0.3125	3.50	4	TM290-27H	TM290-27HA
3/8-32	0.290	0.794	0.014	0.3125	3.50	4	TM290-32H	TM290-32HA
7/16-14	0.345	0.814	0.032	0.375	3.50	4	TM345-14H	TM345-14HA
7/16-18	0.345	0.800	0.025	0.375	3.50	4	TM345-18H	TM345-18HA
7/16-20	0.345	0.820	0.023	0.375	3.50	4	TM345-20H	TM345-20HA
7/16-24	0.345	0.808	0.019	0.375	3.50	4	TM345-24H	TM345-24HA
7/16-28	0.345	0.800	0.016	0.375	3.50	4	TM345-28H	TM345-28HA
9/16-12	0.400	1.117	0.038	0.500	3.50	4	TM400-12H	TM400-12HA
1/2-13	0.400	1.108	0.035	0.500	3.50	4	TM400-13H	TM400-13HA
1/2-16	0.400	1.088	0.028	0.500	3.50	4	TM400-16H	TM400-16HA
1/2-20	0.400	1.120	0.023	0.500	3.50	4	TM400-20H	TM400-20HA
1/2-24	0.400	1.100	0.019	0.500	3.50	4	TM400-24H	TM400-24HA
1/2-28	0.400	1.086	0.016	0.500	3.50	4	TM400-28H	TM400-28HA
1/2-32	0.400	1.106	0.014	0.500	3.50	4	TM400-32H	TM400-32HA
3/4-10	0.450	1.140	0.045	0.500	3.50	4	TM450-10H	TM450-10HA
5/8-11	0.450	1.127	0.041	0.500	3.50	4	TM450-11H	TM450-11HA
5/8-12	0.450	1.117	0.038	0.500	3.50	4	TM450-12H	TM450-12HA
9/16-16	0.450	1.088	0.028	0.500	3.50	4	TM450-16H	TM450-16HA
9/16-18	0.450	1.078	0.025	0.500	3.50	4	TM450-18H	TM450-18HA
9/16-20	0.450	1.120	0.023	0.500	3.50	4	TM450-20H	TM450-20HA

***Thread mills can cut any larger size internal thread of the same pitch**

THREAD MILLS - NPT - STRAIGHT FLUTE
SOLID CARBIDE (NATIONAL PIPE TAPER)

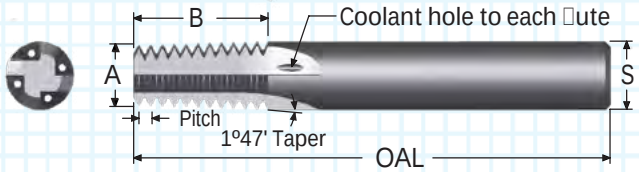


- Made with premium submicron grade carbide
- ALTiN+ coated for higher cutting speed

STRAIGHT FLUTE - NPT

THREAD DIA. / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/16, 1/8-27	0.218	0.534	0.018	0.2500	2.50	4	TM218-27NPT	TM218-27NPT-A
1/8-27	0.280	0.758	0.018	0.3750	3.50	4	TM280-27NPT	TM280-27NPT-A
1/4, 3/8-18	0.330	0.693	0.027	0.3750	3.50	4	TM330-18NPT	TM330-18NPT-A
1/4, 3/8-18	0.382	0.800	0.027	0.4375	3.50	4	TM382-18NPT	TM382-18NPT-A
1/2, 3/4-14	0.430	1.105	0.035	0.5000	3.50	4	TM430-14NPT	TM430-14NPT-A
1 to 2-11½	0.650	1.605	0.043	0.7500	4.00	5	TM650-11.5NPT	TM650-11.5NPT-A
2½ up-8	0.650	1.560	0.062	0.7500	4.00	5	TM650-8NPT	TM650-8NPT-A

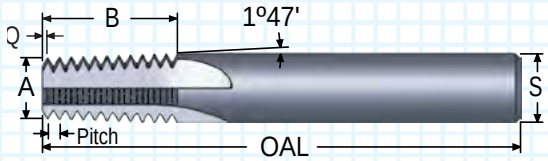
For increased performance, use with tapered pipe reamer on page 114.



- Coolant to each flute
- Cuts internal or external threads

COOLANT THROUGH STRAIGHT FLUTE - NPT

MIN IN THREAD/ PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	COATED
							INTERNAL OR EXTERNAL THREADS	
1/16, 1/8-27	0.218	0.534	0.018	0.250	2.50	4	TMC218-27NPT	TMC218-27NPT-A
1/4, 3/8-18	0.330	0.693	0.027	0.375	3.50	4	TMC330-18NPT	TMC330-18NPT-A
1/2, 3/4-14	0.430	1.105	0.035	0.500	3.50	4	TMC430-14NPT	TMC430-14NPT-A
1 to 2-11½	0.550	1.172	0.043	0.625	3.50	6	TMC550-11.5NPT	TMC550-11.5NPT-A



- ALTiN+ coating for improved surface finish
- Polished flute face for optimum performance

STRAIGHT FLUTE - DRYSEAL - NPTF

THREAD DIA. / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/16, 1/8-27	0.218	0.534	0.018	0.250	2.50	4	TM218-27NPTF	TM218-27NPTF-A
1/8-27	0.280	0.758	0.018	0.375	3.50	4	TM280-27NPTF	TM280-27NPTF-A
1/4, 3/8-18	0.330	0.693	0.027	0.375	3.50	4	TM330-18NPTF	TM330-18NPTF-A
1/4, 3/8-18	0.382	0.800	0.027	0.4375	3.50	4	TM382-18NPTF	TM382-18NPTF-A
1/2, 3/4-14	0.430	1.105	0.035	0.500	3.50	4	TM430-14NPTF	TM430-14NPTF-A
1 to 2-11½	0.650	1.605	0.043	0.750	4.00	5	TM650-11.5NPTF	TM650-11.5NPTF-A
2½ up-8	0.650	1.560	0.062	0.750	4.00	5	TM650-8NPTF	TM650-8NPTF-A

All NPT thread mills are crest cutting (full profile)

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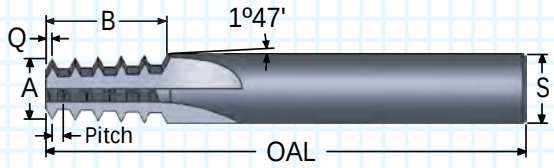
THREAD MILLS - NPT - STRAIGHT FLUTE STAGGERED TOOTH - SOLID CARBIDE
(NATIONAL PIPE TAPER)



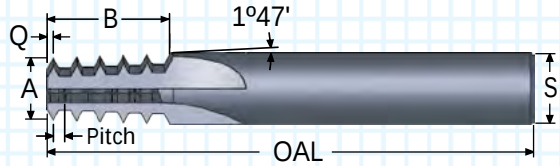
- Staggered tooth design reduces tool pressure
- ALTiN+ coating extends tool life

STRAIGHT FLUTE - STAGGERED TOOTH - NPT

THREAD DIA. / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/16, 1/8-27	0.220	0.534	0.019	0.250	2.50	4	TM220-27NPT	TM220-27NPT-A
1/8-27	0.275	0.758	0.019	0.375	3.50	4	TM275-27NPT	TM275-27NPT-A
1/4, 3/8-18	0.335	0.693	0.028	0.375	3.50	4	TM335-18NPT	TM335-18NPT-A
1/4, 3/8-18	0.387	0.805	0.028	0.4375	3.50	4	TM387-18NPT	TM387-18NPT-A
1/2, 3/4-14	0.435	1.034	0.036	0.500	3.50	4	TM435-14NPT	TM435-14NPT-A
1/2, 3/4-14	0.440	1.034	0.036	0.750	6.00	4	◆ TM440-14NPT	◆ TM440-14NPT-A
1¼ to 2-11½	1.000	1.742	0.044	1.000	6.00	6	▲ TM1.0-11.5NPT	▲ TM1.0-11.5NPT-A

For increased performance, use with tapered pipe reamer on page 114.

◆ Tool is steel shank with a solid carbide head
▲ Tool is carbide tipped with coolant hole to each flute



- Made from premium submicron carbide
- ALTiN+ coated tool for higher cutting speed

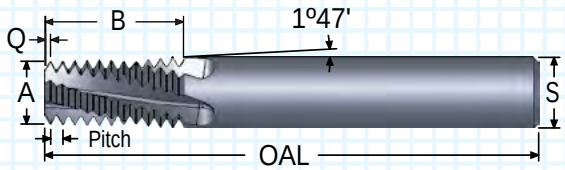
STRAIGHT FLUTE - STAGGERED TOOTH- DRYSEAL - NPTF

THREAD DIA. / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/16, 1/8-27	0.220	0.534	0.019	0.250	2.50	4	TM220-27NPTF	TM220-27NPTF-A
1/8-27	0.275	0.758	0.019	0.375	3.50	4	TM275-27NPTF	TM275-27NPTF-A
1/4, 3/8-18	0.335	0.693	0.028	0.375	3.50	4	TM335-18NPTF	TM335-18NPTF-A
1/4, 3/8-18	0.387	0.805	0.028	0.4375	3.50	4	TM387-18NPTF	TM387-18NPTF-A
1/2, 3/4-14	0.435	1.034	0.036	0.500	3.50	4	TM435-14NPTF	TM435-14NPTF-A
1/2, 3/4-14	0.440	1.034	0.036	0.750	6.00	4	◆ TM440-14NPTF	◆ TM440-14NPTF-A
1¼ to 2-11½	1.000	1.700	0.044	1.00	6.00	6	▲ TM1.0-11.5NPTF	▲ TM1.0-11.5NPTF-A

◆ Tool is steel shank with a solid carbide head
▲ Tool is carbide tipped with coolant hole to each flute

All NPT thread mills are crest cutting (full profile)

THREAD MILLS - NPT - HELICAL - CARBIDE
(NATIONAL PIPE TAPER)

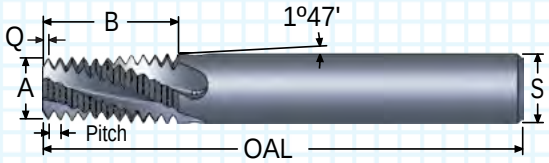


- Made with premium submicron grade carbide
- ALTiN+ coating for improved surface finish

15° HELICAL FLUTE- NPT

THREAD DIA./PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/16,1/8-27	0.222	0.461	0.018	0.250	2.50	3	TMX222-27-H	TMX222-27-HA
1/4,3/8-18	0.270	0.636	0.027	0.312	2.50	4	TMX270-18-H	TMX270-18-HA
1/2,3/4-14	0.440	0.890	0.035	0.500	4.00	4	TMX440-14-H	TMX440-14-HA
1" to 2"-11.5	0.550	1.171	0.043	0.625	4.00	4	TMX550-11.5-H	TMX550-11.5-HA

For increased performance, use with tapered pipe reamer on page 114.

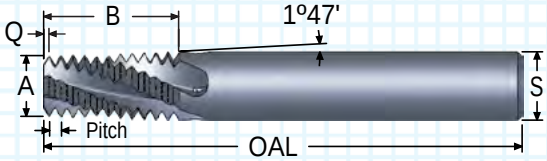


- ALTiN+ coating extends tool life
- Helical flute for reduce side cutting pressure

30° HELICAL FLUTE - NPT

THREAD DIA. / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/16,1/8-27	0.218	0.534	0.018	0.250	2.50	4	TM218-27NPT-H	TM218-27NPT-HA
1/8-27	0.280	0.758	0.018	0.375	3.50	4	TM280-27NPT-H	TM280-27NPT-HA
1/4, 3/8-18	0.330	0.693	0.027	0.375	3.50	4	TM330-18NPT-H	TM330-18NPT-HA
1/4, 3/8-18	0.382	0.800	0.027	0.4375	3.50	4	TM382-18NPT-H	TM382-18NPT-HA
1/2, 3/4-14	0.430	1.105	0.035	0.500	3.50	4	TM430-14NPT-H	TM430-14NPT-HA

For increased performance, use with tapered pipe reamer on page 114.



- Polished flute face for optimum performance
- ALTiN+ coated tool for higher cutting speed

30° HELICAL FLUTE - NPTF - DRYSEAL

THREAD DIA. / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/16, 1/8-27	0.218	0.534	0.018	0.250	2.50	4	TM218-27NPTF-H	TM218-27NPTF-HA
1/8-27	0.280	0.758	0.018	0.375	3.50	4	TM280-27NPTF-H	TM280-27NPTF-HA
1/4, 3/8-18	0.330	0.693	0.027	0.375	3.50	4	TM330-18NPTF-H	TM330-18NPTF-HA
1/4, 3/8-18	0.382	0.800	0.027	0.4375	3.50	4	TM382-18NPTF-H	TM382-18NPTF-HA
1/2, 3/4-14	0.430	1.105	0.035	0.500	3.50	4	TM430-14NPTF-H	TM430-14NPTF-HA

All NPT thread mills are crest cutting (full profile)

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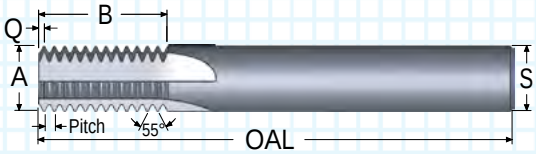
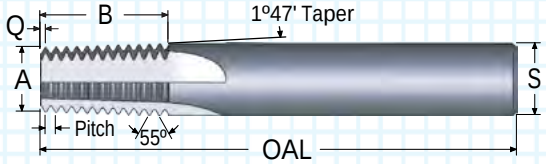
THREAD MILLS - BSPP - SOLID CARBIDE
(BRITISH STANDARD PIPE PARALLEL)
FULL PROFILE



- ALTiN+ coating extends tool life
- Polished flute face for optimum performance

THREAD DIA / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/8-28	0.245	0.657	0.016	0.250	2.50	4	TM245-28BSPP	TM245-28BSPP-A
1/4, 3/8-19	0.345	0.811	0.024	0.375	3.50	4	TM345-19BSPP	TM345-19BSPP-A
1/2, 3/4-14	0.450	1.100	0.034	0.500	3.50	4	TM450-14BSPP	TM450-14BSPP-A
1 to 6-11	0.620	1.125	0.040	0.625	3.50	5	TM620-11BSPP	TM620-11BSPP-A

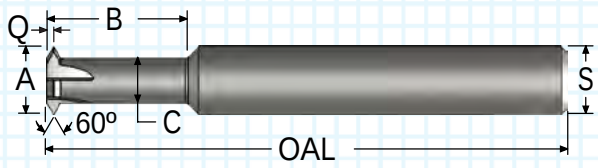
THREAD MILLS - BSPT - SOLID CARBIDE
(BRITISH STANDARD PIPE TAPER)
FULL PROFILE



- ALTiN+ coated for improved surface finish
- Made with premium submicron grade carbide

THREAD DIA. / PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
1/8-28	0.215	0.550	0.017	0.250	2.50	4	TM215-28BSPT	TM215-28BSPT-A
1/4, 3/8-19	0.335	0.650	0.025	0.375	3.50	4	TM335-19BSPT	TM335-19BSPT-A
1/2, 3/4-14	0.430	1.100	0.035	0.500	3.50	4	TM430-14BSPT	TM430-14BSPT-A
1 to 6-11	0.550	1.127	0.045	0.625	3.50	5	TM550-11BSPT	TM550-11BSPT-A

METRIC THREAD MILLS
SINGLE PROFILE (SPTM) - SOLID CARBIDE



With just 19 varieties of Thread Mills, fine and coarse threads ranging from M1.2 to M30+ can be milled

MIN ID THREAD*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	RECOM-MENDED PITCH-MM	FLUTES	ORDER #	
									UNCOATED	ALTiN+
									INTERNAL OR EXTERNAL THREADS	
M1.2	0.032	0.060	0.018	0.005	0.125	1.50	0.20 to 0.25	2	SPTM032	SPTM032A
M1.2	0.032	0.100	0.018	0.005	0.125	1.50	0.20 to 0.25	2	SPTM032L	SPTM032LA
M1.4	0.040	0.090	0.022	0.006	0.125	1.50	0.25 to 0.30	2	SPTM040	SPTM040A
M1.4	0.040	0.109	0.022	0.006	0.125	1.50	0.25 to 0.30	2	SPTM040ML	SPTM040MLA
M1.4	0.040	0.125	0.022	0.006	0.125	1.50	0.25 to 0.30	2	SPTM040L	SPTM040LA
M1.8	0.050	0.100	0.028	0.007	0.125	1.50	0.30 to 0.40	3	SPTM050	SPTM050A
M1.8	0.050	0.125	0.028	0.007	0.125	1.50	0.30 to 0.40	3	SPTM050ML	SPTM050MLA
M1.8	0.050	0.150	0.028	0.007	0.125	1.50	0.30 to 0.40	3	SPTM050L	SPTM050LA
M2.0	0.059	0.125	0.034	0.008	0.125	1.50	0.30 to 0.45	3	SPTM059	SPTM059A
M2.0	0.059	0.165	0.034	0.008	0.125	1.50	0.30 to 0.45	3	SPTM059ML	SPTM059MLA
M2.0	0.059	0.200	0.034	0.008	0.125	1.50	0.30 to 0.45	3	SPTM059L	SPTM059LA
M2.0	0.060	0.125	0.034	0.009	0.1875	2.00	0.30 to 0.45	3	SPTM060	SPTM060A
M2.0	0.060	0.165	0.034	0.009	0.1875	2.00	0.30 to 0.45	3	SPTM060ML	SPTM060MLA
M2.0	0.060	0.200	0.034	0.009	0.1875	2.00	0.30 to 0.45	3	SPTM060L	SPTM060LA
M2.5	0.072	0.150	0.040	0.010	0.1875	2.00	0.35 to 0.50	3	SPTM072	SPTM072A
M2.5	0.072	0.250	0.040	0.010	0.1875	2.00	0.35 to 0.50	3	SPTM072L	SPTM072LA
M3.0	0.080	0.190	0.045	0.011	0.1875	2.00	0.40 to 0.60	3	SPTM080	SPTM080A
M3.0	0.080	0.250	0.045	0.011	0.1875	2.00	0.40 to 0.60	3	SPTM080ML	SPTM080MLA
M3.0	0.080	0.300	0.045	0.011	0.1875	2.00	0.40 to 0.60	3	SPTM080L	SPTM080LA
M3.5	0.098	0.250	0.049	0.015	0.1875	2.00	0.40 to 0.80	3	SPTM098	SPTM098A
M3.5	0.098	0.330	0.049	0.015	0.1875	2.00	0.40 to 0.80	3	SPTM098ML	SPTM098MLA
M3.5	0.098	0.400	0.049	0.015	0.1875	2.00	0.40 to 0.80	3	SPTM098L	SPTM098LA
M4.0	0.120	0.300	0.070	0.016	0.1875	2.00	0.45 to 0.80	3	SPTM120	SPTM120A
M4.0	0.120	0.400	0.070	0.016	0.1875	2.00	0.45 to 0.80	3	SPTM120ML	SPTM120MLA
M4.0	0.120	0.500	0.070	0.016	0.1875	2.00	0.45 to 0.80	3	SPTM120L	SPTM120LA
M5.0	0.138	0.400	0.075	0.020	0.1875	2.00	0.45 to 1.00	3	SPTM138	SPTM138A
M5.0	0.138	0.500	0.075	0.020	0.1875	2.00	0.45 to 1.00	3	SPTM138ML	SPTM138MLA
M5.0	0.138	0.600	0.075	0.020	0.1875	2.00	0.45 to 1.00	3	SPTM138L	SPTM138LA
M6.0	0.160	0.400	0.080	0.025	0.1875	2.00	0.50 to 1.25	3	SPTM160	SPTM160A
M6.0	0.160	0.650	0.080	0.025	0.1875	2.00	0.50 to 1.25	3	SPTM160L	SPTM160LA

***Single profile thread mills can cut any larger size internal thread within the recommended pitch-mm**

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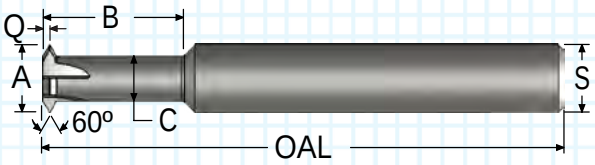
METRIC THREAD MILLS
SINGLE PROFILE (SPTM) - SOLID CARBIDE

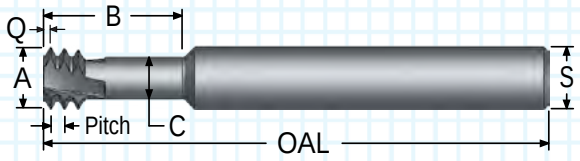


- Solid carbide provides maximum tool rigidity
- Long reach tools are available from stock
- ALTiN+ coating extends tool life

MIN ID THREAD*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	RECOM-MENDED PITCH-MM	FLUTES	ORDER #	
									UNCOATED	ALTiN+
									INTERNAL OR EXTERNAL THREADS	
M7.0	0.182	0.400	0.104	0.025	0.250	2.50	0.50 to 1.25	4	SPTM182	SPTM182A
M7.0	0.182	0.530	0.104	0.025	0.250	2.50	0.50 to 1.25	4	SPTM182ML	SPTM182MLA
M7.0	0.182	0.650	0.104	0.025	0.250	2.50	0.50 to 1.25	4	SPTM182L	SPTM182LA
M8.0	0.240	0.500	0.153	0.028	0.250	2.50	0.50 to 1.50	4	SPTM240	SPTM240A
M8.0	0.240	0.800	0.153	0.028	0.250	2.50	0.50 to 1.50	4	SPTM240L	SPTM240LA
M10	0.290	0.600	0.192	0.031	0.375	3.00	0.75 to 1.75	4	SPTM290	SPTM290A
M10	0.290	1.000	0.192	0.031	0.375	3.00	0.75 to 1.75	4	SPTM290L	SPTM290LA
M12	0.372	0.750	0.240	0.041	0.375	3.00	0.80 to 2.00	4	SPTM372	SPTM372A
M12	0.372	1.200	0.240	0.041	0.375	3.00	0.80 to 2.00	4	SPTM372L	SPTM372LA
M16	0.488	0.850	0.340	0.046	0.500	3.50	0.80 to 2.50	5	SPTM488	SPTM488A
M16	0.488	1.350	0.340	0.046	0.500	3.50	0.80 to 2.50	5	SPTM488L	SPTM488LA
M20	0.595	1.250	0.430	0.051	0.625	4.00	1.00 to 2.50	6	SPTM595	SPTM595A
M20	0.595	2.000	0.430	0.051	0.625	4.00	1.00 to 2.50	6	SPTM595L	SPTM595LA
M24	0.695	1.500	0.490	0.063	0.750	5.00	1.00 to 3.00	6	SPTM695	SPTM695A
M24	0.695	2.500	0.490	0.063	0.750	5.00	1.00 to 3.00	6	SPTM695L	SPTM695LA
M30	0.745	1.500	0.400	0.107	0.750	5.00	3.00 to 6.00	6	SPTM745	SPTM745A
M30	0.745	2.500	0.400	0.107	0.750	5.00	3.00 to 6.00	6	SPTM745L	SPTM745LA

***Single profile thread mills can cut any larger size internal thread within the recommended pitch-mm**

METRIC THREAD MILLS
LONG REACH (TMLR) - SOLID CARBIDE
FULL PROFILE



- Small thread milling is made easy with TMLR tools
- Minimal cutting pressure
- Thread sizes starting from M1.4-.3mm

MIN ID THREAD /PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
								UNCOATED	ALTiN+
								INTERNAL THREADS ONLY	
M1.4-.3	0.039	0.115	0.021	0.006	0.125	1.50	3	TMLR1.4-.3MM	TMLR1.4-.3MMA
M1.4-.3	0.039	0.150	0.021	0.006	0.125	1.50	3	TMLR1.4-.3MMEL	TMLR1.4-.3MMELA
M1.6-.35	0.045	0.135	0.023	0.007	0.125	1.50	3	TMLR1.6-.35MM	TMLR1.6-.35MMA
M1.6-.35	0.045	0.180	0.023	0.007	0.125	1.50	3	TMLR1.6-.35MMEL	TMLR1.6-.35MMELA
M2-.4	0.056	0.150	0.030	0.008	0.125	1.50	3	TMLRS2-.4MM	TMLRS2-.4MMA
M2-.4	0.056	0.200	0.030	0.008	0.125	1.50	3	TMLRS2-.4MMEL	TMLRS2-.4MMELA
M2-.4	0.056	0.150	0.030	0.008	0.250	2.50	3	TMLR2-.4MM	TMLR2-.4MMA
M2-.4	0.056	0.200	0.030	0.008	0.250	2.50	3	TMLR2-.4MMEL	TMLR2-.4MMELA
M2.5-.45	0.073	0.190	0.046	0.009	0.250	2.50	3	TMLR2.5-.45MM	TMLR2.5-.45MMA
M2.5-.45	0.073	0.250	0.046	0.009	0.250	2.50	3	TMLR2.5-.45MMEL	TMLR2.5-.45MMELA
M3-.5	0.090	0.225	0.059	0.010	0.250	2.50	3	TMLR3-.5MM	TMLR3-.5MMA
M3-.5	0.090	0.300	0.059	0.010	0.250	2.50	3	TMLR3-.5MMEL	TMLR3-.5MMELA
M4-.5	0.120	0.300	0.089	0.010	0.250	2.50	3	TMLR4-.5MM	TMLR4-.5MMA
M4-.5	0.120	0.500	0.089	0.010	0.250	2.50	3	TMLR4-.5MMEL	TMLR4-.5MMELA
M4-.7	0.120	0.300	0.079	0.014	0.250	2.50	3	TMLR4-.7MM	TMLR4-.7MMA
M4-.7	0.120	0.500	0.079	0.014	0.250	2.50	3	TMLR4-.7MMEL	TMLR4-.7MMELA
M5-.8	0.150	0.400	0.103	0.016	0.250	2.50	3	TMLR5-.8MM	TMLR5-.8MMA
M5-.8	0.150	0.600	0.103	0.016	0.250	2.50	3	TMLR5-.8MMEL	TMLR5-.8MMELA
M6-1	0.180	0.500	0.120	0.020	0.250	2.50	3	TMLR6-1MM	TMLR6-1MMA
M6-1	0.180	0.700	0.120	0.020	0.250	2.50	3	TMLR6-1MMEL	TMLR6-1MMELA

***Thread mills can cut any larger size internal thread of the same pitch**

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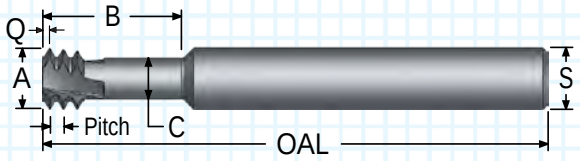
METRIC THREAD MILLS
LONG REACH (TMLR) - SOLID CARBIDE
FULL PROFILE

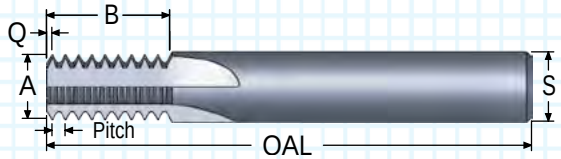


- Economical cost per hole
- Excels in difficult-to-thread materials
- ALTiN+ coating for higher Surface Feet per Minute

MIN ID THREAD/ PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
								UNCOATED	ALTiN+
								INTERNAL THREADS ONLY	
M8-.75	0.234	0.600	0.190	0.015	0.250	2.50	3	TMLR8-.75MM	TMLR8-.75MMA
M8-.75	0.234	0.850	0.190	0.015	0.250	2.50	3	TMLR8-.75MMEL	TMLR8-.75MMELA
M8-1	0.234	0.600	0.175	0.020	0.250	2.50	3	TMLR8-1MM	TMLR8-1MMA
M8-1	0.234	0.850	0.175	0.020	0.250	2.50	3	TMLR8-1MMEL	TMLR8-1MMELA
M8-1.25	0.234	0.600	0.162	0.025	0.250	2.50	3	TMLR8-1.25MM	TMLR8-1.25MMA
M8-1.25	0.234	0.850	0.162	0.025	0.250	2.50	3	TMLR8-1.25MMEL	TMLR8-1.25MMELA
M10-1	0.310	0.750	0.250	0.020	0.375	3.50	3	TMLR10-1MM	TMLR10-1MMA
M10-1	0.310	1.000	0.250	0.020	0.375	3.50	3	TMLR10-1MMEL	TMLR10-1MMELA
M10-1.5	0.310	0.750	0.223	0.030	0.375	3.50	3	TMLR10-1.5MM	TMLR10-1.5MMA
M10-1.5	0.310	1.000	0.223	0.030	0.375	3.50	3	TMLR10-1.5MMEL	TMLR10-1.5MMELA
M12-1	0.370	0.800	0.310	0.020	0.375	3.50	3	TMLR12-1MM	TMLR12-1MMA
M12-1	0.370	1.200	0.310	0.020	0.375	3.50	3	TMLR12-1MMEL	TMLR12-1MMELA
M12-1.25	0.370	0.800	0.295	0.025	0.375	3.50	3	TMLR12-1.25MM	TMLR12-1.25MMA
M12-1.25	0.370	1.200	0.295	0.025	0.375	3.50	3	TMLR12-1.25MMEL	TMLR12-1.25MMELA
M14-1.5	0.450	1.200	0.360	0.030	0.500	4.00	4	TMLR14-1.5MM	TMLR14-1.5MMA
M14-1.5	0.450	1.650	0.360	0.030	0.500	4.00	4	TMLR14-1.5MMEL	TMLR14-1.5MMELA
M14-2	0.450	1.200	0.330	0.039	0.500	4.00	4	TMLR14-2MM	TMLR14-2MMA
M14-2	0.450	1.650	0.330	0.039	0.500	4.00	4	TMLR14-2MMEL	TMLR14-2MMELA

***Thread mills can cut any larger size internal thread of the same pitch**

THREAD MILLS - METRIC
STRAIGHT FLUTE - CARBIDE
FULL PROFILE



- Short length-of-cut for ideal length-to-diameter ratio
- Polished flute face for optimum performance
- Made with premium submicron grade carbide
- Internal crest cutting design for strongest possible tool

3 FLUTE

MIN ID THREAD/ PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
						INTERNAL THREADS ONLY	
M3-.5	0.090	0.264	0.009	0.250	2.50	TM3-.5MM	TM3-.5MM-A
M3-.5	0.090	0.185	0.009	0.250	2.50	TM3-.5MM-S	TM3-.5MM-SA
M3.5-.6	0.090	0.269	0.011	0.250	2.50	TM3.5-.6MM	TM3.5-.6MM-A
M3.5-.6	0.090	0.175	0.011	0.250	2.50	TM3.5-.6MM-S	TM3.5-.6MM-SA
M4-.5	0.110	0.323	0.009	0.250	2.50	TM4-.5MM	TM4-.5MM-A
M4-.5	0.110	0.224	0.009	0.250	2.50	TM4-.5MM-S	TM4-.5MM-SA
M4-.7	0.110	0.342	0.012	0.250	2.50	TM4-.7MM	TM4-.7MM-A
M4-.7	0.110	0.231	0.012	0.250	2.50	TM4-.7MM-S	TM4-.7MM-SA
M4.5-.75	0.125	0.337	0.013	0.250	2.50	TM4.5-.75MM	TM4.5-.75MM-A
M4.5-.75	0.125	0.219	0.013	0.250	2.50	TM4.5-.75MM-S	TM4.5-.75MM-SA
M5-.7	0.140	0.397	0.012	0.250	2.50	TM5-.7MM	TM5-.7MM-A
M5-.7	0.140	0.259	0.012	0.250	2.50	TM5-.7MM-S	TM5-.7MM-SA
M5-.8	0.140	0.391	0.014	0.250	2.50	TM5-.8MM	TM5-.8MM-A
M5-.8	0.140	0.265	0.014	0.250	2.50	TM5-.8MM-S	TM5-.8MM-SA
M6-.5	0.170	0.520	0.009	0.250	2.50	TM6-.5MM	TM6-.5MM-A
M6-.5	0.170	0.382	0.009	0.250	2.50	TM6-.5MM-S	TM6-.5MM-SA
M6-.75	0.170	0.543	0.013	0.250	2.50	TM6-.75MM	TM6-.75MM-A
M6-.75	0.170	0.366	0.013	0.250	2.50	TM6-.75MM-S	TM6-.75MM-SA
M6-1	0.170	0.528	0.018	0.250	2.50	TM6-1MM	TM6-1MM-A
M6-1	0.170	0.370	0.018	0.250	2.50	TM6-1MM-S	TM6-1MM-SA
M6-1.25	0.170	0.561	0.022	0.250	2.50	TM6-1.25MM	TM6-1.25MM-A
M6-1.25	0.170	0.364	0.022	0.250	2.50	TM6-1.25MM-S	TM6-1.25MM-SA
M8-.75	0.235	0.662	0.013	0.250	2.50	TM8-.75MM	TM8-.75MM-A
M8-1	0.235	0.685	0.018	0.250	2.50	TM8-1MM	TM8-1MM-A
M8-1.25	0.235	0.660	0.022	0.250	2.50	TM8-1.25MM	TM8-1.25MM-A

***Thread mills can cut any larger size internal thread of the same pitch**

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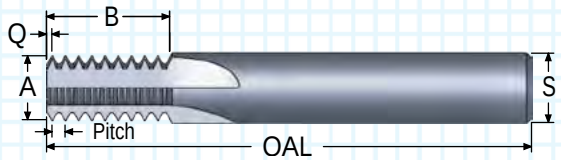
THREAD MILLS - METRIC
STRAIGHT FLUTE - CARBIDE
FULL PROFILE



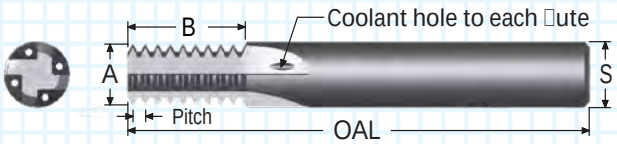
- Polished flute face for optimum performance
- Made with premium submicron grade carbide
- Internal crest cutting design for strongest possible tool

4 FLUTE

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
						INTERNAL THREADS ONLY	
M10-1	0.290	0.803	0.018	0.3125	3.50	TM10-1MM	TM10-1MM-A
M10-1.5	0.290	0.792	0.027	0.3125	3.50	TM10-1.5MM	TM10-1.5MM-A
M12-1.25	0.345	0.807	0.022	0.375	3.50	TM12-1.25MM	TM12-1.25MM-A
M12-1.5	0.345	0.792	0.027	0.375	3.50	TM12-1.5MM	TM12-1.5MM-A
M12-1.75	0.345	0.787	0.031	0.375	3.50	TM12-1.75MM	TM12-1.75MM-A
M12-1	0.400	1.079	0.018	0.500	3.50	TM12-1MM	TM12-1MM-A
M14-1.25	0.450	1.103	0.022	0.500	3.50	TM14-1.25MM	TM14-1.25MM-A
M14-1.5	0.450	1.087	0.027	0.500	3.50	TM14-1.5MM	TM14-1.5MM-A
M14-1.75	0.450	1.134	0.031	0.500	3.50	TM14-1.75MM	TM14-1.75MM-A
M14-2	0.450	1.134	0.035	0.500	3.50	TM14-2MM	TM14-2MM-A
M16-2.5	0.450	1.122	0.044	0.500	3.50	TM16-2.5MM	TM16-2.5MM-A

***Thread mills can cut any larger size internal thread of the same pitch**

METRIC THREAD MILLS
COOLANT THROUGH - SOLID CARBIDE
FULL PROFILE

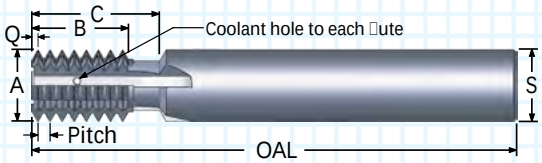


- ALTiN+ coating for higher cutting speed
- Coolant to each flute
- Made with premium submicron grade carbide
- Internal Threads Only

MIN IN THREAD/ PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTE	ORDER #	
							UNCOATED	COATED
							INTERNAL THREADS ONLY	
M3-.5	0.090	0.264	0.009	0.250	2.50	3	TMC3-.5MM	TMC3-.5MM-A
M4-.5	0.110	0.323	0.009	0.250	2.50	3	TMC4-.5MM	TMC4-.5MM-A
M4-.7	0.110	0.342	0.012	0.250	2.50	3	TMC4-.7MM	TMC4-.7MM-A
M4.5-.75	0.125	0.337	0.013	0.250	2.50	3	TMC4.5-.75MM	TMC4.5-.75MM-A
M5-.8	0.140	0.391	0.014	0.250	2.50	3	TMC5-.8MM	TMC5-.8MM-A
M6-.5	0.170	0.520	0.009	0.250	2.50	3	TMC6-.5MM	TMC6-.5MM-A
M6-1	0.170	0.528	0.018	0.250	2.50	3	TMC6-1MM	TMC6-1MM-A
M8-1	0.235	0.685	0.018	0.250	2.50	3	TMC8-1MM	TMC8-1MM-A
M8-1.25	0.235	0.660	0.022	0.250	2.50	3	TMC8-1.25MM	TMC8-1.25MM-A
M10-1	0.290	0.803	0.018	0.3125	3.50	4	TMC10-1MM	TMC10-1MM-A
M10-1.5	0.290	0.792	0.027	0.3125	3.50	4	TMC10-1.5MM	TMC10-1.5MM-A
M12-1.25	0.345	0.807	0.022	0.375	3.50	4	TMC12-1.25MM	TMC12-1.25MM-A
M14-1.5	0.450	1.087	0.027	0.500	3.50	4	TMC14-1.5MM	TMC14-1.5MM-A
M14-2	0.450	1.134	0.035	0.500	3.50	4	TMC14-2MM	TMC14-2MM-A

***Thread mills can cut any larger size internal thread of the same pitch**

METRIC THREAD MILL
COOLANT THROUGH - CARBIDE TIPPED



- Non-crest cutting on the internal thread allows maximum flexibility for plated and non-standard threads

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" TOOL REACH	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
								UNCOATED	ALTiN+
								INTERNAL OR EXTERNAL THREADS	
M24-1.5	0.740	1.058	1.370	0.027	0.750	6.00	4	TMC24-1.5MM	TMC24-1.5MM-A
M24-2	0.740	1.100	1.370	0.036	0.750	6.00	4	TMC24-2MM	TMC24-2MM-A
M24-2.5	0.740	1.076	1.370	0.045	0.750	6.00	4	TMC24-2.5MM	TMC24-2.5MM-A
M24-3	0.740	1.058	1.370	0.054	0.750	6.00	4	TMC24-3MM	TMC24-3MM-A
M36-4	0.990	1.095	2.000	0.071	1.000	6.00	6	TMC36-4MM	TMC36-4MM-A

***Thread mills can cut any larger size internal thread of the same pitch**

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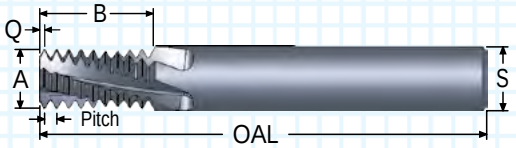
THREAD MILL - METRIC - 15° HELICAL FLUTE - CARBIDE



- Helical flute for reduced side cutting pressure
- ALTiN+ coating extends tool life

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL THREADS ONLY	
M5.0-.8	0.118	0.328	0.014	6mm	58mm	3	TMI5.0-0.80-H	TMI5.0-0.80-HA
M6.0-1	0.169	0.488	0.018	6mm	58mm	3	TMI6.0-1.00-H	TMI6.0-1.00-HA
M8.0-.75	0.234	0.632	0.013	6mm	58mm	3	TMI8.0-0.75-H	TMI8.0-0.75-HA
M8.0-1	0.234	0.646	0.018	6mm	58mm	3	TMI8.0-1.00-H	TMI8.0-1.00-HA
M8.0-1.25	0.234	0.659	0.022	6mm	58mm	3	TMI8.0-1.25-H	TMI8.0-1.25-HA
M10-1.5	0.300	0.790	0.027	8mm	75mm	4	TMI10-1.50-H	TMI10-1.50-HA
M12-1	0.360	0.881	0.018	10mm	100mm	4	TMI12-1.00-H	TMI12-1.00-HA
M12-1.75	0.360	0.923	0.031	10mm	100mm	4	TMI12-1.75-H	TMI12-1.75-HA
M14-1.5	0.370	0.909	0.027	10mm	100mm	4	TMI14-1.50-H	TMI14-1.50-HA
M16-2	0.470	1.290	0.035	12mm	100mm	4	TMI16-2.00-H	TMI16-2.00-HA
M18-1.5	0.470	1.263	0.027	12mm	100mm	4	TMI18-1.50-H	TMI18-1.50-HA
M20-2.5	0.470	1.318	0.044	12mm	100mm	4	TMI20-2.50-H	TMI20-2.50-HA

***Thread mills can cut any larger size internal thread of the same pitch**

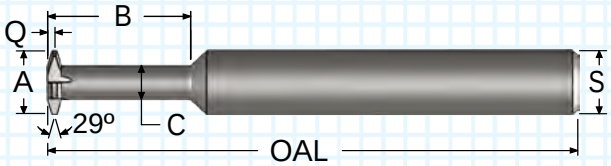
THREAD MILL - METRIC - 30° HELICAL FLUTE - CARBIDE

- Optional short length-of-cut for ideal length-to-diameter ratio
- Internal and external threads

MIN ID THREAD / PITCH*	"A" TOOL DIA.	"B" LENGTH OF CUT	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
							UNCOATED	ALTiN+
							INTERNAL OR EXTERNAL THREADS	
M6-.5	0.170	0.520	0.009	0.250	2.50	3	TM6-.5MM-H	TM6-.5MM-HA
M6-.5	0.170	0.382	0.009	0.250	2.50	3	TM6-.5MM-SH	TM6-.5MM-SHA
M6-.75	0.170	0.543	0.013	0.250	2.50	3	TM6-.75MM-H	TM6-.75MM-HA
M6-.75	0.170	0.366	0.013	0.250	2.50	3	TM6-.75MM-SH	TM6-.75MM-SHA
M6-1	0.170	0.528	0.018	0.250	2.50	3	TM6-1MM-H	TM6-1MM-HA
M6-1	0.170	0.370	0.018	0.250	2.50	3	TM6-1MM-SH	TM6-1MM-SHA
M6-1.25	0.170	0.561	0.022	0.250	2.50	3	TM6-1.25MM-H	TM6-1.25MM-HA
M6-1.25	0.170	0.364	0.022	0.250	2.50	3	TM6-1.25MM-SH	TM6-1.25MM-SHA
M8-.75	0.235	0.662	0.013	0.250	2.50	3	TM8-.75MM-H	TM8-.75MM-HA
M8-1	0.235	0.685	0.018	0.250	2.50	3	TM8-1MM-H	TM8-1MM-HA
M8-1.25	0.235	0.660	0.022	0.250	2.50	3	TM8-1.25MM-H	TM8-1.25MM-HA
M10-1	0.290	0.803	0.018	0.3125	3.50	4	TM10-1MM-H	TM10-1MM-HA
M10-1.5	0.290	0.792	0.027	0.3125	3.50	4	TM10-1.5MM-H	TM10-1.5MM-HA
M12-1.25	0.345	0.807	0.022	0.375	3.50	4	TM12-1.25MM-H	TM12-1.25MM-HA
M12-1.5	0.345	0.792	0.027	0.375	3.50	4	TM12-1.5MM-H	TM12-1.5MM-HA
M12-1.75	0.345	0.787	0.031	0.375	3.50	4	TM12-1.75MM-H	TM12-1.75MM-HA
M12-1	0.400	1.079	0.018	0.500	3.50	4	TM12-1MM-H	TM12-1MM-HA
M14-1.25	0.450	1.103	0.022	0.500	3.50	4	TM14-1.25MM-H	TM14-1.25MM-HA
M14-1.5	0.450	1.087	0.027	0.500	3.50	4	TM14-1.5MM-H	TM14-1.5MM-HA
M14-1.75	0.450	1.134	0.031	0.500	3.50	4	TM14-1.75MM-H	TM14-1.75MM-HA
M14-2	0.450	1.134	0.035	0.500	3.50	4	TM14-2MM-H	TM14-2MM-HA
M16-2.5	0.450	1.122	0.044	0.500	3.50	4	TM16-2.5MM-H	TM16-2.5MM-HA

***Thread mills can cut any larger size internal thread of the same pitch**

STUB ACME - INTERNAL AND EXTERNAL
SOLID CARBIDE SINGLE PROFILE THREAD MILLS



- Solid carbide for maximum tool rigidity
- ALTiN+ coating for increased performance
- Single start threads only

INTERNAL ONLY

* THREAD/ PITCH	"A" CUTTER DIA.	"B" NECK LENGTH	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER # UNCOATED	ORDER # ALTiN+
								INTERNAL THREADS ONLY	
1/4-16	0.170	0.350	0.080	0.022	0.250	2.50	4	SPTM170SA-16	SPTM170SA-16A
1/4-16	0.170	0.500	0.080	0.022	0.250	2.50	4	SPTM170SA-16L	SPTM170SA-16LA
5/16-14	0.200	0.500	0.105	0.024	0.250	2.50	4	SPTM200SA-14	SPTM200SA-14A
5/16-14	0.200	0.750	0.105	0.024	0.250	2.50	4	SPTM200SA-14L	SPTM200SA-14LA
3/8-12, 7/16-12	0.235	0.600	0.130	0.028	0.250	2.50	4	SPTM235SA-12	SPTM235SA-12A
3/8-12, 7/16-12	0.235	0.900	0.130	0.028	0.250	2.50	4	SPTM235SA-12L	SPTM235SA-12LA
1/2-10	0.320	0.750	0.170	0.036	0.375	3.00	4	SPTM320SA-10	SPTM320SA-10A
1/2-10	0.320	1.200	0.170	0.036	0.375	3.00	4	SPTM320SA-10L	SPTM320SA-10LA
5/8-8	0.400	0.800	0.230	0.043	0.500	3.50	4	SPTM400SA-8	SPTM400SA-8A
5/8-8	0.400	1.300	0.230	0.043	0.500	3.50	4	SPTM400SA-8L	SPTM400SA-8LA
3/4-6, 7/8-6	0.490	0.800	0.260	0.058	0.500	3.50	4	SPTM490SA-6	SPTM490SA-6A
3/4-6, 7/8-6	0.490	1.300	0.260	0.058	0.500	3.50	4	SPTM490SA-6L	SPTM490SA-6LA
1-5 to 1¼-5	0.620	1.250	0.350	0.071	0.625	4.00	5	SPTM620SA-5	SPTM620SA-5A
1-5 to 1¼-5	0.620	1.750	0.350	0.071	0.625	4.00	5	SPTM620SA-5L	SPTM620SA-5LA
1⅜-4 to 1¾-4	0.745	1.500	0.425	0.088	0.750	5.00	5	SPTM745SA-4	SPTM745SA-4A
1⅜-4 to 1¾-4	0.745	2.500	0.425	0.088	0.750	5.00	5	SPTM745SA-4L	SPTM745SA-4LA

*** Internal Stub Acme thread mills will only cut the thread size listed. For other thread sizes, please call for availability.**

EXTERNAL ONLY

THREAD/ PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER # UNCOATED	ORDER # ALTiN+
								EXTERNAL THREADS ONLY	
-16	0.240	0.750	0.145	0.024	0.250	2.50	4	SPTM240SA-16EX	SPTM240SA-16EXA
-14	0.240	0.750	0.145	0.026	0.250	2.50	4	SPTM240SA-14EX	SPTM240SA-14EXA
-12	0.370	1.375	0.260	0.031	0.375	3.00	4	SPTM370SA-12EX	SPTM370SA-12EXA
-10	0.495	1.750	0.345	0.038	0.500	3.50	4	SPTM495SA-10EX	SPTM495SA-10EXA
-8	0.495	1.750	0.325	0.046	0.500	3.50	4	SPTM495SA-8EX	SPTM495SA-8EXA
-6	0.620	2.000	0.390	0.062	0.625	4.00	5	SPTM620SA-6EX	SPTM620SA-6EXA
-5	0.745	2.250	0.475	0.074	0.750	5.00	5	SPTM745SA-5EX	SPTM745SA-5EXA
-4	0.745	2.250	0.425	0.091	0.750	5.00	5	SPTM745SA-4EX	SPTM745SA-4EXA

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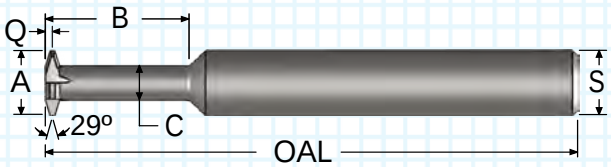
ACME - INTERNAL AND EXTERNAL
SOLID CARBIDE SINGLE PROFILE THREAD MILLS



- Solid carbide for maximum tool rigidity
- ALTiN+ coating extends tool life
- Single start threads only

INTERNAL ONLY

*THREAD/ PITCH	"A" CUTTER DIA.	"B" NECK LENGTH	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER # UNCOATED	ORDER # ALTiN+
								INTERNAL THREADS ONLY	
1/4-16	0.170	0.350	0.080	0.020	0.250	2.50	4	SPTM170FA-16	SPTM170FA-16A
1/4-16	0.170	0.500	0.080	0.020	0.250	2.50	4	SPTM170FA-16L	SPTM170FA-16LA
5/16-14	0.200	0.500	0.105	0.023	0.250	2.50	4	SPTM200FA-14	SPTM200FA-14A
5/16-14	0.200	0.750	0.105	0.023	0.250	2.50	4	SPTM200FA-14L	SPTM200FA-14LA
3/8-12, 7/16-12	0.235	0.600	0.130	0.026	0.250	2.50	4	SPTM235FA-12	SPTM235FA-12A
3/8-12, 7/16-12	0.235	0.900	0.130	0.026	0.250	2.50	4	SPTM235FA-12L	SPTM235FA-12LA
1/2-10	0.320	0.750	0.170	0.033	0.375	3.00	4	SPTM320FA-10	SPTM320FA-10A
1/2-10	0.320	1.200	0.170	0.033	0.375	3.00	4	SPTM320FA-10L	SPTM320FA-10LA
5/8-8	0.400	0.800	0.230	0.039	0.500	3.50	4	SPTM400FA-8	SPTM400FA-8A
5/8-8	0.400	1.300	0.230	0.039	0.500	3.50	4	SPTM400FA-8L	SPTM400FA-8LA
3/4-6, 7/8-6	0.490	0.800	0.260	0.054	0.500	3.50	4	SPTM490FA-6	SPTM490FA-6A
3/4-6, 7/8-6	0.490	1.300	0.260	0.054	0.500	3.50	4	SPTM490FA-6L	SPTM490FA-6LA
1-5 to 1¼-5	0.620	1.250	0.350	0.066	0.625	4.00	5	SPTM620FA-5	SPTM620FA-5A
1-5 to 1¼-5	0.620	1.750	0.350	0.066	0.625	4.00	5	SPTM620FA-5L	SPTM620FA-5LA
1⅜-4 to 1¾-4	0.745	1.500	0.425	0.082	0.750	5.00	5	SPTM745FA-4	SPTM745FA-4A
1⅜-4 to 1¾-4	0.745	2.500	0.425	0.082	0.750	5.00	5	SPTM745FA-4L	SPTM745FA-4LA

*** Internal Acme thread mills will only cut the thread size listed. For other thread sizes, please call for availability.**

EXTERNAL ONLY

THREAD/ PITCH	"A" TOOL DIA.	"B" LENGTH OF CUT	"C" NECK DIA.	"Q" LENGTH	"S" SHANK DIA.	OAL	FLUTES	ORDER # UNCOATED	ORDER # ALTiN+
								EXTERNAL THREADS ONLY	
-16	0.240	0.750	0.145	0.023	0.250	2.50	4	SPTM240FA-16EX	SPTM240FA-16EXA
-14	0.240	0.750	0.145	0.024	0.250	2.50	4	SPTM240FA-14EX	SPTM240FA-14EXA
-12	0.370	1.375	0.260	0.028	0.375	3.00	4	SPTM370FA-12EX	SPTM370FA-12EXA
-10	0.495	1.750	0.345	0.036	0.500	3.50	4	SPTM495FA-10EX	SPTM495FA-10EXA
-8	0.495	1.750	0.325	0.043	0.500	3.50	4	SPTM495FA-8EX	SPTM495FA-8EXA
-6	0.620	2.000	0.390	0.058	0.625	4.00	5	SPTM620FA-6EX	SPTM620FA-6EXA
-5	0.745	2.250	0.475	0.069	0.750	5.00	5	SPTM745FA-5EX	SPTM745FA-5EXA
-4	0.745	2.250	0.425	0.085	0.750	5.00	5	SPTM745FA-4EX	SPTM745FA-4EXA

INTERNAL UN THREAD MILL LOCATOR CHART

This chart is designed to help select the proper thread mill for a given thread size.
ALTiN+ thread mills are highly recommended for ferrous material.

THREAD/ PITCH	EX SPTM PAGE 8,9	TMLR PAGE 10	STRAIGHT FLUTE PAGE 12,13	COOLANT THROUGH PAGE 14	15° HELICAL FLUTE PAGE 18	EX 30° HELICAL FLUTE PAGE 19
00-90	SPTM032	—	—	—	—	—
0-80	SPTM040	—	—	—	—	—
1-64	SPTM050	—	—	—	—	—
1-72	SPTM050	—	—	—	—	—
2-56	SPTM060	TMLR065-56	—	—	—	—
2-64	SPTM060	—	—	—	—	—
3-48	SPTM072	—	—	—	—	—
3-56	SPTM072	TMLR065-56	—	—	—	—
4-40	SPTM080	TMLR082-40	TM080-40	TMC080-40	TMI079-40H	—
4-48	SPTM080	—	—	—	—	—
5-40	SPTM080	TMLR082-40	TM080-40	—	TMI079-40H	—
5-44	SPTM080	—	—	—	—	—
6-32	SPTM098	TMLR100-32	TM098-32	TMC098-32	TMI100-32H	—
6-40	SPTM098	TMLR100-40	TM098-40	TMC098-40	—	—
8-32	SPTM120	TMLR126-32	TM125-32	TMC125-32	TMI115-32H	—
8-36	SPTM120	TMLR126-36	TM110-36	—	—	—
10-24	SPTM138	TMLR139-24	TM140-24	TMC140-24	TMI120-24H	TM140-24H
10-28	SPTM138	—	TM140-28	TMC140-28	TMI120-28H	TM140-28H
10-32	SPTM138	TMLR139-32	TM140-32	TMC140-32	TMI120-32H	TM140-32H
10-36	SPTM138	TMLR126-36	TM110-36	—	—	—
10-40	SPTM138	TMLR100-40	TM098-40	—	—	—
10-48	SPTM138	TMLR139-48	TM140-48	TMC140-48	—	TM140-48H
10-56	SPTM138	—	—	—	—	—
12-24	SPTM160	TMLR139-24	TM140-24	TMC140-24	TMI120-24H	TM140-24H
12-28	SPTM160	—	TM140-28	TMC140-28	TMI120-28H	TM140-28H
12-32	SPTM160	TMLR139-32	TM140-32	TMC140-32	TMI120-32H	TM140-32H
12-36	SPTM160	TMLR126-36	TM170-36	—	—	TM170-36H
12-40	SPTM160	TMLR100-40	TM187-40	—	—	TM187-40H
12-48	SPTM160	TMLR139-48	TM187-48	TMC140-48	—	TM140-48H
12-56	SPTM160	—	—	—	—	—
1/4-20	SPTM182	TMLR186-20	TM187-20	TMC170-20	TMI180-20H	TM187-20H
1/4-24	SPTM182	TMLR139-24	TM187-24	TMC140-24	—	TM187-24H
1/4-27	SPTM182	—	—	—	—	—
1/4-28	SPTM182	TMLR186-28	TM187-28	TMC170-28	TMI180-28H	TM187-28H
1/4-32	SPTM182	TMLR186-32	TM187-32	TMC170-32	—	TM187-32H
1/4-36	SPTM182	TMLR126-36	TM187-36	TMC170-36	—	TM187-36H
1/4-40	SPTM182	TMLR100-40	TM187-40	—	—	TM187-40H
1/4-48	SPTM182	TMLR139-48	TM187-48	—	—	—
1/4-56	SPTM182	—	—	—	—	—

EX **Tools in column will also cut external threads**

Thread mills can cut any larger size internal thread of the same pitch

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INTERNAL UN THREAD MILL LOCATOR CHART

THREAD/ PITCH	EX SPTM PAGE 9	TMLR PAGE 10,11	STRAIGHT FLUTE PAGE 12,13	COOLANT THROUGH PAGE 14,15	EX STAGGERED PAGE 17	15° HELICAL FLUTE PAGE 18	EX 30° HELICAL FLUTE PAGE 19
5/16-18	SPTM240	TMLR234-18	TM235-18	TMC235-18	—	TMI234-18H	TM235-18H
5/16-20	SPTM240	TMLR186-20	TM235-20	TMC235-20	—	TMI180-20H	TM235-20H
5/16-24	SPTM240	TMLR234-24	TM235-24	TMC235-24	—	TMI234-24H	TM235-24H
5/16-27	SPTM240	—	—	—	—	—	—
5/16-28	SPTM240	TMLR234-28	TM235-28	TMC235-28	—	TMI180-28H	TM235-28H
5/16-32	SPTM240	TMLR234-32	TM235-32	TMC235-32	—	TMI234-32H	TM235-32H
5/16-36	SPTM240	TMLR126-36	TM126-36	TMC170-36	—	—	TM187-36H
5/16-40	SPTM240	TMLR234-40	TM235-40	TMC235-40	—	TMI234-40H	TM235-40H
5/16-48	SPTM240	TMLR139-48	TM139-48	TMC140-48	—	—	TM140-48H
3/8-16	SPTM290	TMLR285-16	TM290-16	TMC290-16	—	TMI285-16H	TM290-16H
3/8-18	SPTM240	TMLR234-18	TM235-18	TMC235-18	—	TMI234-18H	TM235-18H
3/8-20	SPTM290	TMLR285-20	TM285-20	TMC290-20	TM250-20	TMI285-20H	TM290-20H
3/8-24	SPTM290	TMLR285-24	TM290-24	TMC290-24	TM250-24	TMI285-24H	TM290-24H
3/8-27	SPTM290	—	TM290-27	—	—	—	TM290-27H
3/8-28	SPTM290	TMLR234-28	TM235-28	TMC235-28	TM250-28	TMI180-28H	TM235-28H
3/8-32	SPTM290	TMLR285-32	TM290-32	TMC235-32	TM250-32	TMI285-32H	TM290-32H
3/8-36	SPTM290	TMLR126-36	TM187-36	TMC170-36	TM250-36	—	TM187-36H
3/8-40	SPTM290	TMLR345-40	TM187-40	TMC235-40	TM250-40	TMI234-40H	TM235-40H
7/16-14	SPTM290	TMLR340-14	TM345-14	TMC345-14	—	TMI305-14H	TM345-14H
7/16-16	SPTM290	TMLR285-16	TM290-16	TMC290-16	TM350-16	TMI285-16H	TM290-16H
7/16-18	SPTM290	TMLR340-18	TM345-18	TMC345-18	TM350-18	TMI335-18H	TM345-18H
7/16-20	SPTM290	TMLR340-20	TM345-20	TMC345-20	TM350-20	TMI335-20H	TM345-20H
7/16-24	SPTM290	TMLR285-24	TM345-24	TMC290-24	TM350-24	TMI285-24H	TM345-24H
7/16-27	SPTM290	—	TM290-27	—	—	—	TM290-27H
7/16-28	SPTM290	TMLR234-28	TM345-28	TMC345-28	TM250-28	—	TM345-28H
7/16-32	SPTM290	TMLR285-32	TM290-32	TMC235-32	TM250-32	TMI285-32H	TM290-32H
1/2-12	SPTM372	TMLR370-12	—	—	—	TMI370-12H	—
1/2-13	SPTM372	TMLR370-13	TM400-13	TMC400-13	—	TMI350-13H	TM400-13H
1/2-14	SPTM372	TMLR340-14	TM345-14	TMC345-14	—	TMI305-14H	TM345-14H
1/2-16	SPTM372	TMLR285-16	TM400-16	TMC290-16	TM350-16	TMI285-16H	TM400-16H
1/2-18	SPTM372	TMLR370-18	TM345-18	TMC345-18	TM350-18	TMI370-18H	TM345-18H
1/2-20	SPTM372	TMLR370-20	TM400-20	TMC400-20	TM350-20	TMI335-20H	TM400-20H
1/2-24	SPTM372	TMLR285-24	TM400-24	TMC290-24	TM350-24	TMI285-24H	TM400-24H
1/2-27	SPTM372	—	TM290-27	—	—	—	TM290-27H
1/2-28	SPTM372	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
1/2-32	SPTM372	TMLR370-32	TM400-32	TMC400-32	TM250-32	TMI285-32H	TM400-32H
9/16-12	SPTM372	TMLR370-12	TM400-12	—	—	TMI370-12H	TM400-12H
9/16-14	SPTM372	TMLR340-14	TM345-14	TMC345-14	—	TMI305-14H	TM345-14H
9/16-16	SPTM372	TMLR285-16	TM450-16	TMC450-16	TM350-16	TMI285-16H	TM450-16H
9/16-18	SPTM372	TMLR370-18	TM450-18	TMC450-18	TM350-18	TMI370-18H	TM450-18H
9/16-20	SPTM372	TMLR370-20	TM450-20	TMC450-20	TM350-20	TMI335-20H	TM450-20H
9/16-24	SPTM372	TMLR285-24	TM400-24	TMC-290-24	TM350-24	TMI285-24	TM400-24H
9/16-27	SPTM372	—	TM290-27	—	—	—	TM290-27H
9/16-28	SPTM372	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
9/16-32	SPTM372	TMLR370-32	TM400-32	TMC400-32	TM250-32	TMI370-32H	TM400-32H

EX **Tools in column will also cut external threads**

INTERNAL UN THREAD MILL LOCATOR CHART

This chart is designed to help select the proper thread mill for a given thread size.

ALTiN+ thread mills are highly recommended for ferrous material.

THREAD/ PITCH	EX SPTM PAGE 9	TMLR PAGE 10,11	STRAIGHT FLUTE PAGE 13	COOLANT THROUGH PAGE 14	EX STAGGERED PAGE 17	15° HELICAL FLUTE PAGE 18	EX 30° HELICAL FLUTE PAGE 19
5/8-11	SPTM488	TMLR470-11	TM450-11	TMC450-11	—	TMI470-11H	TM450-11H
5/8-12	SPTM488	TMLR370-12	TM450-12	TMC450-12	TM500-12	TMI370-12H	TM450-12H
5/8-14	SPTM488	TMLR340-14	TM490-14	TMC345-14	TM500-14	TMI305-14H	TM345-14H
5/8-16	SPTM488	TMLR285-16	TM490-16	TMC450-16	TM500-16	TMI285-16H	TM450-16H
5/8-18	SPTM488	TMIR370-18	TM450-18	TMC345-18	TM350-18	TMI370-18H	TM450-18H
5/8-20	SPTM488	TMLR370-20	TM450-20	TMC450-20	TM350-20	TMI335-20H	TM450-20H
5/8-24	SPTM488	TMLR285-24	TM400-24	TMC290-24	TM350-24	TMI285-24H	TM400-24H
5/8-27	SPTM488	—	TM290-27	—	—	—	TM290-27H
5/8-28	SPTM488	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
5/8-32	SPTM488	TMLR370-32	TM400-32	TMC400-32	TM250-32	TMI370-32H	TM400-32H
11/16-12	SPTM488	TMLR370-12	TM490-12	TMC450-12	TM500-12	TMI495-12H	TM450-12H
11/16-16	SPTM488	TMLR285-16	TM490-16	TMC450-16	TM500-16	TMI495-16H	TM450-16H
11/16-20	SPTM488	TMLR370-20	TM450-20	TMC450-20	TM350-20	TMI495-20H	TM450-20H
11/16-24	SPTM488	TMLR285-24	TM400-24	TMC290-24	TM350-24	TMI285-24H	TM400-24H
11/16-28	SPTM488	TMLR234-28	TM400-28	TMC345-28	TM250-28	—	TM400-28H
11/16-32	SPTM488	TMLR370-32	TM400-32	TMC400-32	TM250-32	TMI495-32H	TM400-32H
3/4-10	SPTM595	TMLR495-10	TM450-10	TMC450-10	—	TMI495-10H	TM450-10H
3/4-12	SPTM595	TMLR495-12	TM490-12	TMC450-12	TM500-12	TMI495-12H	TM450-12H
3/4-14	SPTM595	TMLR340-14	TM490-14	TMC345-14	TM500-14	TMI495-14H	TM345-14H
3/4-16	SPTM595	TMLR495-16	TM490-16	TMC450-16	TM500-16	TMI495-16H	TM450-16H
3/4-18	SPTM595	TMLR370-18	TM450-18	TMC345-18	TM350-18	TMI495-18H	TM450-18H
3/4-20	SPTM595	TMLR370-20	TM450-20	TMC450-20	TM350-20	TMI495-20H	TM450-20H
3/4-24	SPTM595	TMLR285-24	TM400-24	TMC290-24	TM350-24	TMI285-24H	TM400-24H
3/4-27	SPTM595	—	TM290-27	—	—	—	TM290-27H
3/4-28	SPTM595	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
3/4-32	SPTM595	TMLR370-32	TM400-32	TMC400-32	TM250-32	TMI495-32H	TM400-32H
13/16-12	SPTM595	TMLR495-12	TM490-12	TMC450-10	TM500-12	TMI495-12H	TM450-12H
13/16-16	SPTM595	TMLR495-16	TM490-16	TMC450-16	TM500-16	TMI495-16H	TM450-16H
13/16-20	SPTM595	TMLR370-20	TM450-20	TMC450-20	TM350-20	TMI495-20H	TM450-20H
13/16-28	SPTM595	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
13/16-32	SPTM595	TMLR370-32	TM400-32	TMC400-32	TM250-32	TMI495-32H	TM400-32H
7/8-9	SPTM695	—	TM620-9	—	—	TMI620-9H	—
7/8-10	SPTM695	TMLR495-10	TM450-10	TMC450-10	—	TMI495-10H	TM450-10H
7/8-12	SPTM695	TMLR495-12	TM490-12	TMC620-12	TM500-12	TMI495-12H	TM450-12H
7/8-14	SPTM695	TMLR340-14	TM490-14	TMC620-14	TM500-14	TMI495-14H	TM345-14H
7/8-16	SPTM695	TMLR495-16	TM490-16	TMC620-16	TM500-16	TMI495-16H	TM450-16H
7/8-18	SPTM695	TMLR370-18	TM450-18	TMC345-18	TM350-18	TMI495-18H	TM450-18H
7/8-20	SPTM695	TMLR370-20	TM450-20	TMC450-20	TM350-20	TMI495-20H	TM450-20H
7/8-24	SPTM695	TMLR285-24	TM400-24	TMC290-24	TM350-24	TMI285-24H	TM400-24H
7/8-27	SPTM595	—	TM290-27	—	—	—	TM290-27H
7/8-28	SPTM595	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
7/8-32	SPTM595	TMLR370-32	TM400-32	TCM400-32	TM250-32	TMI495-32H	TM400-32H

EX **Tools in column will also cut external threads**

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INTERNAL UN THREAD MILL LOCATOR CHART

THREAD/ PITCH	EX SPTM PAGE 9	TMLR PAGE 11, 12	STRAIGHT FLUTE PAGE 13	COOLANT THROUGH PAGE 14,15	EX STAGGERED PAGE 17	15° HELICAL FLUTE PAGE 18	EX 30° HELICAL FLUTE PAGE 19
15/16-12	SPTM695	TMLR495-12	TM490-12	TMC620-12	TM500-12	TMI495-12H	TM450-12H
15/16-16	SPTM695	TMLR495-16	TM490-16	TMC620-16	TM500-16	TMI495-16H	TM450-16H
15/16-20	SPTM695	TMLR370-20	TM450-20	TMC450-20	TM350-20	TMI495-20H	TM450-20H
15/16-28	SPTM595	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
15/16-32	SPTM595	TMLR370-32	TM400-32	TMC400-32	TM250-32	TMI495-32H	TM400-32H
1-8	SPTM695	—	TM620-8	TMC740-8	—	TMI620-8H	—
1-10	SPTM695	TMLR495-10	TM450-10	TMC450-10	—	TMI495-10H	TM450-10H
1-12	SPTM695	TMLR495-12	TM620-12	TMC740-12	TMC750-12	TMI620-12H	TM450-12H
1-14	SPTM695	TMLR340-14	TM620-14	TMC740-14	TMC750-14	TMI620-14H	TM345-14H
1-16	SPTM695	TMLR495-16	TM620-16	TMC740-16	TM500-16	TMI620-16H	TM450-16H
1-18	SPTM695	TMLR370-18	TM450-18	TMC450-18	TMC750-18	TMI495-18H	TM450-18H
1-20	SPTM695	TMLR370-20	TM450-20	TMC740-20	TMC750-20	TMI495-20H	TM450-20H
1-24	SPTM695	TMLR285-24	TM400-24	TMC290-24	TM350-24	TMI285-24H	TM400-24H
1-27	SPTM595	—	TM290-27	—	—	—	TM290-27H
1-28	SPTM595	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
1-32	SPTM595	TMLR370-32	TM400-32	TMC400-32	TM250-32	TMI495-32H	TM400-32H
1-1/4-7	SPTM745	—	—	E TMC740-7	—	—	—
1-1/4-8	SPTM745	—	TM620-8	E TMC740-8	—	TMI620-8H	—
1-1/4-10	SPTM695	TMLR495-10	TM450-10	TMC450-10	—	TMI495-10H	TM450-10H
1-1/4-12	SPTM695	TMLR495-12	TM620-12	E TMC740-12	TMC750-12	TMI620-12H	TM450-12H
1-1/4-14	SPTM695	TMLR340-14	TM620-14	E TMC740-14	TMC750-14	TMI620-14H	TM345-14H
1-1/4-16	SPTM695	TMLR495-16	TM620-16	E TMC740-16	TM500-16	TMI620-16H	TM450-16H
1-1/4-18	SPTM695	TMLR370-18	TM450-18	TM450-18	TMC750-18	TMI495-18H	TM450-18H
1-1/4-20	SPTM695	TMLR370-20	TM450-20	E TMC740-20	TMC750-20	TMI495-20H	TM450-20H
1-1/4-24	SPTM695	TMLR285-24	TM400-24	TMC400-24	TM350-24	TMI285-24H	TM400-24H
1-1/4-28	SPTM595	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
1-3/8-8	SPTM745	—	TM620-8	E TMC740-8	—	TMI620-8H	—
1-3/8-10	SPTM695	TMLR495-10	TM450-10	TMC450-10	—	TMI495-10H	TM450-10H
1-3/8-12	SPTM695	TMLR495-12	TM620-12	E TMC740-12	TMC750-12	TMI620-12H	TM450-12H
1-3/8-14	SPTM695	TMLR340-14	TM620-14	E TMC740-14	TMC750-14	TMI620-14H	TM345-14H
1-3/8-16	SPTM695	TMLR495-16	TM620-16	E TMC740-16	TM500-16	TMI620-16H	TM450-16H
1-3/8-18	SPTM695	TMLR370-18	TM450-18	TMC450-18	TMC750-18	TMI495-18H	TM450-18H
1-3/8-20	SPTM695	TMLR370-20	TM450-20	E TMC740-20	TMC750-20	TMI495-20H	TM450-20H
1-3/8-24	SPTM695	TMLR285-24	TM400-24	TMC400-24	TM350-24	TMI285-24H	TM400-24H
1-3/8-28	SPTM595	TMLR234-28	TM400-28	TMC400-28	TM250-28	—	TM400-28H
1-1/2-6	SPTM745	—	—	E TMC990-6	—	—	—
1-1/2-8	SPTM745	—	TM620-8	E TMC990-8	—	TMI620-8H	—
1-1/2-10	SPTM695	TMLR495-10	TM450-10	—	—	TMI495-10H	TM450-10H
1-1/2-12	SPTM695	TMLR495-12	TM620-12	E TMC990-12	TMC1000-12	TMI620-12H	TM450-12H
1-1/2-14	SPTM695	TMLR340-14	TM620-14	E TMC740-14	TMC750-14	TMI620-14H	TM345-14H
1-1/2-16	SPTM695	TMLR495-16	TM620-16	E TMC990-16	TMC1000-16	TMI620-16H	TM450-16H
1-1/2-18	SPTM695	TMLR370-18	TM450-18	TMC450-18	TMC750-18	TMI495-18H	TM450-18H
1-1/2-20	SPTM695	TMLR370-20	TM450-20	E TMC740-20	TMC750-20	TMI495-20H	TM450-20H

EX Tools in column will also cut external threads **E Tools in this series will also cut external threads**

Thread mills can cut any larger size internal thread of the same pitch

INTERNAL METRIC THREAD MILL LOCATOR CHART

This chart is designed to help select the proper thread mill for a given thread size.
ALTiN+ thread mills are highly recommended for ferrous material.

THREAD/ PITCH	EX SPTM PAGE 24,25	TMLR PAGE 26,27	STRAIGHT FLUTE PAGE 28,29	COOLANT THROUGH PAGE 30	15° HELICAL FLUTE PAGE 31	EX 30° HELICAL FLUTE PAGE 31
M1.2-.25	SPTM032	—	—	—	—	—
M1.4-.3	SPTM040	TMLR1.4-.3MM	—	—	—	—
M1.6-.35	SPTM040	TMLR1.6-.35MM	—	—	—	—
M1.8-.35	SPTM050	—	—	—	—	—
M2-.4	SPTM060	TMLR2-.4MM	—	—	—	—
M2.5-.45	SPTM072	TMLR2.5-.45MM	—	—	—	—
M3-.35	SPTM072	—	—	—	—	—
M3-.5	SPTM080	TMLR3-.5MM	TM3-.5MM	TMC3-.5MM	—	—
M3.5-.35	SPTM072	—	—	—	—	—
M3.5-.6	SPTM098	—	TM3.5-.6MM	—	—	—
M4-.5	SPTM120	TMLR4-.5MM	TM4-.5MM	TMC4-.5MM	—	—
M4-.7	SPTM120	TMLR4-.7MM	TM4-.7MM	TMC4-.7MM	TMI4.0-0.70-H	—
M4.5-.5	SPTM120	TMLR4-.5MM	TM4-.5MM	TMC4-.5MM	—	—
M4.5-.75	SPTM120	—	TM4.5-.75MM	TMC4.5-.75MM	TMI4.5-0.75-H	—
M5-.5	SPTM138	TMLR4-.5MM	TM4-.5MM	TMC4-.5MM	—	—
M5-.7	SPTM138	TMLR4-.7MM	TM5-.7MM	TMC4-.7MM	—	—
M5-.8	SPTM138	TMLR5-.8MM	TM5-.8MM	TMC5-.8MM	TMI5.0-0.80-H	—
M6-.5	SPTM160	TMLR4-.5MM	TM6-.5MM	TMC6-.5MM	—	TM6-.5MM-H
M6-.75	SPTM160	—	TM6-.75MM	TMC4.5-.75MM	TMI4.5-0.75-H	TM6-.75MM-H
M6-1.0	SPTM160	TMLR6-1MM	TM6-1MM	TMC6-1MM	TMI6.0-1.00-H	TM6-1MM-H
M6-1.25	SPTM160	—	TM6-1.25MM	—	—	TM6-1.25MM-H
M8-.75	SPTM240	TMLR8-.75MM	TM8-.75MM	—	TMI8.0-0.75-H	TM8-.75MM-H
M8-1.0	SPTM240	TMLR8-1MM	TM8-1MM	TMC8-1MM	TMI8.0-1.00-H	TM8-1MM-H
M8-1.25	SPTM240	TMLR8-1.25MM	TM8-1.25MM	TMC8-1.5MM	TMI8.0-1.25-H	TM8-1.25MM-H
M9-1.25	SPTM240	TMLR8-1.25MM	TM8-1.25MM	—	TMI8.0-1.25-H	TM8-1.25MM-H
M10-.75	SPTM290	TMLR8-.75MM	TM8-.75MM	—	TMI8.0-0.75-H	TM8-.75MM-H
M10-1.0	SPTM290	TMLR10-1MM	TM10-1MM	TMC10-1MM	TMI8.0-1.00-H	TM10-1MM-H
M10-1.25	SPTM290	TMLR8-1.25MM	TM8-1.25MM	TMC8-1.25MM	TMI8.0-1.25-H	TM8-1.25MM-H
M10-1.5	SPTM290	TMLR10-1.5MM	TM10-1.5mm	TMC10-1.5MM	TMI10-1.50-H	TM10-1.5MM-H
M11-1.5	SPTM290	TMLR10-1.5MM	TM10-1.5MM	TMC10-1.5MM	TMI10-1.50-H	TM10-1.5MM-H

EX **Tools in column will also cut external threads**

Thread mills can cut any larger size internal thread of the same pitch

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(800) 383-2244 Fax: (888) 728-3295

INTERNAL METRIC THREAD MILL LOCATOR CHART

THREAD/ PITCH	EX SPTM PAGE 25	TMLR PAGE 27	STRAIGHT FLUTE PAGE 29	COOLANT THROUGH PAGE 30	15° HELICAL FLUTE PAGE 31	EX 30° HELICAL FLUTE PAGE 31
M12-1.0	SPTM372	TMLR12-1MM	TM12-1MM	TMC10-1MM	TMI12-1.00-H	TM12-1mm-H
M12-1.25	SPTM372	TMLR12-1.25MM	TM12-1.25MM	TMC12-1.25MM	TMI8-1.25-H	TM12-1.25mm-H
M12-1.5	SPTM372	TMLR10-1.5MM	TM12-1.5MM	TMC10-1.5MM	TMI10-1.50-H	TM12-1.5mm-H
M12-1.75	SPTM372	—	TM12-1.75MM	—	TMI12-1.75-H	TM12-1.75mm-H
M14-1.0	SPTM372	TMLR12-1MM	TM12-1MM	TMC10-1MM	TMI12-1.00-H	TM12-1mm-H
M14-1.25	SPTM372	TMLR12-1.25MM	TM14-1.25MM	TMC12-1.25MM	TMI8-1.25-H	TM14-1.25mm-H
M14-1.5	SPTM372	TMLR14-1.5MM	TM14-1.5MM	TMC10-1.5MM	TMI14-1.50-H	TM14-1.5mm-H
M14-1.75	SPTM372	—	TM14-1.75MM	—	TMI12-1.75-H	TM14-1.75mm-H
M14-2.0	SPTM372	TMLR14-2MM	TM14-2MM	TMC14-2MM	—	TM14-2mm-H
M16-1.0	SPTM488	TMLR12-1MM	TM12-1MM	TMC10-1MM	TMI12-1.00-H	TM12-1mm-H
M16-1.5	SPTM488	TMLR14-1.5MM	TM14-1.5MM	TMC10-1.5MM	TMI14-1.50-H	TM14-1.5mm-H
M16-2.0	SPTM488	TMLR14-2MM	TM14-2MM	TMC14-2MM	TMI16-2.00-H	TM14-2mm-H
M16-2.5	SPTM488	—	TM16-2.5MM	—	—	TM16-2.5mm-H
M18-1.0	SPTM488	TMLR12-1MM	TM12-1MM	TMC10-1MM	TMI12-1.00-H	TM12-1mm-H
M18-1.5	SPTM488	TMLR14-1.5MM	TM14-1.5MM	TMC10-1.5MM	TMI18-1.50-H	TM14-1.5mm-H
M18-2.5	SPTM488	—	TM16-2.5MM	—	—	TM16-2.5mm-H
M20-1.0	SPTM595	TMLR12-1MM	TM12-1MM	TMC10-1MM	TMI12-1.00-H	TM12-1mm-H
M20-1.5	SPTM595	TMLR14-1.5MM	TM14-1.5MM	TMC10-1.5MM	TMI18-1.50-H	TM14-1.5mm-H
M20-2.0	SPTM595	TMLR14-2MM	TM14-2MM	TMC14-2MM	TMI16-2.00-H	TM14-2mm-H
M20-2.5	SPTM595	—	TM16-2.5MM	—	TMI20-2.50-H	TM16-2.5mm-H
M24-1.0	SPTM695	TMLR12-1MM	TM12-1MM	TMC10-1MM	TMI12-1.00-H	TM12-1mm-H
M24-1.5	SPTM695	TMLR14-1.5MM	TM14-1.5MM	E TMC24-1.5MM	TMI18-1.50-H	TM14-1.5mm-H
M24-2.0	SPTM695	TMLR14-2MM	TM14-2MM	E TMC24-2MM	TMI16-2.00-H	TM14-2mm-H
M24-2.5	SPTM695	—	TM16-2.5MM	E TMC24-2.5MM	TMI20-2.50-H	TM16-2.5mm-H
M24-3.0	SPTM695	—	—	E TMC24-3MM	—	—
M27-3.0	SPTM695	—	—	E TMC24-3MM	—	—
M30-1.0	SPTM695	TMLR12-1MM	TM12-1MM	TMC10-1MM	TMI12-1.00-H	TM12-1mm-H
M30-1.5	SPTM695	TMLR14-1.5MM	TM14-1.5MM	E TMC24.15MM	TMI18-1.50-H	TM14-1.5mm-H
M30-2.0	SPTM695	TMLR14-2MM	TM14-2MM	E TMC24-2MM	TMI16-2.00-H	TM14-2mm-H
M30-3.0	SPTM695	—	—	E TMC24-3MM	—	—
M30-3.5	SPTM745	—	—	—	—	—
M33-3.5	SPTM745	—	—	—	—	—
M36-4.0	SPTM745	—	—	E TMC36-4MM	—	—
M40-6.0	SPTM745	—	—	—	—	—

EX **Tools in column will also cut external threads** E **Tools in this series will also cut external threads**

Thread mills can cut any larger size internal thread of the same pitch

THREAD MILL FEED AND SPEED CHART

MATERIAL	HB/Rc	SPEED SFM* UNCOATED	SPEED SFM ALTiN+	FEED (INCHES PER TOOTH)					
				TOOL DIAMETER					
				.032 - .056	.059 - .090	.100 - .190	.200 - .350	.370 - .595	.600+
CAST IRON	160 HB	100-220	200-425	.0004-.001	.0004-.0008	.0004-.0014	.0004-.002	.0004-.0035	.0004-.006
CARBON STEEL	18 Rc	100-200	190-425	.0003-.001	.0003-.0008	.0003-.0014	.0003-.002	.0003-.005	.0003-.006
ALLOY STEEL	20 Rc	80-200	200-375	.0003-.001 2 Passes	.0003-.0008 3 Passes	.0003-.0014	.0003-.0024	.0003-.005	.0003-.006
TOOL STEEL	20 Rc	80-175	175-250	.0003-.0004 2 Passes	.0003-0.0005 3 Passes	.0003-.0005	.0003-.0009	.0003-.0026	.0003-.004
300 STAINLESS STEEL	150 HB	90-120	120-255	.0003-.0005 2 Passes	.0003-0.0006 3 Passes	.0003-.0007	.0003-.002	.0003-.0035	.0003-.0045
400 STAINLESS STEEL	195 HB	90-150	140-375	.0003-.0005 2 Passes	.0003-.0006 3 Passes	.0003-.0007	.0003-.002	.0003-.0026	.0003-.0045
HIGH TEMP ALLOY (Ni & Co BASE)	20 Rc	50-125	100-125	.0003-.0004 3 Passes	.0003-.00045 3 Passes	.0003-.0005 2 Passes	.0003-.0009	.0003-.0026	.0003-.004
TITANIUM	25 Rc	50-130	100-170	.0003-.0004 3 Passes	.0003-.00045 3 Passes	.0003-.001 2 Passes	.0003-.0009	.0003-.0015	.0003-.003
HEAT TREATED ALLOYS (38-45Rc)	40 Rc	50-90	90-150	.0003-.0004 3 Passes	.0003-.00045 3 Passes	.0003-.0005 2 Passes	.0003-.0008	.0003-.001	.0003-.0025
ALUMINUM	100 HB	100-800	100-1200	.0005-.0015	.0005-.002	.0005-.0025	.0005-.003	.0005-.006	.0005-.009
BRASS, ZINC	80 HB	200-350	200-750	.0005-.0015	.0005-.002	.0005-.0025	.0005-.003	.0005-.006	.0005-.009

*SFM = Surface Feet per Minute

**Parameters are a starting point based on machinability rating at hardness listed.
Check machinability rating of the material to be machined and adjust accordingly.**

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(805) 584-9495 Fax: (805) 584-9629
(800) 383-2244 Fax: (888) 728-3295

THREAD MILL FEED AND SPEED APPLICATION

It may be necessary to use more radial depth passes than shown on the chart (p.40) when cutting an unfavorable length-to-diameter ratio, coarse pitches, or hard materials. When cutting a thread with two passes, cut approximately **65% of the thread on the first pass and 35 percent on the finish pass.** For three passes, use a **50/30/20** ratio. For four passes, use a **40/27/20/13** ratio. The idea is to equalize the side cutting pressure.

Thread mills can sometimes be used to cut multiple start threads. Call engineering for assistance.
Thread mills can be cut off for shorter thread depths or necked back for deeper thread depths. Call for price and delivery.

In order to apply the Feed and Speed chart appropriately, it is necessary to understand that machining centers will apply the feed rate at the centerline of the spindle. It is correct to use a normal calculation and the following Feed & Speed Chart when cutting in a straight line; however, it is incorrect when cutting an internal thread. Therefore, the feed rate must be recalculated.

The following is an example of how to apply the feed rate correctly:
The tool is a TM290-24A cutting a 3/8-24 thread in stainless steel.
The outside diameter of the tool is 0.290.
The surface foot per minute (SFM) is 150.
The chip per tooth ia 0.001. The tool has four flutes.
The revolutions per minute (RPM) equal the SFM x 3.82 divided by the outside diameter of the tool.

In this example: **(150 x 3.82) / 0.290**, which equals 1975 RPM.
The RPM x feed (chip per tooth) x the number of flutes equals the Non-Adjusted Feed Rate or NAFR.
In this example: **1975 x 0.001 x 4 = 7.9 NAFR**
The major diameter of the thread is 0.375. We will call this D.
The outside diameter of the tool is 0.290. We will call this d.
We will call the Adjusted Feed Rate the AFR.
The formula for the AFR for internal interpolation is **AFR = NAFR x (D-d) ÷ D**

In this example: **AFR = 7.9 x (0.375 - 0.290) ÷ 0.375**

Therefore, the Adjusted Feed Rate equals 1.79. This is the feed rate that will equal 0.001 chip per tooth in the above example. This is the feed rate that must be used in the CNC program.

THREAD MILL TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
TAPERED THREADED HOLE	TOOL PRESSURE	Reduce the chip load and/or make more radial passes.
NO-GO GAGE GOES & GO GAGE DOES NOT GO	THREAD OVERCUTTING	Use a tool of smaller diameter with correct pitch. Make sure helical "ramp in" is used.
TEETH ARE CHIPPING	TOOL PRESSURE	Reduce feed rate per tooth.
	BUILT-UP EDGE	Use a coated tool to help reduce built-up edge.
RAPID WEAR	TOOL RUBBING NOT CUTTING	Increase chip load per tooth.
TEETH ARE BURNING	TOO MUCH HEAT	Reduce speed. Use a coated tool. Increase coolant.
TOOL BREAKS	TOO MUCH TOOL PRESSURE	Helical "arc in" must be used. Reduce feed rate and/or use more radial passes. Adjusted Feed Rate (AFR) must be used. (See Thread Mill Feed and Speed Chart)

Thread milling tools form a thread using a motion referred to as “helical interpolation.” This process involves the machine simultaneously moving all three axes. The resulting motions are circular and axial. The “X” and “Y” axes move in a circular manner and the “Z” axis in an axial direction per 360° at a distance equal to the pitch of the thread being machined. The tool should "ramp in" over 90° in order to avoid breakage. This must be a helical move. Move "Z" axially by pitch ÷ 4 since 90° is 360° ÷ 4.

Bottom-to-top climb cutting machining is recommended when machining a right-hand thread. This will avoid re-cutting any chips. For left hand threading, a top-to-bottom machining with a right-hand helical tool is the preferred method. Refer to troubleshooting chart above for solutions to potential thread milling problems.

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SINGLE POINT

- Holders
- Radial Relief
- Mini Boring Bars
- Boring Bars
- PCD/CBN Tipped
- Helical Boring Bars
- Profile Boring Bars
- Back Chamfer
- Acme Threading Tools
- Thread Tools Qualified
- Thread Tools
- Groove Tools

SINGLE POINT TOOLS - PRODUCT OVERVIEW

All single point tools are designed for internal machining on a lathe. The helical boring bars can be used for both lathe and mill applications. All cutting tools are made from premium submicron carbide and are stocked with and without an ALTiN+ coating. Technical information is available on pages 80-84.

Single Point Holders

QHC Holders have two flats on the shank, two coolant holes, and four set screws. QHC Holders can be used with a Back Stop. DH Holders have two set screws and no flats.

Mini Boring Bars

Mini Boring Bars range in diameter from 0.015 to 0.045 inch. They are fluted for maximum strength.

Radial Relief Boring Bars

Radial Relief Boring Bars have a radial relief behind the cutting edge that provides for a strong cutting edge.

Boring Bars

Boring Bars come range in diameter from 0.050 to 0.490 inch and many different bore depths to achieve max rigidity.

Radius Boring Bars

Radius boring bars feature a corner radius that provides an improved surface finish.

Left-Hand Boring Bars

Left-Hand Boring Bars come range in diameter from 0.050 to 0.490 inch and many different bore depths to achieve max rigidity.

Diamond Tipped Boring Bars

PCD-Tipped Boring Bars cut abrasive non-ferrous materials. CBN-Tipped Boring Bars are for cutting ferrous metal over 45 RC.

Helical Boring Bars

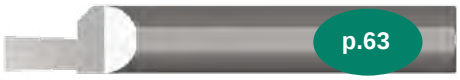
Helical Boring Bars have a helical flute that produces less side cutting pressure, ideal for the cutting of unfavorable length-to-diameter ratios.

Back Chamfer Boring Bars

Back Chamfer Boring Bars are designed to bore, cut a chamfer at the end of a hole, and cut thread reliefs.

Profile Boring Bars

Profile Boring Bars are ideal tools for internal profiling on CNC lathes.



Face Groove Tools

Face Groove Tools cut a groove in the face of the part.

Undercut Groove Tools

Undercut Groove Tools come with and without a radius. The radius style can be used as a profile tool.

Groove Tool - Retaining Ring

Retaining Ring Groove Tools cut an internal groove with straight edges.

Groove Tools - Full Radius

Full Radius Groove Tools cut an internal groove with straight edges and a full radius.

O-Ring Groove Tools

O-Ring Groove Tools are ideal for machining a groove with tapered sides.

Thread Tools

Threading Tools come in many different sizes. This facilitates selecting the tool with maximum rigidity.

Thread Tools Qualified

Thread Tools Qualified have a positive top rake on the flute and a qualified length to facilitate quick tool changes.

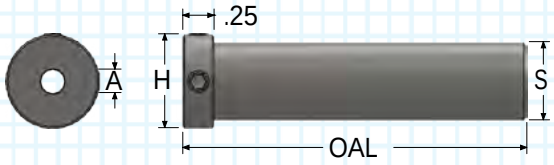
Acme Threading Tools

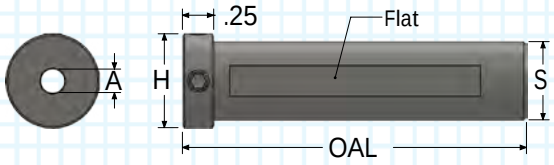
Acme Threading Tools come with both acme and stub acme profiles.

SINGLE POINT TECHNICAL INFORMATION PAGES 80-84

SINGLE POINT HOLDERS

- Made with heat-treated steel
- Features two lock-down screws
- Holders available with or without flat





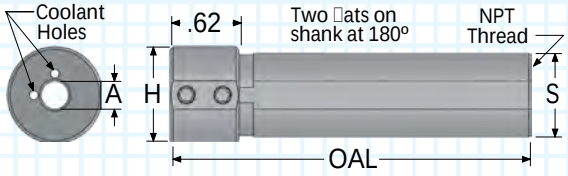
DH HOLDERS
WITHOUT FLAT

"A" INSIDE DIA.	"S" SHANK DIA.	"H" HEAD DIA.	OAL	ORDER #
0.1250	0.375	0.500	2.00	DH37-1/8
0.1562	0.375	0.500	2.00	DH37-5/32
0.1875	0.375	0.500	2.00	DH37-3/16
0.2187	0.375	0.500	2.00	DH37-7/32
0.2500	0.375	0.500	2.00	DH37-1/4
0.1250	0.500	0.625	2.75	DH50-1/8
0.1562	0.500	0.625	2.75	DH50-5/32
0.1875	0.500	0.625	2.75	DH50-3/16
0.2187	0.500	0.625	2.75	DH50-7/32
0.2500	0.500	0.625	2.75	DH50-1/4
0.3125	0.500	0.625	2.75	DH50-5/16
0.3750	0.500	0.625	2.75	DH50-3/8
0.1250	0.625	0.750	2.75	DH62-1/8
0.1562	0.625	0.750	2.75	DH62-5/32
0.1875	0.625	0.750	2.75	DH62-3/16
0.2187	0.625	0.750	2.75	DH62-7/32
0.2500	0.625	0.750	2.75	DH62-1/4
0.3125	0.625	0.750	2.75	DH62-5/16
0.3750	0.625	0.750	2.75	DH62-3/8
0.1250	0.750	0.875	2.75	DH75-1/8
0.1875	0.750	0.875	2.75	DH75-3/16
0.2500	0.750	0.875	2.75	DH75-1/4
0.3125	0.750	0.875	2.75	DH75-5/16
0.3750	0.750	0.875	2.75	DH75-3/8
0.5000	0.750	0.875	2.75	DH75-1/2

DHF HOLDERS
WITH FLAT

"A" INSIDE DIA.	"S" SHANK DIA.	"H" HEAD DIA.	OAL	ORDER #
0.1250	0.375	0.500	2.00	DHF37-1/8
0.1562	0.375	0.500	2.00	DHF37-5/32
0.1875	0.375	0.500	2.00	DHF37-3/16
0.2187	0.375	0.500	2.00	DHF37-7/32
0.2500	0.375	0.500	2.00	DHF37-1/4
0.1250	0.500	0.625	2.75	DHF50-1/8
0.1562	0.500	0.625	2.75	DHF50-5/32
0.1875	0.500	0.625	2.75	DHF50-3/16
0.2187	0.500	0.625	2.75	DHF50-7/32
0.2500	0.500	0.625	2.75	DHF50-1/4
0.3125	0.500	0.625	2.75	DHF50-5/16
0.3750	0.500	0.625	2.75	DHF50-3/8
0.1250	0.625	0.750	2.75	DHF62-1/8
0.1562	0.625	0.750	2.75	DHF62-5/32
0.1875	0.625	0.750	2.75	DHF62-3/16
0.2187	0.625	0.750	2.75	DHF62-7/32
0.2500	0.625	0.750	2.75	DHF62-1/4
0.3125	0.625	0.750	2.75	DHF62-5/16
0.3750	0.625	0.750	2.75	DHF62-3/8
0.1250	0.750	0.875	2.75	DHF75-1/8
0.1875	0.750	0.875	2.75	DHF75-3/16
0.2500	0.750	0.875	2.75	DHF75-1/4
0.3125	0.750	0.875	2.75	DHF75-5/16
0.3750	0.750	0.875	2.75	DHF75-3/8
0.5000	0.750	0.875	2.75	DHF75-1/2

SINGLE POINT COOLANT HOLDERS



- Made with heat-treated steel
- Four lock-down screws for maximum rigidity
- Engineered for maximum coolant flow

QHC HOLDERS (INCH)

"A" INSIDE DIA.	"S" SHANK DIA.	"H" HEAD DIA.	NPT THREAD	OAL	ORDER #
0.1250	0.375	0.500	1/16-27NPT	2.50	QHC37-1/8
0.1562	0.375	0.500	1/16-27NPT	2.50	QHC37-5/32
0.1875	0.375	0.500	1/16-27NPT	2.50	QHC37-3/16
0.1250	0.500	0.625	1/8-27NPT	2.75	QHC50-1/8
0.1875	0.500	0.625	1/8-27NPT	2.75	QHC50-3/16
0.2500	0.500	0.625	1/8-27NPT	2.75	QHC50-1/4
0.1250	0.625	0.750	1/4-18NPT	3.25	QHC62-1/8
0.1562	0.625	0.750	1/4-18NPT	3.25	QHC62-5/32
0.1875	0.625	0.750	1/4-18NPT	3.25	QHC62-3/16
0.2187	0.625	0.750	1/4-18NPT	3.25	QHC62-7/32
0.2500	0.625	0.750	1/4-18NPT	3.25	QHC62-1/4

QHC HOLDERS (INCH)

"A" INSIDE DIA.	"S" SHANK DIA.	"H" HEAD DIA.	NPT THREAD	OAL	ORDER #
0.1250	0.750	0.865	3/8-18NPT	3.25	QHC75-1/8
0.1562	0.750	0.865	3/8-18NPT	3.25	QHC75-5/32
0.1875	0.750	0.865	3/8-18NPT	3.25	QHC75-3/16
0.2187	0.750	0.865	3/8-18NPT	3.25	QHC75-7/32
0.2500	0.750	0.865	3/8-18NPT	3.25	QHC75-1/4
0.3125	0.750	0.865	3/8-18NPT	3.25	QHC75-5/16
0.3750	0.750	0.865	3/8-18NPT	3.25	QHC75-3/8
0.1250	1.000	1.115	1/2-14NPT	3.25	QHC10-1/8
0.1875	1.000	1.115	1/2-14NPT	3.25	QHC10-3/16
0.2500	1.000	1.115	1/2-14NPT	3.25	QHC10-1/4
0.3125	1.000	1.115	1/2-14NPT	3.25	QHC10-5/16
0.3750	1.000	1.115	1/2-14NPT	3.25	QHC10-3/8
0.5000	1.000	1.115	1/2-14NPT	3.25	QHC10-1/2

QHC HOLDERS (METRIC)

"A" INSIDE DIA.	"S" SHANK DIA.	"H" HEAD DIA.	NPT THREAD	OAL	ORDER #
0.1250	20mm	0.865	3/8-18NPT	3.25	QHC20-1/8
0.1875	20mm	0.865	3/8-18NPT	3.25	QHC20-3/16
0.2500	20mm	0.865	3/8-18NPT	3.25	QHC20-1/4
0.3125	20mm	0.865	3/8-18NPT	3.25	QHC20-5/16
0.3750	20mm	0.865	3/8-18NPT	3.25	QHC20-3/8

QHC HOLDERS (METRIC)

"A" INSIDE DIA.	"S" SHANK DIA.	"H" HEAD DIA.	NPT THREAD	OAL	ORDER #
0.1250	22mm	0.865	3/8-18NPT	3.25	QHC22-1/8
0.1875	22mm	0.865	3/8-18NPT	3.25	QHC22-3/16
0.2500	22mm	0.865	3/8-18NPT	3.25	QHC22-1/4
0.3125	22mm	0.865	3/8-18NPT	3.25	QHC22-5/16
0.3750	22mm	0.865	3/8-18NPT	3.25	QHC22-3/8

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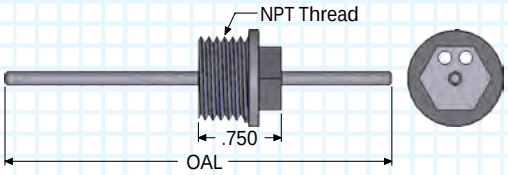
BACK STOPS - FOR QHC SERIES



- Adjustable back stop for quick tool change
- Ideal for qualified threading tools (see pages 76-77)
- Engineered for maximum coolant flow
- Accessory set comes with 6 screws and 1 key

BACK STOP

NPT THREAD	STOP ROD DIAMETER	STOP ROD OAL	HOLDER SERIES	ORDER #
1/16-27NPT	0.093	2.75	QHC37	QHC37-BKS
1/8-27NPT	0.125	3.00	QHC50	QHC50-BKS
1/4-18NPT	0.125	3.00	QHC62	QHC62-BKS
3/8-18NPT	0.125	3.00	QHC75	QHC75-BKS
1/2-14NPT	0.125	3.50	QHC10	QHC10-BKS

BACK STOP ACCESSORIES

6 SCREWS, 1 KEY	
BACKSTOP REFERENCE	ORDER #
QHC37-BKS	PKH-1/8
QHC50-BKS	
QHC62-BKS	PKH-3/16
QHC75-BKS	
QHC10-BKS	

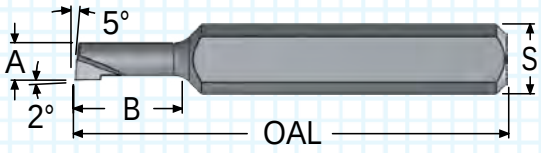
DH & QHC HOLDER ACCESSORIES

- Works as a replacement set or as spares
- Use the holder order number to locate the proper accessory set for size.

6 SCREWS, 1 KEY	
DH HOLDER REFERENCE	ORDER #
DH37-1/4 DH50-3/8	PKH-1/8
DH37-1/8 DH37-5/32 DH37-3/16 DH37-7/32 DH50-7/32 DH50-1/4 DH50-5/16 DH62-5/16 DH62-3/8 DH75-1/2	PKH-3/16
DH50-1/8 DH50-5/32 DH50-3/16 DH62-1/8 DH62-5/32 DH62-3/16 DH62-7/32 DH62-1/4 DH75-1/4 DH75-5/16 DH75-3/8	PKH-1/4
DH75-1/8 DH75-3/16	PKH-3/8

6 SCREWS, 1 KEY	
QHC HOLDER REFERENCE	ORDER #
QHC37-1/8 QHC37-5/32 QHC37-3/16 QHC50-3/16 QHC50-1/4	PKH-3/16
QHC50-1/8 QHC62-1/8 QHC62-5/32 QHC62-3/16 QHC62-7/32 QHC62-1/4 QHC75-3/16 QHC75-7/32 QHC75-1/4 QHC75-5/16 QHC75-3/8 QHC10-1/2	PKH-1/4
QHC75-1/8 QHC75-5/32 QHC10-1/4 QHC10-5/16 QHC10-3/8	PKH-3/8
QHC10-1/8 QHC10-3/16	PKH-1/2

MINI BORING BARS - SOLID CARBIDE



- Flute engineered for maximum strength
- ALTiN+ coating for improved surface finish
- Made with premium submicron grade carbide
- Starts at 0.015 minimum bore

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.015	0.050	0.125	1.50	MB015050	MB015050A
0.020	0.075	0.125	1.50	MB020075	MB020075A
0.025	0.100	0.125	1.50	MB025100	MB025100A
0.025	0.125	0.125	1.50	MB025125	MB025125A
0.030	0.100	0.125	1.50	MB030100	MB030100A
0.030	0.125	0.125	1.50	MB030125	MB030125A
0.030	0.150	0.125	1.50	MB030150	MB030150A
0.035	0.100	0.125	1.50	MB035100	MB035100A
0.035	0.150	0.125	1.50	MB035150	MB035150A
0.035	0.200	0.125	1.50	MB035200	MB035200A
0.040	0.100	0.125	1.50	MB040100	MB040100A
0.040	0.150	0.125	1.50	MB040150	MB040150A
0.040	0.200	0.125	1.50	MB040200	MB040200A
0.040	0.250	0.125	1.50	MB040250	MB040250A
0.045	0.100	0.125	1.50	MB045100	MB045100A
0.045	0.150	0.125	1.50	MB045150	MB045150A
0.045	0.200	0.125	1.50	MB045200	MB045200A
0.045	0.250	0.125	1.50	MB045250	MB045250A
0.045	0.300	0.125	1.50	MB045300	MB045300A
0.045	0.350	0.125	1.50	MB045350	MB045350A

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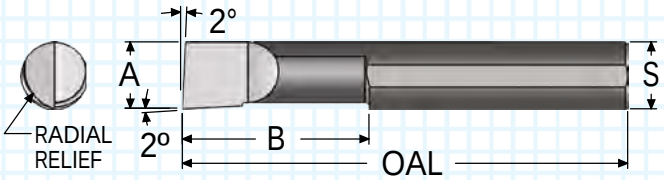
BORING BARS - RADIAL RELIEF - SOLID CARBIDE

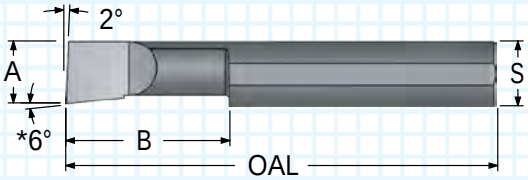


"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.060	0.125	0.125	1.50	BB61	BB61A
0.060	0.250	0.125	1.50	BB62	BB62A
0.060	0.375	0.125	1.50	BB63	BB63A
0.060	0.500	0.125	1.50	BB64	BB64A
0.075	0.125	0.125	1.50	BB71	BB71A
0.075	0.250	0.125	1.50	BB72	BB72A
0.075	0.375	0.125	1.50	BB73	BB73A
0.075	0.500	0.125	1.50	BB74	BB74A
0.090	0.125	0.125	1.50	BB91	BB91A
0.090	0.250	0.125	1.50	BB92	BB92A
0.090	0.375	0.125	1.50	BB93	BB93A
0.090	0.500	0.125	1.50	BB94	BB94A
0.090	0.625	0.125	1.50	BB95	BB95A
0.105	0.250	0.125	1.50	BB102	BB102A
0.105	0.375	0.125	1.50	BB103	BB103A
0.105	0.500	0.125	1.50	BB104	BB104A
0.105	0.625	0.125	1.50	BB105	BB105A
0.120	0.250	0.125	1.50	BB122	BB122A
0.120	0.375	0.125	1.50	BB123	BB123A
0.120	0.500	0.125	1.50	BB124	BB124A
0.120	0.625	0.125	1.50	BB125	BB125A
0.120	0.750	0.125	1.50	BB126	BB126A
0.155	0.375	0.1875	2.00	BB153	BB153A
0.155	0.500	0.1875	2.00	BB154	BB154A
0.155	0.625	0.1875	2.00	BB155	BB155A
0.155	0.750	0.1875	2.00	BB156	BB156A
0.155	1.000	0.1875	2.00	BB158	BB158A
0.185	0.375	0.1875	2.00	BB183	BB183A
0.185	0.500	0.1875	2.00	BB184	BB184A
0.185	0.625	0.1875	2.00	BB185	BB185A
0.185	0.750	0.1875	2.00	BB186	BB186A
0.185	1.000	0.1875	2.00	BB188	BB188A
0.185	1.250	0.1875	2.00	BB1812	BB1812A

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.220	0.500	0.250	2.00	BB224	BB224A
0.220	0.625	0.250	2.00	BB225	BB225A
0.220	0.750	0.250	2.00	BB226	BB226A
0.220	1.000	0.250	2.00	BB228	BB228A
0.220	1.250	0.250	2.50	BB2212	BB2212A
0.248	0.500	0.250	2.00	BB254	BB254A
0.248	0.625	0.250	2.00	BB255	BB255A
0.248	0.750	0.250	2.00	BB256	BB256A
0.248	1.000	0.250	2.00	BB258	BB258A
0.248	1.250	0.250	2.50	BB2512	BB2512A
0.248	1.500	0.250	2.50	BB2514	BB2514A
0.310	0.500	0.3125	2.00	BB314	BB314A
0.310	0.750	0.3125	2.00	BB316	BB316A
0.310	0.750	0.3125	2.50	BB316L	BB316LA
0.310	1.000	0.3125	2.50	BB318	BB318A
0.310	1.250	0.3125	2.50	BB3112	BB3112A
0.310	1.500	0.3125	2.50	BB3114	BB3114A
0.310	1.750	0.3125	3.00	BB3116	BB3116A
0.373	0.500	0.375	2.00	BB374	BB374A
0.373	0.750	0.375	2.00	BB376	BB376A
0.373	0.750	0.375	2.50	BB376L	BB376LA
0.373	1.000	0.375	2.50	BB378	BB378A
0.373	1.250	0.375	2.50	BB3712	BB3712A
0.373	1.500	0.375	2.50	BB3714	BB3714A
0.373	1.500	0.375	3.00	BB3714L	BB3714LA
0.373	1.750	0.375	3.00	BB3716	BB3716A
0.373	2.000	0.375	3.00	BB3718	BB3718A

- Made with premium submicron grade carbide
- ALTiN+ coating extends tool life
- Radial relieved cutting clearance for max strength
- Polished flute face for optimal performance

BORING BARS - SOLID CARBIDE



- Made with premium submicron grade carbide
- ALTiN+ coating for higher Surface Feet per Minute
- Precision ground flat for guaranteed tool orientation

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.050	0.150	0.125	1.50	B050150	B050150A
0.050	0.200	0.125	1.50	B050200	B050200A
0.050	0.300	0.125	1.50	B050300	B050300A
0.050	0.400	0.125	1.50	B050400	B050400A
0.060	0.150	0.125	1.50	B060150	B060150A
0.060	0.200	0.125	1.50	B060200	B060200A
0.060	0.300	0.125	1.50	B060300	B060300A
0.060	0.400	0.125	1.50	B060400	B060400A
0.060	0.500	0.125	1.50	B060500	B060500A
0.080	0.150	0.125	1.50	B080150	B080150A
0.080	0.200	0.125	1.50	B080200	B080200A
0.080	0.300	0.125	1.50	B080300	B080300A
0.080	0.400	0.125	1.50	B080400	B080400A
0.080	0.500	0.125	1.50	B080500	B080500A
0.080	0.600	0.125	1.50	B080600	B080600A
0.100	0.150	0.125	1.50	B100150	B100150A
0.100	0.200	0.125	1.50	B100200	B100200A
0.100	0.300	0.125	1.50	B100300	B100300A
0.100	0.400	0.125	1.50	B100400	B100400A
0.100	0.500	0.125	1.50	B100500	B100500A
0.100	0.600	0.125	1.50	B100600	B100600A
0.100	0.700	0.125	1.50	B100700	B100700A
0.110	0.150	0.125	1.50	B110150	B110150A
0.110	0.200	0.125	1.50	B110200	B110200A
0.110	0.300	0.125	1.50	B110300	B110300A
0.110	0.400	0.125	1.50	B110400	B110400A
0.110	0.500	0.125	1.50	B110500	B110500A
0.110	0.600	0.125	1.50	B110600	B110600A
0.110	0.700	0.125	1.50	B110700	B110700A
0.120	0.250	0.1875	2.00	B120250	B120250A
0.120	0.350	0.1875	2.00	B120350	B120350A
0.120	0.500	0.1875	2.00	B120500	B120500A
0.120	0.600	0.1875	2.00	B120600	B120600A
0.120	0.700	0.1875	2.00	B120700	B120700A
0.120	0.800	0.1875	2.00	B120800	B120800A

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.140	0.250	0.1875	2.00	B140250	B140250A
0.140	0.400	0.1875	2.00	B140400	B140400A
0.140	0.500	0.1875	2.00	B140500	B140500A
0.140	0.600	0.1875	2.00	B140600	B140600A
0.140	0.700	0.1875	2.00	B140700	B140700A
0.140	0.750	0.1875	2.00	B140750	B140750A
0.140	0.800	0.1875	2.00	B140800	B140800A
0.160	0.250	0.1875	2.00	B160250	B160250A
0.160	0.400	0.1875	2.00	B160400	B160400A
0.160	0.500	0.1875	2.00	B160500	B160500A
0.160	0.600	0.1875	2.00	B160600	B160600A
0.160	0.750	0.1875	2.00	B160750	B160750A
0.160	0.900	0.1875	2.00	B160900	B160900A
0.160	1.000	0.1875	2.00	B1601000	B1601000A
0.180	0.350	0.250	2.50	B180350	B180350A
0.180	0.500	0.250	2.50	B180500	B180500A
0.180	0.600	0.250	2.50	B180600	B180600A
0.180	0.750	0.250	2.50	B180750	B180750A
0.180	0.900	0.250	2.50	B180900	B180900A
0.180	1.000	0.250	2.50	B1801000	B1801000A
0.180	1.100	0.250	2.50	B1801100	B1801100A
0.180	1.250	0.250	2.50	B1801250	B1801250A
0.180	1.500	0.250	2.50	B1801500	B1801500A
0.200	0.400	0.250	2.50	B200400	B200400A
0.200	0.500	0.250	2.50	B200500	B200500A
0.200	0.600	0.250	2.50	B200600	B200600A
0.200	0.700	0.250	2.50	B200700	B200700A
0.200	0.800	0.250	2.50	B200800	B200800A
0.200	0.900	0.250	2.50	B200900	B200900A
0.200	1.000	0.250	2.50	B2001000	B2001000A
0.200	1.100	0.250	2.50	B2001100	B2001100A
0.200	1.200	0.250	2.50	B2001200	B2001200A
0.200	1.300	0.250	2.50	B2001300	B2001300A

*** The B050 and the B060 series have 3° side clearance.**

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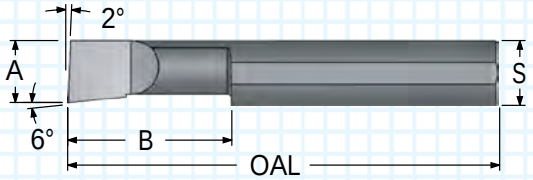
BORING BARS - SOLID CARBIDE

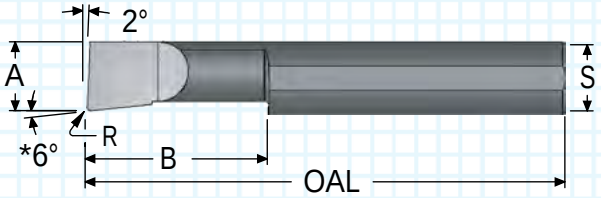


- ALTiN+ coating extends tool life
- Elliptically ground neck provides maximum strength
- Precision ground shank flat guarantees tool orientation

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.230	0.400	0.3125	2.50	B230400	B230400A
0.230	0.500	0.3125	2.50	B230500	B230500A
0.230	0.600	0.3125	2.50	B230600	B230600A
0.230	0.700	0.3125	2.50	B230700	B230700A
0.230	0.800	0.3125	2.50	B230800	B230800A
0.230	0.900	0.3125	2.50	B230900	B230900A
0.230	1.000	0.3125	2.50	B2301000	B2301000A
0.230	1.100	0.3125	2.50	B2301100	B2301100A
0.230	1.150	0.3125	2.50	B2301150	B2301150A
0.230	1.200	0.3125	2.50	B2301200	B2301200A
0.230	1.250	0.3125	2.50	B2301250	B2301250A
0.230	1.400	0.3125	2.50	B2301400	B2301400A
0.230	1.500	0.3125	2.50	B2301500	B2301500A
0.230	1.600	0.3125	3.00	B2301600	B2301600A
0.290	0.500	0.3125	2.50	B290500	B290500A
0.290	0.600	0.3125	2.50	B290600	B290600A
0.290	0.750	0.3125	2.50	B290750	B290750A
0.290	0.900	0.3125	2.50	B290900	B290900A
0.290	1.000	0.3125	2.50	B2901000	B2901000A
0.290	1.100	0.3125	2.50	B2901100	B2901100A
0.290	1.250	0.3125	2.50	B2901250	B2901250A
0.290	1.350	0.3125	2.50	B2901350	B2901350A
0.290	1.500	0.3125	2.50	B2901500	B2901500A
0.290	1.600	0.3125	3.00	B2901600	B2901600A
0.290	1.750	0.3125	3.00	B2901750	B2901750A
0.320	0.500	0.375	2.50	B320500	B320500A
0.320	0.600	0.375	2.50	B320600	B320600A
0.320	0.750	0.375	2.50	B320750	B320750A
0.320	0.900	0.375	2.50	B320900	B320900A
0.320	1.000	0.375	2.50	B3201000	B3201000A
0.320	1.100	0.375	2.50	B3201100	B3201100A
0.320	1.250	0.375	2.50	B3201250	B3201250A
0.320	1.500	0.375	2.50	B3201500	B3201500A
0.320	1.600	0.375	3.00	B3201600	B3201600A
0.320	1.800	0.375	3.00	B3201800	B3201800A
0.320	2.000	0.375	4.00	B3202000	B3202000A
0.320	2.500	0.375	4.00	B3202500	B3202500A
0.320	3.000	0.375	4.00	B3203000	B3203000A

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.360	0.500	0.375	2.50	B360500	B360500A
0.360	0.600	0.375	2.50	B360600	B360600A
0.360	0.750	0.375	2.50	B360750	B360750A
0.360	0.900	0.375	2.50	B360900	B360900A
0.360	1.000	0.375	2.50	B3601000	B3601000A
0.360	1.150	0.375	2.50	B3601150	B3601150A
0.360	1.250	0.375	2.50	B3601250	B3601250A
0.360	1.500	0.375	2.50	B3601500	B3601500A
0.360	1.600	0.375	3.00	B3601600	B3601600A
0.360	1.800	0.375	3.00	B3601800	B3601800A
0.360	2.000	0.375	4.00	B3602000	B3602000A
0.360	2.500	0.375	4.00	B3602500	B3602500A
0.360	3.000	0.375	4.00	B3603000	B3603000A
0.490	0.750	0.500	3.00	B490750	B490750A
0.490	1.000	0.500	3.00	B4901000	B4901000A
0.490	1.250	0.500	3.00	B4901250	B4901250A
0.490	1.500	0.500	3.00	B4901500	B4901500A
0.490	2.000	0.500	4.00	B4902000	B4902000A
0.490	2.500	0.500	4.00	B4902500	B4902500A
0.490	2.600	0.500	4.00	B4902600	B4902600A
0.490	2.750	0.500	4.00	B4902750	B4902750A
0.490	3.000	0.500	6.00	B4903000	B4903000A
0.490	3.500	0.500	6.00	B4903500	B4903500A
0.490	4.000	0.500	6.00	B4904000	B4904000A
0.490	4.500	0.500	6.00	B4904500	B4904500A

RADIUS BORING BARS - SOLID CARBIDE



- ALTiN+ coating extends tool life
- Polished flute face for optimum performance
- Corner radius ensures strength and better surface finish

"A" MIN BORE	"B" MAX DEPTH	"R" RADIUS ±0.001	"S" SHANK DIA.	OAL	ORDER #	
					UNCOATED	ALTiN+
0.050	0.150	0.004	0.125	1.50	B050150R	B050150RA
0.050	0.200	0.004	0.125	1.50	B050200R	B050200RA
0.050	0.300	0.004	0.125	1.50	B050300R	B050300RA
0.050	0.400	0.004	0.125	1.50	B050400R	B050400RA
0.060	0.150	0.004	0.125	1.50	B060150R	B060150RA
0.060	0.200	0.004	0.125	1.50	B060200R	B060200RA
0.060	0.300	0.004	0.125	1.50	B060300R	B060300RA
0.060	0.400	0.004	0.125	1.50	B060400R	B060400RA
0.060	0.500	0.004	0.125	1.50	B060500R	B060500RA
0.080	0.150	0.004	0.125	1.50	B080150R	B080150RA
0.080	0.200	0.004	0.125	1.50	B080200R	B080200RA
0.080	0.300	0.004	0.125	1.50	B080300R	B080300RA
0.080	0.400	0.004	0.125	1.50	B080400R	B080400RA
0.080	0.500	0.004	0.125	1.50	B080500R	B080500RA
0.080	0.600	0.004	0.125	1.50	B080600R	B080600RA
0.100	0.150	0.004	0.125	1.50	B100150R	B100150RA
0.100	0.200	0.004	0.125	1.50	B100200R	B100200RA
0.100	0.300	0.004	0.125	1.50	B100300R	B100300RA
0.100	0.400	0.004	0.125	1.50	B100400R	B100400RA
0.100	0.500	0.004	0.125	1.50	B100500R	B100500RA
0.100	0.600	0.004	0.125	1.50	B100600R	B100600RA
0.100	0.700	0.004	0.125	1.50	B100700R	B100700RA
0.110	0.150	0.004	0.125	1.50	B110150R	B110150RA
0.110	0.200	0.004	0.125	1.50	B110200R	B110200RA
0.110	0.300	0.004	0.125	1.50	B110300R	B110300RA
0.110	0.400	0.004	0.125	1.50	B110400R	B110400RA
0.110	0.500	0.004	0.125	1.50	B110500R	B110500RA
0.110	0.600	0.004	0.125	1.50	B110600R	B110600RA
0.110	0.700	0.004	0.125	1.50	B110700R	B110700RA
0.120	0.250	0.0065	0.1875	2.00	B120250R	B120250RA
0.120	0.350	0.0065	0.1875	2.00	B120350R	B120350RA
0.120	0.500	0.0065	0.1875	2.00	B120500R	B120500RA
0.120	0.600	0.0065	0.1875	2.00	B120600R	B120600RA
0.120	0.700	0.0065	0.1875	2.00	B120700R	B120700RA
0.120	0.800	0.0065	0.1875	2.00	B120800R	B120800RA

"A" MIN BORE	"B" MAX DEPTH	"R" RADIUS ±0.001	"S" SHANK DIA.	OAL	ORDER #	
					UNCOATED	ALTiN+
0.140	0.250	0.0065	0.1875	2.00	B140250R	B140250RA
0.140	0.400	0.0065	0.1875	2.00	B140400R	B140400RA
0.140	0.500	0.0065	0.1875	2.00	B140500R	B140500RA
0.140	0.600	0.0065	0.1875	2.00	B140600R	B140600RA
0.140	0.700	0.0065	0.1875	2.00	B140700R	B140700RA
0.140	0.750	0.0065	0.1875	2.00	B140750R	B140750RA
0.140	0.800	0.0065	0.1875	2.00	B140800R	B140800RA
0.160	0.250	0.0065	0.1875	2.00	B160250R	B160250RA
0.160	0.400	0.0065	0.1875	2.00	B160400R	B160400RA
0.160	0.500	0.0065	0.1875	2.00	B160500R	B160500RA
0.160	0.600	0.0065	0.1875	2.00	B160600R	B160600RA
0.160	0.750	0.0065	0.1875	2.00	B160750R	B160750RA
0.160	0.900	0.0065	0.1875	2.00	B160900R	B160900RA
0.160	1.000	0.0065	0.1875	2.00	B1601000R	B1601000RA
0.180	0.350	0.0065	0.250	2.50	B180350R	B180350RA
0.180	0.500	0.0065	0.250	2.50	B180500R	B180500RA
0.180	0.600	0.0065	0.250	2.50	B180600R	B180600RA
0.180	0.750	0.0065	0.250	2.50	B180750R	B180750RA
0.180	0.900	0.0065	0.250	2.50	B180900R	B180900RA
0.180	1.000	0.0065	0.250	2.50	B1801000R	B1801000RA
0.180	1.100	0.0065	0.250	2.50	B1801100R	B1801100RA
0.180	1.250	0.0065	0.250	2.50	B1801250R	B1801250RA
0.180	1.500	0.0065	0.250	2.50	B1801500R	B1801500RA
0.200	0.400	0.0065	0.250	2.50	B200400R	B200400RA
0.200	0.500	0.0065	0.250	2.50	B200500R	B200500RA
0.200	0.600	0.0065	0.250	2.50	B200600R	B200600RA
0.200	0.700	0.0065	0.250	2.50	B200700R	B200700RA
0.200	0.800	0.0065	0.250	2.50	B200800R	B200800RA
0.200	0.900	0.0065	0.250	2.50	B200900R	B200900RA
0.200	1.000	0.0065	0.250	2.50	B2001000R	B2001000RA
0.200	1.100	0.0065	0.250	2.50	B2001100R	B2001100RA
0.200	1.200	0.0065	0.250	2.50	B2001200R	B2001200RA
0.200	1.300	0.0065	0.250	2.50	B2001300R	B2001300RA

*** The B050 and the B060 series have 3° side clearance.**

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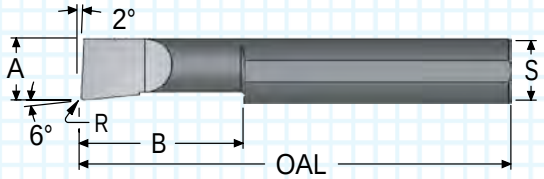
RADIUS BORING BARS - SOLID CARBIDE

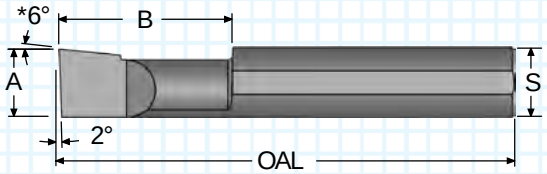


- Elliptically ground neck provides maximum strength
- Made with premium submicron grade carbide
- ALTiN+ coating for higher Surface Feet per Minute

"A" MIN BORE	"B" MAX DEPTH	"R" RADIUS ±0.001	"S" SHANK DIA.	OAL	ORDER #	
					UNCOATED	ALTiN+
0.230	0.400	0.0065	0.3125	2.50	B230400R	B230400RA
0.230	0.500	0.0065	0.3125	2.50	B230500R	B230500RA
0.230	0.600	0.0065	0.3125	2.50	B230600R	B230600RA
0.230	0.700	0.0065	0.3125	2.50	B230700R	B230700RA
0.230	0.800	0.0065	0.3125	2.50	B230800R	B230800RA
0.230	0.900	0.0065	0.3125	2.50	B230900R	B230900RA
0.230	1.000	0.0065	0.3125	2.50	B2301000R	B2301000RA
0.230	1.100	0.0065	0.3125	2.50	B2301100R	B2301100RA
0.230	1.150	0.0065	0.3125	2.50	B2301150R	B2301150RA
0.230	1.200	0.0065	0.3125	2.50	B2301200R	B2301200RA
0.230	1.250	0.0065	0.3125	2.50	B2301250R	B2301250RA
0.230	1.400	0.0065	0.3125	2.50	B2301400R	B2301400RA
0.230	1.500	0.0065	0.3125	2.50	B2301500R	B2301500RA
0.230	1.600	0.0065	0.3125	3.00	B2301600R	B2301600RA
0.290	0.500	0.0065	0.3125	2.50	B290500R	B290500RA
0.290	0.600	0.0065	0.3125	2.50	B290600R	B290600RA
0.290	0.750	0.0065	0.3125	2.50	B290750R	B290750RA
0.290	0.900	0.0065	0.3125	2.50	B290900R	B290900RA
0.290	1.000	0.0065	0.3125	2.50	B2901000R	B2901000RA
0.290	1.100	0.0065	0.3125	2.50	B2901100R	B2901100RA
0.290	1.250	0.0065	0.3125	2.50	B2901250R	B2901250RA
0.290	1.350	0.0065	0.3125	2.50	B2901350R	B2901350RA
0.290	1.500	0.0065	0.3125	2.50	B2901500R	B2901500RA
0.290	1.600	0.0065	0.3125	3.00	B2901600R	B2901600RA
0.290	1.750	0.0065	0.3125	3.00	B2901750R	B2901750RA
0.320	0.500	0.0065	0.375	2.50	B320500R	B320500RA
0.320	0.600	0.0065	0.375	2.50	B320600R	B320600RA
0.320	0.750	0.0065	0.375	2.50	B320750R	B320750RA
0.320	0.900	0.0065	0.375	2.50	B320900R	B320900RA
0.320	1.000	0.0065	0.375	2.50	B3201000R	B3201000RA
0.320	1.100	0.0065	0.375	2.50	B3201100R	B3201100RA
0.320	1.250	0.0065	0.375	2.50	B3201250R	B3201250RA
0.320	1.500	0.0065	0.375	2.50	B3201500R	B3201500RA
0.320	1.600	0.0065	0.375	3.00	B3201600R	B3201600RA
0.320	1.800	0.0065	0.375	3.00	B3201800R	B3201800RA
0.320	2.000	0.0065	0.375	4.00	B3202000R	B3202000RA
0.320	2.500	0.0065	0.375	4.00	B3202500R	B3202500RA
0.320	3.000	0.0065	0.375	4.00	B3203000R	B3203000RA

"A" MIN BORE	"B" MAX DEPTH	"R" RADIUS ±0.001	"S" SHANK DIA.	OAL	ORDER #	
					UNCOATED	ALTiN+
0.360	0.500	0.0065	0.375	2.50	B360500R	B360500RA
0.360	0.600	0.0065	0.375	2.50	B360600R	B360600RA
0.360	0.750	0.0065	0.375	2.50	B360750R	B360750RA
0.360	0.900	0.0065	0.375	2.50	B360900R	B360900RA
0.360	1.000	0.0065	0.375	2.50	B3601000R	B3601000RA
0.360	1.150	0.0065	0.375	2.50	B3601150R	B3601150RA
0.360	1.250	0.0065	0.375	2.50	B3601250R	B3601250RA
0.360	1.500	0.0065	0.375	2.50	B3601500R	B3601500RA
0.360	1.600	0.0065	0.375	3.00	B3601600R	B3601600RA
0.360	1.800	0.0065	0.375	3.00	B3601800R	B3601800RA
0.360	2.000	0.0065	0.375	4.00	B3602000R	B3602000RA
0.360	2.500	0.0065	0.375	4.00	B3602500R	B3602500RA
0.360	3.000	0.0065	0.375	4.00	B3603000R	B3603000RA
0.490	0.750	0.0065	0.500	3.00	B490750R	B490750RA
0.490	1.000	0.0065	0.500	3.00	B4901000R	B4901000RA
0.490	1.250	0.0065	0.500	3.00	B4901250R	B4901250RA
0.490	1.500	0.0065	0.500	3.00	B4901500R	B4901500RA
0.490	2.000	0.0065	0.500	4.00	B4902000R	B4902000RA
0.490	2.500	0.0065	0.500	4.00	B4902500R	B4902500RA
0.490	2.600	0.0065	0.500	4.00	B4902600R	B4902600RA
0.490	2.750	0.0065	0.500	4.00	B4902750R	B4902750RA
0.490	3.000	0.0065	0.500	6.00	B4903000R	B4903000RA
0.490	3.500	0.0065	0.500	6.00	B4903500R	B4903500RA
0.490	4.000	0.0065	0.500	6.00	B4904000R	B4904000RA
0.490	4.500	0.0065	0.500	6.00	B4904500R	B4904500RA

BORING BARS - LEFT HAND - SOLID CARBIDE



- ALTiN+ coating provides better surface finish
- Elliptically ground neck provides maximum strength
- Made with premium submicron grade carbide

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.050	0.150	0.125	1.50	LHB050150	LHB050150A
0.050	0.200	0.125	1.50	LHB050200	LHB050200A
0.050	0.300	0.125	1.50	LHB050300	LHB050300A
0.050	0.400	0.125	1.50	LHB050400	LHB050400A
0.060	0.150	0.125	1.50	LHB060150	LHB060150A
0.060	0.200	0.125	1.50	LHB060200	LHB060200A
0.060	0.300	0.125	1.50	LHB060300	LHB060300A
0.060	0.400	0.125	1.50	LHB060400	LHB060400A
0.060	0.500	0.125	1.50	LHB060500	LHB060500A
0.080	0.150	0.125	1.50	LHB080150	LHB080150A
0.080	0.200	0.125	1.50	LHB080200	LHB080200A
0.080	0.300	0.125	1.50	LHB080300	LHB080300A
0.080	0.400	0.125	1.50	LHB080400	LHB080400A
0.080	0.500	0.125	1.50	LHB080500	LHB080500A
0.080	0.600	0.125	1.50	LHB080600	LHB080600A
0.100	0.150	0.125	1.50	LHB100150	LHB100150A
0.100	0.200	0.125	1.50	LHB100200	LHB100200A
0.100	0.300	0.125	1.50	LHB100300	LHB100300A
0.100	0.400	0.125	1.50	LHB100400	LHB100400A
0.100	0.500	0.125	1.50	LHB100500	LHB100500A
0.100	0.600	0.125	1.50	LHB100600	LHB100600A
0.100	0.700	0.125	1.50	LHB100700	LHB100700A
0.110	0.150	0.125	1.50	LHB110150	LHB110150A
0.110	0.200	0.125	1.50	LHB110200	LHB110200A
0.110	0.300	0.125	1.50	LHB110300	LHB110300A
0.110	0.400	0.125	1.50	LHB110400	LHB110400A
0.110	0.500	0.125	1.50	LHB110500	LHB110500A
0.110	0.600	0.125	1.50	LHB110600	LHB110600A
0.110	0.700	0.125	1.50	LHB110700	LHB110700A
0.120	0.250	0.1875	2.00	LHB120250	LHB120250A
0.120	0.350	0.1875	2.00	LHB120350	LHB120350A
0.120	0.500	0.1875	2.00	LHB120500	LHB120500A
0.120	0.600	0.1875	2.00	LHB120600	LHB120600A
0.120	0.700	0.1875	2.00	LHB120700	LHB120700A
0.120	0.800	0.1875	2.00	LHB120800	LHB120800A

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.140	0.250	0.1875	2.00	LHB140250	LHB140250A
0.140	0.400	0.1875	2.00	LHB140400	LHB140400A
0.140	0.500	0.1875	2.00	LHB140500	LHB140500A
0.140	0.600	0.1875	2.00	LHB140600	LHB140600A
0.140	0.700	0.1875	2.00	LHB140700	LHB140700A
0.140	0.750	0.1875	2.00	LHB140750	LHB140750A
0.140	0.800	0.1875	2.00	LHB140800	LHB140800A
0.160	0.250	0.1875	2.00	LHB160250	LHB160250A
0.160	0.400	0.1875	2.00	LHB160400	LHB160400A
0.160	0.500	0.1875	2.00	LHB160500	LHB160500A
0.160	0.600	0.1875	2.00	LHB160600	LHB160600A
0.160	0.750	0.1875	2.00	LHB160750	LHB160750A
0.160	0.900	0.1875	2.00	LHB160900	LHB160900A
0.160	1.000	0.1875	2.00	LHB1601000	LHB1601000A
0.180	0.350	0.250	2.50	LHB180350	LHB180350A
0.180	0.500	0.250	2.50	LHB180500	LHB180500A
0.180	0.600	0.250	2.50	LHB180600	LHB180600A
0.180	0.750	0.250	2.50	LHB180750	LHB180750A
0.180	0.900	0.250	2.50	LHB180900	LHB180900A
0.180	1.000	0.250	2.50	LHB1801000	LHB1801000A
0.180	1.100	0.250	2.50	LHB1801100	LHB1801100A
0.200	0.400	0.250	2.50	LHB200400	LHB200400A
0.200	0.500	0.250	2.50	LHB200500	LHB200500A
0.200	0.600	0.250	2.50	LHB200600	LHB200600A
0.200	0.700	0.250	2.50	LHB200700	LHB200700A
0.200	0.800	0.250	2.50	LHB200800	LHB200800A
0.200	0.900	0.250	2.50	LHB200900	LHB200900A
0.200	1.000	0.250	2.50	LHB2001000	LHB2001000A
0.200	1.100	0.250	2.50	LHB2001100	LHB2001100A
0.200	1.200	0.250	2.50	LHB2001200	LHB2001200A
0.200	1.300	0.250	2.50	LHB2001300	LHB2001300A

*** The LHB050 and the LHB060 series have 3° side clearance.**

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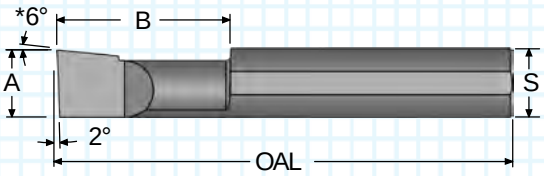
BORING BARS - LEFT HAND - SOLID CARBIDE



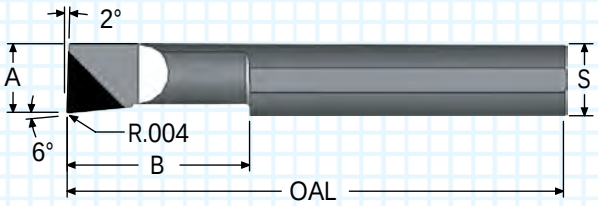
- ALTiN+ coating extends tool life
- Polished flute face for optimum performance
- Precision ground shank flat guarantees tool orientation

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.230	0.400	0.3125	2.50	LHB230400	LHB230400A
0.230	0.500	0.3125	2.50	LHB230500	LHB230500A
0.230	0.600	0.3125	2.50	LHB230600	LHB230600A
0.230	0.700	0.3125	2.50	LHB230700	LHB230700A
0.230	0.800	0.3125	2.50	LHB230800	LHB230800A
0.230	0.900	0.3125	2.50	LHB230900	LHB230900A
0.230	1.000	0.3125	2.50	LHB2301000	LHB2301000A
0.230	1.150	0.3125	2.50	LHB2301150	LHB2301150A
0.230	1.200	0.3125	2.50	LHB2301200	LHB2301200A
0.230	1.250	0.3125	2.50	LHB2301250	LHB2301250A
0.230	1.400	0.3125	2.50	LHB2301400	LHB2301400A
0.230	1.500	0.3125	2.50	LHB2301500	LHB2301500A
0.230	1.600	0.3125	3.00	LHB2301600	LHB2301600A
0.290	0.500	0.3125	2.50	LHB290500	LHB290500A
0.290	0.600	0.3125	2.50	LHB290600	LHB290600A
0.290	0.750	0.3125	2.50	LHB290750	LHB290750A
0.290	0.900	0.3125	2.50	LHB290900	LHB290900A
0.290	1.000	0.3125	2.50	LHB2901000	LHB2901000A
0.290	1.100	0.3125	2.50	LHB2901100	LHB2901100A
0.290	1.250	0.3125	2.50	LHB2901250	LHB2901250A
0.290	1.350	0.3125	2.50	LHB2901350	LHB2901350A
0.290	1.500	0.3125	2.50	LHB2901500	LHB2901500A
0.290	1.600	0.3125	3.00	LHB2901600	LHB2901600A
0.290	1.750	0.3125	3.00	LHB2901750	LHB2901750A
0.320	0.500	0.375	2.50	LHB320500	LHB320500A
0.320	0.600	0.375	2.50	LHB320600	LHB320600A
0.320	0.750	0.375	2.50	LHB320750	LHB320750A
0.320	0.900	0.375	2.50	LHB320900	LHB320900A
0.320	1.000	0.375	2.50	LHB3201000	LHB3201000A
0.320	1.100	0.375	2.50	LHB3201100	LHB3201100A
0.320	1.250	0.375	2.50	LHB3201250	LHB3201250A
0.320	1.500	0.375	2.50	LHB3201500	LHB3201500A
0.320	1.600	0.375	3.00	LHB3201600	LHB3201600A
0.320	1.800	0.375	3.00	LHB3201800	LHB3201800A
0.320	2.000	0.375	4.00	LHB3202000	LHB3202000A
0.320	2.500	0.375	4.00	LHB3202500	LHB3202500A
0.320	3.000	0.375	4.00	LHB3203000	LHB3203000A

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.360	0.500	0.375	2.50	LHB360500	LHB360500A
0.360	0.600	0.375	2.50	LHB360600	LHB360600A
0.360	0.750	0.375	2.50	LHB360750	LHB360750A
0.360	0.900	0.375	2.50	LHB360900	LHB360900A
0.360	1.000	0.375	2.50	LHB3601000	LHB3601000A
0.360	1.150	0.375	2.50	LHB3601150	LHB3601150A
0.360	1.250	0.375	2.50	LHB3601250	LHB3601250A
0.360	1.500	0.375	2.50	LHB3601500	LHB3601500A
0.360	1.600	0.375	3.00	LHB3601600	LHB3601600A
0.360	1.800	0.375	3.00	LHB3601800	LHB3601800A
0.360	2.000	0.375	4.00	LHB3602000	LHB3602000A
0.360	2.500	0.375	4.00	LHB3602500	LHB3602500A
0.360	3.000	0.375	4.00	LHB3603000	LHB3603000A
0.490	0.750	0.500	3.00	LHB490750	LHB490750A
0.490	1.000	0.500	3.00	LHB4901000	LHB4901000A
0.490	1.250	0.500	3.00	LHB4901250	LHB4901250A
0.490	1.500	0.500	3.00	LHB4901500	LHB4901500A
0.490	2.000	0.500	4.00	LHB4902000	LHB4902000A
0.490	2.500	0.500	4.00	LHB4902500	LHB4902500A
0.490	2.600	0.500	4.00	LHB4902600	LHB4902600A
0.490	2.750	0.500	4.00	LHB4902750	LHB4902750A
0.490	3.000	0.500	6.00	LHB4903000	LHB4903000A
0.490	3.500	0.500	6.00	LHB4903500	LHB4903500A
0.490	4.000	0.500	6.00	LHB4904000	LHB4904000A
0.490	4.500	0.500	6.00	LHB4904500	LHB4904500A

*** The LHB050 and the LHB060 series have 3° side clearance.**

BORING BARS - CBN TIPPED - PCD TIPPED



- PCD for abrasive non-ferrous materials
- CBN for hard ferrous metal - 45Rc plus
- Faster speeds and feeds
- Maintains tighter tolerances
- Solid carbide body for maximum rigidity

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				PCD	CBN
0.120	0.250	0.1875	2.00	PCD-B120250	CBN-B120250
0.120	0.350	0.1875	2.00	PCD-B120350	CBN-B120350
0.120	0.500	0.1875	2.00	PCD-B120500	CBN-B120500
0.120	0.600	0.1875	2.00	PCD-B120600	CBN-B120600
0.120	0.700	0.1875	2.00	PCD-B120700	CBN-B120700
0.120	0.800	0.1875	2.00	PCD-B120800	CBN-B120800
0.140	0.250	0.1875	2.00	PCD-B140250	CBN-B140250
0.140	0.400	0.1875	2.00	PCD-B140400	CBN-B140400
0.140	0.500	0.1875	2.00	PCD-B140500	CBN-B140500
0.140	0.600	0.1875	2.00	PCD-B140600	CBN-B140600
0.140	0.700	0.1875	2.00	PCD-B140700	CBN-B140700
0.140	0.750	0.1875	2.00	PCD-B140750	CBN-B140750
0.140	0.800	0.1875	2.00	PCD-B140800	CBN-B140800
0.160	0.250	0.1875	2.00	PCD-B160250	CBN-B160250
0.160	0.400	0.1875	2.00	PCD-B160400	CBN-B160400
0.160	0.500	0.1875	2.00	PCD-B160500	CBN-B160500
0.160	0.600	0.1875	2.00	PCD-B160600	CBN-B160600
0.160	0.750	0.1875	2.00	PCD-B160750	CBN-B160750
0.160	0.900	0.1875	2.00	PCD-B160900	CBN-B160900
0.160	1.000	0.1875	2.00	PCD-B1601000	CBN-B1601000
0.180	0.350	0.250	2.50	PCD-B180350	CBN-B180350
0.180	0.500	0.250	2.50	PCD-B180500	CBN-B180500
0.180	0.600	0.250	2.50	PCD-B180600	CBN-B180600
0.180	0.750	0.250	2.50	PCD-B180750	CBN-B180750
0.180	0.900	0.250	2.50	PCD-B180900	CBN-B180900
0.180	1.000	0.250	2.50	PCD-B1801000	CBN-B1801000
0.180	1.100	0.250	2.50	PCD-B1801100	CBN-B1801100

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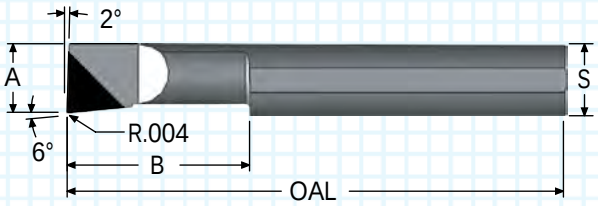
BORING BARS - CBN TIPPED - PCD TIPPED



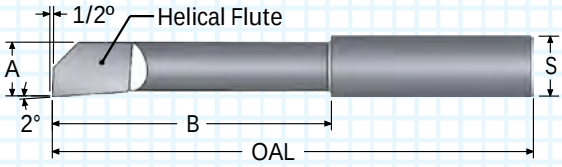
- PCD for abrasive non-ferrous materials
- CBN for hard ferrous metal - 45Rc plus
- Faster speeds and feeds
- Maintains tighter tolerances
- Solid carbide body for maximum rigidity

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				PCD	CBN
0.200	0.400	0.250	2.50	PCD-B200400	CBN-B200400
0.200	0.500	0.250	2.50	PCD-B200500	CBN-B200500
0.200	0.600	0.250	2.50	PCD-B200600	CBN-B200600
0.200	0.700	0.250	2.50	PCD-B200700	CBN-B200700
0.200	0.800	0.250	2.50	PCD-B200800	CBN-B200800
0.200	0.900	0.250	2.50	PCD-B200900	CBN-B200900
0.200	1.000	0.250	2.50	PCD-B2001000	CBN-B2001000
0.200	1.100	0.250	2.50	PCD-B2001100	CBN-B2001100
0.200	1.200	0.250	2.50	PCD-B2001200	CBN-B2001200
0.200	1.300	0.250	2.50	PCD-B2001300	CBN-B2001300
0.230	0.400	0.3125	2.50	PCD-B230400	CBN-B230400
0.230	0.500	0.3125	2.50	PCD-B230500	CBN-B230500
0.230	0.600	0.3125	2.50	PCD-B230600	CBN-B230600
0.230	0.700	0.3125	2.50	PCD-B230700	CBN-B230700
0.230	0.800	0.3125	2.50	PCD-B230800	CBN-B230800
0.230	0.900	0.3125	2.50	PCD-B230900	CBN-B230900
0.230	1.000	0.3125	2.50	PCD-B2301000	CBN-B2301000
0.230	1.150	0.3125	2.50	PCD-B2301150	CBN-B2301150
0.230	1.200	0.3125	2.50	PCD-B2301200	CBN-B2301200
0.230	1.250	0.3125	2.50	PCD-B2301250	CBN-B2301250
0.230	1.400	0.3125	2.50	PCD-B2301400	CBN-B2301400
0.230	1.500	0.3125	2.50	PCD-B2301500	CBN-B2301500
0.230	1.600	0.3125	2.50	PCD-B2301600	CBN-B2301600
0.290	0.500	0.3125	2.50	PCD-B290500	CBN-B290500
0.290	0.600	0.3125	2.50	PCD-B290600	CBN-B290600
0.290	0.750	0.3125	2.50	PCD-B290750	CBN-B290750
0.290	0.900	0.3125	2.50	PCD-B290900	CBN-B290900
0.290	1.000	0.3125	2.50	PCD-B2901000	CBN-B2901000
0.290	1.100	0.3125	2.50	PCD-B2901100	CBN-B2901100
0.290	1.250	0.3125	2.50	PCD-B2901250	CBN-B2901250
0.290	1.350	0.3125	2.50	PCD-B2901350	CBN-B2901350
0.290	1.500	0.3125	2.50	PCD-B2901500	CBN-B2901500
0.290	1.600	0.3125	2.50	PCD-B2901600	CBN-B2901600
0.290	1.750	0.3125	2.50	PCD-B2901750	CBN-B2901750

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				PCD	CBN
0.320	0.500	0.375	2.50	PCD-B320500	CBN-B320500
0.320	0.600	0.375	2.50	PCD-B320600	CBN-B320600
0.320	0.750	0.375	2.50	PCD-B320750	CBN-B320750
0.320	0.900	0.375	2.50	PCD-B320900	CBN-B320900
0.320	1.000	0.375	2.50	PCD-B3201000	CBN-B3201000
0.320	1.100	0.375	2.50	PCD-B3201100	CBN-B3201100
0.320	1.250	0.375	2.50	PCD-B3201250	CBN-B3201250
0.320	1.500	0.375	2.50	PCD-B3201500	CBN-B3201500
0.320	1.600	0.375	2.50	PCD-B3201600	CBN-B3201600
0.320	1.800	0.375	2.50	PCD-B3201800	CBN-B3201800
0.320	2.000	0.375	4.00	PCD-B3202000	CBN-B3202000
0.320	2.500	0.375	4.00	PCD-B3202500	CBN-B3202500
0.320	3.000	0.375	4.00	PCD-B3203000	CBN-B3203000
0.360	0.500	0.375	2.50	PCD-B360500	CBN-B360500
0.360	0.600	0.375	2.50	PCD-B360600	CBN-B360600
0.360	0.750	0.375	2.50	PCD-B360750	CBN-B360750
0.360	0.900	0.375	2.50	PCD-B360900	CBN-B360900
0.360	1.000	0.375	2.50	PCD-B3601000	CBN-B3601000
0.360	1.150	0.375	2.50	PCD-B3601150	CBN-B3601150
0.360	1.250	0.375	2.50	PCD-B3601250	CBN-B3601250
0.360	1.500	0.375	2.50	PCD-B3601500	CBN-B3601500
0.360	1.600	0.375	2.50	PCD-B3601600	CBN-B3601600
0.360	1.800	0.375	2.50	PCD-B3601800	CBN-B3601800
0.360	2.000	0.375	4.00	PCD-B3602000	CBN-B3602000
0.360	2.500	0.375	4.00	PCD-B3602500	CBN-B3602500
0.360	3.000	0.375	4.00	PCD-B3603000	CBN-B3603000

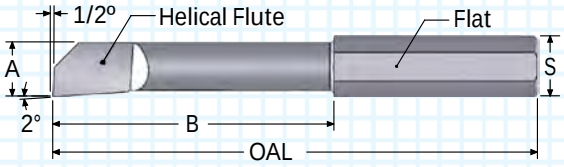
BORING BARS - HELICAL - SOLID CARBIDE

- Positive high shear tool design reduces cutting force
- ALTiN+ coating helps extend tool life
- Stocked in both uncoated and ALTiN+ coating
- Made with premium submicron grade carbide



HELICAL BACK RAKE
WITHOUT FLAT

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.025	0.093	0.125	1.50	HB25	HB25A
0.027	0.125	0.125	1.50	HB27	HB27A
0.031	0.156	0.125	1.50	HB31	HB31A
0.031	0.187	0.125	1.50	HB31L	HB31LA
0.036	0.156	0.125	1.50	HB36	HB36A
0.036	0.250	0.125	1.50	HB36L	HB36LA
0.042	0.250	0.125	1.50	HB42	HB42A
0.042	0.312	0.125	1.50	HB42L	HB42LA
0.052	0.312	0.125	1.50	HB52	HB52A
0.057	0.312	0.125	1.50	HB57	HB57A
0.060	0.375	0.125	1.50	HB60	HB60A
0.060	0.500	0.125	1.50	HB60L	HB60LA
0.070	0.437	0.125	1.50	HB70	HB70A
0.080	0.500	0.125	1.50	HB80	HB80A
0.085	0.500	0.125	1.50	HB85	HB85A
0.090	0.500	0.125	1.50	HB90	HB90A
0.090	0.625	0.125	1.50	HB90L	HB90LA
0.100	0.562	0.125	1.50	HB100	HB100A
0.100	0.625	0.125	2.00	HB100L	HB100LA
0.110	0.562	0.125	1.50	HB110	HB110A
0.110	0.625	0.125	2.00	HB110L	HB110LA
0.115	0.625	0.125	1.50	HB120	HB120A
0.115	0.625	0.125	2.00	HB120L	HB120LA



HELICAL BACK RAKE
WITH FLAT

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.025	0.093	0.125	1.50	HB25F	HB25FA
0.027	0.125	0.125	1.50	HB27F	HB27FA
0.031	0.156	0.125	1.50	HB31F	HB31FA
0.031	0.187	0.125	1.50	HB31LF	HB31LFA
0.036	0.156	0.125	1.50	HB36F	HB36FA
0.036	0.250	0.125	1.50	HB36LF	HB36LFA
0.042	0.250	0.125	1.50	HB42F	HB42FA
0.042	0.312	0.125	1.50	HB42LF	HB42LFA
0.052	0.312	0.125	1.50	HB52F	HB52FA
0.057	0.312	0.125	1.50	HB57F	HB57FA
0.060	0.375	0.125	1.50	HB60F	HB60FA
0.060	0.500	0.125	1.50	HB60LF	HB60LFA
0.070	0.437	0.125	1.50	HB70F	HB70FA
0.080	0.500	0.125	1.50	HB80F	HB80FA
0.085	0.500	0.125	1.50	HB85F	HB85FA
0.090	0.500	0.125	1.50	HB90F	HB90FA
0.090	0.625	0.125	1.50	HB90LF	HB90LFA
0.100	0.562	0.125	1.50	HB100F	HB100FA
0.100	0.625	0.125	2.00	HB100LF	HB100LFA
0.110	0.562	0.125	1.50	HB110F	HB110FA
0.110	0.625	0.125	2.00	HB110LF	HB110LFA
0.120	0.625	0.125	1.50	HB120F	HB120FA
0.120	0.625	0.125	2.00	HB120LF	HB120LFA

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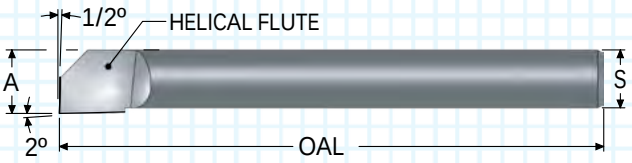
BORING BARS - HELICAL - SOLID CARBIDE

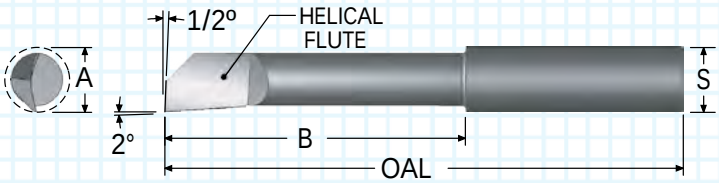


- Bar features an adjustable max bore depth
- ALTiN+ coating provides better surface finish
- Positive high shear tool design reduces cutting force
- Made with premium submicron grade carbide

HELICAL BACK RAKE

"A" MIN BORE	"S" SHANK DIA.	OAL	ORDER #	
			UNCOATED	ALTiN+
0.130	0.1093	1.50	HB135	HB135A
0.145	0.1250	1.50	HB150	HB150A
0.145	0.1250	2.50	HB150L	HB150LA
0.174	0.1562	1.50	HB180	HB180A
0.174	0.1562	2.00	HB180L	HB180LA
0.174	0.1562	3.00	HB180EL	HB180ELA
0.205	0.1875	1.50	HB210	HB210A
0.205	0.1875	3.00	HB210L	HB210LA
0.235	0.2187	1.50	HB240	HB240A
0.235	0.2187	3.00	HB240L	HB240LA
0.284	0.2500	2.50	HB300	HB300A
0.284	0.2500	3.50	HB300L	HB300LA
0.345	0.3125	3.00	HB360	HB360A
0.345	0.3125	5.00	HB360L	HB360LA
0.470	0.4375	3.00	HB480	HB480A
0.470	0.4375	6.00	HB480L	HB480LA

BORING BARS - HELICAL - SOLID CARBIDE



"A" minimum bore diameter refers to the size of the hole that is produced when the tools are rotated on centerline. These tools are designed to be used for both mill and lathe applications.

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.020	0.062	0.125	1.50	HB020062	HB020062A
0.025	0.062	0.125	1.50	HB025062	HB025062A
0.025	0.125	0.125	1.50	HB025125	HB025125A
0.030	0.125	0.125	1.50	HB030125	HB030125A
0.030	0.187	0.125	1.50	HB030187	HB030187A
0.035	0.125	0.125	1.50	HB035125	HB035125A
0.035	0.187	0.125	1.50	HB035187	HB035187A
0.040	0.187	0.125	1.50	HB040187	HB040187A
0.040	0.250	0.125	1.50	HB040250	HB040250A
0.050	0.312	0.125	1.50	HB050312	HB050312A
0.060	0.375	0.125	1.50	HB060375	HB060375A
0.070	0.437	0.125	1.50	HB070437	HB070437A
0.080	0.500	0.125	1.50	HB080500	HB080500A
0.090	0.500	0.125	1.50	HB090500	HB090500A
0.100	0.562	0.125	1.50	HB100562	HB100562A
0.120	0.625	0.125	1.50	HB120625	HB120625A
0.120	1.000	0.125	2.00	HB1201000	HB1201000A
0.135	0.750	0.1875	2.00	HB135750	HB135750A
0.135	1.000	0.1875	2.00	HB1351000	HB1351000A
0.150	1.000	0.1875	2.00	HB1501000	HB1501000A
0.150	1.250	0.1875	2.00	HB1501250	HB1501250A
0.180	1.000	0.1875	2.00	HB1801000	HB1801000A
0.180	1.250	0.1875	2.50	HB1801250	HB1801250A
0.180	1.500	0.1875	2.50	HB1801500	HB1801500A

"A" MIN BORE	"B" MAX DEPTH	"S" SHANK DIA.	OAL	ORDER #	
				UNCOATED	ALTiN+
0.210	1.000	0.250	2.50	HB2101000	HB2101000A
0.210	1.250	0.250	2.50	HB2101250	HB2101250A
0.210	1.500	0.250	2.50	HB2101500	HB2101500A
0.240	1.000	0.250	2.50	HB2401000	HB2401000A
0.240	1.500	0.250	2.50	HB2401500	HB2401500A
0.240	1.750	0.250	3.00	HB2401750	HB2401750A
0.300	1.000	0.312	2.50	HB3001000	HB3001000A
0.300	1.500	0.312	2.50	HB3001500	HB3001500A
0.300	1.750	0.312	3.00	HB3001750	HB3001750A
0.360	1.000	0.375	2.50	HB3601000	HB3601000A
0.360	1.500	0.375	2.50	HB3601500	HB3601500A
0.360	1.750	0.375	3.00	HB3601750	HB3601750A
0.360	2.000	0.375	4.00	HB3602000	HB3602000A
0.360	2.250	0.375	4.00	HB3602250	HB3602250A
0.360	2.500	0.375	4.00	HB3602500	HB3602500A
0.480	1.500	0.500	3.00	HB4801500	HB4801500A
0.480	2.000	0.500	3.00	HB4802000	HB4802000A
0.480	2.500	0.500	4.00	HB4802500	HB4802500A
0.480	3.000	0.500	4.00	HB4803000	HB4803000A
0.480	3.500	0.500	6.00	HB4803500	HB4803500A
0.480	4.000	0.500	6.00	HB4804000	HB4804000A
0.480	4.500	0.500	6.00	HB4804500	HB4804500A

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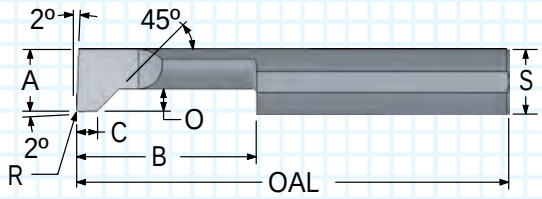
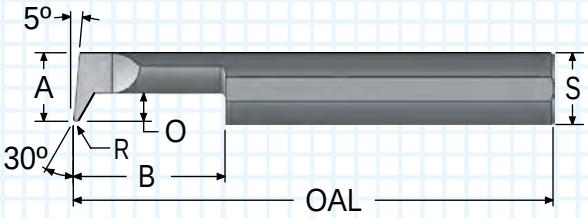
BACK CHAMFER BORING BARS - SOLID CARBIDE



- Bar features multifunction design: bore, back bore, thread relief, and back chamfer
- ALTiN+ coating extends tool life
- Elliptically ground neck provides maximum strength
- Made with premium submicron grade carbide

"A" MIN BORE	"B" MAX DEPTH	"C" CUT WIDTH	"O" OFF SET	"R" TOOL RADIUS	"S" SHANK DIA.	OAL	ORDER #	
							UNCOATED	ALTiN+
0.090	0.300	0.040	0.035	0.010	0.125	1.50	BC090300	BC090300A
0.090	0.400	0.040	0.035	0.010	0.125	1.50	BC090400	BC090400A
0.090	0.500	0.040	0.035	0.010	0.125	1.50	BC090500	BC090500A
0.120	0.400	0.050	0.045	0.010	0.125	1.50	BC120400	BC120400A
0.120	0.500	0.050	0.045	0.010	0.125	1.50	BC120500	BC120500A
0.120	0.600	0.050	0.045	0.010	0.125	1.50	BC120600	BC120600A
0.180	0.500	0.060	0.050	0.010	0.1875	2.00	BC180500	BC180500A
0.180	0.650	0.060	0.050	0.010	0.1875	2.00	BC180650	BC180650A
0.180	0.800	0.060	0.050	0.010	0.1875	2.00	BC180800	BC180800A
0.230	0.500	0.080	0.060	0.010	0.250	2.50	BC230500	BC230500A
0.230	0.700	0.080	0.060	0.010	0.250	2.50	BC230700	BC230700A
0.230	0.900	0.080	0.060	0.010	0.250	2.50	BC230900	BC230900A
0.290	0.700	0.080	0.080	0.010	0.3125	2.50	BC290700	BC290700A
0.290	0.900	0.080	0.080	0.010	0.3125	2.50	BC290900	BC290900A
0.290	1.100	0.080	0.080	0.010	0.3125	2.50	BC2901100	BC2901100A
0.360	0.750	0.100	0.120	0.010	0.375	2.50	BC360750	BC360750A
0.360	1.000	0.100	0.120	0.010	0.375	2.50	BC3601000	BC3601000A
0.360	1.250	0.100	0.120	0.010	0.375	2.50	BC3601250	BC3601250A
0.490	1.000	0.110	0.130	0.010	0.500	3.00	BC4901000	BC4901000A
0.490	1.250	0.110	0.130	0.010	0.500	3.00	BC4901250	BC4901250A
0.490	1.500	0.110	0.130	0.010	0.500	3.00	BC4901500	BC4901500A

PROFILE BORING BARS - SOLID CARBIDE



- Machines complex internal shapes with ease
- ALTiN+ coating allows higher Surface Feet per Minute
- Elliptically ground neck provides maximum strength
- Made with premium submicron grade carbide

"A" MIN BORE	"B" MAX DEPTH	"O" OFF SET	"R" TOOL RADIUS	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.090	0.200	0.040	0.005	0.125	1.50	PB090200	PB090200A
0.090	0.300	0.040	0.005	0.125	1.50	PB090300	PB090300A
0.090	0.400	0.040	0.005	0.125	1.50	PB090400	PB090400A
0.120	0.250	0.050	0.007	0.125	1.50	PB120250	PB120250A
0.120	0.500	0.050	0.007	0.125	1.50	PB120500	PB120500A
0.120	0.750	0.050	0.007	0.125	1.50	PB120750	PB120750A
0.180	0.500	0.080	0.010	0.1875	2.00	PB180500	PB180500A
0.180	0.750	0.080	0.010	0.1875	2.00	PB180750	PB180750A
0.180	1.000	0.080	0.010	0.1875	2.00	PB1801000	PB1801000A
0.230	0.500	0.090	0.010	0.250	2.50	PB230500	PB230500A
0.230	0.750	0.090	0.010	0.250	2.50	PB230750	PB230750A
0.230	1.000	0.090	0.010	0.250	2.50	PB2301000	PB2301000A
0.290	0.500	0.110	0.015	0.3125	2.50	PB290500	PB290500A
0.290	0.750	0.110	0.015	0.3125	2.50	PB290750	PB290750A
0.290	1.000	0.110	0.015	0.3125	2.50	PB2901000	PB2901000A
0.360	0.500	0.140	0.015	0.375	2.50	PB360500	PB360500A
0.360	0.750	0.140	0.015	0.375	2.50	PB360750	PB360750A
0.360	1.000	0.140	0.015	0.375	2.50	PB3601000	PB3601000A
0.360	1.250	0.140	0.015	0.375	2.50	PB3601250	PB3601250A
0.490	0.500	0.180	0.015	0.500	3.00	PB490500	PB490500A
0.490	0.750	0.180	0.015	0.500	3.00	PB490750	PB490750A
0.490	1.000	0.180	0.015	0.500	3.00	PB4901000	PB4901000A
0.490	1.250	0.180	0.015	0.500	3.00	PB4901250	PB4901250A

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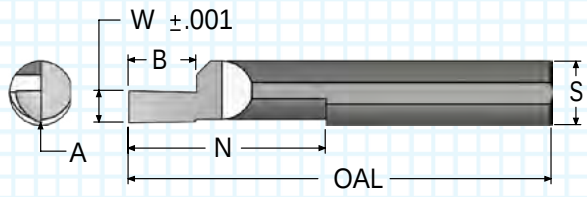
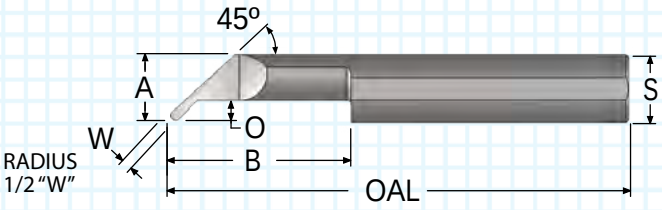
FACE GROOVE TOOLS - SOLID CARBIDE



- ALTiN+ coating extends tool life
- Polished flute face for maximum performance
- Precision ground flat for guaranteed tool orientation
- Made with premium submicron grade carbide

"A" MIN. DIA.	"W" GROOVE WIDTH	"B" GROOVE DEPTH	"N" NECK RELIEF	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.135	0.015	0.040	0.400	0.125	1.50	FG125-015	FG125-015A
0.135	0.020	0.050	0.400	0.125	1.50	FG125-020	FG125-020A
0.135	0.025	0.050	0.400	0.125	1.50	FG125-025	FG125-025A
0.135	0.030	0.060	0.400	0.125	1.50	FG125-030	FG125-030A
0.195	0.035	0.070	0.500	0.1875	2.00	FG187-035	FG187-035A
0.195	0.040	0.080	0.500	0.1875	2.00	FG187-040	FG187-040A
0.195	0.045	0.090	0.500	0.1875	2.00	FG187-045	FG187-045A
0.195	0.050	0.100	0.500	0.1875	2.00	FG187-050	FG187-050A
0.260	0.021	0.050	0.750	0.250	2.50	FG250-020	FG250-020A
0.260	0.031	0.060	0.750	0.250	2.50	FG250-030	FG250-030A
0.260	0.041	0.080	0.750	0.250	2.50	FG250-040	FG250-040A
0.260	0.051	0.100	0.750	0.250	2.50	FG250-050	FG250-050A
0.320	0.031	0.060	1.000	0.3125	2.50	FG312-030	FG312-030A
0.320	0.041	0.080	1.000	0.3125	2.50	FG312-040	FG312-040A
0.320	0.051	0.100	1.000	0.3125	2.50	FG312-050	FG312-050A
0.320	0.063	0.130	1.000	0.3125	2.50	FG312-062	FG312-062A
0.385	0.031	0.060	1.125	0.375	2.50	FG375-030	FG375-030A
0.385	0.063	0.130	1.125	0.375	2.50	FG375-062	FG375-062A
0.385	0.094	0.190	1.125	0.375	2.50	FG375-093	FG375-093A
0.385	0.126	0.250	1.125	0.375	2.50	FG375-125	FG375-125A
0.510	0.063	0.130	1.250	0.500	3.00	FG500-062	FG500-062A
0.510	0.094	0.190	1.250	0.500	3.00	FG500-093	FG500-093A
0.510	0.125	0.250	1.250	0.500	3.00	FG500-125	FG500-125A
0.510	0.157	0.310	1.250	0.500	3.00	FG500-156	FG500-156A
0.635	0.063	0.130	1.500	0.625	3.50	FG625-062	FG625-062A
0.635	0.094	0.190	1.500	0.625	3.50	FG625-093	FG625-093A
0.635	0.126	0.250	1.500	0.625	3.50	FG625-125	FG625-125A
0.635	0.157	0.310	1.500	0.625	3.50	FG625-156	FG625-156A
0.635	0.188	0.375	1.500	0.625	3.50	FG625-187	FG625-187A
0.760	0.063	0.130	1.750	0.750	4.00	FG750-062	FG750-062A
0.760	0.094	0.190	1.750	0.750	4.00	FG750-093	FG750-093A
0.760	0.126	0.250	1.750	0.750	4.00	FG750-125	FG750-125A
0.760	0.157	0.310	1.750	0.750	4.00	FG750-156	FG750-156A
0.760	0.188	0.375	1.750	0.750	4.00	FG750-187	FG750-187A
0.760	0.251	0.500	1.750	0.750	4.00	FG750-250	FG750-250A

UNDERCUT GROOVE TOOLS - SOLID CARBIDE



- ALTiN+ coating for higher Surface Feet per Minute
- Elliptically ground for maximum strength
- Polished flute face for optimum performance
- Made with premium submicron grade carbide

UNDERCUT & PROFILE GROOVE TOOLS

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.250	0.031	0.500	0.060	0.250	2.50	UP25030-8	UP25030-8A
0.250	0.031	1.000	0.060	0.250	2.50	UP25030-16	UP25030-16A
0.310	0.051	0.500	0.110	0.3125	2.50	UP31050-8	UP31050-8A
0.310	0.051	1.000	0.110	0.3125	2.50	UP31050-16	UP31050-16A
0.310	0.063	1.000	0.110	0.3125	2.50	UP31062-16	UP31062-16A
0.310	0.063	1.250	0.110	0.3125	2.50	UP31062-20	UP31062-20A
0.375	0.063	1.000	0.110	0.375	2.50	UP37062-16	UP37062-16A
0.375	0.063	1.250	0.110	0.375	2.50	UP37062-20	UP37062-20A
0.375	0.094	1.000	0.110	0.375	2.50	UP37093-16	UP37093-16A
0.375	0.094	1.250	0.110	0.375	2.50	UP37093-20	UP37093-20A
0.375	0.126	1.000	0.110	0.375	2.50	UP37125-16	UP37125-16A
0.375	0.126	1.250	0.110	0.375	2.50	UP37125-20	UP37125-20A
0.500	0.063	1.000	0.160	0.500	3.00	UP50062-16	UP50062-16A
0.500	0.063	1.500	0.160	0.500	3.00	UP50062-24	UP50062-24A
0.500	0.094	1.000	0.160	0.500	3.00	UP50093-16	UP50093-16A
0.500	0.094	1.500	0.160	0.500	3.00	UP50093-24	UP50093-24A
0.500	0.126	1.000	0.160	0.500	3.00	UP50125-16	UP50125-16A
0.500	0.126	1.500	0.160	0.500	3.00	UP50125-24	UP50125-24A

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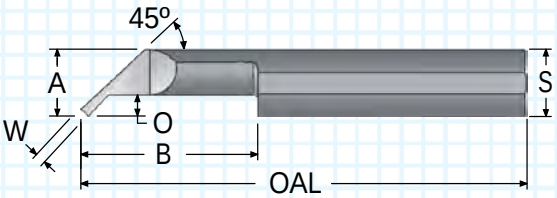
UNDERCUT GROOVE TOOLS - SOLID CARBIDE

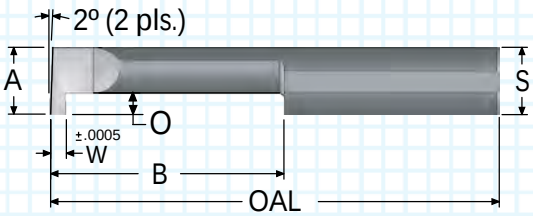


- ALTiN+ coating allows higher Surface Feet per Minute
- Elliptically ground for maximum strength
- Polished flute face for optimum performance

UNDERCUT GROOVE TOOLS

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.250	0.031	0.500	0.060	0.250	2.50	UC25030-8	UC25030-8A
0.250	0.031	1.000	0.060	0.250	2.50	UC25030-16	UC25030-16A
0.310	0.051	0.500	0.110	0.3125	2.50	UC31050-8	UC31050-8A
0.310	0.051	1.000	0.110	0.3125	2.50	UC31050-16	UC31050-16A
0.310	0.063	1.000	0.110	0.3125	2.50	UC31062-16	UC31062-16A
0.310	0.063	1.250	0.110	0.3125	2.50	UC31062-20	UC31062-20A
0.375	0.063	1.000	0.110	0.375	2.50	UC37062-16	UC37062-16A
0.375	0.063	1.250	0.110	0.375	2.50	UC37062-20	UC37062-20A
0.375	0.094	1.000	0.110	0.375	2.50	UC37093-16	UC37093-16A
0.375	0.094	1.250	0.110	0.375	2.50	UC37093-20	UC37093-20A
0.375	0.126	1.000	0.110	0.375	2.50	UC37125-16	UC37125-16A
0.375	0.126	1.250	0.110	0.375	2.50	UC37125-20	UC37125-20A
0.500	0.063	1.000	0.160	0.500	3.00	UC50062-16	UC50062-16A
0.500	0.063	1.500	0.160	0.500	3.00	UC50062-24	UC50062-24A
0.500	0.094	1.000	0.160	0.500	3.00	UC50093-16	UC50093-16A
0.500	0.094	1.500	0.160	0.500	3.00	UC50093-24	UC50093-24A
0.500	0.126	1.000	0.160	0.500	3.00	UC50125-16	UC50125-16A
0.500	0.126	1.500	0.160	0.500	3.00	UC50125-24	UC50125-24A

GROOVE TOOLS – RETAINING RING – SOLID CARBIDE



- ALTiN+ coating for higher Surface Feet per Minute
- Shank diameter is precision ground
- Made with premium submicron grade carbide

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.060	0.0320	0.187	0.020	0.125	1.50	GT031-3	GT031-3A
0.060	0.0320	0.250	0.020	0.125	1.50	GT031-4	GT031-4A
0.060	0.0320	0.375	0.020	0.125	1.50	GT031-6	GT031-6A
0.090	0.0460	0.250	0.030	0.125	1.50	GT045-4	GT045-4A
0.090	0.0460	0.375	0.030	0.125	1.50	GT045-6	GT045-6A
0.090	0.0460	0.500	0.030	0.125	1.50	GT045-8	GT045-8A
0.120	0.0620	0.250	0.040	0.125	1.50	GT061-4	GT061-4A
0.120	0.0620	0.375	0.040	0.125	1.50	GT061-6	GT061-6A
0.120	0.0620	0.500	0.040	0.125	1.50	GT061-8	GT061-8A
0.120	0.0620	0.625	0.040	0.125	1.50	GT061-10	GT061-10A
0.187	0.0175	0.250	0.050	0.1875	2.00	GT017K-4	GT017K-4A
0.187	0.0175	0.375	0.050	0.1875	2.00	GT017K-6	GT017K-6A
0.187	0.0175	0.500	0.050	0.1875	2.00	GT017K-8	GT017K-8A
0.187	0.0175	0.625	0.050	0.1875	2.00	GT017K-10	GT017K-10A
0.187	0.0255	0.250	0.050	0.1875	2.00	GT025K-4	GT025K-4A
0.187	0.0255	0.375	0.050	0.1875	2.00	GT025K-6	GT025K-6A
0.187	0.0255	0.500	0.050	0.1875	2.00	GT025K-8	GT025K-8A
0.187	0.0255	0.625	0.050	0.1875	2.00	GT025K-10	GT025K-10A
0.187	0.0305	0.250	0.050	0.1875	2.00	GT030K-4	GT030K-4A
0.187	0.0305	0.375	0.050	0.1875	2.00	GT030K-6	GT030K-6A
0.187	0.0305	0.500	0.050	0.1875	2.00	GT030K-8	GT030K-8A
0.187	0.0305	0.625	0.050	0.1875	2.00	GT030K-10	GT030K-10A
0.187	0.0630	0.250	0.050	0.1875	2.00	GT062K-4	GT062K-4A
0.187	0.0630	0.375	0.050	0.1875	2.00	GT062K-6	GT062K-6A
0.187	0.0630	0.500	0.050	0.1875	2.00	GT062K-8	GT062K-8A
0.187	0.0630	0.625	0.050	0.1875	2.00	GT062K-10	GT062K-10A

Left-hand style available in all sizes. To order left-hand style, start order number with "LH."

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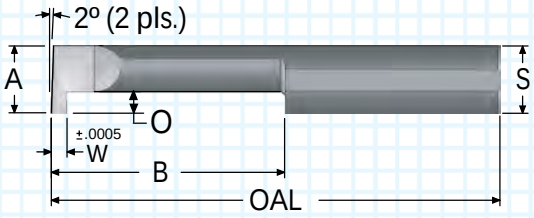
GROOVE TOOLS – RETAINING RING – SOLID CARBIDE

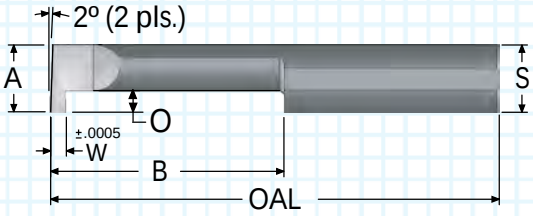


- ALTiN+ coating extends tool life
- Polished flute face for optimum performance
- Precision ground shank flat for guaranteed tool orientation

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.250	0.0175	0.250	0.060	0.250	2.50	GT017Q-4	GT017Q-4A
0.250	0.0175	0.375	0.060	0.250	2.50	GT017Q-6	GT017Q-6A
0.250	0.0175	0.500	0.060	0.250	2.50	GT017Q-8	GT017Q-8A
0.250	0.0175	0.625	0.060	0.250	2.50	GT017Q-10	GT017Q-10A
0.250	0.0255	0.250	0.060	0.250	2.50	GT025Q-4	GT025Q-4A
0.250	0.0255	0.375	0.060	0.250	2.50	GT025Q-6	GT025Q-6A
0.250	0.0255	0.500	0.060	0.250	2.50	GT025Q-8	GT025Q-8A
0.250	0.0255	0.625	0.060	0.250	2.50	GT025Q-10	GT025Q-10A
0.250	0.0305	0.250	0.060	0.250	2.50	GT030Q-4	GT030Q-4A
0.250	0.0305	0.375	0.060	0.250	2.50	GT030Q-6	GT030Q-6A
0.250	0.0305	0.500	0.060	0.250	2.50	GT030Q-8	GT030Q-8A
0.250	0.0305	0.625	0.060	0.250	2.50	GT030Q-10	GT030Q-10A
0.250	0.0630	0.250	0.060	0.250	2.50	GT062Q-4	GT062Q-4A
0.250	0.0630	0.375	0.060	0.250	2.50	GT062Q-6	GT062Q-6A
0.250	0.0630	0.500	0.060	0.250	2.50	GT062Q-8	GT062Q-8A
0.250	0.0630	0.625	0.060	0.250	2.50	GT062Q-10	GT062Q-10A
0.250	0.0930	0.250	0.060	0.250	2.50	GT092Q-4	GT092Q-4A
0.250	0.0930	0.375	0.060	0.250	2.50	GT092Q-6	GT092Q-6A
0.250	0.0930	0.500	0.060	0.250	2.50	GT092Q-8	GT092Q-8A
0.250	0.0930	0.625	0.060	0.250	2.50	GT092Q-10	GT092Q-10A
0.312	0.0335	0.250	0.110	0.3125	2.50	GT033-4	GT033-4A
0.312	0.0335	0.375	0.110	0.3125	2.50	GT033-6	GT033-6A
0.312	0.0335	0.500	0.110	0.3125	2.50	GT033-8	GT033-8A
0.312	0.0335	0.750	0.110	0.3125	2.50	GT033-12	GT033-12A
0.312	0.0385	0.250	0.110	0.3125	2.50	GT038-4	GT038-4A
0.312	0.0385	0.375	0.110	0.3125	2.50	GT038-6	GT038-6A
0.312	0.0385	0.500	0.110	0.3125	2.50	GT038-8	GT038-8A
0.312	0.0385	0.750	0.110	0.3125	2.50	GT038-12	GT038-12A
0.312	0.0630	0.375	0.110	0.3125	2.50	GT063-6	GT063-6A
0.312	0.0630	0.500	0.110	0.3125	2.50	GT063-8	GT063-8A
0.312	0.0630	0.750	0.110	0.3125	2.50	GT063-12	GT063-12A
0.312	0.0630	1.000	0.110	0.3125	2.50	GT063-16	GT063-16A
0.312	0.1250	0.375	0.110	0.3125	2.50	GT124-6	GT124-6A
0.312	0.1250	0.500	0.110	0.3125	2.50	GT124-8	GT124-8A
0.312	0.1250	0.750	0.110	0.3125	2.50	GT124-12	GT124-12A
0.312	0.1250	1.000	0.110	0.3125	2.50	GT124-16	GT124-16A

Left-hand style available in all sizes. To order left-hand style, start order number with "LH."

GROOVE TOOLS – RETAINING RING – SOLID CARBIDE



- ALTiN+ coating for higher Surface Feet per Minute
- Shank diameter is precision ground
- Polished flute face for optimum performance
- Made with premium submicron grade carbide

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.375	0.040	0.250	0.110	0.375	2.50	GT039-4	GT039-4A
0.375	0.040	0.375	0.110	0.375	2.50	GT039-6	GT039-6A
0.375	0.040	0.500	0.110	0.375	2.50	GT039-8	GT039-8A
0.375	0.040	0.750	0.110	0.375	2.50	GT039-12	GT039-12A
0.375	0.040	1.000	0.110	0.375	2.50	GT039-16	GT039-16A
0.375	0.040	1.250	0.110	0.375	2.50	GT039-20	GT039-20A
0.375	0.047	0.250	0.110	0.375	2.50	GT046-4	GT046-4A
0.375	0.047	0.375	0.110	0.375	2.50	GT046-6	GT046-6A
0.375	0.047	0.500	0.110	0.375	2.50	GT046-8	GT046-8A
0.375	0.047	0.750	0.110	0.375	2.50	GT046-12	GT046-12A
0.375	0.047	1.000	0.110	0.375	2.50	GT046-16	GT046-16A
0.375	0.047	1.250	0.110	0.375	2.50	GT046-20	GT046-20A
0.375	0.056	0.250	0.110	0.375	2.50	GT055-4	GT055-4A
0.375	0.056	0.375	0.110	0.375	2.50	GT055-6	GT055-6A
0.375	0.056	0.500	0.110	0.375	2.50	GT055-8	GT055-8A
0.375	0.056	0.750	0.110	0.375	2.50	GT055-12	GT055-12A
0.375	0.056	1.000	0.110	0.375	2.50	GT055-16	GT055-16A
0.375	0.056	1.250	0.110	0.375	2.50	GT055-20	GT055-20A
0.375	0.063	0.250	0.110	0.375	2.50	GT062-4	GT062-4A
0.375	0.063	0.375	0.110	0.375	2.50	GT062-6	GT062-6A
0.375	0.063	0.500	0.110	0.375	2.50	GT062-8	GT062-8A
0.375	0.063	0.750	0.110	0.375	2.50	GT062-12	GT062-12A
0.375	0.063	1.000	0.110	0.375	2.50	GT062-16	GT062-16A
0.375	0.063	1.250	0.110	0.375	2.50	GT062-20	GT062-20A
0.375	0.070	0.250	0.110	0.375	2.50	GT069-4	GT069-4A
0.375	0.070	0.375	0.110	0.375	2.50	GT069-6	GT069-6A
0.375	0.070	0.500	0.110	0.375	2.50	GT069-8	GT069-8A
0.375	0.070	0.750	0.110	0.375	2.50	GT069-12	GT069-12A
0.375	0.070	1.000	0.110	0.375	2.50	GT069-16	GT069-16A
0.375	0.070	1.250	0.110	0.375	2.50	GT069-20	GT069-20A

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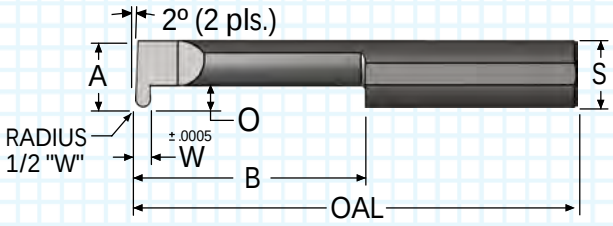
GROOVE TOOLS - RETAINING RING - SOLID CARBIDE

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	TiALN
0.375	0.088	0.250	0.110	0.375	2.50	GT087-4	GT087-4A
0.375	0.088	0.375	0.110	0.375	2.50	GT087-6	GT087-6A
0.375	0.088	0.500	0.110	0.375	2.50	GT087-8	GT087-8A
0.375	0.088	0.750	0.110	0.375	2.50	GT087-12	GT087-12A
0.375	0.088	1.000	0.110	0.375	2.50	GT087-16	GT087-16A
0.375	0.088	1.250	0.110	0.375	2.50	GT087-20	GT087-20A
0.375	0.127	0.375	0.110	0.375	2.50	GT126-6	GT126-6A
0.375	0.127	0.500	0.110	0.375	2.50	GT126-8	GT126-8A
0.375	0.127	0.750	0.110	0.375	2.50	GT126-12	GT126-12A
0.375	0.127	1.000	0.110	0.375	2.50	GT126-16	GT126-16A
0.375	0.127	1.250	0.110	0.375	2.50	GT126-20	GT126-20A
0.375	0.158	0.375	0.110	0.375	2.50	GT157-6	GT157-6A
0.375	0.158	0.500	0.110	0.375	2.50	GT157-8	GT157-8A
0.375	0.158	0.750	0.110	0.375	2.50	GT157-12	GT157-12A
0.375	0.158	1.000	0.110	0.375	2.50	GT157-16	GT157-16A
0.375	0.158	1.250	0.110	0.375	2.50	GT157-20	GT157-20A
0.500	0.094	0.500	0.160	0.500	3.00	GT093-8	GT093-8A
0.500	0.094	0.750	0.160	0.500	3.00	GT093-12	GT093-12A
0.500	0.094	1.000	0.160	0.500	3.00	GT093-16	GT093-16A
0.500	0.094	1.250	0.160	0.500	3.00	GT093-20	GT093-20A
0.500	0.094	1.500	0.160	0.500	3.00	GT093-24	GT093-24A
0.500	0.126	0.500	0.160	0.500	3.00	GT125-8	GT125-8A
0.500	0.126	0.750	0.160	0.500	3.00	GT125-12	GT125-12A
0.500	0.126	1.000	0.160	0.500	3.00	GT125-16	GT125-16A
0.500	0.126	1.250	0.160	0.500	3.00	GT125-20	GT125-20A
0.500	0.126	1.500	0.160	0.500	3.00	GT125-24	GT125-24A
0.500	0.157	0.500	0.160	0.500	3.00	GT156-8	GT156-8A
0.500	0.157	0.750	0.160	0.500	3.00	GT156-12	GT156-12A
0.500	0.157	1.000	0.160	0.500	3.00	GT156-16	GT156-16A
0.500	0.157	1.250	0.160	0.500	3.00	GT156-20	GT156-20A
0.500	0.157	1.500	0.160	0.500	3.00	GT156-24	GT156-24A
0.500	0.188	0.500	0.160	0.500	3.00	GT187-8	GT187-8A
0.500	0.188	0.750	0.160	0.500	3.00	GT187-12	GT187-12A
0.500	0.188	1.000	0.160	0.500	3.00	GT187-16	GT187-16A
0.500	0.188	1.250	0.160	0.500	3.00	GT187-20	GT187-20A
0.500	0.188	1.500	0.160	0.500	3.00	GT187-24	GT187-24A
0.500	0.251	0.500	0.160	0.500	3.00	GT250-8	GT250-8A
0.500	0.251	0.750	0.160	0.500	3.00	GT250-12	GT250-12A
0.500	0.251	1.000	0.160	0.500	3.00	GT250-16	GT250-16A
0.500	0.251	1.250	0.160	0.500	3.00	GT250-20	GT250-20A
0.500	0.251	1.500	0.160	0.500	3.00	GT250-24	GT250-24A

Left-hand style available in all sizes. To order left-hand style, start order number with "LH."

GROOVE TOOLS - FULL RADIUS - SOLID CARBIDE



- ALTiN+ coating for higher Surface Feet per Minute
- Elliptically ground for maximum strength
- Polished flute face for optimum performance

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.187	0.0175	0.250	0.050	0.1875	2.00	GFR017K-4	GFR017K-4A
0.187	0.0175	0.375	0.050	0.1875	2.00	GFR017K-6	GFR017K-6A
0.187	0.0175	0.500	0.050	0.1875	2.00	GFR017K-8	GFR017K-8A
0.187	0.0175	0.625	0.050	0.1875	2.00	GFR017K-10	GFR017K-10A
0.187	0.0255	0.250	0.050	0.1875	2.00	GFR025K-4	GFR025K-4A
0.187	0.0255	0.375	0.050	0.1875	2.00	GFR025K-6	GFR025K-6A
0.187	0.0255	0.500	0.050	0.1875	2.00	GFR025K-8	GFR025K-8A
0.187	0.0255	0.625	0.050	0.1875	2.00	GFR025K-10	GFR025K-10A
0.187	0.0305	0.250	0.050	0.1875	2.00	GFR030K-4	GFR030K-4A
0.187	0.0305	0.375	0.050	0.1875	2.00	GFR030K-6	GFR030K-6A
0.187	0.0305	0.500	0.050	0.1875	2.00	GFR030K-8	GFR030K-8A
0.187	0.0305	0.625	0.050	0.1875	2.00	GFR030K-10	GFR030K-10A
0.250	0.0175	0.250	0.060	0.250	2.50	GFR017Q-4	GFR017Q-4A
0.250	0.0175	0.375	0.060	0.250	2.50	GFR017Q-6	GFR017Q-6A
0.250	0.0175	0.500	0.060	0.250	2.50	GFR017Q-8	GFR017Q-8A
0.250	0.0175	0.625	0.060	0.250	2.50	GFR017Q-10	GFR017Q-10A
0.250	0.0255	0.250	0.060	0.250	2.50	GFR025Q-4	GFR025Q-4A
0.250	0.0255	0.375	0.060	0.250	2.50	GFR025Q-6	GFR025Q-6A
0.250	0.0255	0.500	0.060	0.250	2.50	GFR025Q-8	GFR025Q-8A
0.250	0.0255	0.625	0.060	0.250	2.50	GFR025Q-10	GFR025Q-10A
0.250	0.0305	0.250	0.060	0.250	2.50	GFR030Q-4	GFR030Q-4A
0.250	0.0305	0.375	0.060	0.250	2.50	GFR030Q-6	GFR030Q-6A
0.250	0.0305	0.500	0.060	0.250	2.50	GFR030Q-8	GFR030Q-8A
0.250	0.0305	0.625	0.060	0.250	2.50	GFR030Q-10	GFR030Q-10A
0.312	0.0335	0.250	0.110	0.3125	2.50	GFR033-4	GFR033-4A
0.312	0.0335	0.375	0.110	0.3125	2.50	GFR033-6	GFR033-6A
0.312	0.0335	0.500	0.110	0.3125	2.50	GFR033-8	GFR033-8A
0.312	0.0335	0.750	0.110	0.3125	2.50	GFR033-12	GFR033-12A
0.312	0.0385	0.250	0.110	0.3125	2.50	GFR038-4	GFR038-4A
0.312	0.0385	0.375	0.110	0.3125	2.50	GFR038-6	GFR038-6A
0.312	0.0385	0.500	0.110	0.3125	2.50	GFR038-8	GFR038-8A
0.312	0.0385	0.750	0.110	0.3125	2.50	GFR038-12	GFR038-12A

Left-hand style available in all sizes. To order left-hand style, start order number with "LH."

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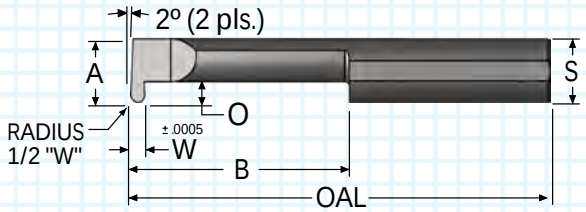
GROOVE TOOLS - FULL RADIUS - SOLID CARBIDE

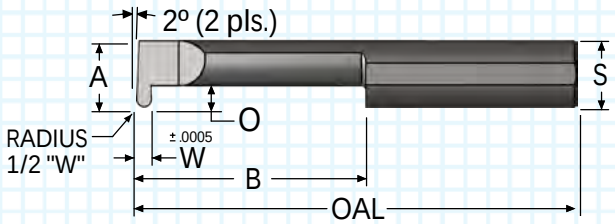


- ALTiN+ coating extends tool life
- Made with premium submicron grade carbide
- Precision ground shank flat for guaranteed tool orientation

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.375	0.040	0.250	0.110	0.375	2.50	GFR039-4	GFR039-4A
0.375	0.040	0.375	0.110	0.375	2.50	GFR039-6	GFR039-6A
0.375	0.040	0.500	0.110	0.375	2.50	GFR039-8	GFR039-8A
0.375	0.040	0.750	0.110	0.375	2.50	GFR039-12	GFR039-12A
0.375	0.040	1.000	0.110	0.375	2.50	GFR039-16	GFR039-16A
0.375	0.040	1.250	0.110	0.375	2.50	GFR039-20	GFR039-20A
0.375	0.047	0.250	0.110	0.375	2.50	GFR046-4	GFR046-4A
0.375	0.047	0.375	0.110	0.375	2.50	GFR046-6	GFR046-6A
0.375	0.047	0.500	0.110	0.375	2.50	GFR046-8	GFR046-8A
0.375	0.047	0.750	0.110	0.375	2.50	GFR046-12	GFR046-12A
0.375	0.047	1.000	0.110	0.375	2.50	GFR046-16	GFR046-16A
0.375	0.047	1.250	0.110	0.375	2.50	GFR046-20	GFR046-20A
0.375	0.056	0.250	0.110	0.375	2.50	GFR055-4	GFR055-4A
0.375	0.056	0.375	0.110	0.375	2.50	GFR055-6	GFR055-6A
0.375	0.056	0.500	0.110	0.375	2.50	GFR055-8	GFR055-8A
0.375	0.056	0.750	0.110	0.375	2.50	GFR055-12	GFR055-12A
0.375	0.056	1.000	0.110	0.375	2.50	GFR055-16	GFR055-16A
0.375	0.056	1.250	0.110	0.375	2.50	GFR055-20	GFR055-20A
0.375	0.063	0.250	0.110	0.375	2.50	GFR062-4	GFR062-4A
0.375	0.063	0.375	0.110	0.375	2.50	GFR062-6	GFR062-6A
0.375	0.063	0.500	0.110	0.375	2.50	GFR062-8	GFR062-8A
0.375	0.063	0.750	0.110	0.375	2.50	GFR062-12	GFR062-12A
0.375	0.063	1.000	0.110	0.375	2.50	GFR062-16	GFR062-16A
0.375	0.063	1.250	0.110	0.375	2.50	GFR062-20	GFR062-20A
0.375	0.070	0.250	0.110	0.375	2.50	GFR069-4	GFR069-4A
0.375	0.070	0.375	0.110	0.375	2.50	GFR069-6	GFR069-6A
0.375	0.070	0.500	0.110	0.375	2.50	GFR069-8	GFR069-8A
0.375	0.070	0.750	0.110	0.375	2.50	GFR069-12	GFR069-12A
0.375	0.070	1.000	0.110	0.375	2.50	GFR069-16	GFR069-16A
0.375	0.070	1.250	0.110	0.375	2.50	GFR069-20	GFR069-20A
0.375	0.088	0.250	0.110	0.375	2.50	GFR087-4	GFR087-4A
0.375	0.088	0.375	0.110	0.375	2.50	GFR087-6	GFR087-6A
0.375	0.088	0.500	0.110	0.375	2.50	GFR087-8	GFR087-8A
0.375	0.088	0.750	0.110	0.375	2.50	GFR087-12	GFR087-12A
0.375	0.088	1.000	0.110	0.375	2.50	GFR087-16	GFR087-16A
0.375	0.088	1.250	0.110	0.375	2.50	GFR087-20	GFR087-20A

Left-hand style available in all sizes. To order left-hand style, start order number with "LH."

GROOVE TOOLS - FULL RADIUS - SOLID CARBIDE



- ALTiN+ coating extends tool life
- Elliptically ground for maximum strength
- Polished flute face for optimum performance
- Made with premium submicron grade carbide

"A" MIN BORE	"W" TOOL WIDTH	"B" MAX DEPTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
						UNCOATED	ALTiN+
0.375	0.125	0.375	0.110	0.375	2.50	GFR124-6	GFR124-6A
0.375	0.125	0.500	0.110	0.375	2.50	GFR124-8	GFR124-8A
0.375	0.125	0.750	0.110	0.375	2.50	GFR124-12	GFR124-12A
0.375	0.125	1.000	0.110	0.375	2.50	GFR124-16	GFR124-16A
0.375	0.125	1.250	0.110	0.375	2.50	GFR124-20	GFR124-20A
0.500	0.094	0.500	0.160	0.500	3.00	GFR093-8	GFR093-8A
0.500	0.094	0.750	0.160	0.500	3.00	GFR093-12	GFR093-12A
0.500	0.094	1.000	0.160	0.500	3.00	GFR093-16	GFR093-16A
0.500	0.094	1.250	0.160	0.500	3.00	GFR093-20	GFR093-20A
0.500	0.094	1.500	0.160	0.500	3.00	GFR093-24	GFR093-24A
0.500	0.126	0.500	0.160	0.500	3.00	GFR125-8	GFR125-8A
0.500	0.126	0.750	0.160	0.500	3.00	GFR125-12	GFR125-12A
0.500	0.126	1.000	0.160	0.500	3.00	GFR125-16	GFR125-16A
0.500	0.126	1.250	0.160	0.500	3.00	GFR125-20	GFR125-20A
0.500	0.126	1.500	0.160	0.500	3.00	GFR125-24	GFR125-24A
0.500	0.157	0.500	0.160	0.500	3.00	GFR156-8	GFR156-8A
0.500	0.157	0.750	0.160	0.500	3.00	GFR156-12	GFR156-12A
0.500	0.157	1.000	0.160	0.500	3.00	GFR156-16	GFR156-16A
0.500	0.157	1.250	0.160	0.500	3.00	GFR156-20	GFR156-20A
0.500	0.157	1.500	0.160	0.500	3.00	GFR156-24	GFR156-24A
0.500	0.188	0.500	0.160	0.500	3.00	GFR187-8	GFR187-8A
0.500	0.188	0.750	0.160	0.500	3.00	GFR187-12	GFR187-12A
0.500	0.188	1.000	0.160	0.500	3.00	GFR187-16	GFR187-16A
0.500	0.188	1.250	0.160	0.500	3.00	GFR187-20	GFR187-20A
0.500	0.188	1.500	0.160	0.500	3.00	GFR187-24	GFR187-24A
0.500	0.251	0.500	0.160	0.500	3.00	GFR250-8	GFR250-8A
0.500	0.251	0.750	0.160	0.500	3.00	GFR250-12	GFR250-12A
0.500	0.251	1.000	0.160	0.500	3.00	GFR250-16	GFR250-16A
0.500	0.251	1.250	0.160	0.500	3.00	GFR250-20	GFR250-20A
0.500	0.251	1.500	0.160	0.500	3.00	GFR250-24	GFR250-24A

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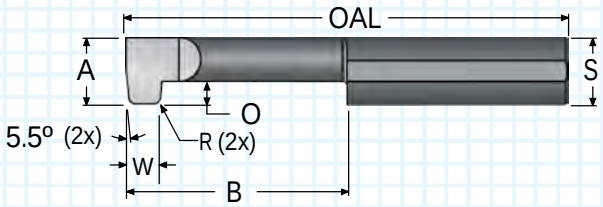
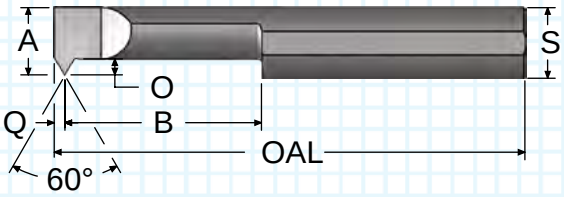
GROOVE TOOLS - O-RING - SOLID CARBIDE



- ALTiN+ coating for higher Surface Feet per Minute
- Elliptically ground for maximum strength
- Made with premium submicron grade carbide

"A" MIN BORE	"W" GROOVE WIDTH	"B" MAX DEPTH	"R" CORNER RADIUS	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
							UNCOATED	ALTiN+
0.250	0.097	0.500	0.015	0.110	0.250	2.50	GOR096-8	GOR096-8A
0.250	0.142	0.562	0.040	0.110	0.250	2.50	GOR141-9	GOR141-9A
0.250	0.145	0.625	0.040	0.110	0.250	2.50	GOR144-10	GOR144-10A
0.375	0.175	0.750	0.015	0.125	0.375	2.50	GOR174-12	GOR174-12A
0.375	0.209	0.812	0.040	0.125	0.375	2.50	GOR208-13	GOR208-13A
0.375	0.242	0.937	0.040	0.125	0.375	2.50	GOR241-15	GOR241-15A

THREADING TOOLS - SOLID CARBIDE



- 60° thread form for cutting UN, ISO, and NPT threads
- ALTiN+ coating extends tool life
- Precision ground shank flat guarantees tool orientation

"A" MIN BORE	"B" MAX DEPTH	"O" MIN OFFSET	RECOM-MENDED TPI*	"Q" LENGTH	"S" SHANK DIA.	OAL	ORDER #	
							MIN	ALTiN+
0.040	0.080	0.013	56 to 80	0.009	0.125	1.50	TT040080	TT040080A
0.040	0.100	0.013	56 to 80	0.009	0.125	1.50	TT040100	TT040100A
0.040	0.130	0.013	56 to 80	0.009	0.125	1.50	TT040130	TT040130A
0.050	0.100	0.017	48 to 80	0.012	0.125	1.50	TT050100	TT050100A
0.050	0.150	0.017	48 to 80	0.012	0.125	1.50	TT050150	TT050150A
0.050	0.200	0.017	48 to 80	0.012	0.125	1.50	TT050200	TT050200A
0.060	0.150	0.020	40 to 80	0.014	0.125	1.50	TT060150	TT060150A
0.060	0.200	0.020	40 to 80	0.014	0.125	1.50	TT060200	TT060200A
0.060	0.250	0.020	40 to 80	0.014	0.125	1.50	TT060250	TT060250A
0.060	0.300	0.020	40 to 80	0.014	0.125	1.50	TT060300	TT060300A
0.075	0.200	0.020	36 to 72	0.014	0.125	1.50	TT075200	TT075200A
0.075	0.300	0.020	36 to 72	0.014	0.125	1.50	TT075300	TT075300A
0.075	0.400	0.020	36 to 72	0.014	0.125	1.50	TT075400	TT075400A
0.090	0.200	0.025	32 to 64	0.017	0.125	1.50	TT090200	TT090200A
0.090	0.300	0.025	32 to 64	0.017	0.125	1.50	TT090300	TT090300A
0.090	0.400	0.025	32 to 64	0.017	0.125	1.50	TT090400	TT090400A
0.090	0.500	0.025	32 to 64	0.017	0.125	1.50	TT090500	TT090500A
0.120	0.250	0.030	24 to 56	0.021	0.1875	2.00	TT120250	TT120250A
0.120	0.400	0.030	24 to 56	0.021	0.1875	2.00	TT120400	TT120400A
0.120	0.600	0.030	24 to 56	0.021	0.1875	2.00	TT120600	TT120600A
0.120	0.750	0.030	24 to 56	0.021	0.1875	2.00	TT120750	TT120750A
0.150	0.350	0.035	20 to 56	0.023	0.1875	2.00	TT150350	TT150350A
0.150	0.500	0.035	20 to 56	0.023	0.1875	2.00	TT150500	TT150500A
0.150	0.750	0.035	20 to 56	0.023	0.1875	2.00	TT150750	TT150750A
0.180	0.350	0.040	18 to 56	0.027	0.250	2.50	TT180350	TT180350A
0.180	0.500	0.040	18 to 56	0.027	0.250	2.50	TT180500	TT180500A
0.180	0.750	0.040	18 to 56	0.027	0.250	2.50	TT180750	TT180750A
0.180	1.000	0.040	18 to 56	0.027	0.250	2.50	TT1801000	TT1801000A

*TPI = Threads Per Inch

Left-hand style available in all sizes. To order left-hand style, start order number with "LH."

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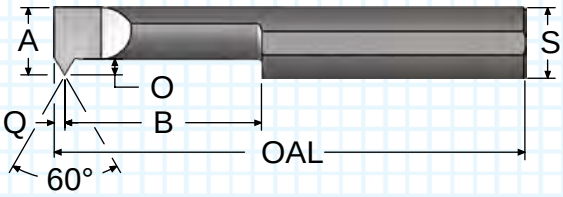
THREADING TOOLS - SOLID CARBIDE



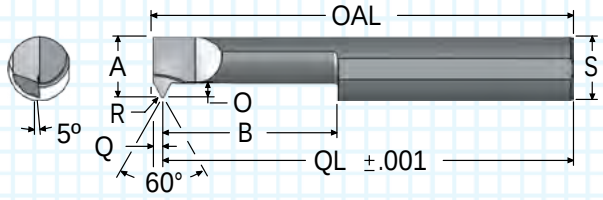
- 60° thread form for cutting UN, ISO, and NPT threads
- Elliptically ground neck provides maximum strength
- Made with premium submicron carbide

"A" MIN BORE	"B" MAX DEPTH	"O" MIN OFFSET	RECOM-MENDED TPI*	"Q" LENGTH	"S" SHANK DIA.	OAL	ORDER #	
							UNCOATED	ALTiN+
0.200	0.400	0.045	16 to 40	0.029	0.250	2.50	TT200400	TT200400A
0.200	0.600	0.045	16 to 40	0.029	0.250	2.50	TT200600	TT200600A
0.200	0.800	0.045	16 to 40	0.029	0.250	2.50	TT200800	TT200800A
0.200	1.000	0.045	16 to 40	0.029	0.250	2.50	TT2001000	TT2001000A
0.230	0.400	0.055	14 to 40	0.038	0.3125	2.50	TT230400	TT230400A
0.230	0.600	0.055	14 to 40	0.038	0.3125	2.50	TT230600	TT230600A
0.230	0.750	0.055	14 to 40	0.038	0.3125	2.50	TT230750	TT230750A
0.230	1.000	0.055	14 to 40	0.038	0.3125	2.50	TT2301000	TT2301000A
0.230	1.250	0.055	14 to 40	0.038	0.3125	2.50	TT2301250	TT2301250A
0.290	0.500	0.070	12 to 40	0.047	0.3125	2.50	TT290500	TT290500A
0.290	0.750	0.070	12 to 40	0.047	0.3125	2.50	TT290750	TT290750A
0.290	1.000	0.070	12 to 40	0.047	0.3125	2.50	TT2901000	TT2901000A
0.290	1.250	0.070	12 to 40	0.047	0.3125	2.50	TT2901250	TT2901250A
0.290	1.500	0.070	12 to 40	0.047	0.3125	2.50	TT2901500	TT2901500A
0.320	0.500	0.075	10 to 32	0.049	0.375	2.50	TT320500	TT320500A
0.320	0.750	0.075	10 to 32	0.049	0.375	2.50	TT320750	TT320750A
0.320	1.000	0.075	10 to 32	0.049	0.375	2.50	TT3201000	TT3201000A
0.320	1.250	0.075	10 to 32	0.049	0.375	2.50	TT3201250	TT3201250A
0.320	1.500	0.075	10 to 32	0.049	0.375	2.50	TT3201500	TT3201500A
0.360	0.500	0.080	8 to 32	0.057	0.375	2.50	TT360500	TT360500A
0.360	0.750	0.080	8 to 32	0.057	0.375	2.50	TT360750	TT360750A
0.360	1.000	0.080	8 to 32	0.057	0.375	2.50	TT3601000	TT3601000A
0.360	1.250	0.080	8 to 32	0.057	0.375	2.50	TT3601250	TT3601250A
0.360	1.500	0.080	8 to 32	0.057	0.375	2.50	TT3601500	TT3601500A
0.360	1.800	0.080	8 to 32	0.057	0.375	3.00	TT3601800	TT3601800A
0.490	0.750	0.120	8 to 32	0.077	0.500	3.00	TT490750	TT490750A
0.490	1.500	0.120	8 to 32	0.077	0.500	3.00	TT4901500	TT4901500A
0.490	2.000	0.120	8 to 32	0.077	0.500	3.00	TT4902000	TT4902000A

*TPI = Threads Per Inch

Left-hand style available in all sizes. To order left-hand style, start order number with "LH."

THREADING TOOLS QUALIFIED - SOLID CARBIDE



- 60° thread form for cutting UN, ISO, and NPT threads
- Positive rake improves surface finish and reduces burrs
- ALTiN+ coating provides better surface finish

"A" MIN BORE	"B" MAX DEPTH	"O" MIN OFFSET	"Q" LENGTH ±.001	"R" TOOL RADIUS	"QL" LENGTH ±.001	RECOM-MENDED TPI*	"S" SHANK DIA.	OAL	ORDER #	
									UNCOATED	ALTiN+
0.060	0.150	0.020	0.014	0.0012	1.486	40 to 80	0.125	1.50	TTQ060150	TTQ060150A
0.060	0.200	0.020	0.014	0.0012	1.486	40 to 80	0.125	1.50	TTQ060200	TTQ060200A
0.060	0.250	0.020	0.014	0.0012	1.486	40 to 80	0.125	1.50	TTQ060250	TTQ060250A
0.060	0.300	0.020	0.014	0.0012	1.486	40 to 80	0.125	1.50	TTQ060300	TTQ060300A
0.075	0.200	0.020	0.014	0.0013	1.486	36 to 72	0.125	1.50	TTQ075200	TTQ075200A
0.075	0.300	0.020	0.014	0.0013	1.486	36 to 72	0.125	1.50	TTQ075300	TTQ075300A
0.075	0.400	0.020	0.014	0.0013	1.486	36 to 72	0.125	1.50	TTQ075400	TTQ075400A
0.090	0.200	0.025	0.017	0.0015	1.483	32 to 64	0.125	1.50	TTQ090200	TTQ090200A
0.090	0.300	0.025	0.017	0.0015	1.483	32 to 64	0.125	1.50	TTQ090300	TTQ090300A
0.090	0.400	0.025	0.017	0.0015	1.483	32 to 64	0.125	1.50	TTQ090400	TTQ090400A
0.090	0.500	0.025	0.017	0.0015	1.483	32 to 64	0.125	1.50	TTQ090500	TTQ090500A
0.120	0.250	0.030	0.021	0.0017	1.979	24 to 56	0.1875	2.00	TTQ120250	TTQ120250A
0.120	0.400	0.030	0.021	0.0017	1.979	24 to 56	0.1875	2.00	TTQ120400	TTQ120400A
0.120	0.600	0.030	0.021	0.0017	1.979	24 to 56	0.1875	2.00	TTQ120600	TTQ120600A
0.120	0.750	0.030	0.021	0.0017	1.979	24 to 56	0.1875	2.00	TTQ120750	TTQ120750A
0.150	0.350	0.035	0.023	0.0017	1.977	20 to 56	0.1875	2.00	TTQ150350	TTQ150350A
0.150	0.500	0.035	0.023	0.0017	1.977	20 to 56	0.1875	2.00	TTQ150500	TTQ150500A
0.150	0.750	0.035	0.023	0.0017	1.977	20 to 56	0.1875	2.00	TTQ150750	TTQ150750A
0.180	0.350	0.040	0.027	0.0017	2.473	18 to 56	0.250	2.50	TTQ180350	TTQ180350A
0.180	0.500	0.040	0.027	0.0017	2.473	18 to 56	0.250	2.50	TTQ180500	TTQ180500A
0.180	0.750	0.040	0.027	0.0017	2.473	18 to 56	0.250	2.50	TTQ180750	TTQ180750A
0.180	1.000	0.040	0.027	0.0017	2.473	18 to 56	0.250	2.50	TTQ1801000	TTQ1801000A
0.200	0.400	0.045	0.029	0.0024	2.471	16 to 40	0.250	2.50	TTQ200400	TTQ200400A
0.200	0.600	0.045	0.029	0.0024	2.471	16 to 40	0.250	2.50	TTQ200600	TTQ200600A
0.200	0.800	0.045	0.029	0.0024	2.471	16 to 40	0.250	2.50	TTQ200800	TTQ200800A
0.200	1.000	0.045	0.029	0.0024	2.471	16 to 40	0.250	2.50	TTQ2001000	TTQ2001000A

*TPI = Threads Per Inch

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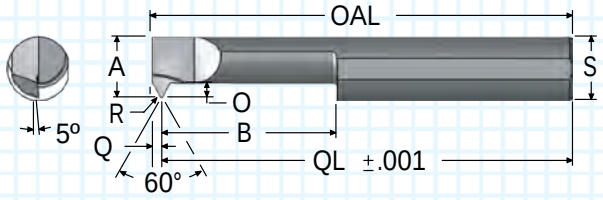
THREADING TOOLS QUALIFIED - SOLID CARBIDE

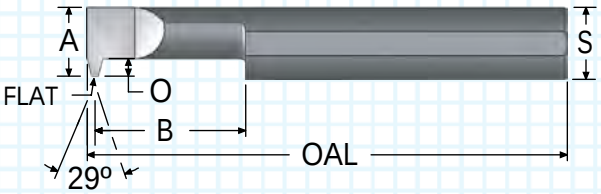


- Radius on tool tip for maximum strength
- Qualified length provides faster tool changes
- Made with premium submicron grade carbide

"A" MIN BORE	"B" MAX DEPTH	"O" MIN OFFSET	"Q" LENGTH ±.001	"R" TOOL RADIUS	"QL" LENGTH ±.001	RECOM-MENDED TPI*	"S" SHANK DIA.	OAL	ORDER #	
									UNCOATED	ALTiN+
0.230	0.400	0.055	0.038	0.0024	2.462	14 to 40	0.3125	2.50	TTQ230400	TTQ230400A
0.230	0.600	0.055	0.038	0.0024	2.462	14 to 40	0.3125	2.50	TTQ230600	TTQ230600A
0.230	0.750	0.055	0.038	0.0024	2.462	14 to 40	0.3125	2.50	TTQ230750	TTQ230750A
0.230	1.000	0.055	0.038	0.0024	2.462	14 to 40	0.3125	2.50	TTQ2301000	TTQ2301000A
0.230	1.250	0.055	0.038	0.0024	2.462	14 to 40	0.3125	2.50	TTQ2301250	TTQ2301250A
0.290	0.500	0.070	0.047	0.0024	2.453	12 to 40	0.3125	2.50	TTQ290500	TTQ290500A
0.290	0.750	0.070	0.047	0.0024	2.453	12 to 40	0.3125	2.50	TTQ290750	TTQ290750A
0.290	1.000	0.070	0.047	0.0024	2.453	12 to 40	0.3125	2.50	TTQ2901000	TTQ2901000A
0.290	1.250	0.070	0.047	0.0024	2.453	12 to 40	0.3125	2.50	TTQ2901250	TTQ2901250A
0.290	1.500	0.070	0.047	0.0024	2.453	12 to 40	0.3125	2.50	TTQ2901500	TTQ2901500A
0.320	0.500	0.075	0.049	0.0030	2.451	10 to 32	0.375	2.50	TTQ320500	TTQ320500A
0.320	0.750	0.075	0.049	0.0030	2.451	10 to 32	0.375	2.50	TTQ320750	TTQ320750A
0.320	1.000	0.075	0.049	0.0030	2.451	10 to 32	0.375	2.50	TTQ3201000	TTQ3201000A
0.320	1.250	0.075	0.049	0.0030	2.451	10 to 32	0.375	2.50	TTQ3201250	TTQ3201250A
0.320	1.500	0.075	0.049	0.0030	2.451	10 to 32	0.375	2.50	TTQ3201500	TTQ3201500A
0.360	0.500	0.080	0.057	0.0040	2.443	8 to 24	0.375	2.50	TTQ360500	TTQ360500A
0.360	0.750	0.080	0.057	0.0040	2.443	8 to 24	0.375	2.50	TTQ360750	TTQ360750A
0.360	1.000	0.080	0.057	0.0040	2.443	8 to 24	0.375	2.50	TTQ3601000	TTQ3601000A
0.360	1.250	0.080	0.057	0.0040	2.443	8 to 24	0.375	2.50	TTQ3601250	TTQ3601250A
0.360	1.500	0.080	0.057	0.0040	2.443	8 to 24	0.375	2.50	TTQ3601500	TTQ3601500A

*TPI = Threads Per Inch

ACME THREADING TOOLS - SOLID CARBIDE



- ALTiN+ coating provides better surface finish
- Elliptically ground neck provides maximum strength
- Polished flute face for optimum performance

MIN THREAD SIZE*	"A" MIN HOLE	"B" MAX DEPTH	FLAT WIDTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
							UNCOATED	ALTiN+
1/4-16	0.180	0.350	0.021	0.045	0.250	2.50	FAT180350-16	FAT180350-16A
1/4-16	0.180	0.500	0.021	0.045	0.250	2.50	FAT180500-16	FAT180500-16A
1/4-16	0.180	0.750	0.021	0.045	0.250	2.50	FAT180750-16	FAT180750-16A
1/4-16	0.180	1.000	0.021	0.045	0.250	2.50	FAT1801000-16	FAT1801000-16A
5/16-14	0.230	0.400	0.024	0.055	0.3125	2.50	FAT230400-14	FAT230400-14A
5/16-14	0.230	0.600	0.024	0.055	0.3125	2.50	FAT230600-14	FAT230600-14A
5/16-14	0.230	0.750	0.024	0.055	0.3125	2.50	FAT230750-14	FAT230750-14A
5/16-14	0.230	1.000	0.024	0.055	0.3125	2.50	FAT2301000-14	FAT2301000-14A
5/16-14	0.230	1.250	0.024	0.055	0.3125	2.50	FAT2301250-14	FAT2301250-14A
3/8-12	0.290	0.400	0.028	0.070	0.3125	2.50	FAT290400-12	FAT290400-12A
3/8-12	0.290	0.600	0.028	0.070	0.3125	2.50	FAT290600-12	FAT290600-12A
3/8-12	0.290	0.750	0.028	0.070	0.3125	2.50	FAT290750-12	FAT290750-12A
3/8-12	0.290	1.000	0.028	0.070	0.3125	2.50	FAT2901000-12	FAT2901000-12A
3/8-12	0.290	1.250	0.028	0.070	0.3125	2.50	FAT2901250-12	FAT2901250-12A
1/2-10	0.360	0.500	0.032	0.085	0.375	2.50	FAT360500-10	FAT360500-10A
1/2-10	0.360	0.750	0.032	0.085	0.375	2.50	FAT360750-10	FAT360750-10A
1/2-10	0.360	1.000	0.032	0.085	0.375	2.50	FAT3601000-10	FAT3601000-10A
1/2-10	0.360	1.250	0.032	0.085	0.375	2.50	FAT3601250-10	FAT3601250-10A
1/2-10	0.360	1.500	0.032	0.085	0.375	2.50	FAT3601500-10	FAT3601500-10A
5/8-8	0.490	0.750	0.041	0.120	0.500	3.00	FAT490750-8	FAT490750-8A
5/8-8	0.490	1.000	0.041	0.120	0.500	3.00	FAT4901000-8	FAT4901000-8A
5/8-8	0.490	2.000	0.041	0.120	0.500	3.00	FAT4902000-8	FAT4902000-8A
3/4-6	0.490	0.750	0.057	0.120	0.500	3.00	FAT490750-6	FAT490750-6A
3/4-6	0.490	1.000	0.057	0.120	0.500	3.00	FAT4901000-6	FAT4901000-6A
3/4-6	0.490	2.000	0.057	0.120	0.500	3.00	FAT4902000-6	FAT4902000-6A
1.0-5	0.490	0.750	0.069	0.130	0.500	3.00	FAT490750-5	FAT490750-5A
1.0-5	0.490	1.000	0.069	0.130	0.500	3.00	FAT4901000-5	FAT4901000-5A
1.0-5	0.490	2.000	0.069	0.130	0.500	3.00	FAT4902000-5	FAT4902000-5A

*These tools can cut any larger size internal thread of the same pitch.

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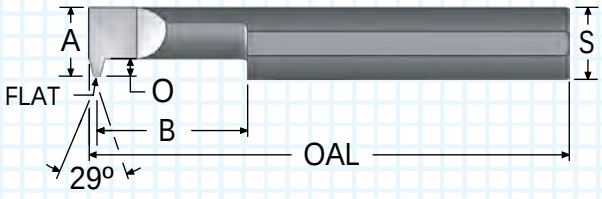
STUB ACME THREADING TOOLS - SOLID CARBIDE



- ALTiN+ coating extends tool life
- Polished flute face for optimum performance
- Made with premium submicron grade carbide

MIN THREAD SIZE*	"A" MIN HOLE	"B" MAX DEPTH	FLAT WIDTH	"O" OFF SET	"S" SHANK DIA.	OAL	ORDER #	
							UNCOATED	ALTiN+
1/4-16	0.180	0.350	0.024	0.045	0.250	2.50	SAT180350-16	SAT180350-16A
1/4-16	0.180	0.500	0.024	0.045	0.250	2.50	SAT180500-16	SAT180500-16A
1/4-16	0.180	0.750	0.024	0.045	0.250	2.50	SAT180750-16	SAT180750-16A
1/4-16	0.180	1.000	0.024	0.045	0.250	2.50	SAT1801000-16	SAT1801000-16A
5/16-14	0.230	0.400	0.028	0.055	0.3125	2.50	SAT230400-14	SAT230400-14A
5/16-14	0.230	0.600	0.028	0.055	0.3125	2.50	SAT230600-14	SAT230600-14A
5/16-14	0.230	0.750	0.028	0.055	0.3125	2.50	SAT230750-14	SAT230750-14A
5/16-14	0.230	1.000	0.028	0.055	0.3125	2.50	SAT2301000-14	SAT2301000-14A
5/16-14	0.230	1.250	0.028	0.055	0.3125	2.50	SAT2301250-14	SAT2301250-14A
3/8-12	0.290	0.400	0.033	0.070	0.3125	2.50	SAT290400-12	SAT290400-12A
3/8-12	0.290	0.600	0.033	0.070	0.3125	2.50	SAT290600-12	SAT290600-12A
3/8-12	0.290	0.750	0.033	0.070	0.3125	2.50	SAT290750-12	SAT290750-12A
3/8-12	0.290	1.000	0.033	0.070	0.3125	2.50	SAT2901000-12	SAT2901000-12A
3/8-12	0.290	1.250	0.033	0.070	0.3125	2.50	SAT2901250-12	SAT2901250-12A
1/2-10	0.360	0.500	0.037	0.085	0.375	2.50	SAT360500-10	SAT360500-10A
1/2-10	0.360	0.750	0.037	0.085	0.375	2.50	SAT360750-10	SAT360750-10A
1/2-10	0.360	1.000	0.037	0.085	0.375	2.50	SAT3601000-10	SAT3601000-10A
1/2-10	0.360	1.250	0.037	0.085	0.375	2.50	SAT3601250-10	SAT3601250-10A
1/2-10	0.360	1.500	0.037	0.085	0.375	2.50	SAT3601500-10	SAT3601500-10A
5/8-8	0.490	0.750	0.048	0.120	0.500	3.00	SAT490750-8	SAT490750-8A
5/8-8	0.490	1.000	0.048	0.120	0.500	3.00	SAT4901000-8	SAT4901000-8A
5/8-8	0.490	2.000	0.048	0.120	0.500	3.00	SAT4902000-8	SAT4902000-8A
3/4-6	0.490	0.750	0.065	0.120	0.500	3.00	SAT490750-6	SAT490750-6A
3/4-6	0.490	1.000	0.065	0.120	0.500	3.00	SAT4901000-6	SAT4901000-6A
3/4-6	0.490	2.000	0.065	0.120	0.500	3.00	SAT4902000-6	SAT4902000-6A
1.0-5	0.490	0.750	0.079	0.130	0.500	3.00	SAT490750-5	SAT490750-5A
1.0-5	0.490	1.000	0.079	0.130	0.500	3.00	SAT4901000-5	SAT4901000-5A
1.0-5	0.490	2.000	0.079	0.130	0.500	3.00	SAT4902000-5	SAT4902000-5A

*These tools can cut any larger size internal thread of the same pitch.

SOLID CARBIDE BORING BAR FEED AND SPEED CHART

MATERIAL	HB/Rc	SPEED (SFM)		CUTTING CONDITIONS						
				FEED IPR	TOOL DIAMETER					
		UNCOATED	ALTiN+		.015-.045	.050-.100	.110-.160	.180-.230	.290-.320	.360+
					MAX DOC	MAX DOC	MAX DOC	MAX DOC	MAX DOC	MAX DOC
CAST IRON	160 HB	75-200	200-550	.0005-.010	0.006	0.008	0.010	0.014	0.020	0.031
CARBON STEEL	18 Rc	75-200	200-450	.0005-.007	0.003	0.005	0.006	0.008	0.012	0.017
ALLOY STEEL	20 Rc	75-200	200-425	.0005-.007	0.003	0.004	0.005	0.007	0.010	0.015
TOOL STEEL	25 Rc	75-175	175-300	.0005-.005	0.002	0.003	0.004	0.006	0.008	0.012
300 STAINLESS STEEL	150 HB	75-175	175-350	.0005-.005	0.003	0.003	0.004	0.006	0.008	0.013
400 STAINLESS STEEL	195 HB	75-210	130-420	.0005-.005	0.002	0.003	0.004	0.006	0.008	0.012
HIGH TEMP ALLOY (Ni & Co BASE)	20 Rc	50-130	130-300	.0005-.004	0.002	0.003	0.003	0.005	0.007	0.010
TITANIUM	25 Rc	50-120	120-275	.0005-.005	0.003	0.004	0.005	0.006	0.009	0.014
HEAT TREATED ALLOYS (38-45Rc)	40 Rc	50-100	100-200	.0005-.005	0.002	0.002	0.003	0.004	0.006	0.009
ALUMINUM	100 HB	75-250	250-750	.0005-.015	0.011	0.015	0.019	0.026	0.038	0.056
BRASS, ZINC	80 HB	75-300	250-650	.001-.010	0.009	0.012	0.015	0.021	0.030	0.045

SFM = Surface Feet Per Minute DOC = Depth of Cut IPR = Inches Per Revolution

Starting parameters only. Length-to-diameter ratios, setup, and machine rigidity may affect performance.

SFM = .262 × DIAMETER × RPM
RPM = 3.82 × SFM ÷ DIAMETER
IPM = FPT × Number of Teeth × RPM

Meters/Min = SFM × .3048
Millimeters/Rev = IPR x 25.40

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SOLID CARBIDE BORING TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
RAPID FLANK WEAR	CUTTING CONDITIONS	Check for excessive speed and feed - See chart.
	TOOL	Select a coated tool.
	PART	Make sure prior operation did not work harden the metal.
BUILT-UP EDGE	TOOL	Select a coated tool.
	CUTTING FORCE	Check for excessive feed rate (IPR) - See chart.
	HEAT	Use the SCT coolant holder. If coolant is not available, use shop air and a coated tool.
CORNER BREAKAGE	CUTTING CONDITIONS	Check for excessive feed and speed and depth of cut - see chart.
	TOOL	Select a tool with a radius. A radius is stronger than a sharp corner.
	PART	Check the drilled hole.
SURFACE TOO ROUGH	CUTTING CONDITIONS	Check for excessive feed rate (IPR) - See chart.
	BUILT-UP EDGE	See above (Built-Up Edge).
CHATTER	SET UP	Set tool above center. Reduce the overhang ratio. Clamping length should be at least 3x the boring bar diameter. Change the speed of the machine. Speed change may break up harmonics and reduce chatter.
	BORING BAR	Select the largest diameter boring bar that will bore the required diameter.
TAPER SMALLER IN BACK	CHIP PACKING	If the boring bar is too large to allow chips to evacuate, then the chips may pack on the tool and cause the bar to deflect away from the bore.
	PROGRAM	If the taper is consistent, then the program can be altered to bore a taper in opposite direction resulting in a straight hole.
TAPER BIGGER IN BACK	CUTTING FORCES	Reduce forces. Deflecting bar below center causes hole to become larger.
	BUILT-UP EDGE	Built-up edge will cause the hole to become larger until the built edge breaks off, then the hole becomes smaller.
	PROGRAM	If taper is consistent, then the program can be altered to bore a taper in the opposite direction resulting in a straight hole.

GROOVING TOOL FEED AND SPEED CHART

MATERIAL	HB/Rc	SPEED (SFM)		CUTTING CONDITIONS				
				TOOL DIAMETER				
		UNCOATED	ALTiN+	.060 -0.080	.090 -.120	.187	.250-.312	.375+
				MAX FPR	MAX FPR	MAX FPR	MAX FPR	MAX FPR
CAST IRON	160 HB	75-200	200-550	0.0010	0.0012	0.0017	0.0031	0.0044
CARBON STEEL	18 Rc	75-200	200-450	0.0007	0.0008	0.0011	0.0022	0.0030
ALLOY STEEL	20 Rc	75-200	200-425	0.0006	0.0007	0.0010	0.0019	0.0026
TOOL STEEL	25 Rc	75-175	175-300	0.0005	0.0006	0.0008	0.0015	0.0022
300 STAINLESS STEEL	150 HB	75-175	75-350	0.0006	0.0007	0.0010	0.0019	0.0026
400 STAINLESS STEEL	195 HB	75-210	130-420	0.0005	0.0006	0.0008	0.0016	0.0023
HIGH TEMP ALLOY (NICKEL & COBALT BASE)	20 Rc	50-130	130-300	0.0004	0.0005	0.0007	0.0013	0.0017
TITANIUM	25 Rc	50-120	120-275	0.0005	0.0006	0.0008	0.0016	0.0022
HEAT TREATED ALLOYS (38-45Rc)	40 Rc	50-100	100-200	0.0004	0.0004	0.0006	0.0011	0.0016
ALUMINUM	100 HB	75-250	250-750	0.0022	0.0026	0.0037	0.0065	0.0085
BRASS, ZINC	80 HB	250-300	250-650	0.0018	0.0021	0.0030	0.0053	0.0079

SFM = Surface Feet Per Minute FPR = Feed Per Revolution

Starting parameters only. Length-to-diameter ratios, setup, and machine rigidity may affect performance.

GROOVING TOOL TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
RAPID FLANK WEAR	CUTTING CONDITIONS	Check for excessive speed - see chart.
	TOOL	Select a coated tool.
	PART	Make sure prior operation did not work harden the material.
BUILT-UP EDGE	TOOL	Select a coated tool.
	CUTTING FORCE	Check for excessive speed rate (IPR) - see chart.
	HEAT	Use the SCT coolant holder. If coolant is not available, use shop air and a coated tool.
CHATTER	CUTTING CONDITIONS	Reduce RPM and increase feed rate within the feed and speed chart parameters.
	CLAMPING	Clamping length should be a minimum of 3x the shank diameter in the tool holder. Check tool holding rigidity.
	TOOL	Hone cutting edge. A light hone (0.0001-0.0003 inch) will help keep force constant.
TOOL BREAKAGE	CUTTING CONDITIONS	Check for excessive feed rate (IPR) - see chart.
	CHIP PACKING	Stagger - Peck grooving.

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SINGLE POINT THREADING TECHNICAL CHART

MATERIAL	HB/Rc	SPEED (SFM)		FIRST PASS DEPTH TOOL DIAMETER					
		UNCOATED	ALTiN+	.040-.050	.060-.092	.120-.152	.180-.232	.290-.362	.373+
CAST IRON	160 HB	75-200	200-550	0.003	0.004	0.005	0.007	0.008	0.009
CARBON STEEL	18 Rc	75-200	200-450	0.003	0.005	0.006	0.007	0.008	0.009
ALLOY STEEL	20 Rc	75-200	200-425	0.003	0.004	0.005	0.006	0.007	0.008
TOOL STEEL	25 Rc	75-175	175-300	0.002	0.003	0.004	0.005	0.006	0.007
300 STAINLESS STEEL	150 HB	75-175	175-350	0.003	0.003	0.004	0.005	0.006	0.007
400 STAINLESS STEEL	195 HB	75-210	130-420	0.003	0.004	0.005	0.006	0.006	0.007
HIGH TEMP ALLOY (NICKEL & COBALT BASE)	20 Rc	50-130	130-300	0.002	0.003	0.003	0.004	0.005	0.005
TITANIUM	25 Rc	50-100	120-275	0.003	0.003	0.004	0.005	0.006	0.007
HEAT TREATED ALLOYS (38-45Rc)	40 Rc	50-100	100-200	0.002	0.002	0.003	0.004	0.004	0.005
ALUMINUM	100 HB	75-250	200-750	0.004	0.005	0.007	0.008	0.010	0.011
BRASS, ZINC	80 HB	75-300	250-650	0.003	0.005	0.006	0.007	0.008	0.009

Parameters are a starting point based on machinability rating at hardness listed.
Check machinability rating of the material to be machined and adjust First Pass Depth.

Helpful Formulas and Information

$$\text{PITCH} = \frac{1}{\text{TPI}}$$

TPI = Threads Per Inch

ACME Thread Depth = Pitch × 0.5

Stub ACME Thread Depth = Pitch × 0.3

NPT Pipe Thread Depth = Pitch × 0.76

Internal 60° Thread Depth = Pitch × 0.54

Feed Rate = Pitch × Number of Thread Starts

Minimum Depth per Pass should not be less than 0.0003

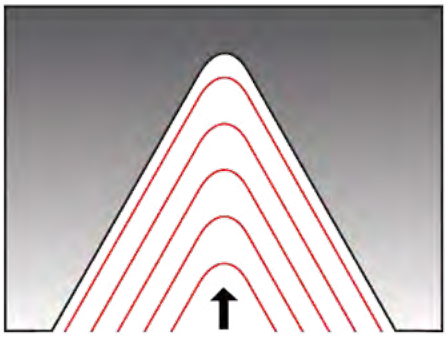
Threads not ending in a relief need at least one thread pitch length of pullout

Make sure feed rate calculation does not exceed the maximum feed rate of the machine

SINGLE POINT THREADING TROUBLESHOOTING

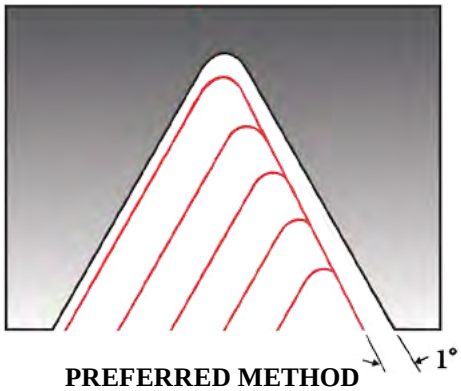
PROBLEM	CAUSE	SOLUTION
RAPID FLANK WEAR	CUTTING CONDITIONS	Check for excessive speed - see chart.
	PART	Make sure prior operation did not work harden the material.
	TOOL	Select a coated tool.
BUILT-UP EDGE	TOOL	Select a coated tool.
	CUTTING FORCE	Increase the number of passes.
	HEAT	Use the SCT coolant holder. If coolant is not available, use shop air and a coated tool.
CORNER BREAKAGE	CUTTING CONDITIONS	Reduce the depth-of-cut on the first pass.
	PROGRAM	If there is no thread relief, withdraw the tool on an angle.
	PART	End in thread relief.
CHIPS WRAPPING AROUND TOOL	TOOL	Use a tool that is at least 30% smaller than the hole diameter.

RADIAL INFEED



NOT RECOMMENDED

MODIFIED FLANK



PREFERRED METHOD

Radial Infeed is not recommended. Modified flank at 1° is recommended.

For unfavorable length-to-diameter ratios or difficult-to-machine materials, the number of passes will need to be increased up to 40% more.

Depth of cut per pass should not be less than 0.0003 inch.

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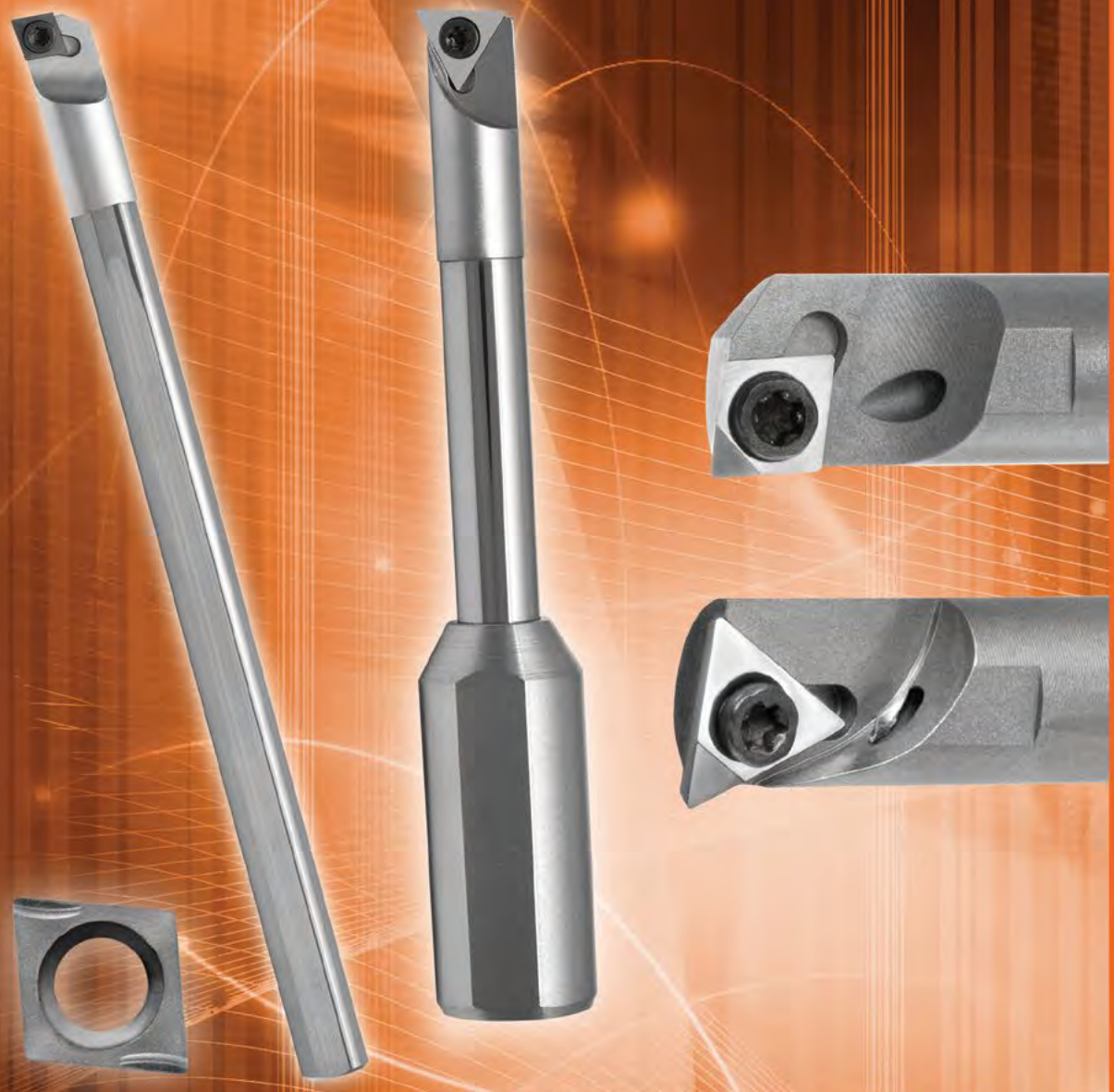
(800) 383-2244 Fax: (888) 728-3295

SCT

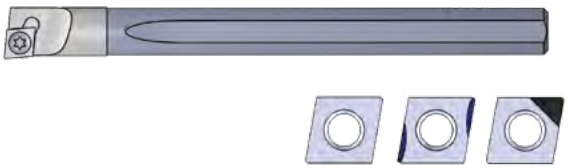
INDEXABLE TOOLING



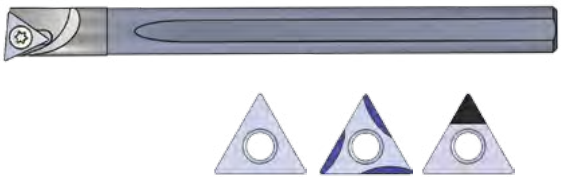
Right Hand Indexable Bars
Left Hand Indexable Bars
Diamond Shaped Inserts
Triangle Shaped Inserts
Chip Control Inserts
CBN/PCD Inserts
Coolant Through Bars

SCT INDEXABLE BORING - PRODUCT OVERVIEW

SCT indexable boring bars consist of micro grain carbide shanks with heat-treated steel heads. Select tools are crafted with a unique top cut which strengthens the pocket by 40% and directs chips away from the cut zone. Bars are stocked with or without flats and are available with or without coolant holes. Inserts are available uncoated or in ALTiN+ coating and are available as diamond-shaped or triangle-shaped. Technical information is available on pages 98-100.



DIAMOND INSERT INDEXABLE BARS

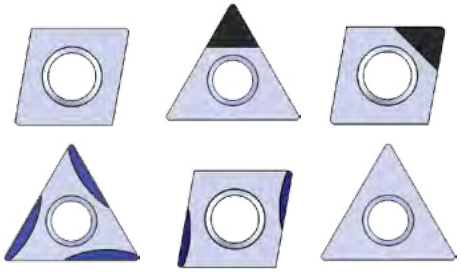


TRIANGLE INSERT INDEXABLE BARS

DIAMOND INSERT STEP BARS

TRIANGLE INSERT STEP BARS

INDEXABLE BAR ACCESSORIES



INDEXABLE CARBIDE INSERTS

Inserts and compatible bars are listed on the same page.

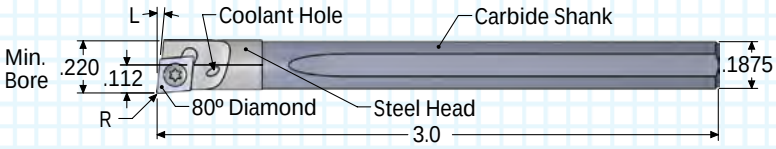
INDEXABLE BORING BAR TECHNICAL INFORMATION PAGES 98-100

INDEXABLE BORING BAR AND INSERTS

3/16" CARBIDE SHANK - DIAMOND SHAPED INSERTS

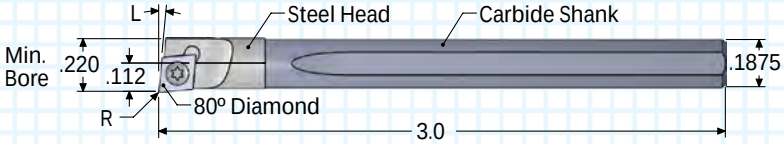
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



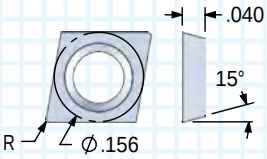
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ACD5	RIGHT	ADBC187R5R
5°	FLAT	ACD5	RIGHT	ADBC187F5R
0°	NONE	ACD5	RIGHT	ADBC187R0R
0°	FLAT	ACD5	RIGHT	ADBC187F0R
5°	NONE	ACD5	LEFT	ADBC187R5L
5°	FLAT	ACD5	LEFT	ADBC187F5L
0°	NONE	ACD5	LEFT	ADBC187R0L
0°	FLAT	ACD5	LEFT	ADBC187F0L

BAR WITHOUT COOLANT HOLE



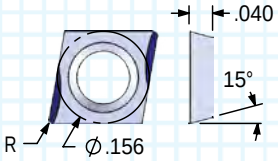
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ACD5	RIGHT	ACBC187R5R
5°	FLAT	ACD5	RIGHT	ACBC187F5R
0°	NONE	ACD5	RIGHT	ACBC187R0R
0°	FLAT	ACD5	RIGHT	ACBC187F0R
5°	NONE	ACD5	LEFT	ACBC187R5L
5°	FLAT	ACD5	LEFT	ACBC187F5L
0°	NONE	ACD5	LEFT	ACBC187R0L
0°	FLAT	ACD5	LEFT	ACBC187F0L

CARBIDE INSERTS



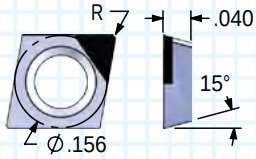
80° DIAMOND FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.003	ACD5031	ACD5031E
AT6+	0.007	ACD5071	ACD5071E
AT6+	0.015	ACD5151	ACD5151E



80° DIAMOND CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.007	ACD507L2	ACD507L2E
AT6+	0.015	ACD515L2	ACD515L2E



80° DIAMOND CBN/PCD TIPPED

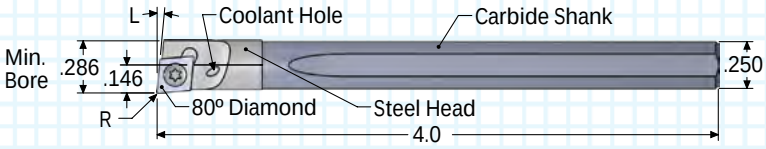
ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ORDER NUMBER ONE PCD
AT6+	0.007	ACD5071CBN2	ACD5071PCD
AT6+	0.015	ACD5151CBN2	ACD5151PCD

INDEXABLE BORING BAR AND INSERTS

1/4" CARBIDE SHANK - DIAMOND SHAPED INSERTS

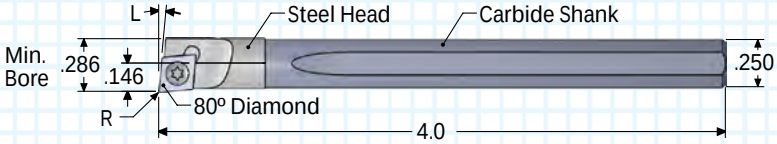
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



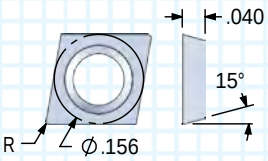
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ACD5	RIGHT	ADBC250R5R
5°	FLAT	ACD5	RIGHT	ADBC250F5R
0°	NONE	ACD5	RIGHT	ADBC250R0R
0°	FLAT	ACD5	RIGHT	ADBC250F0R
5°	NONE	ACD5	LEFT	ADBC250R5L
5°	FLAT	ACD5	LEFT	ADBC250F5L
0°	NONE	ACD5	LEFT	ADBC250R0L
0°	FLAT	ACD5	LEFT	ADBC250F0L

BAR WITHOUT COOLANT HOLE



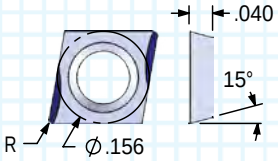
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ACD5	RIGHT	ACBC250R5R
5°	FLAT	ACD5	RIGHT	ACBC250F5R
0°	NONE	ACD5	RIGHT	ACBC250R0R
0°	FLAT	ACD5	RIGHT	ACBC250F0R
5°	NONE	ACD5	LEFT	ACBC250R5L
5°	FLAT	ACD5	LEFT	ACBC250F5L
0°	NONE	ACD5	LEFT	ACBC250R0L
0°	FLAT	ACD5	LEFT	ACBC250F0L

CARBIDE INSERTS



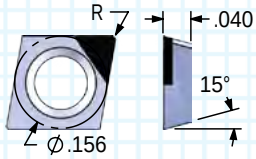
80° DIAMOND FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.003	ACD5031	ACD5031E
AT6+	0.007	ACD5071	ACD5071E
AT6+	0.015	ACD5151	ACD5151E



80° DIAMOND CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.007	ACD507L2	ACD507L2E
AT6+	0.015	ACD515L2	ACD515L2E



80° DIAMOND CBN/PCD TIPPED

ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ORDER NUMBER ONE PCD
AT6+	0.007	ACD5071CBN2	ACD5071PCD
AT6+	0.015	ACD5151CBN2	ACD5151PCD

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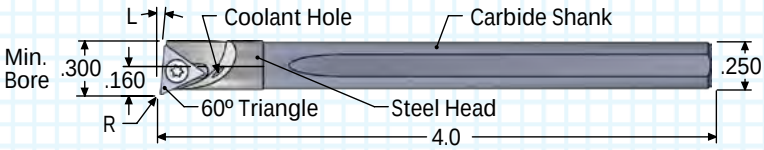
INDEXABLE BORING BAR AND INSERTS

1/4" CARBIDE SHANK - TRIANGLE SHAPED INSERTS

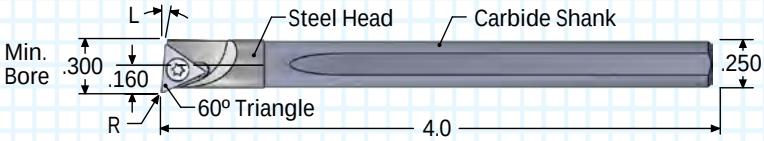
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



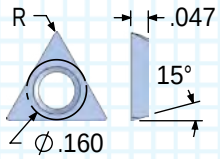
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ATD5	RIGHT	ADBT250R5R
5°	FLAT	ATD5	RIGHT	ADBT250F5R
0°	NONE	ATD5	RIGHT	ADBT250R0R
0°	FLAT	ATD5	RIGHT	ADBT250F0R
5°	NONE	ATD5	LEFT	ADBT250R5L
5°	FLAT	ATD5	LEFT	ADBT250F5L
0°	NONE	ATD5	LEFT	ADBT250R0L
0°	FLAT	ATD5	LEFT	ADBT250F0L

BAR WITHOUT COOLANT HOLE



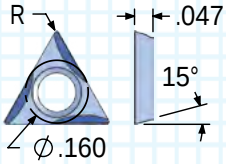
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ATD5	RIGHT	ACBT250R5R
5°	FLAT	ATD5	RIGHT	ACBT250F5R
0°	NONE	ATD5	RIGHT	ACBT250R0R
0°	FLAT	ATD5	RIGHT	ACBT250F0R
5°	NONE	ATD5	LEFT	ACBT250R5L
5°	FLAT	ATD5	LEFT	ACBT250F5L
0°	NONE	ATD5	LEFT	ACBT250R0L
0°	FLAT	ATD5	LEFT	ACBT250F0L

CARBIDE INSERTS



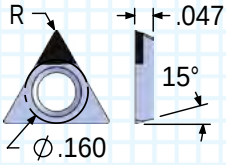
60° TRIANGLE FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.003	ATD5031	ATD5031E
AT6+	0.007	ATD5071	ATD5071E
AT6+	0.015	ATD5151	ATD5151E



60° TRIANGLE CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.007	ATD507L2	ATD507L2E
AT6+	0.015	ATD515L2	ATD515L2E



60° TRIANGLE CBN/PCD TIPPED

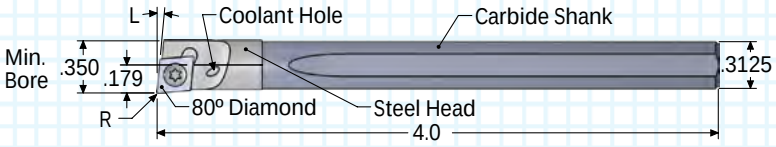
ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ORDER NUMBER ONE PCD
AT6+	0.007	ATD5071CBN2	ATD5071PCD
AT6+	0.015	ATD5151CBN2	ATD5151PCD

INDEXABLE BORING BAR AND INSERTS

5/16" CARBIDE SHANK - DIAMOND SHAPED INSERTS

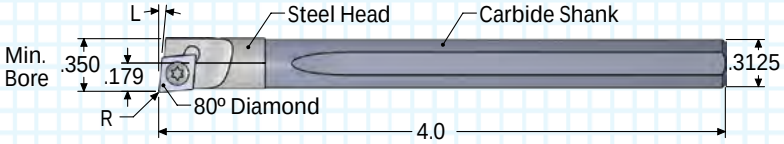
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



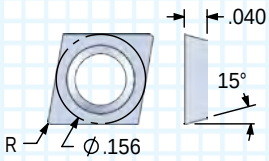
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ACD5	RIGHT	ADBC312R5R
5°	FLAT	ACD5	RIGHT	ADBC312F5R
0°	NONE	ACD5	RIGHT	ADBC312R0R
0°	FLAT	ACD5	RIGHT	ADBC312F0R
5°	NONE	ACD5	LEFT	ADBC312R5L
5°	FLAT	ACD5	LEFT	ADBC312F5L
0°	NONE	ACD5	LEFT	ADBC312R0L
0°	FLAT	ACD5	LEFT	ADBC312F0L

BAR WITHOUT COOLANT HOLE



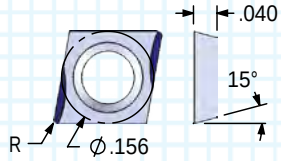
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ACD5	RIGHT	ACBC312R5R
5°	FLAT	ACD5	RIGHT	ACBC312F5R
0°	NONE	ACD5	RIGHT	ACBC312R0R
0°	FLAT	ACD5	RIGHT	ACBC312F0R
5°	NONE	ACD5	LEFT	ACBC312R5L
5°	FLAT	ACD5	LEFT	ACBC312F5L
0°	NONE	ACD5	LEFT	ACBC312R0L
0°	FLAT	ACD5	LEFT	ACBC312F0L

CARBIDE INSERTS



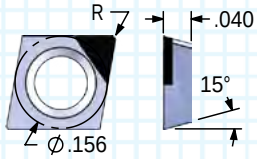
80° DIAMOND FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.003	ACD5031	ACD5031E
AT6+	0.007	ACD5071	ACD5071E
AT6+	0.015	ACD5151	ACD5151E



80° DIAMOND CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.007	ACD507L2	ACD507L2E
AT6+	0.015	ACD515L2	ACD515L2E



80° DIAMOND CBN/PCD TIPPED

ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ORDER NUMBER ONE PCD
AT6+	0.007	ACD5071CBN2	ACD5071PCD
AT6+	0.015	ACD5151CBN2	ACD5151PCD

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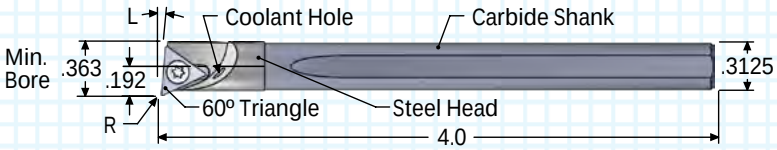
INDEXABLE BORING BAR AND INSERTS

5/16" CARBIDE SHANK - TRIANGLE SHAPED INSERTS

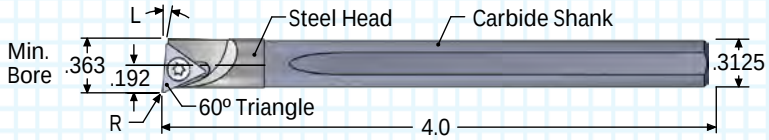
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



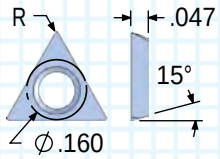
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ATD5	RIGHT	ADBT312R5R
5°	FLAT	ATD5	RIGHT	ADBT312F5R
0°	NONE	ATD5	RIGHT	ADBT312R0R
0°	FLAT	ATD5	RIGHT	ADBT312F0R
5°	NONE	ATD5	LEFT	ADBT312R5L
5°	FLAT	ATD5	LEFT	ADBT312F5L
0°	NONE	ATD5	LEFT	ADBT312R0L
0°	FLAT	ATD5	LEFT	ADBT312F0L

BAR WITHOUT COOLANT HOLE



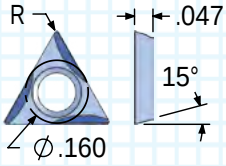
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ATD5	RIGHT	ACBT312R5R
5°	FLAT	ATD5	RIGHT	ACBT312F5R
0°	NONE	ATD5	RIGHT	ACBT312R0R
0°	FLAT	ATD5	RIGHT	ACBT312F0R
5°	NONE	ATD5	LEFT	ACBT312R5L
5°	FLAT	ATD5	LEFT	ACBT312F5L
0°	NONE	ATD5	LEFT	ACBT312R0L
0°	FLAT	ATD5	LEFT	ACBT312F0L

CARBIDE INSERTS



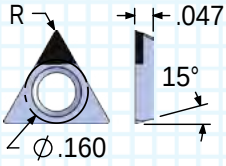
60° TRIANGLE FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.003	ATD5031	ATD5031E
AT6+	0.007	ATD5071	ATD5071E
AT6+	0.015	ATD5151	ATD5151E



60° TRIANGLE CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT6+	0.007	ATD507L2	ATD507L2E
AT6+	0.015	ATD515L2	ATD515L2E



60° TRIANGLE CBN/PCD TIPPED

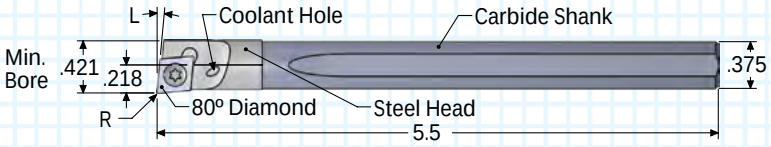
ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ORDER NUMBER ONE PCD
AT6+	0.007	ATD5071CBN2	ATD5071PCD
AT6+	0.015	ATD5151CBN2	ATD5151PCD

INDEXABLE BORING BAR AND INSERTS

3/8" CARBIDE SHANK - DIAMOND SHAPED INSERTS

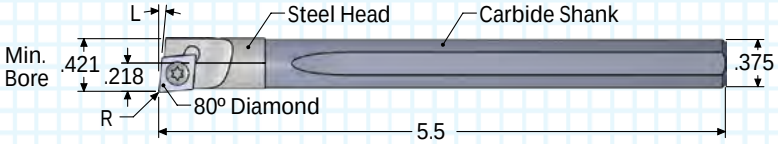
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



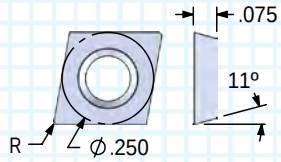
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ACP2	RIGHT	ADBC375R5R
5°	FLAT	ACP2	RIGHT	ADBC375F5R
0°	NONE	ACP2	RIGHT	ADBC375R0R
0°	FLAT	ACP2	RIGHT	ADBC375F0R
5°	NONE	ACP2	LEFT	ADBC375R5L
5°	FLAT	ACP2	LEFT	ADBC375F5L
0°	NONE	ACP2	LEFT	ADBC375R0L
0°	FLAT	ACP2	LEFT	ADBC375F0L

BAR WITHOUT COOLANT HOLE



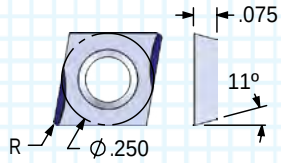
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ACP2	RIGHT	ACBC375R5R
5°	FLAT	ACP2	RIGHT	ACBC375F5R
0°	NONE	ACP2	RIGHT	ACBC375R0R
0°	FLAT	ACP2	RIGHT	ACBC375F0R
5°	NONE	ACP2	LEFT	ACBC375R5L
5°	FLAT	ACP2	LEFT	ACBC375F5L
0°	NONE	ACP2	LEFT	ACBC375R0L
0°	FLAT	ACP2	LEFT	ACBC375F0L

CARBIDE INSERTS



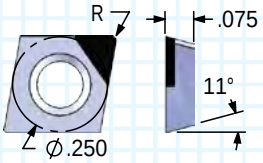
80° DIAMOND FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	FIVE ALTiN+
AT8+	0.003	ACP2031	ACP2031E
AT8+	0.007	ACP2071	ACP2071E
AT8+	0.015	ACP2151	ACP2151E



80° DIAMOND CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	FIVE ALTiN+
AT8+	0.007	ACP207L2	ACP207L2E
AT8+	0.015	ACP215L2	ACP215L2E



80° DIAMOND CBN/PCD TIPPED

ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ONE PCD
AT8+	0.007	ACP2071CBN2	ACP2071PCD
AT8+	0.015	ACP2151CBN2	ACP2151PCD

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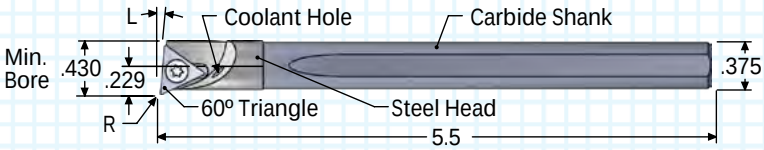
INDEXABLE BORING BAR AND INSERTS

3/8" CARBIDE SHANK - TRIANGLE SHAPED INSERTS

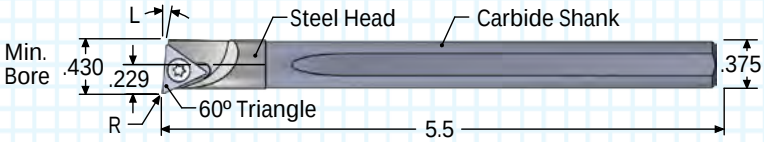
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



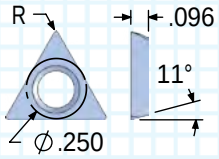
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ATP2	RIGHT	ADBT375R5R
5°	FLAT	ATP2	RIGHT	ADBT375F5R
0°	NONE	ATP2	RIGHT	ADBT375R0R
0°	FLAT	ATP2	RIGHT	ADBT375F0R
5°	NONE	ATP2	LEFT	ADBT375R5L
5°	FLAT	ATP2	LEFT	ADBT375F5L
0°	NONE	ATP2	LEFT	ADBT375R0L
0°	FLAT	ATP2	LEFT	ADBT375F0L

BAR WITHOUT COOLANT HOLE



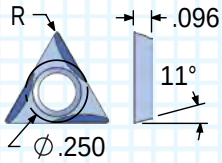
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ATP2	RIGHT	ACBT375R5R
5°	FLAT	ATP2	RIGHT	ACBT375F5R
0°	NONE	ATP2	RIGHT	ACBT375R0R
0°	FLAT	ATP2	RIGHT	ACBT375F0R
5°	NONE	ATP2	LEFT	ACBT375R5L
5°	FLAT	ATP2	LEFT	ACBT375F5L
0°	NONE	ATP2	LEFT	ACBT375R0L
0°	FLAT	ATP2	LEFT	ACBT375F0L

CARBIDE INSERTS



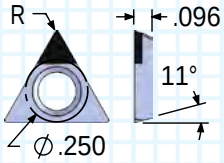
60° TRIANGLE FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT8+	0.007	ATP2071	ATP2071E
AT8+	0.015	ATP2151	ATP2151E



60° TRIANGLE CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT8+	0.007	ATP207L2	ATP207L2E
AT8+	0.015	ATP215L2	ATP215L2E



60° TRIANGLE CBN/PCD TIPPED

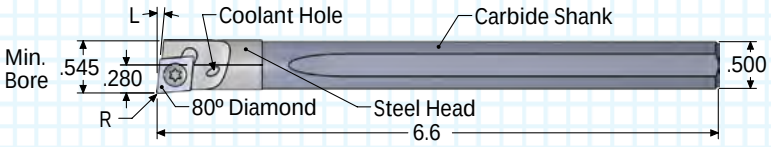
ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ORDER NUMBER ONE PCD
AT8+	0.007	ATP2071CBN2	ATP2071PCD
AT8+	0.015	ATP2151CBN2	ATP2151PCD

INDEXABLE BORING BAR AND INSERTS

1/2" CARBIDE SHANK - DIAMOND SHAPED INSERTS

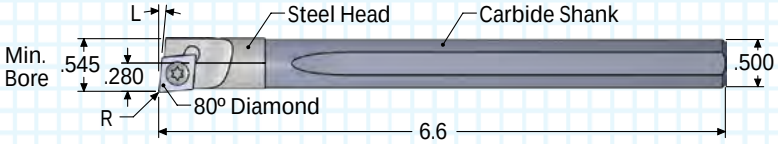
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



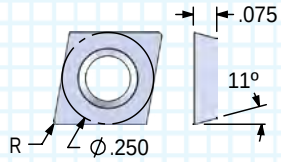
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ACP2	RIGHT	ADBC500R5R
5°	FLAT	ACP2	RIGHT	ADBC500F5R
0°	NONE	ACP2	RIGHT	ADBC500R0R
0°	FLAT	ACP2	RIGHT	ADBC500F0R
5°	NONE	ACP2	LEFT	ADBC500R5L
5°	FLAT	ACP2	LEFT	ADBC500F5L
0°	NONE	ACP2	LEFT	ADBC500R0L
0°	FLAT	ACP2	LEFT	ADBC500F0L

BAR WITHOUT COOLANT HOLE



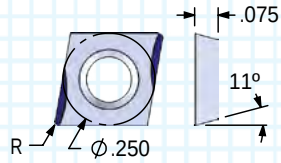
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ACP2	RIGHT	ACBC500R5R
5°	FLAT	ACP2	RIGHT	ACBC500F5R
0°	NONE	ACP2	RIGHT	ACBC500R0R
0°	FLAT	ACP2	RIGHT	ACBC500F0R
5°	NONE	ACP2	LEFT	ACBC500R5L
5°	FLAT	ACP2	LEFT	ACBC500F5L
0°	NONE	ACP2	LEFT	ACBC500R0L
0°	FLAT	ACP2	LEFT	ACBC500F0L

CARBIDE INSERTS



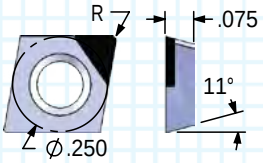
80° DIAMOND FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	FIVE ALTiN+
AT8+	0.003	ACP2031	ACP2031E
AT8+	0.007	ACP2071	ACP2071E
AT8+	0.015	ACP2151	ACP2151E



80° DIAMOND CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	FIVE ALTiN+
AT8+	0.007	ACP207L2	ACP207L2E
AT8+	0.015	ACP215L2	ACP215L2E



80° DIAMOND CBN/PCD TIPPED

ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ONE PCD
AT8+	0.007	ACP2071CBN2	ACP2071PCD
AT8+	0.015	ACP2151CBN2	ACP2151PCD

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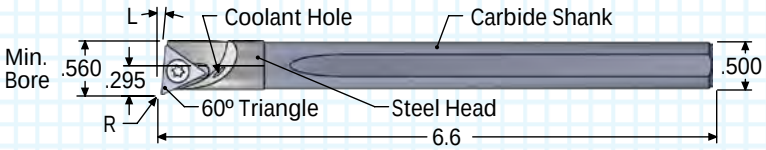
INDEXABLE BORING BAR AND INSERTS

1/2" CARBIDE SHANK - TRIANGLE SHAPED INSERTS

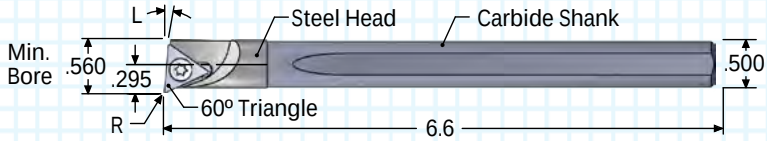
EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

BAR WITH COOLANT HOLE



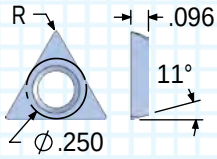
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # COOLANT THROUGH
5°	NONE	ATP2	RIGHT	ADBT500R5R
5°	FLAT	ATP2	RIGHT	ADBT500F5R
0°	NONE	ATP2	RIGHT	ADBT500R0R
0°	FLAT	ATP2	RIGHT	ADBT500F0R
5°	NONE	ATP2	LEFT	ADBT500R5L
5°	FLAT	ATP2	LEFT	ADBT500F5L
0°	NONE	ATP2	LEFT	ADBT500R0L
0°	FLAT	ATP2	LEFT	ADBT500F0L

BAR WITHOUT COOLANT HOLE



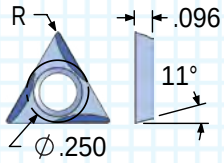
"L" ANGLE	BAR FLAT	INSERT TYPE	RH/LH	ORDER # NO COOLANT HOLE
5°	NONE	ATP2	RIGHT	ACBT500R5R
5°	FLAT	ATP2	RIGHT	ACBT500F5R
0°	NONE	ATP2	RIGHT	ACBT500R0R
0°	FLAT	ATP2	RIGHT	ACBT500F0R
5°	NONE	ATP2	LEFT	ACBT500R5L
5°	FLAT	ATP2	LEFT	ACBT500F5L
0°	NONE	ATP2	LEFT	ACBT500R0L
0°	FLAT	ATP2	LEFT	ACBT500F0L

CARBIDE INSERTS



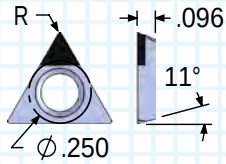
60° TRIANGLE FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT8+	0.007	ATP2071	ATP2071E
AT8+	0.015	ATP2151	ATP2151E



60° TRIANGLE CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER FIVE UNCOATED	ORDER NUMBER FIVE ALTiN+
AT8+	0.007	ATP207L2	ATP207L2E
AT8+	0.015	ATP215L2	ATP215L2E



60° TRIANGLE CBN/PCD TIPPED

ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER ONE CBN	ORDER NUMBER ONE PCD
AT8+	0.007	ATP2071CBN2	ATP2071PCD
AT8+	0.015	ATP2151CBN2	ATP2151PCD

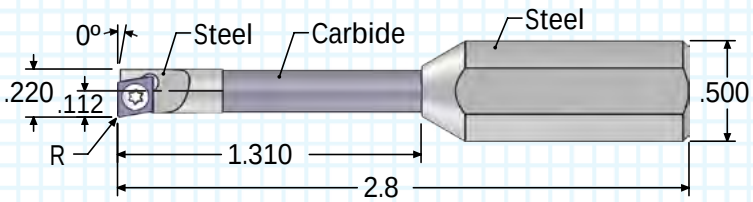
INDEXABLE STEP BORING BAR AND INSERTS

1/2" SHANK STEP BARS WITH DIAMOND SHAPED INSERTS

EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

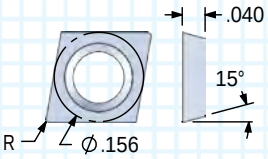
STEP BORING BAR

0.220 MINIMUM BORE



BAR FLAT	INSERT TYPE	RH/LH	ORDER #
			NO COOLANT HOLE
FLAT	ACD5	RIGHT	ACBC187S4F0R

CARBIDE INSERTS

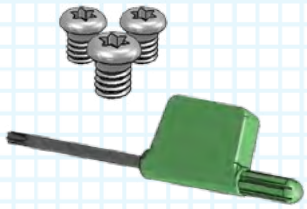


80° DIAMOND FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER	
		FIVE UNCOATED	FIVE ALTiN+
AT6+	0.003	ACD5031	ACD5031E
AT6+	0.007	ACD5071	ACD5071E
AT6+	0.015	ACD5151	ACD5151E

INDEXABLE BORING BAR ACCESSORIES

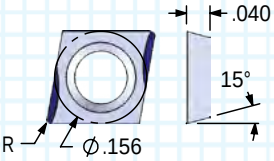
REPLACEMENT FLAG KEYS AND SCREWS



- All 3/16", 1/4", and 5/16" right and left-hand bars use AT6+ screws (for triangle or diamond-shaped inserts)
- All 3/8" and 1/2" bars use AT8+ screws
- AT6+ screws use AT6+ flag keys. AT8+ screws use AT8+ flag keys.

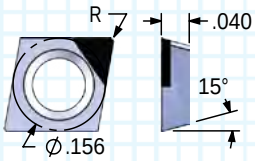
REPLACEMENT PACKS

ACCESSORY	SIZE	ORDER NUMBER
FLAG KEY (2 PACK)	AT6+	A6KEY
FLAG KEY (2 PACK)	AT8+	A8KEY
SCREWS (10 PACK)	AT6+	A6SCREWS
SCREWS (10 PACK)	AT8+	A8SCREWS



80° DIAMOND CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER	
		FIVE UNCOATED	FIVE ALTiN+
AT6+	0.007	ACD507L2	ACD507L2E
AT6+	0.015	ACD515L2	ACD515L2E



80° DIAMOND CBN/PCD TIPPED

ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER	
		ONE CBN	ONE PCD
AT6+	0.007	ACD5071CBN2	ACD5071PCD
AT6+	0.015	ACD5151CBN2	ACD5151PCD

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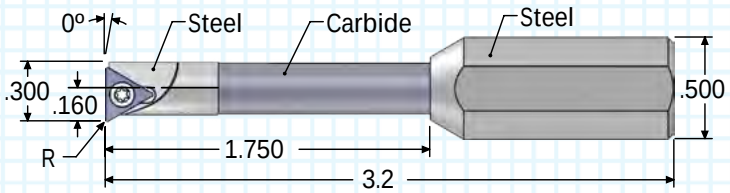
INDEXABLE STEP BORING BAR AND INSERTS

1/2" SHANK STEP BARS WITH TRIANGLE SHAPED INSERTS

EACH BAR COMES WITH ONE SCREW AND ONE KEY. INSERTS SOLD SEPARATELY.

STEP BORING BAR

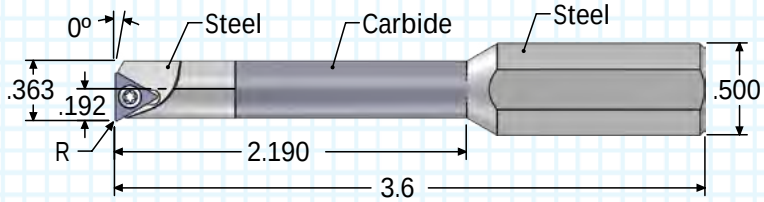
0.300 MINIMUM BORE



BAR FLAT	INSERT TYPE	RH/LH	ORDER #
			NO COOLANT HOLE
FLAT	ATD5	RIGHT	ACBT250S4F0R

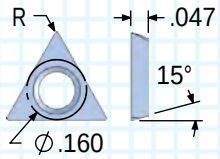
STEP BORING BAR

0.363 MINIMUM BORE



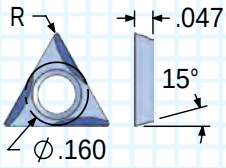
BAR FLAT	INSERT TYPE	RH/LH	ORDER #
			NO COOLANT HOLE
FLAT	ATD5	RIGHT	ACBT312S4F0R

CARBIDE INSERTS



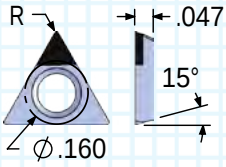
60° TRIANGLE FLAT TOP

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER	
		FIVE UNCOATED	FIVE ALTiN+
AT6+	0.003	ATD5031	ATD5031E
AT6+	0.007	ATD5071	ATD5071E
AT6+	0.015	ATD5151	ATD5151E



60° TRIANGLE CHIP CONTROL RIGHT HAND ONLY

FIVE SCREWS	"R" CORNER RADIUS	ORDER NUMBER	
		FIVE UNCOATED	FIVE ALTiN+
AT6+	0.007	ATD507L2	ATD507L2E
AT6+	0.015	ATD515L2	ATD515L2E



60° TRIANGLE CBN/PCD TIPPED

ONE SCREW	"R" CORNER RADIUS	ORDER NUMBER	
		ONE CBN	ONE PCD
AT6+	0.007	ATD5071CBN2	ATD5071PCD
AT6+	0.015	ATD5151CBN2	ATD5151PCD

INDEXABLE BORING BAR FEED AND SPEED CHART

MATERIAL	HB/Rc	SPEED RANGE (SFM)		CUTTING CONDITIONS		
		UNCOATED	ALTIN+	MAX DOC ACD & ATD	MAX DOC ATP & ACP	FEED IPR
CAST IRON	160 HB	75-200	200-550	0.020	0.060	.0005-.010
CARBON STEEL	18 Rc	75-200	200-450	0.018	0.060	.0005-.010
ALLOY STEEL	20 Rc	75-200	200-425	0.015	0.060	.0005-.010
TOOL STEEL	25 Rc	75-175	175-300	0.010	0.030	.0005-.010
300 STAINLESS STEEL	150 HB	75-175	175-350	0.015	0.028	.0005-.010
400 STAINLESS STEEL	195 HB	75-210	130-420	0.012	0.028	.0005-.010
HIGH TEMP ALLOY (Ni & Co BASE)	20 Rc	50-130	130-300	0.008	0.020	.0005-.010
TITANIUM	25 Rc	50-120	120-275	0.009	0.022	.0005-.010
HEAT TREATED ALLOYS (38-45Rc)	40 Rc	50-100	100-200	0.005	0.010	.0005-.005
ALUMINUM	100 HB	75-250	250-750	0.025	0.095	.0005-.010
BRASS, ZINC	80 HB	75-300	250-650	0.023	0.090	.0005-.010

SFM = Surface Feet per Minute

Starting parameters only. Length to diameter ratios, setup, and machine rigidity may affect performance. The max Depth Of Cut (DOC) acceptable at the minimum Inches Per Revolution (IPR).

SELECTING AN INDEXABLE BORING BAR	
1	From the part or print, verify the diameter of hole to be machined. Select the boring bar that has a minimum bore diameter smaller than the diameter to be machined.
2	Check machine for shank size needed. If the shank needs to be larger, go to page 96.
3	Match the operation needed on the part with the necessary lead angle. Select 0° lead to bore to a shoulder. Select 5° lead to bore and face a shoulder.
4	Choose from flat top or chip control insert based on application and material being machined.
5	Choose from .003", .007", or .015" radius based on finish required and part specifications for corner radius.

SELECTING AN INDEXABLE INSERT GRADE	
UNCOATED	is a submicron premium carbide grade for machining steel and non-ferrous materials.
ALTiN+	is a premium coated grade for steel, cast irons and high temperature alloys at highest SFM.
CBN	are ideal for hardened steel (45+ RC) and cast iron.
PCD	are ideal for non-ferrous materials.

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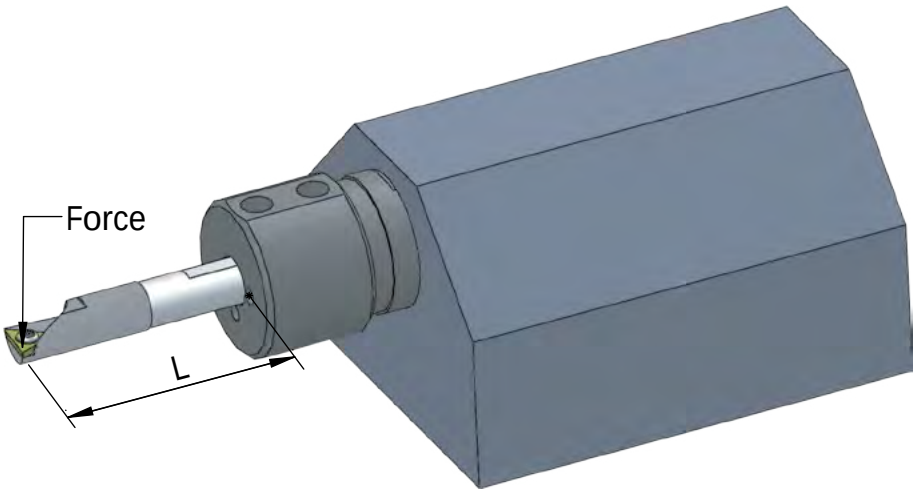
INDEXABLE BORING BAR TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
RAPID FLANK WEAR	CUTTING CONDITIONS	Reduce the cutting speed.
	INSERT	Select a coated grade.
	HEAT	Use the SCT coolant holder. If coolant is not available, use shop air and a coated tool. Use a coolant through boring bar.
BUILT-UP EDGE	INSERT	Select a coated grade.
	CUTTING FORCE	Use chip control insert to free up cut.
	HEAT	Use coolant through boring bar or holder. If coolant is not available, use shop air and a coated tool. Use coolant through boring bar.
INSERT BREAKAGE	CUTTING CONDITIONS	Reduce depth of cut. Reduce feed rate.
	INSERT	Select a larger corner radius
	PART	Check the drilled hole to make sure the full diameter of the drill is deeper than the programmed bore depth.
SURFACE TOO ROUGH	CUTTING CONDITIONS	Reduce feed rate. The rate is too great for the nose radius.
	INSERT	Select a larger corner radius. The feed rate (IPR) should not be greater than 1/2 the nose radius.
CHATTER	SETUP	Set insert above center. Change the speed of the machine. The overhang ratio should be less than 8x bar diameter for carbide. Clamping length should be at least 3x the boring bar diameter.
	BORING BAR	Select the largest diameter bar that will bore the required diameter.
TAPER BIGGER IN BACK	CUTTING FORCES	Forces may deflect bar below center causing the hole to become larger.
	BUILT-UP EDGE	A built-up edge will cause the hole to become large until the built-up edge breaks off, then hole will be smaller.
	PROGRAM	If the taper is consistent (not from chip packing) then the program can be altered to bore a taper in opposite direction resulting in a straight hole.
TAPER SMALLER IN BACK	CHIP PACKING	If the boring bar is too large to allow chips to evacuate then the chips may pack on the insert and cause the bar to deflect away from the bore.
	PROGRAM	If the taper is consistent (not from chip packing) then the program can be altered to bore a taper in opposite direction resulting in a straight hole.

INDEXABLE BORING BAR DEFLECTION



Bar Deflection: $\dfrac{F \times L^3}{3 \times E \times I}$ $I = \dfrac{3.14 \times D^4}{64}$

F = Cutting force (lbs) L = Overhang (in.) E = Coefficient of Elasticity of Bar Shank D = Tool Diameter I= Moment of Inertia

The greatest amount of force on the boring bar is on the top of the cutting edge. This force can deflect the cutting edge below the centerline of the part, resulting in incorrect bore size.

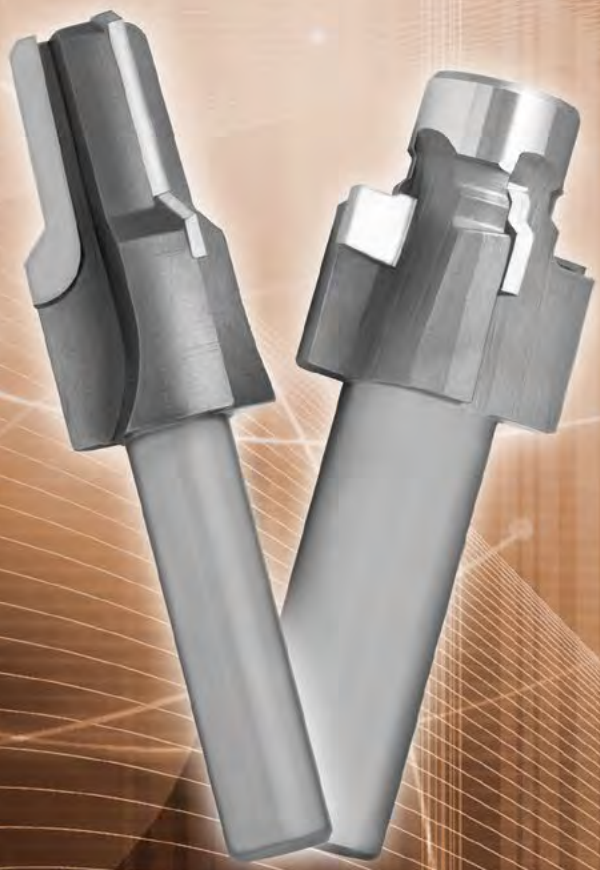
To minimize deflection, the length of overhang should be kept as short as possible. As shown in the formula, the length of overhang is multiplied to the third power, and the diameter is multiplied to the fourth power. This means that a small change in length of overhang or bar diameter can make a large difference in deflection.

Using the largest diameter bar with the least amount of overhang as possible gives the best chance of successful boring operations.

The picture shows the boring bar in a coolant holder.* Coolant or shop air provided to the holder will cool the insert and part and evacuate chips from the hole.

*Coolant holders available. See page 46.

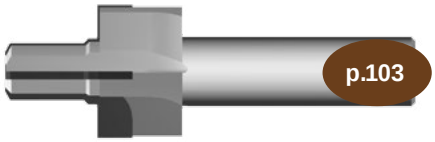
PORT TOOLS



Tapered Pipe Reamer
BSPP
MS16142
ISO6149
MS33649
AND10050
MS33514
RPT - Rosan Cavity
Hydraforce
MS21921
MS33651
Coolant Through

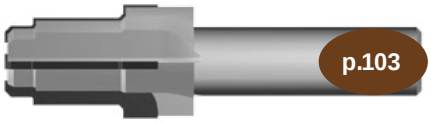
PORT TOOLS - PRODUCT OVERVIEW

All Port Tools are ground between centers to ensure absolute concentricity. They are made from heat-treated alloy steel with brazed carbide inserts. They are designed to enlarge a pre-drilled hole and easily produce a complex form. Port Tools can be used for both lathe and mill applications. Technical information available on page 128. Modified Port Tools and Specials quoted upon request.



MS33651

This carbide tipped port tool also meets the requirements of the AND10071 port.



Hard to Find Port Tools

Many of these hard-to-find port tools are stocked. They also serve as an example of the types of specials we offer.

MS16142-S

This port is also called the O-Ring Boss or ORB, SAEJ1926-1, SAEJ514 or just SAE (dash number). The solid pilot design does not cut the minor-thread diameter.

MS16142-R

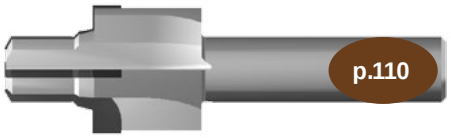
This port is also called the O-Ring Boss or ORB, SAEJ1926-1, SAEJ514 or just SAE (dash number). The reamer pilot design cuts the minor-thread diameter.

MS33649-S

This port is also called the AS5202. The solid pilot design does not cut the minor-thread diameter.

MS33649-R

This port is also called the AS5202. The reamer pilot design cuts the minor-thread diameter.



ISO6149-1

This port is also called the SAEJ2244-1. This port does not have the identification notch that identifies it as a metric port.

ISO6149-1 (ID)

This port is also called the SAEJ2244-1. This port has the identification notch that identifies it as a metric port.

AND10050-S

The solid pilot design does not cut the minor-thread diameter.

AND10050-R

The reamer pilot design cuts the minor-thread diameter.

Tapered Pipe Reamer

The (PRSS) tapered pipe reamers cut taper minor diameter of the NPT (1º47' angle) and the 45º countersink for the thread.

BSPP- Pipe Reamer

British standard parallel pipe port tools (PT-BSPP) cut the minor-thread diameter, the 45º angle, and the spot face.

RPT – Rosan Cavity

RPT port tool will cut a Rosan cavity per AS1300 specification. Another name for this port is PS10035.

MS33514

This port will cut the AS33514, MS33514 and MS33515 in both style "E" and "G" configurations.

MS21921

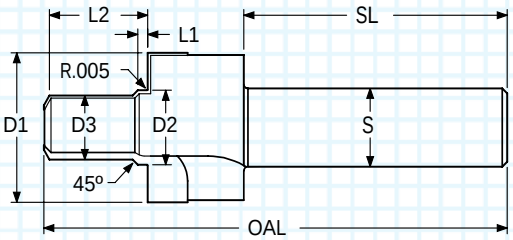
MS21921 port tools are made with the same quality heat-treated steel and carbide as the rest of our port tools.

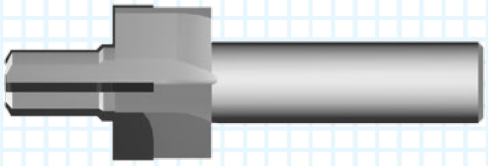
BACD2036

BACD2036 carbide tipped port tools are designed to cut this otherwise difficult-to-cut port.

PORT TOOL TECHNICAL INFORMATION PAGE 128

MS33651 (AND10071) - PORT TOOL - CARBIDE TIPPED

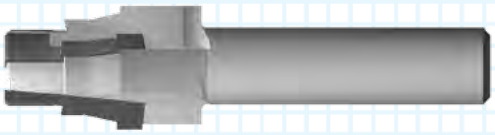




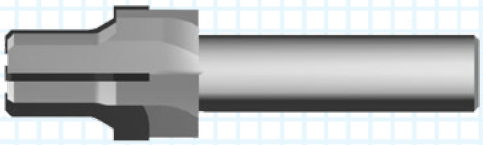
- Polished flute face for optimum performance
- ALTiN+ coating for improved surface finish

D1	D2	D3	L1	L2	S	SL	OAL	FLUTES	THREAD	ORDER #	
										UNCOATED	ALTiN+
1.050	0.523	0.450	0.070	0.690	0.500	1.88	3.25	4	0.500-20 UNF-3B	MS33651	MS33651A

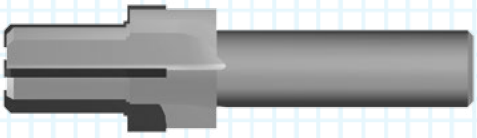
HARD TO FIND PORT TOOLS
CALL FOR AVAILABILITY



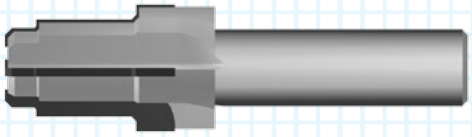
BACU24AB



MS20819

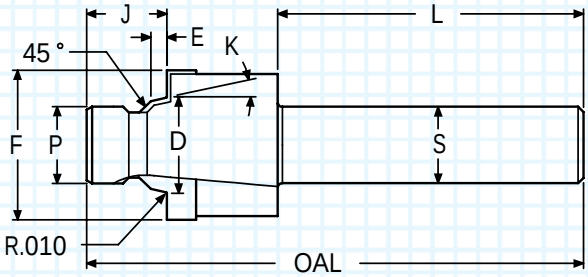


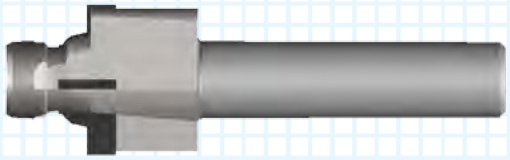
MS21922



AN818

MS16142 (SAEJ1926-1) (SAEJ514) O-RING BOSS SOLID PILOT - CARBIDE TIPPED





- Ideal for non-standard minor diameter lengths
- Often called ORB (followed by port size number)
- Meets the requirements of SAEJ1926-1
- Polished flute face for optimum performance
- ALTiN+ coating for improved surface finish
- Meets the requirements of SAEJ514

K	D	E	F	P	J	L	S	OAL	FLUTES	TUBE	THREAD	SAE#	ORDER #	
													UNCOATED	ALTiN+
12°	0.3605	0.082	0.682	0.270	0.365	2.00	0.500	3.00	3	0.125	0.3125-24 UNF-2B	SAE#2	MS16142-2S	MS16142-2SA
12°	0.4235	0.082	0.760	0.331	0.415	2.00	0.500	3.00	3	0.188	0.3750-24 UNF-2B	SAE#3	MS16142-3S	MS16142-3SA
12°	0.4895	0.101	0.838	0.385	0.445	2.00	0.500	3.12	3	0.250	0.4375-20 UNF-2B	SAE#4	MS16142-4S	MS16142-4SA
12°	0.5525	0.101	0.916	0.448	0.465	2.00	0.500	3.12	4	0.312	0.5000-20 UNF-2B	SAE#5	MS16142-5S	MS16142-5SA
12°	0.6185	0.105	0.979	0.504	0.495	2.00	0.500	3.25	4	0.375	0.5625-18 UNF-2B	SAE#6	MS16142-6S	MS16142-6SA
15°	0.8135	0.108	1.198	0.685	0.560	2.12	0.750	3.57	4	0.500	0.7500-16 UNF-2B	SAE#8	MS16142-8S	MS16142-8SA
15°	0.9445	0.108	1.354	0.801	0.610	2.12	0.750	3.66	4	0.625	0.8750-14 UNF-2B	SAE#10	MS16142-10S	MS16142-10SA
15°	1.1505	0.138	1.635	0.975	0.640	2.12	0.750	3.75	4	0.750	1.0625-12 UN-2B	SAE#12	MS16142-12S	MS16142-12SA
15°	1.2755	0.138	1.775	1.101	0.710	2.25	1.000	4.00	4	0.875	1.1875-12 UN-2B	SAE#14	MS16142-14S	MS16142-14SA
15°	1.4005	0.138	1.920	1.225	0.710	2.25	1.000	4.05	4	1.000	1.3125-12 UN-2B	SAE#16	MS16142-16S	MS16142-16SA
15°	1.7155	0.140	2.280	1.537	0.750	2.25	1.000	4.20	4	1.250	1.6250-12 UN-2B	SAE#20	MS16142-20S	MS16142-20SA
15°	1.9645	0.140	2.570	1.787	0.750	2.25	1.000	4.20	4	1.500	1.8750-12 UN-2B	SAE#24	MS16142-24S	MS16142-24SA
15°	2.5895	0.140	3.490	2.412	0.800	2.50	1.250	4.60	4	2.000	2.5000-12 UN-2B	SAE#32	MS16142-32S	MS16142-32SA

Thread mills available. See pages 9-19.

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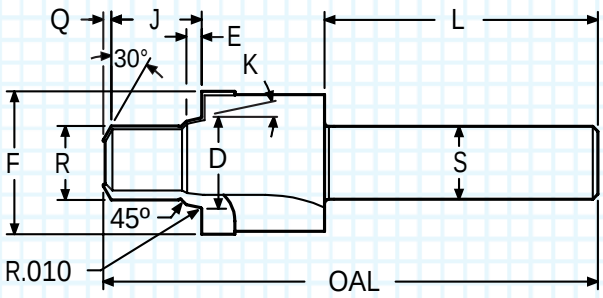
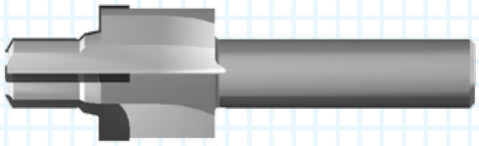
MS16142 (SAEJ1926-1) (SAEJ514) O-RING BOSS REAMER PILOT - CARBIDE TIPPED



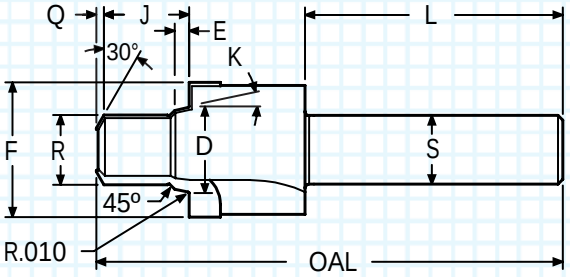


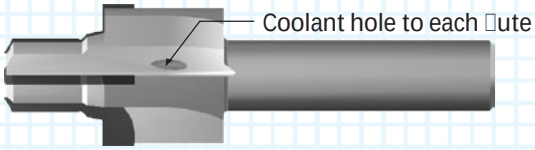
- Reams minor-thread diameter to size
- Often called ORB (followed by port size number)
- Meets the requirements of SAEJ1926-1
- Precision ground for maximum concentricity
- ALTiN+ coating extends tool life
- Meets the requirements of SAEJ514

K	D	E	F	R	J	Q	L	S	OAL	FLUTES	TUBE	THREAD	SAE#	ORDER #	
														UNCOATED	ALTiN+
12°	0.3605	0.082	0.682	0.271	0.479	0.032	1.75	0.500	3.00	3	0.125	0.3125-24 UNF-2B	SAE#2	MS16142-2R	MS16142-2RA
12°	0.4235	0.082	0.760	0.333	0.479	0.040	1.75	0.500	3.00	3	0.188	0.3750-24 UNF-2B	SAE#3	MS16142-3R	MS16142-3RA
12°	0.4895	0.101	0.838	0.388	0.558	0.045	1.88	0.500	3.12	3	0.250	0.4375-20 UNF-2B	SAE#4	MS16142-4R	MS16142-4RA
12°	0.5525	0.101	0.916	0.450	0.558	0.045	1.88	0.500	3.12	4	0.312	0.5000-20 UNF-2B	SAE#5	MS16142-5R	MS16142-5RA
12°	0.6185	0.105	0.979	0.507	0.620	0.055	1.88	0.500	3.38	4	0.375	0.5625-18 UNF-2B	SAE#6	MS16142-6R	MS16142-6RA
15°	0.8135	0.108	1.198	0.688	0.699	0.070	2.12	0.750	3.70	4	0.500	0.7500-16 UNF-2B	SAE#8	MS16142-8R	MS16142-8RA
15°	0.9445	0.108	1.354	0.804	0.792	0.080	2.12	0.750	3.80	4	0.625	0.8750-14 UNF-2B	SAE#10	MS16142-10R	MS16142-10RA
15°	1.1505	0.138	1.635	0.979	0.917	0.080	2.12	0.750	3.94	4	0.750	1.0625-12 UN-2B	SAE#12	MS16142-12R	MS16142-12RA
15°	1.2755	0.138	1.775	1.104	0.917	0.090	2.25	1.000	4.21	4	0.875	1.1875-12 UN-2B	SAE#14	MS16142-14R	MS16142-14RA
15°	1.4005	0.138	1.920	1.229	0.917	0.090	2.25	1.000	4.25	4	1.000	1.3125-12 UN-2B	SAE#16	MS16142-16R	MS16142-16RA
15°	1.7155	0.140	2.280	1.542	0.917	0.095	2.25	1.000	4.35	4	1.250	1.6250-12 UN-2B	SAE#20	MS16142-20R	MS16142-20RA
15°	1.9645	0.140	2.570	1.792	0.917	0.095	2.25	1.000	4.54	4	1.500	1.8750-12 UN-2B	SAE#24	MS16142-24R	MS16142-24RA
15°	2.5895	0.140	3.490	2.417	0.917	0.095	2.50	1.250	5.15	4	2.000	2.5000-12 UN-2B	SAE#32	MS16142-32R	MS16142-32RA

Thread mills available. See pages 9-19.

MS16142 (SAEJ1926-1) (SAEJ514) O-RING BOSS REAMER PILOT - CARBIDE TIPPED
COOLANT THROUGH





- Reams minor-thread diameter to size
- Often called ORB (followed by port size number)
- Meets the requirements of SAEJ1926-1
- Precision ground for maximum concentricity
- ALTiN+ coating extends tool life
- Meets the requirements of SAEJ514

K	D	E	F	R	J	Q	L	S	OAL	FLUTES	TUBE	THREAD	SAE#	ORDER #	
														UNCOATED	ALTiN+
12°	0.3605	0.082	0.682	0.271	0.479	0.032	1.75	0.500	3.00	3	0.125	0.3125-24 UNF-2B	SAE#2	MS16142-2R-X3	MS16142-2R-X3A
12°	0.4235	0.082	0.760	0.333	0.479	0.040	1.75	0.500	3.00	3	0.188	0.3750-24 UNF-2B	SAE#3	MS16142-3R-X3	MS16142-3R-X3A
12°	0.4895	0.101	0.838	0.388	0.558	0.045	1.88	0.500	3.12	3	0.250	0.4375-20 UNF-2B	SAE#4	MS16142-4R-X3	MS16142-4R-X3A
12°	0.5525	0.101	0.916	0.450	0.558	0.045	1.88	0.500	3.12	3	0.312	0.5000-20 UNF-2B	SAE#5	MS16142-5R-X3	MS16142-5R-X3A
12°	0.6185	0.105	0.979	0.507	0.620	0.055	1.88	0.500	3.38	3	0.375	0.5625-18 UNF-2B	SAE#6	MS16142-6R-X3	MS16142-6R-X3A
15°	0.8135	0.108	1.198	0.688	0.699	0.070	2.12	0.750	3.70	5	0.500	0.7500-16 UNF-2B	SAE#8	MS16142-8R-X5	MS16142-8R-X5A
15°	0.9445	0.108	1.354	0.804	0.792	0.080	2.12	0.750	3.80	5	0.625	0.8750-14 UNF-2B	SAE#10	MS16142-10R-X5	MS16142-10R-X5A
15°	1.1505	0.138	1.635	0.979	0.917	0.080	2.12	0.750	3.94	5	0.750	1.0625-12 UN-2B	SAE#12	MS16142-12R-X5	MS16142-12R-X5A
15°	1.2755	0.138	1.775	1.104	0.917	0.090	2.25	1.000	4.21	5	0.875	1.1875-12 UN-2B	SAE#14	MS16142-14R-X5	MS16142-14R-X5A
15°	1.4005	0.138	1.920	1.229	0.917	0.090	2.25	1.000	4.25	5	1.000	1.3125-12 UN-2B	SAE#16	MS16142-16R-X5	MS16142-16R-X5A

Thread mills available. See pages 9-19.

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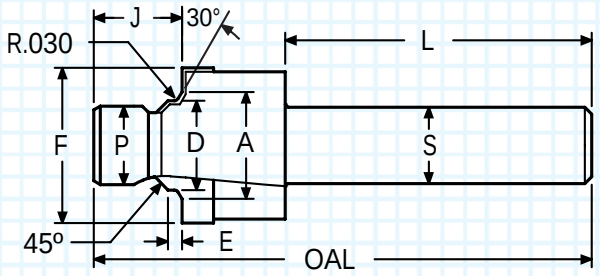
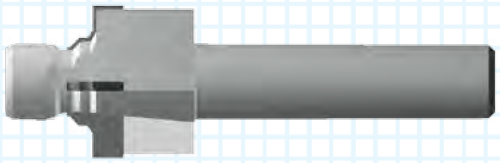
MS33649 (AS5202) - SOLID PILOT PORT TOOL CARBIDE TIPPED



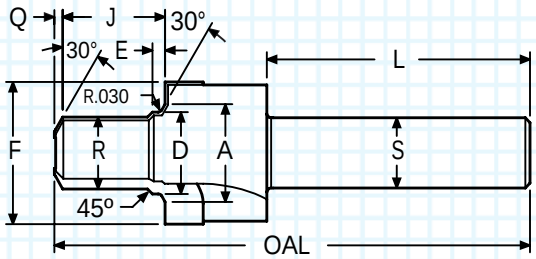


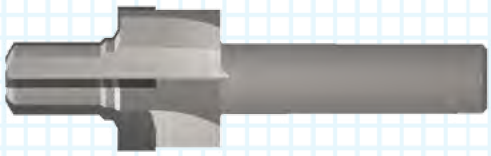
- Ideal for non-standard minor diameter lengths
- Polished flute face for optimum performance
- ALTiN+ coating for improved surface finish
- This port requires a UNJ thread which will specify a larger minor-thread diameter

A	D	E	F	J	P	L	S	OAL	FLUTES	TUBE	THREAD	ORDER #	
												UNCOATED	ALTiN+
0.367	0.2665	0.071	0.575	0.345	0.217	2.00	0.500	3.00	3	N/A	0.2500-28 UNJF-3B	MS33649-1S	MS33649-1SA
0.446	0.3305	0.071	0.742	0.365	0.274	2.00	0.500	3.00	3	0.125	0.3125-24 UNJF-3B	MS33649-2S	MS33649-2SA
0.508	0.3925	0.071	0.805	0.415	0.337	2.00	0.500	3.00	3	0.188	0.3750-24 UNJF-3B	MS33649-3S	MS33649-3SA
0.570	0.4565	0.083	0.888	0.445	0.392	2.00	0.500	3.12	4	0.250	0.4375-20 UNJF-3B	MS33649-4S	MS33649-4SA
0.633	0.5195	0.083	0.950	0.465	0.454	2.00	0.500	3.12	4	0.312	0.5000-20 UNJF-3B	MS33649-5S	MS33649-5SA
0.696	0.5825	0.091	1.012	0.495	0.511	2.00	0.500	3.25	4	0.375	0.5625-18 UNJF-3B	MS33649-6S	MS33649-6SA
0.758	0.6455	0.102	1.105	0.495	0.574	2.00	0.500	3.25	4	0.438	0.6250-18 UNJF-3B	MS33649-7S	MS33649-7SA
0.883	0.7715	0.102	1.240	0.560	0.692	2.12	0.750	3.57	4	0.500	0.7500-16 UNJF-3B	MS33649-8S	MS33649-8SA
0.946	0.8345	0.115	1.300	0.590	0.755	2.12	0.750	3.61	4	0.562	0.8125-16 UNJ-3B	MS33649-9S	MS33649-9SA
1.008	0.8985	0.115	1.415	0.610	0.809	2.12	0.750	3.66	4	0.625	0.8750-14 UNJF-3B	MS33649-10S	MS33649-10SA
1.164	1.0255	0.133	1.602	0.640	0.923	2.12	0.750	3.75	4	0.688	1.0000-12 UNJF-3B	MS33649-11S	MS33649-11SA
1.242	1.0885	0.133	1.665	0.640	0.983	2.12	0.750	3.75	4	0.750	1.0625-12 UNJ-3B	MS33649-12S	MS33649-12SA
1.370	1.2135	0.133	1.790	0.710	1.110	2.25	1.000	4.00	4	0.875	1.1875-12 UNJ-3B	MS33649-14S	MS33649-14SA
1.495	1.3385	0.133	1.965	0.710	1.233	2.25	1.000	4.05	4	1.000	1.3125-12 UNJ-3B	MS33649-16S	MS33649-16SA
1.808	1.6505	0.133	2.310	0.750	1.547	2.25	1.000	4.20	4	1.250	1.6250-12 UNJ-3B	MS33649-20S	MS33649-20SA
2.058	1.9005	0.133	2.628	0.750	1.797	2.25	1.000	4.20	4	1.500	1.8750-12 UNJ-3B	MS33649-24S	MS33649-24SA
2.433	2.2755	0.133	3.050	0.800	2.172	2.25	1.250	4.50	4	1.750	2.2500-12 UNJ-3B	MS33649-28S	MS33649-28SA
2.683	2.5265	0.133	3.520	0.800	2.422	2.50	1.250	4.60	4	2.000	2.5000-12 UNJ-3B	MS33649-32S	MS33649-32SA

Thread mills available. See pages 9-19.

MS33649 (AS5202) - REAMER PILOT PORT TOOL CARBIDE TIPPED





- Reams minor-thread diameter to size
- Precision ground for maximum concentricity
- ALTiN+ coated tool for higher cutting speed
- This port requires a UNJ thread which specifies a larger minor-thread diameter

A	D	E	F	J	Q	R	L	S	OAL	FLUTES	TUBE	THREAD	ORDER #	
													UNCOATED	ALTiN+
0.367	0.2665	0.071	0.575	0.425	0.025	0.219	2.00	0.500	3.00	3	N/A	0.2500-28 UNJF-3B	Solid Carbide	
													MS33649-1R	MS33649-1RA
0.446	0.3305	0.071	0.742	0.597	0.032	0.276	1.75	0.500	3.00	3	0.125	0.3125-24 UNJF-3B	Carbide Tipped	
													MS33649-2R	MS33649-2RA
0.508	0.3925	0.071	0.805	0.603	0.040	0.339	1.75	0.500	3.00	3	0.188	0.3750-24 UNJF-3B	MS33649-3R	MS33649-3RA
0.570	0.4565	0.083	0.888	0.676	0.040	0.393	1.88	0.500	3.12	4	0.250	0.4375-20 UNJF-3B	MS33649-4R	MS33649-4RA
0.633	0.5195	0.083	0.950	0.676	0.045	0.455	1.88	0.500	3.12	4	0.312	0.5000-20 UNJF-3B	MS33649-5R	MS33649-5RA
0.696	0.5825	0.091	1.012	0.729	0.060	0.513	1.88	0.500	3.38	4	0.375	0.5625-18 UNJF-3B	MS33649-6R	MS33649-6RA
0.758	0.6455	0.102	1.105	0.745	0.060	0.575	1.88	0.500	3.38	4	0.438	0.6250-18 UNJF-3B	MS33649-7R	MS33649-7RA
0.883	0.7715	0.102	1.240	0.854	0.070	0.693	2.12	0.750	3.84	4	0.500	0.7500-16 UNJF-3B	MS33649-8R	MS33649-8RA
0.946	0.8345	0.115	1.300	0.870	0.070	0.758	2.12	0.750	3.84	4	0.562	0.8125-16 UNJ-3B	MS33649-9R	MS33649-9RA
1.008	0.8985	0.115	1.415	0.950	0.080	0.810	2.12	0.750	3.94	4	0.625	0.8750-14 UNJF-3B	MS33649-10R	MS33649-10RA
1.164	1.0255	0.133	1.500	1.084	0.080	0.925	2.12	0.750	4.12	4	0.688	1.0000-12 UNJF-3B	MS33649-11R	MS33649-11RA
1.242	1.0885	0.133	1.665	1.084	0.080	0.985	2.12	0.750	4.12	4	0.750	1.0625-12 UNJ-3B	MS33649-12R	MS33649-12RA
1.370	1.2135	0.133	1.790	1.084	0.090	1.112	2.25	1.000	4.37	4	0.875	1.1875-12 UNJ-3B	MS33649-14R	MS33649-14RA
1.495	1.3385	0.133	1.965	1.084	0.090	1.235	2.25	1.000	4.37	4	1.000	1.3125-12 UNJ-3B	MS33649-16R	MS33649-16RA
1.683	1.5265	0.133	2.090	1.136	0.090	1.425	2.25	1.000	4.53	4	1.125	1.5000-12 UNJF-3B	MS33649-18R	MS33649-18RA
1.808	1.6505	0.133	2.310	1.136	0.090	1.549	2.25	1.000	4.54	4	1.250	1.6250-12 UNJ-3B	MS33649-20R	MS33649-20RA
2.058	1.9005	0.133	2.628	1.147	0.095	1.799	2.25	1.000	4.54	4	1.500	1.8750-12 UNJ-3B	MS33649-24R	MS33649-24RA
2.433	2.2755	0.133	3.050	1.263	0.095	2.174	2.50	1.250	4.92	4	1.750	2.2500-12 UNJ-3B	MS33649-28R	MS33649-28RA
2.683	2.5265	0.133	3.520	1.388	0.095	2.424	2.50	1.250	5.15	4	2.000	2.5000-12 UNJ-3B	MS33649-32R	MS33649-32RA

Thread mills available. See pages 9-19.

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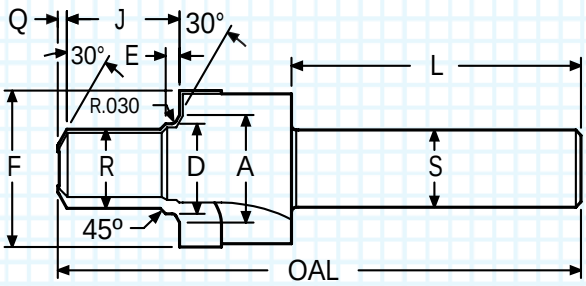
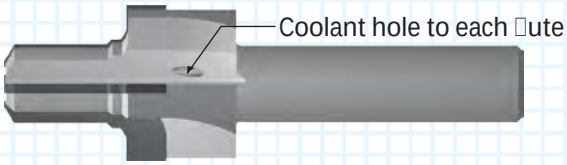
MS33649 (AS5202) - REAMER PILOT PORT TOOL COOLANT THROUGH - CARBIDE TIPPED



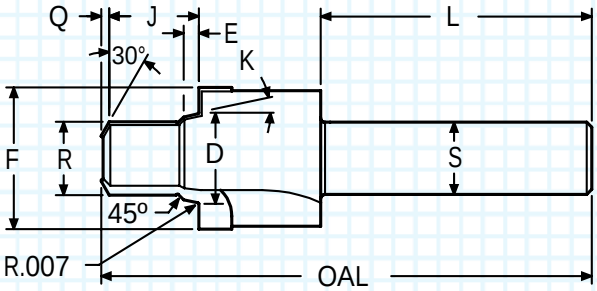


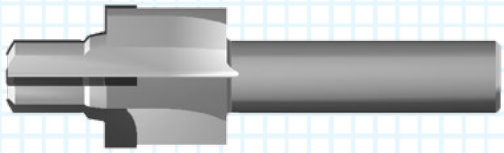
- Reams minor-thread diameter to size
- Precision ground for maximum concentricity
- ALTiN+ coated tool for higher cutting speed
- This port requires a UNJ thread which specifies a larger minor-thread diameter

A	D	E	F	J	Q	R	L	S	OAL	FLUTES	TUBE	THREAD	ORDER #	
													UNCOATED	ALTiN+
0.446	0.3305	0.071	0.742	0.597	0.032	0.276	1.75	0.500	3.00	3	0.125	0.3125-24 UNJF-3B	MS33649-2R-X3	MS33649-2R-X3A
0.508	0.3925	0.071	0.805	0.603	0.040	0.339	1.75	0.500	3.00	3	0.188	0.3750-24 UNJF-3B	MS33649-3R-X3	MS33649-3R-X3A
0.570	0.4565	0.083	0.888	0.676	0.040	0.393	1.88	0.500	3.12	3	0.250	0.4375-20 UNJF-3B	MS33649-4R-X3	MS33649-4R-X3A
0.633	0.5195	0.083	0.950	0.676	0.045	0.455	1.88	0.500	3.12	3	0.312	0.5000-20 UNJF-3B	MS33649-5R-X3	MS33649-5R-X3A
0.696	0.5825	0.091	1.012	0.729	0.060	0.513	1.88	0.500	3.38	3	0.375	0.5625-18 UNJF-3B	MS33649-6R-X3	MS33649-6R-X3A
0.883	0.7715	0.102	1.240	0.854	0.070	0.693	2.12	0.750	3.84	5	0.500	0.7500-16 UNJF-3B	MS33649-8R-X5	MS33649-8R-X5A
1.008	0.8985	0.115	1.415	0.950	0.080	0.810	2.12	0.750	3.94	5	0.625	0.8750-14 UNJF-3B	MS33649-10R-X5	MS33649-10R-X5A
1.242	1.0885	0.133	1.665	1.084	0.080	0.985	2.12	0.750	4.12	5	0.750	1.0625-12 UNJ-3B	MS33649-12R-X5	MS33649-12R-X5A
1.370	1.2135	0.133	1.790	1.084	0.090	1.112	2.25	1.000	4.37	5	0.875	1.1875-12 UNJ-3B	MS33649-14R-X5	MS33649-14R-X5A
1.495	1.3385	0.133	1.965	1.084	0.090	1.235	2.25	1.000	4.37	5	1.000	1.3125-12 UNJ-3B	MS33649-16R-X5	MS33649-16R-X5A

Thread mills available. See pages 9-19.

IS06149-1 (SAEJ2244-1) METRIC PORT TOOL CARBIDE TIPPED





- Bodies are made with heat treated alloy steel
- Carbide inserts are made with premium submicron carbide
- Polished flute face for optimum performance
- ALTiN+ coated for improved surface finish

K (deg)	D (mm)	E (mm)	F (mm)	R (mm)	J (mm)	Q (inch)	L (inch)	S (inch)	OAL (inch)	FLUTES	THREAD	ORDER #	
												UNCOATED	ALTiN+
12°	9.15	1.8	14.1	7.0	11.6	0.032	1.75	0.500	3.00	3	M8X1	6149-M8X1	6149-M8X1A
12°	11.15	1.8	16.1	9.0	11.6	0.045	1.75	0.500	3.00	3	M10X1	6149-M10X1	6149-M10X1A
15°	13.85	2.6	19.1	10.5	14.1	0.045	1.88	0.500	3.12	3	M12X1.5	6149-M12X1.5	6149-M12X1.5A
15°	15.85	2.6	21.1	12.5	14.1	0.055	1.88	0.500	3.38	4	M14X1.5	6149-M14X1.5	6149-M14X1.5A
15°	17.85	2.6	24.1	14.5	15.6	0.060	1.88	0.500	3.38	4	M16X1.5	6149-M16X1.5	6149-M16X1.5A
15°	19.85	2.6	26.1	16.5	17.1	0.070	2.12	0.750	3.70	4	M18X1.5	6149-M18X1.5	6149-M18X1.5A
15°	21.85	2.6	27.1	18.5	17.5	0.080	2.12	0.750	3.75	4	M20X1.5	6149-M20X1.5	6149-M20X1.5A
15°	23.85	2.6	29.1	20.5	18.1	0.080	2.12	0.750	3.80	4	M22X1.5	6149-M22X1.5	6149-M22X1.5A
15°	29.45	3.3	34.2	25.0	22.1	0.080	2.12	0.750	3.94	4	M27X2.0	6149-M27X2.0	6149-M27X2.0A
15°	35.45	3.3	43.1	31.0	22.1	0.090	2.25	1.000	4.25	4	M33X2.0	6149-M33X2.0	6149-M33X2.0A
15°	44.45	3.3	52.1	40.0	22.6	0.090	2.25	1.000	4.35	4	M42X2.0	6149-M42X2.0	6149-M42X2.0A
15°	50.45	3.3	57.1	46.0	25.1	0.095	2.25	1.000	4.35	4	M48X2.0	6149-M48X2.0	6149-M48X2.0A
15°	62.45	3.3	67.1	58.0	27.6	0.095	2.25	1.250	4.35	4	M60X2.0	6149-M60X2.0	6149-M60X2.0A

Thread mills available. See pages 25-31.

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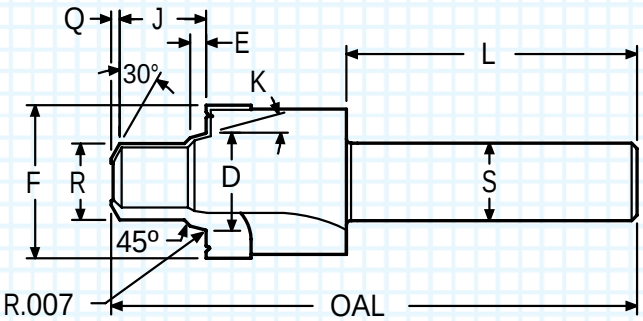
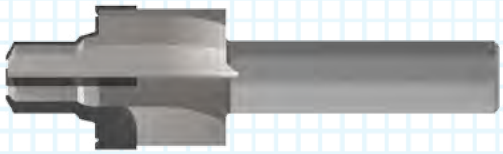
ISO6149-1 (SAEJ2244-1) METRIC PORT TOOL WITH ID NOTCH - CARBIDE TIPPED



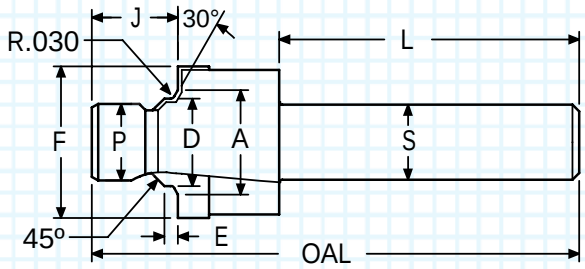


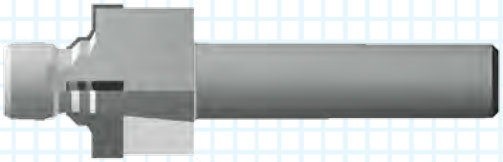
- Metric port with identification notch
- Precision ground for maximum concentricity
- Polished flute face for optimum performance
- ALTiN+ coating extends tool life

K (deg)	D (mm)	E (mm)	F (mm)	R (mm)	J (mm)	Q (inch)	L (inch)	S (inch)	OAL (inch)	FLUTES	THREAD	ORDER #	
												UNCOATED	ALTiN+
12°	9.15	1.8	17.1	7.0	11.6	0.032	1.75	0.500	3.00	3	M8X1	6149-M8X1-ID	6149-M8X1-IDA
12°	11.15	1.8	20.1	9.0	11.6	0.045	1.75	0.500	3.00	3	M10X1	6149-M10X1-ID	6149-M10X1-IDA
15°	13.85	2.6	23.1	10.5	14.1	0.045	1.88	0.500	3.12	3	M12X1.5	6149-M12X1.5-ID	6149-M12X1.5-IDA
15°	15.85	2.6	25.1	12.5	14.1	0.055	1.88	0.500	3.38	4	M14X1.5	6149-M14X1.5-ID	6149-M14X1.5-IDA
15°	17.85	2.6	28.1	14.5	15.6	0.060	1.88	0.500	3.38	4	M16X1.5	6149-M16X1.5-ID	6149-M16X1.5-IDA
15°	19.85	2.6	30.1	16.5	17.1	0.070	2.12	0.750	3.70	4	M18X1.5	6149-M18X1.5-ID	6149-M18X1.5-IDA
15°	21.85	2.6	32.1	18.5	17.5	0.080	2.12	0.750	3.75	4	M20X1.5	6149-M20X1.5-ID	6149-M20X1.5-IDA
15°	23.85	2.6	34.1	20.5	18.1	0.080	2.12	0.750	3.80	4	M22X1.5	6149-M22X1.5-ID	6149-M22X1.5-IDA
15°	29.45	3.3	40.1	25.0	22.1	0.080	2.12	0.750	3.94	4	M27X2.0	6149-M27X2.0-ID	6149-M27X2.0-IDA
15°	35.45	3.3	49.1	31.0	22.1	0.090	2.25	1.000	4.25	4	M33X2.0	6149-M33X2.0-ID	6149-M33X2.0-IDA
15°	44.45	3.3	60.1	40.0	22.6	0.090	2.25	1.000	4.35	4	M42X2.0	6149-M42X2.0-ID	6149-M42X2.0-IDA
15°	50.45	3.3	66.1	46.0	25.1	0.095	2.25	1.000	4.35	4	M48X2.0	6149-M48X2.0-ID	6149-M48X2.0-IDA
15°	62.45	3.3	76.1	58.0	27.6	0.095	2.25	1.250	4.35	4	M60X2.0	6149-M60X2.0-ID	6149-M60X2.0-IDA

Thread mills available. See pages 25-31.

AND10050 - SOLID PILOT PORT TOOL CARBIDE TIPPED





- Bodies made with heat treated alloy steel
- Ideal for non-standard minor-thread diameter lengths
- ALTiN+ coating for improved surface finish
- Carbide inserts made with premium submicron carbide

A	D	E	F	J	P	L	S	OAL	FLUTES	TUBE	THREAD	ORDER #	
												UNCOATED	ALTiN+
0.446	0.3305	0.071	0.742	0.365	0.270	2.00	0.500	3.00	3	0.125	0.3125-24 UNF-3B	AND10050-2S	AND10050-2SA
0.508	0.3925	0.071	0.805	0.415	0.331	2.00	0.500	3.00	3	0.188	0.3750-24 UNF-3B	AND10050-3S	AND10050-3SA
0.570	0.4565	0.083	0.888	0.445	0.385	2.00	0.500	3.12	4	0.250	0.4375-20 UNF-3B	AND10050-4S	AND10050-4SA
0.633	0.5195	0.083	0.950	0.465	0.448	2.00	0.500	3.12	4	0.312	0.5000-20 UNF-3B	AND10050-5S	AND10050-5SA
0.696	0.5825	0.091	1.012	0.495	0.504	2.00	0.500	3.25	4	0.375	0.5625-18 UNF-3B	AND10050-6S	AND10050-6SA
0.883	0.7715	0.102	1.240	0.560	0.685	2.12	0.750	3.57	4	0.500	0.7500-16 UNF-3B	AND10050-8S	AND10050-8SA
1.008	0.8985	0.115	1.415	0.590	0.801	2.12	0.750	3.66	4	0.625	0.8750-14 UNF-3B	AND10050-10S	AND10050-10SA
1.242	1.0885	0.133	1.665	0.640	0.975	2.12	0.750	3.75	4	0.750	1.0625-12 UN-3B	AND10050-12S	AND10050-12SA
1.495	1.3385	0.133	1.965	0.710	1.225	2.25	1.000	4.05	4	1.000	1.3125-12 UN-3B	AND10050-16S	AND10050-16SA
1.808	1.6505	0.133	2.310	0.750	1.537	2.25	1.000	4.20	4	1.250	1.6250-12 UN-3B	AND10050-20S	AND10050-20SA
2.058	1.9005	0.133	2.628	0.750	1.787	2.25	1.000	4.20	4	1.500	1.8750-12 UN-3B	AND10050-24S	AND10050-24SA
2.433	2.2755	0.133	3.050	0.800	2.162	2.50	1.250	4.50	4	1.750	2.2500-12 UN-3B	AND10050-28S	AND10050-28SA
2.683	2.5265	0.133	3.520	0.800	2.412	2.50	1.250	4.60	4	2.000	2.5000-12 UN-3B	AND10050-32S	AND10050-32SA

Thread mills available. See pages 9-19.

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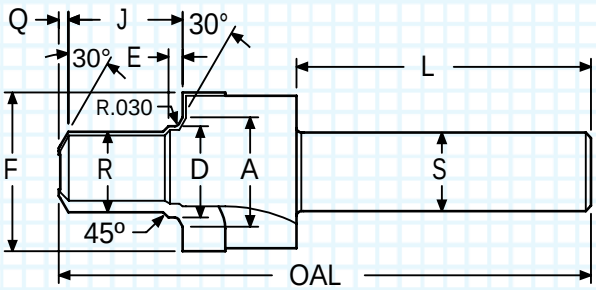
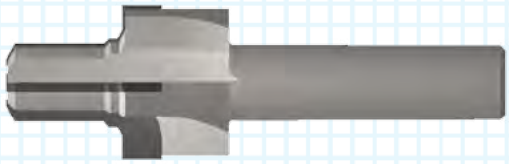
AND10050 - REAMER PILOT PORT TOOL CARBIDE TIPPED



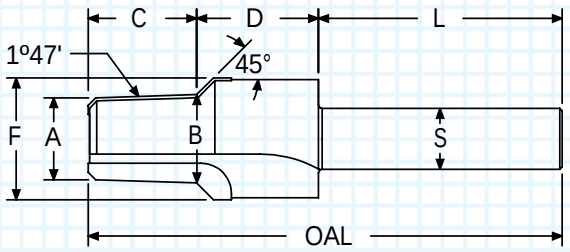


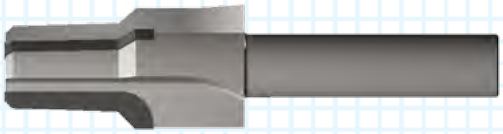
- Reams the minor-thread diameter to size
- Bodies made with heat treated alloy steel
- Bodies made with head treated alloy steel
- ALTiN+ coating extends tool life

A	D	E	F	J	R	Q	L	S	OAL	FLUTES	TUBE	THREAD	ORDER #	
													UNCOATED	ALTiN+
0.446	0.3305	0.071	0.742	0.520	0.271	0.032	1.75	0.500	3.00	3	0.125	0.3125-24 UNF-3B	AND10050-2R	AND10050-2RA
0.508	0.3925	0.071	0.805	0.520	0.333	0.040	1.75	0.500	3.00	3	0.188	0.3750-24 UNF-3B	AND10050-3R	AND10050-3RA
0.570	0.4565	0.083	0.888	0.610	0.386	0.045	1.88	0.500	3.12	4	0.250	0.4375-20 UNF-3B	AND10050-4R	AND10050-4RA
0.633	0.5195	0.083	0.950	0.610	0.449	0.045	1.88	0.500	3.12	4	0.312	0.5000-20 UNF-3B	AND10050-5R	AND10050-5RA
0.696	0.5825	0.091	1.012	0.630	0.506	0.060	1.88	0.500	3.38	4	0.375	0.5625-18 UNF-3B	AND10050-6R	AND10050-6RA
0.883	0.7715	0.102	1.240	0.738	0.686	0.070	2.12	0.750	3.70	4	0.500	0.7500-16 UNF-3B	AND10050-8R	AND10050-8RA
1.008	0.8985	0.115	1.415	0.801	0.802	0.080	2.12	0.750	3.80	4	0.625	0.8750-14 UNF-3B	AND10050-10R	AND10050-10RA
1.242	1.0885	0.133	1.665	0.926	0.976	0.080	2.12	0.750	3.94	4	0.750	1.0625-12 UN-3B	AND10050-12R	AND10050-12RA
1.495	1.3385	0.133	1.965	0.958	1.226	0.080	2.25	1.000	4.25	4	1.000	1.3125-12 UN-3B	AND10050-16R	AND10050-16RA
1.808	1.6505	0.133	2.310	1.004	1.538	0.090	2.25	1.000	4.35	4	1.250	1.6250-12 UN-3B	AND10050-20R	AND10050-20RA
2.058	1.9005	0.133	2.628	1.145	1.788	0.095	2.25	1.000	4.54	4	1.500	1.8750-12 UN-3B	AND10050-24R	AND10050-24RA
2.433	2.2755	0.133	3.050	1.260	2.163	0.095	2.50	1.250	4.92	4	1.750	2.2500-12 UN-3B	AND10050-28R	AND10050-28RA
2.683	2.5265	0.133	3.520	1.395	2.413	0.095	2.50	1.250	5.15	4	2.000	2.5000-12 UN-3B	AND10050-32R	AND10050-32RA

Thread mills available. See pages 9-19.

TAPERED PIPE REAMERS (NPT) - CARBIDE TIPPED





- Reams minor thread diameter on a taper
- Cuts 45° chamfer for easy threading
- ALTiN+ coating for higher cutting speed
- Carbide inserts made with premium submicron carbide

A	B	C	D	F	L	S	OAL	FLUTES	THREAD	ORDER #	
										UNCOATED	ALTiN+
0.318	0.347	0.467	0.625	0.625	1.50	0.500	2.60	3	1/8-27NPT	PRSS-01	PRSS-01A
0.409	0.450	0.655	0.750	0.750	1.50	0.500	2.91	3	1/4-18NPT	PRSS-02	PRSS-02A
0.543	0.586	0.687	0.750	0.875	2.00	0.500	3.44	3	3/8-18NPT	PRSS-03	PRSS-03A
0.670	0.725	0.875	1.000	1.000	2.00	0.500	3.88	3	1/2-14NPT	PRSS-04	PRSS-04A
0.882	0.937	0.875	1.250	1.250	2.50	1.000	4.62	5	3/4-14NPT	PRSS-05	PRSS-05A
1.107	1.173	1.060	1.500	1.500	2.50	1.000	5.06	5	1-11.5NPT	PRSS-06	PRSS-06A
1.448	1.518	1.125	1.500	1.875	3.00	1.250	5.62	5	1¼-11.5NPT	PRSS-07	PRSS-07A
1.687	1.757	1.125	1.750	2.125	3.00	1.250	5.88	5	1½-11.5NPT	PRSS-08	PRSS-08A
2.154	2.230	1.220	2.000	2.625	3.00	1.250	6.22	5	2-11.5NPT	PRSS-09	PRSS-09A
2.561	2.670	1.750	2.000	3.125	3.00	1.250	6.75	5	2½-8NPT	PRSS-10	PRSS-10A
3.180	3.296	1.875	2.000	3.750	3.00	1.250	6.88	5	3-8NPT	PRSS-11	PRSS-11A

Thread mills available. See pages 20-22.

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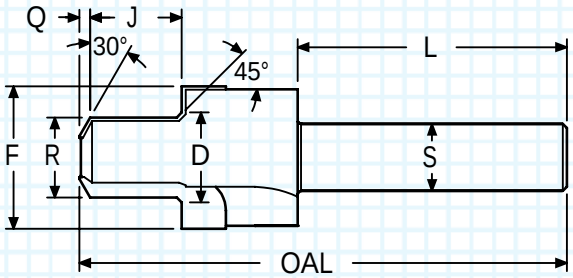
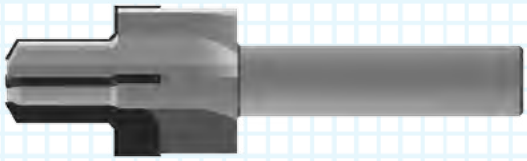
BRITISH STANDARD PARALLEL PIPE - PORT TOOL CARBIDE TIPPED



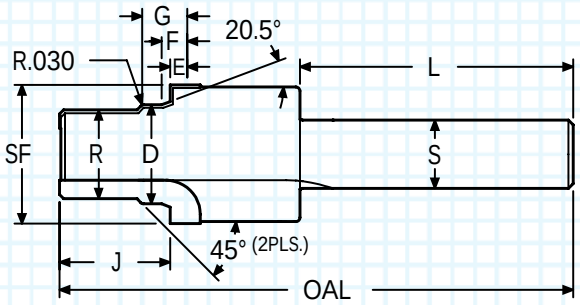


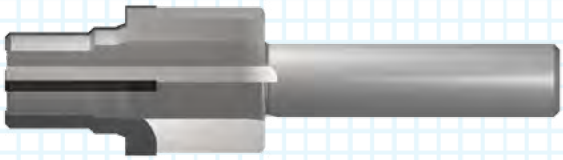
- Meets the requirements of the ISO/BS2779
- Precision ground for maximum concentricity
- Polished flute face for optimum performance
- Bodies made with head treated alloy steel

D	F	J	R	Q	L	S	OAL	FLUTES	THREAD	ORDER #	
										UNCOATED	ALTiN+
0.398	0.719	0.565	0.345	0.045	2.00	0.500	3.62	3	1/8 BSPP	PT-BSPP-1/8	PT-BSPP-1/8A
0.533	0.938	0.683	0.459	0.065	2.00	0.500	3.62	3	1/4 BSPP	PT-BSPP-1/4	PT-BSPP-1/4A
0.671	1.063	0.683	0.597	0.080	2.00	0.500	3.62	4	3/8 BSPP	PT-BSPP-3/8	PT-BSPP-3/8A
0.840	1.250	0.801	0.741	0.090	2.00	0.750	3.62	4	1/2 BSPP	PT-BSPP-1/2	PT-BSPP-1/2A
1.055	1.500	0.880	0.958	0.120	2.50	0.750	4.37	4	3/4 BSPP	PT-BSPP-3/4	PT-BSPP-3/4A
1.325	1.875	0.998	1.201	0.120	2.50	1.000	4.62	4	1.0 BSPP	PT-BSPP-1.0	PT-BSPP-1.0A
1.665	2.313	1.078	1.541	0.125	2.50	1.000	4.62	4	1 ¼ BSPP	PT-BSPP-1-1/4	PT-BSPP-1-1/4A
1.897	2.563	1.078	1.774	0.125	2.50	1.000	4.88	4	1 ½ BSPP	PT-BSPP-1-1/2	PT-BSPP-1-1/2A

Thread mills available. See page 23.

RPT (AS1300) (PS10035) - ROSAN CAVITY PORT TOOL CARBIDE TIPPED





- Polished flute face for optimum performance
- Precision ground for maximum concentricity
- Bodies made with heat-treated alloy steel
- ALTiN+ coating extends tool life
- Meets requires of PS10035, AS1300, AS4201, and 6M152

D	E	F	G	J	R	SF	L	S	OAL	FLUTES	TUBE	THREAD	ORDER #	
													UNCOATED	ALTiN+
0.255	0.093	0.1555	0.2985	0.610	0.184	0.382	2.00	0.500	3.50	3	0.125	0.2160-28 UNJF-3B	Solid Carbide	
													RPT-2	RPT-2A
0.287	0.093	0.1555	0.2985	0.670	0.218	0.449	2.00	0.500	4.00	3	0.188	0.2500-28 UNJF-3B	RPT-3	RPT-3A
0.340	0.093	0.1555	0.2985	0.700	0.275	0.496	2.00	0.500	4.00	3	0.250	0.3125-24 UNJF-3B	RPT-4	RPT-4A
0.402	0.093	0.1555	0.2985	0.725	0.337	0.602	2.00	0.500	3.48	3	0.312	0.3750-24 UNJF-3B	Carbide Tipped	
													RPT-5	RPT-5A
0.465	0.108	0.1705	0.3135	0.785	0.392	0.676	2.00	0.500	3.53	4	0.375	0.4375-20 UNJF-3B	RPT-6	RPT-6A
0.583	0.108	0.1705	0.3135	0.850	0.511	0.785	2.00	0.500	3.85	4	0.500	0.5625-18 UNJF-3B	RPT-8	RPT-8A
0.726	0.108	0.1705	0.3135	0.810	0.650	1.016	2.00	0.500	3.81	4	0.625	0.6875-24 UNJEF-3B	RPT-10	RPT-10A
0.900	0.108	0.1705	0.3455	0.950	0.767	1.140	2.00	0.750	4.20	4	0.750	0.8125-20 UNJEF-3B	RPT-12	RPT-12A
1.163	0.108	0.1705	0.3455	1.015	1.073	1.428	2.00	0.750	4.26	4	1.000	1.1250-18 UNJEF-3B	RPT-16	RPT-16A
1.388	0.135	0.1975	0.3775	1.020	1.261	1.751	2.00	0.750	4.52	4	1.250	1.3125-18 UNJEF-3B	RPT-20	RPT-20A

Thread mills available. See pages 8-19.

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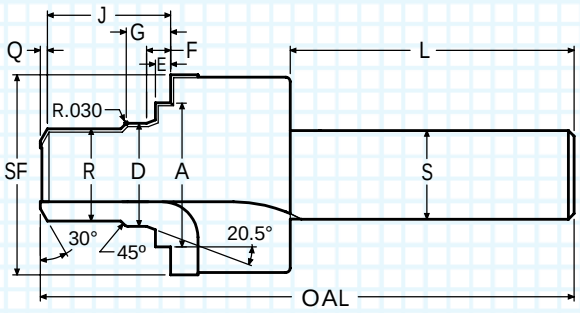
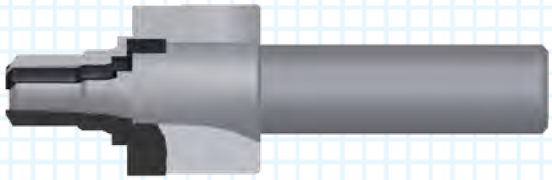
RFPT - ROSAN CAVITY PORT TOOL
CARBIDE TIPPED



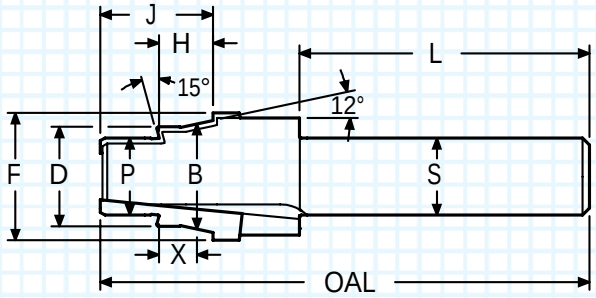


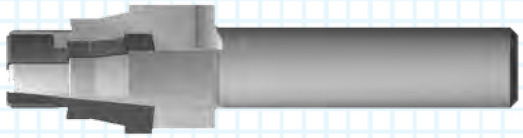
- Polished flute face for optimum performance
- Precision ground for maximum concentricity
- Bodies made with heat-treated alloy steel
- ALTiN+ coating extends tool life
- Meets requirements of PS10035, AS1300, AS4201, and 6M152

A	D	R	SF	E	F	G	J	Q	L	S	OAL	FLUTES	TUBE	THREAD	ORDER #	
															UNCOATED	ALTiN+
															Solid Carbide	
0.382	0.255	0.184	0.590	0.093	0.1555	0.2985	0.602	0.015	2.00	0.500	3.38	3	0.125	0.2160-28 UNJF-3B	RFPT-02	RFPT-02A
0.449	0.287	0.218	0.728	0.093	0.1555	0.2985	0.663	0.015	2.00	0.500	3.38	3	0.188	0.2500-28 UNJF-3B	RFPT-03	RFPT-03A
															Carbide Tipped	
0.469	0.340	0.275	0.797	0.093	0.1555	0.2985	0.678	0.025	2.00	0.500	3.50	3	0.250	0.3125-24 UNJF-3B	RFPT-04	RFPT-04
0.602	0.402	0.337	0.924	0.093	0.1555	0.2985	0.708	0.708	2.00	0.500	3.50	3	0.312	0.375-24 UNJF-3B	RFPT-05	RFPT-05A
0.676	0.465	0.392	0.995	0.108	0.1705	0.3135	0.734	0.050	2.00	0.500	3.50	3	0.375	0.4375-20 UNJF-3B	RFPT-06	RFPT-06A
0.785	0.583	0.511	1.211	0.108	0.1705	0.3135	0.798	0.050	2.00	0.500	3.50	3	0.500	0.5625-18 UNJF-3B	RFPT-08	RFPT-08A
1.016	0.726	0.650	1.355	0.108	0.1705	0.3135	0.828	0.060	2.00	0.750	3.85	4	0.625	0.6875-24 UNJEF-3B	RFPT-10	RFPT-10A
1.140	0.900	0.767	1.643	0.108	0.1705	0.3455	0.898	0.080	2.00	0.750	4.00	4	0.750	0.8125-20 UNJEF-3B	RFPT-12	RFPT-12A
1.312	1.031	0.892	1.780	0.108	0.1705	0.3455	0.935	0.090	2.25	1.000	4.25	4	0.875	0.9375-20 UNJEF-3B	RFPT-14	RFPT-14A
1.428	1.163	1.073	1.930	0.108	0.1705	0.3455	1.008	0.100	2.25	1.000	4.50	4	1.000	1.1250-18 UNJEF-3B	RFPT-16	RFPT-16A
1.751	1.388	1.261	2.298	0.135	0.1975	0.3775	1.040	0.120	2.25	1.000	4.50	4	1.250	1.3125-18 UNJEF-3B	RFPT-20	RFPT-20A
2.002	1.665	1.574	2.591	0.135	0.1975	0.3775	1.131	0.120	2.25	1.000	4.50	4	1.500	1.6250-18 UNJEF-3B	RFPT-24	RFPT-24A
2.518	2.203	2.064	3.500	0.135	0.2385	0.4185	1.338	0.120	2.50	1.250	5.00	4	2.000	2.1250-16 UNJ-3B	RFPT-32	RFPT-32A

Thread mills available. See pages 8-19.

MS33514 (AS33514) - PORT TOOL CARBIDE





- Meets the requirements of the MS33515
- ALTiN+ coating for higher cutting speed
- Precision ground for maximum contricity
- Polished flute face for optimum performance
- Meets the requirements of MS33515, AS33515, AS4375, NAS-1214, and NAS1215

B	D	F	H	J	P	X	L	S	OAL	FLUTES	TUBE	THREAD	ORDER #	
													UNCOATED	ALTiN+
0.163	0.137	0.300	0.188	0.380	0.091	0.128	2.00	0.375	3.00	3	0.125	0.3125-24 UNJF-3A	Solid Carbide	
													MS33514-2	MS33514-2A
0.234	0.198	0.375	0.234	0.460	0.123	0.158	2.00	0.375	3.00	3	0.188	0.3750-24 UNJF-3A	MS33514-3	MS33514-3A
0.293	0.263	0.415	0.234	0.460	0.185	0.174	2.00	0.500	3.00	3	0.250	0.4375-20 UNJF-3A	MS33514-4	MS33514-4A
0.356	0.326	0.475	0.250	0.480	0.232	0.190	2.00	0.500	3.00	3	0.312	0.5000-20 UNJF-3A	MS33514-5	MS33514-5A
0.416	0.388	0.530	0.250	0.480	0.295	0.193	2.00	0.500	3.00	3	0.375	0.5625-18 UNJF-3A	MS33514-6	MS33514-6A
0.560	0.516	0.690	0.305	0.675	0.420	0.210	1.88	0.500	3.00	3	0.500	0.7500-16 UNJF-3A	Carbide Tipped	
													MS33514-8	MS33514-8A
0.686	0.643	0.825	0.350	0.725	0.498	0.255	1.88	0.500	3.15	3	0.625	0.8750-14 UNJF-3A	MS33514-10	MS33514-10A
0.810	0.768	1.000	0.350	0.775	0.654	0.253	1.88	0.500	3.23	3	0.750	1.0625-12 UNJ-3A	MS33514-12	MS33514-12A
1.062	1.018	1.250	0.415	0.915	0.873	0.322	2.00	0.750	3.50	4	1.000	1.3125-12 UNJ-3A	MS33514-16	MS33514-16A
1.316	1.272	1.560	0.415	0.925	1.091	0.325	2.00	0.750	3.62	4	1.250	1.6250-12 UNJ-3A	MS33514-20	MS33514-20A
1.565	1.522	1.800	0.485	0.925	1.342	0.390	2.12	1.000	3.82	4	1.500	1.8750-12 UNJ-3A	MS33514-24	MS33514-24A
2.068	2.024	2.400	0.485	0.925	1.811	0.395	2.25	1.000	4.09	4	2.000	2.5000-12 UNJ-3A	MS33514-32	MS33514-32A

Thread mills available. See page 16.

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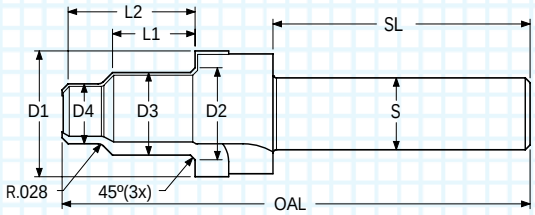
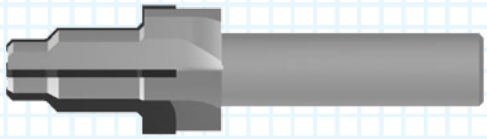
MS21921 - PORT TOOL - CARBIDE TIPPED



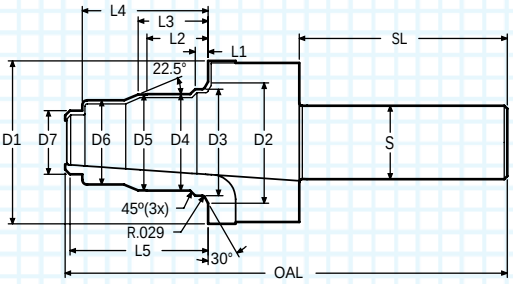


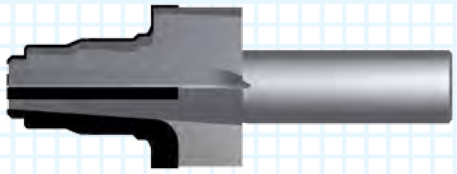
- ALTiN+ coating extends tool life
- Precision ground for maximum concentricity
- Polished flute face for optimum performance
- Bodies made with head treated alloy steel

D1	D2	D3	D4	L1	L2	S	SL	OAL	FLUTES	TUBE	THREAD	ORDER #	
												UNCOATED	ALTiN+
												Solid Carbide	
0.400	0.328	0.277	0.173	0.425	0.570	0.500	1.75	3.00	3	0.125	0.3125-24 UNJF-3B	MS21921-2	MS21921-2A
0.475	0.391	0.338	0.234	0.429	0.625	0.500	1.75	3.00	3	0.187	0.3750-24 UNJF-3B	MS21921-3	MS21921-3A
												Carbide Tipped	
0.600	0.460	0.393	0.393	0.547	0.760	0.500	1.75	3.25	3	0.250	0.4375-20 UNJF-3B	MS21921-4	MS21921-4A
0.675	0.520	0.455	0.368	0.562	0.800	0.500	1.75	3.25	3	0.312	0.5000-20 UNJF-3B	MS21921-5	MS21921-5A
0.750	0.582	0.513	0.427	0.578	0.840	0.625	1.75	3.25	4	0.375	0.5625-18 UNJF-3B	MS21921-6	MS21921-6A
0.900	0.770	0.693	0.554	0.609	0.900	0.625	1.75	3.50	4	0.500	0.7500-16 UNJF-3B	MS21921-8	MS21921-8A
1.050	0.895	0.810	0.692	0.687	1.020	0.750	2.00	3.75	4	0.625	0.8750-14 UNJF-3B	MS21921-10	MS21921-10A
1.300	1.082	0.987	0.828	0.687	1.040	0.750	2.13	4.00	4	0.750	1.0625-12 UNJF-3B	MS21921-12	MS21921-12A
1.550	1.332	1.236	1.076	0.687	1.090	1.000	2.25	4.25	4	1.000	1.3125-12 UNJF-3B	MS21921-16	MS21921-16A

Thread mills available. See pages 9-19.

BACD2036 - PORT TOOL - CARBIDE TIPPED





D1	D2	D3	D4	D5	D6	D7	L1	L2	L3	L4	L5	S	SL	OAL	TEETH	THREAD	ORDER #	
																	UNCOATED	ALTiN+
0.888	0.570	0.4565	0.392	0.387	0.2945	.170	.083	.425	.480	0.971	1.071	½	2.00	4.00	3	0.4375-20 UNJF-3B	BACD2036-4	BACD2036-4A
1.012	0.696	0.5825	0.512	0.507	0.4195	.280	.091	.450	.505	1.004	1.104	½	2.00	4.00	3	0.5625-18 UNJF-3B	BACD2036-6	BACD2036-6A
1.290	0.883	0.7715	0.693	0.688	0.6110	.400	.104	.545	.605	1.144	1.244	¾	2.13	4.25	4	0.7500-18 UNJF-3B	BACD2036-8	BACD2036-8A
1.415	1.008	0.8985	0.810	0.804	0.7330	.490	.115	.600	.665	1.215	1.340	¾	2.13	4.50	4	0.8750-14 UNJF-3B	BACD2036-10	BACD2036-10A
1.665	1.242	1.0885	0.985	0.980	0.8610	.650	.133	.625	.715	1.287	1.412	¾	2.13	4.50	4	1.0625-12 UNJF-3B	BACD2036-12	BACD2036-12A
1.965	1.495	1.3385	1.235	1.230	1.1140	.825	.133	.665	.755	1.392	1.517	1	2.13	4.50	4	1.3125-16 UNJF-3B	BACD2036-16	BACD2036-16A

Thread mills available. See pages 9-19.

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SCT

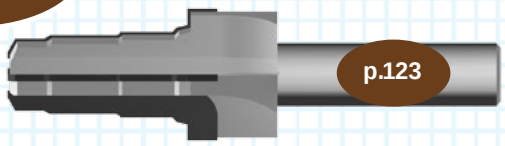
CAVITY TOOLS

Parker Common Cavity
Hydraforce Rougher
Hydraforce Finisher
Sun Cavity Rougher
Sun Cavity Finisher

CAVITY TOOLS - PRODUCT OVERVIEW

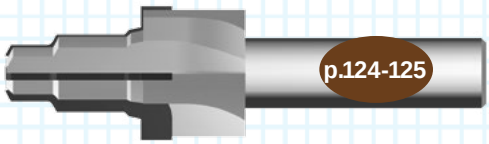
All Cavity Tools are ground between centers to ensure absolute concentricity. They are made from heat-treated alloy steel with brazed carbide inserts. They are designed to enlarge a pre-drilled hole and easily produce a complex form. Cavity Tools can be used for both lathe and mill applications. Technical information available on page 128.

New Product



Parker Common Cavity

Parker Common Cavity tools are carbide tipped and are stocked in both roughing and finishing versions.



Hydraforce

Hydraforce (VC) carbide tipped cavity tools are stocked in both roughing and finishing versions.

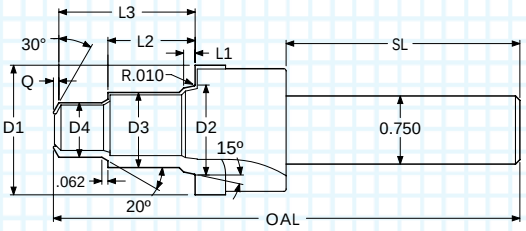
Sun Hydraulic

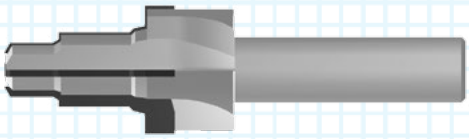
Sun Hydraulic cavity tools are stocked in both HSS roughing step drills and carbide tipped finishing versions.

CAVITY TOOL TECHNICAL INFORMATION PAGE 128

PARKER COMMON CAVITY TOOLS

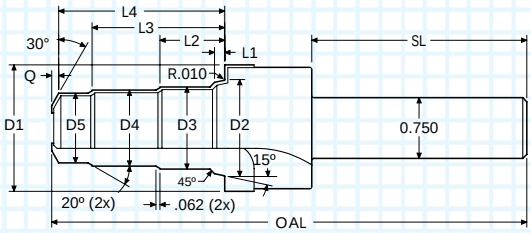
CARBIDE TIPPED

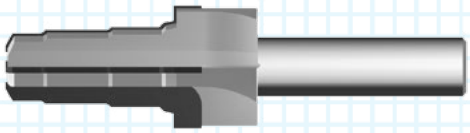




TWO WAY CAVITY

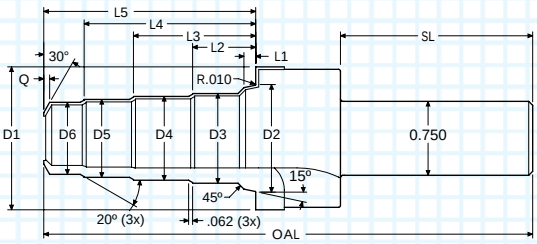
D1	D2	D3	D4	L1	L2	L3	Q	OAL	SL	ORDER #	
										UNCOATED	COATED
1.188	0.813	0.688	0.501	0.108	0.750	1.156	0.050	4.00	2.00	C08-2-FINISH	C08-2-FINISH-A
1.344	0.945	0.812	0.626	0.108	0.965	1.332	0.060	4.00	2.00	C10-2-FINISH	C10-2-FINISH-A
1.625	1.150	0.976	0.876	0.138	1.182	1.678	0.075	5.25	2.25	C12-2-FINISH	C12-2-FINISH-A
1.910	1.401	1.234	1.127	0.138	1.344	1.864	0.075	5.50	2.25	C16-2-FINISH	C16-2-FINISH-A

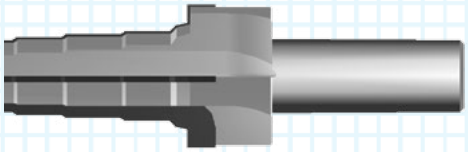




THREE WAY CAVITY

D1	D2	D3	D4	D5	L1	L2	L3	L4	Q	OAL	SL	ORDER #	
												UNCOATED	COATED
1.188	0.813	0.688	0.626	0.563	0.108	0.680	1.240	1.750	0.060	5.00	2.12	C08-3-FINISH	C08-3-FINISH-A
1.344	0.945	0.812	0.689	0.626	0.108	0.850	1.500	1.895	0.050	5.00	2.12	C10-3-FINISH	C10-3-FINISH-A
1.625	1.150	0.975	0.938	0.876	0.138	1.062	1.908	2.346	0.070	5.75	2.12	C12-3-FINISH	C12-3-FINISH-A
1.910	1.401	1.234	1.127	1.064	0.138	1.344	2.469	2.988	0.065	6.25	2.12	C16-3-FINISH	C16-3-FINISH-A



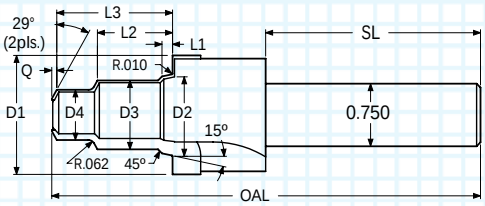


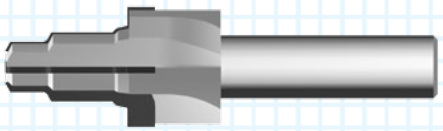
FOUR WAY CAVITY

D1	D2	D3	D4	D5	D6	L1	L2	L3	L4	L5	Q	OAL	SL	ORDER #	
														UNCOATED	COATED
1.188	0.813	0.688	0.626	0.563	0.501	.108	0.680	1.240	1.797	2.150	.050	5.50	2.12	C08-4-FINISH	C08-4-FINISH-A
1.344	0.945	0.812	0.751	0.689	0.626	.108	0.875	1.500	2.125	2.520	.055	5.50	2.12	C10-4-FINISH	C10-4-FINISH-A
1.625	1.150	0.975	0.938	0.876	0.814	.138	1.062	1.908	2.758	3.196	.070	7.00	2.25	C12-4-FINISH	C12-4-FINISH-A
1.910	1.401	1.234	1.127	1.064	1.002	.138	1.344	2.469	3.594	4.096	.070	7.25	2.25	C16-4-FINISH	C16-4-FINISH-A

HYDRAFORCE CARTRIDGE VALVE TOOLS

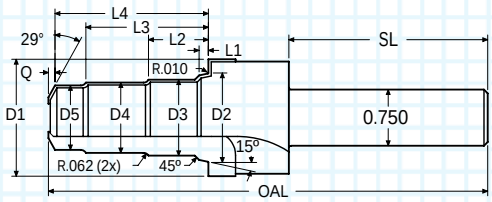
4 FLUTE ROUGHER - CARBIDE TIPPED

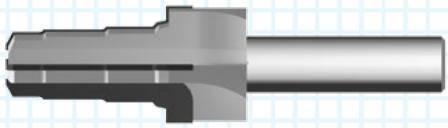




TWO WAY CAVITY

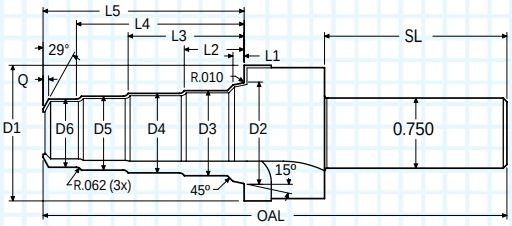
D1	D2	D3	D4	L1	L2	L3	Q	OAL	SL	ORDER #	
										UNCOATED	ALTiN+
1.163	0.788	0.663	0.476	0.108	0.750	1.156	0.045	4.00	2.00	VC08-2-ROUGH	VC08-2-ROUGH-A
1.163	0.920	0.787	0.601	0.108	0.932	1.312	0.060	4.00	2.00	VC10-2-ROUGH	VC10-2-ROUGH-A
1.475	1.125	0.952	0.851	0.138	1.400	1.920	0.075	5.25	2.25	VC12-2-ROUGH	VC12-2-ROUGH-A
1.725	1.376	1.209	1.102	0.138	1.344	1.844	0.075	5.50	2.25	VC16-2-ROUGH	VC16-2-ROUGH-A

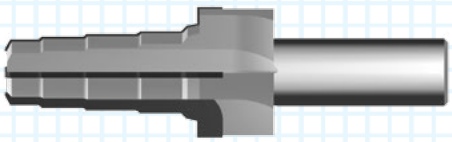




THREE WAY CAVITY

D1	D2	D3	D4	D5	L1	L2	L3	L4	Q	OAL	SL	ORDER #	
												UNCOATED	ALTiN+
1.163	0.788	0.663	0.601	0.538	0.108	0.718	1.270	1.703	0.060	5.00	2.12	VC08-3-ROUGH	VC08-3-ROUGH-A
1.163	0.920	0.787	0.664	0.601	0.108	0.860	1.500	1.875	0.050	5.00	2.12	VC10-3-ROUGH	VC10-3-ROUGH-A
1.475	1.125	0.950	0.913	0.851	0.138	1.400	2.370	2.890	0.070	6.25	2.12	VC12-3-ROUGH	VC12-3-ROUGH-A
1.725	1.376	1.209	1.102	1.039	0.138	1.344	2.469	2.968	0.065	6.25	2.12	VC16-3-ROUGH	VC16-3-ROUGH-A





FOUR WAY CAVITY

D1	D2	D3	D4	D5	D6	L1	L2	L3	L4	L5	Q	OAL	SL	ORDER #	
														UNCOATED	ALTiN+
1.163	0.788	0.663	0.601	0.538	0.476	0.108	0.718	1.270	1.830	2.210	0.050	5.50	2.12	VC08-4-ROUGH	VC08-4-ROUGH-A
1.163	0.920	0.787	0.726	0.664	0.601	0.108	0.870	1.500	2.125	2.500	0.045	5.50	2.12	VC10-4-ROUGH	VC10-4-ROUGH-A
1.475	1.125	0.950	0.913	0.851	0.788	0.138	1.400	2.370	3.330	3.860	0.070	7.00	2.25	VC12-4-ROUGH	VC12-4-ROUGH-A
1.725	1.376	1.209	1.102	1.039	0.977	0.138	1.344	2.469	3.594	4.094	0.070	7.25	2.25	VC16-4-ROUGH	VC16-4-ROUGH-A

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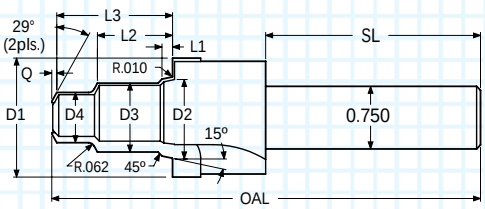
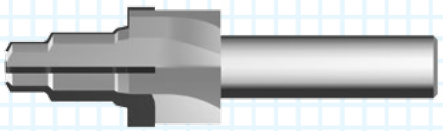
HYDRAFORCE CARTRIDGE VALVE TOOLS

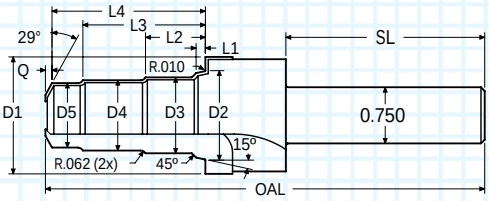
4 FLUTE FINISHER - CARBIDE TIPPED

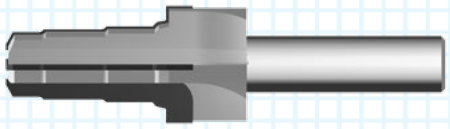




TWO WAY CAVITY

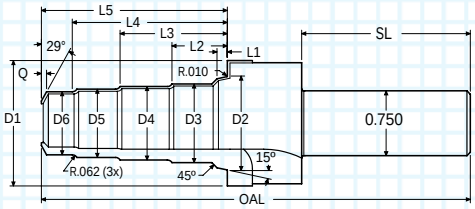
D1	D2	D3	D4	L1	L2	L3	Q	OAL	SL	ORDER #	
										UNCOATED	ALTiN+
1.188	0.813	0.688	0.501	0.108	0.750	1.156	0.050	4.00	2.00	VC08-2-FINISH	VC08-2-FINISH-A
1.188	0.945	0.812	0.626	0.108	0.932	1.312	0.060	4.00	2.00	VC10-2-FINISH	VC10-2-FINISH-A
1.500	1.150	0.977	0.876	0.138	1.400	1.920	0.075	5.25	2.25	VC12-2-FINISH	VC12-2-FINISH-A
1.750	1.401	1.234	1.127	0.138	1.344	1.844	0.075	5.50	2.25	VC16-2-FINISH	VC16-2-FINISH-A

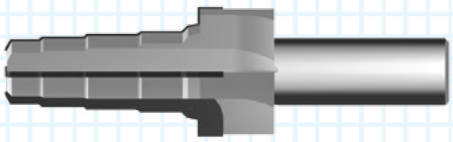




THREE WAY CAVITY

D1	D2	D3	D4	D5	L1	L2	L3	L4	Q	OAL	SL	ORDER #	
												UNCOATED	ALTiN+
1.188	0.813	0.688	0.626	0.563	0.108	0.718	1.270	1.703	0.060	5.00	2.12	VC08-3-FINISH	VC08-3-FINISH-A
1.188	0.945	0.812	0.689	0.626	0.108	0.860	1.500	1.875	0.050	5.00	2.12	VC10-3-FINISH	VC10-3-FINISH-A
1.500	1.150	0.975	0.938	0.876	0.138	1.400	2.370	2.890	0.070	6.25	2.12	VC12-3-FINISH	VC12-3-FINISH-A
1.750	1.401	1.234	1.127	1.064	0.138	1.344	2.469	2.968	0.065	6.25	2.12	VC16-3-FINISH	VC16-3-FINISH-A

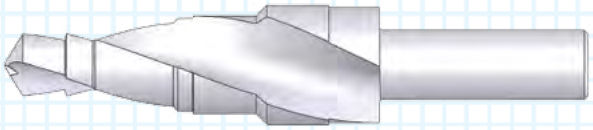




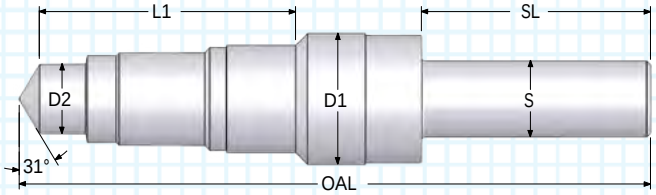
FOUR WAY CAVITY

D1	D2	D3	D4	D5	D6	L1	L2	L3	L4	L5	Q	OAL	SL	ORDER #	
														UNCOATED	ALTiN+
1.188	0.813	0.688	0.626	0.563	0.501	0.108	0.718	1.270	1.830	2.210	0.050	5.50	2.12	VC08-4-FINISH	VC08-4-FINISH-A
1.188	0.945	0.812	0.751	0.689	0.626	0.108	0.870	1.500	2.125	2.500	0.055	5.50	2.12	VC10-4-FINISH	VC10-4-FINISH-A
1.500	1.150	0.975	0.938	0.876	0.813	0.138	1.400	2.370	3.330	3.860	0.070	7.00	2.25	VC12-4-FINISH	VC12-4-FINISH-A
1.750	1.401	1.234	1.127	1.064	1.002	0.138	1.344	2.469	3.594	4.094	0.070	7.25	2.25	VC16-4-FINISH	VC16-4-FINISH-A

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

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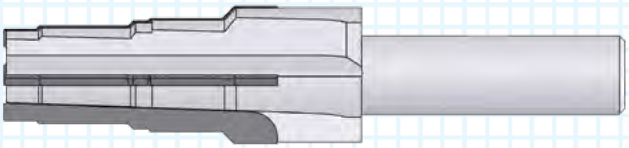
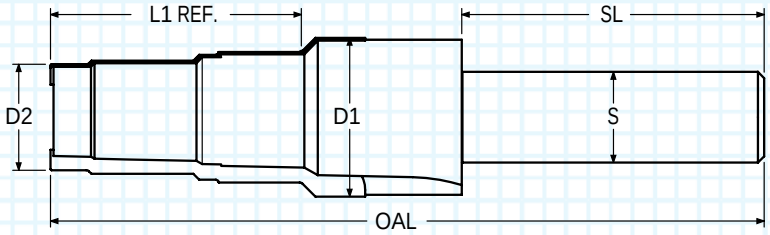
SUN HYDRAULIC CARTRIDGE VALVE TOOLS

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

PORT AND CAVITY TOOL TECHNICAL INFORMATION

MATERIAL	HB/Rc	SPEED (SFM)		CUTTING CONDITIONS	
		UNCOATED	ALTiN+	INFEED PER FLUTE REAM	INFEED 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	

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SCT

SPECIALTY END MILL

Corner Rounding

Engraving Tool

SPECIALTY END MILLS - PRODUCT OVERVIEW

These specialty end mills feature the same premium submicron carbide as the rest of the product lines. They are ground on modern CNC tool-and-cutter grinders to tight tolerances and have been engineered for high performance.

Corner Rounding End Mills

Corner Rounding End Mills have three flutes and are double ended to provide maximum value. The cutter diameter and the cut depth are held to ±0.001 inch tolerance to provide ease of set-up.

Engraving Tools

Engraving Tools come in a large variety of angles and sizes. These solid carbide tools will engrave on a large variety of materials. The tool tip is held to ±0.001 inch tolerance for uniformity.

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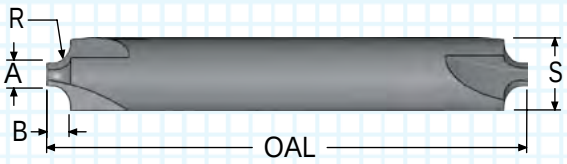
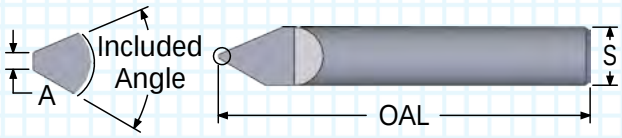
CORNER ROUNDING END MILLS - SOLID CARBIDE



- Tool diameter (A) and the cut depth (B) are held to ±0.001 inch tolerance to provide ease of set-up
- ALTiN+ coating for higher cutting speed
- Precision ground for maximum concentricity

"R" RADIUS SIZE	"A" TOOL DIA.	"B" CUT DEPTH	"S" SHANK DIA.	OAL	FLUTES	ORDER #	
						UNCOATED	ALTiN+
0.005	0.080	0.020	0.125	1.50	3	CR125005	CR125005A
0.008	0.080	0.023	0.125	1.50	3	CR125008	CR125008A
0.010	0.080	0.025	0.125	1.50	3	CR125010	CR125010A
0.015	0.080	0.030	0.125	1.50	3	CR125015	CR125015A
0.010	0.120	0.025	0.1875	2.00	3	CR187010	CR187010A
0.015	0.120	0.030	0.1875	2.00	3	CR187015	CR187015A
0.020	0.100	0.035	0.1875	2.00	3	CR187020	CR187020A
0.031	0.100	0.046	0.1875	2.00	3	CR187031	CR187031A
0.010	0.170	0.025	0.250	2.50	3	CR250010	CR250010A
0.015	0.170	0.030	0.250	2.50	3	CR250015	CR250015A
0.020	0.170	0.035	0.250	2.50	3	CR250020	CR250020A
0.025	0.170	0.040	0.250	2.50	3	CR250025	CR250025A
0.031	0.140	0.046	0.250	2.50	3	CR250031	CR250031A
0.035	0.140	0.050	0.250	2.50	3	CR250035	CR250035A
0.040	0.140	0.055	0.250	2.50	3	CR250040	CR250040A
0.046	0.140	0.061	0.250	2.50	3	CR250046	CR250046A
0.050	0.100	0.065	0.250	2.50	3	CR250050	CR250050A
0.055	0.100	0.070	0.250	2.50	3	CR250055	CR250055A
0.062	0.100	0.077	0.250	2.50	3	CR250062	CR250062A
0.072	0.100	0.087	0.250	2.50	3	CR250072	CR250072A
0.078	0.150	0.098	0.375	2.50	3	CR375078	CR375078A
0.085	0.150	0.105	0.375	2.50	3	CR375085	CR375085A
0.094	0.150	0.114	0.375	2.50	3	CR375094	CR375094A
0.100	0.120	0.120	0.375	2.50	3	CR375100	CR375100A
0.110	0.120	0.130	0.375	2.50	3	CR375110	CR375110A
0.118	0.100	0.138	0.375	2.50	3	CR375118	CR375118A
0.125	0.100	0.145	0.375	2.50	3	CR375125	CR375125A
0.140	0.150	0.10	0.500	3.00	3	CR500140	CR500140A
0.156	0.150	0.176	0.500	3.00	3	CR500156	CR500156A
0.172	0.100	0.192	0.500	3.00	3	CR500172	CR500172A
0.187	0.100	0.207	0.500	3.00	3	CR500187	CR500187A

ENGRAVING TOOLS - SOLID CARBIDE



- The tool tip (A) is held to ±0.001 inch tolerance
- ALTiN+ coating extends tool life
- Made with premium submicron carbide

INCLUDED ANGLE	"S" SHANK DIA.	OAL	"A" TIP DIA.	ORDER #	
				UNCOATED	ALTiN+
30°	0.1250	1.50	0.005	EN125-30	EN125-30A
30°	0.1875	2.00	0.007	EN187-30	EN187-30A
30°	0.2500	2.50	0.009	EN250-30	EN250-30A
30°	0.3125	2.50	0.011	EN312-30	EN312-30A
30°	0.3750	2.50	0.013	EN375-30	EN375-30A
30°	0.5000	3.00	0.015	EN500-30	EN500-30A
40°	0.1250	1.50	0.005	EN125-40	EN125-40A
40°	0.1875	2.00	0.007	EN187-40	EN187-40A
40°	0.2500	2.50	0.009	EN250-40	EN250-40A
40°	0.3125	2.50	0.011	EN312-40	EN312-40A
40°	0.3750	2.50	0.013	EN375-40	EN375-40A
40°	0.5000	3.00	0.015	EN500-40	EN500-40A
60°	0.1250	1.50	0.005	EN125-60	EN125-60A
60°	0.1875	2.00	0.007	EN187-60	EN187-60A
60°	0.2500	2.50	0.009	EN250-60	EN250-60A
60°	0.3125	2.50	0.011	EN312-60	EN312-60A
60°	0.3750	2.50	0.013	EN375-60	EN375-60A
60°	0.5000	3.00	0.015	EN500-60	EN500-60A
90°	0.1250	1.50	0.005	EN125-90	EN125-90A
90°	0.1875	2.00	0.007	EN187-90	EN187-90A
90°	0.2500	2.50	0.009	EN250-90	EN250-90A
90°	0.3125	2.50	0.011	EN312-90	EN312-90A
90°	0.3750	2.50	0.013	EN375-90	EN375-90A
90°	0.5000	3.00	0.015	EN500-90	EN500-90A
120°	0.1250	1.50	0.005	EN125-120	EN125-120A
120°	0.1875	2.00	0.007	EN187-120	EN187-120A
120°	0.2500	2.50	0.009	EN250-120	EN250-120A
120°	0.3125	2.50	0.011	EN312-120	EN312-120A
120°	0.3750	2.50	0.013	EN375-120	EN375-120A
120°	0.5000	3.00	0.015	EN500-120	EN500-120A

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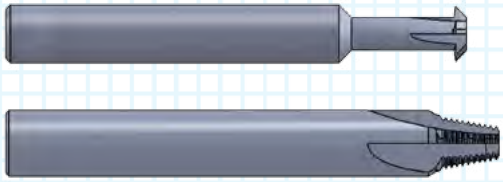
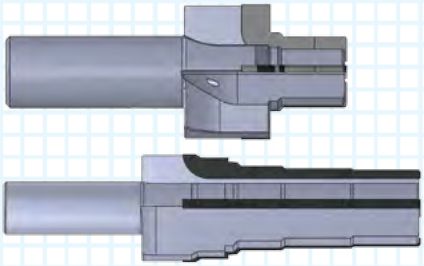


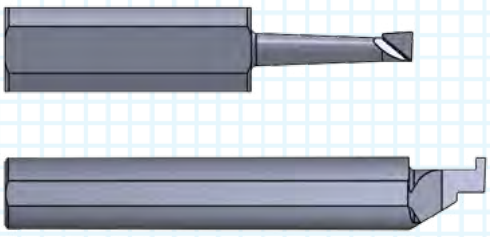
THREAD MILLS

Special Thread Forms
ACME
Stub ACME
Tapered double lead
Locking Threads
Serration Tools
Buttress
Custom Tools to Print



PORT TOOLS

Autoclave
Cavity
Multi-step Port Tools
High Performance
Coolant Through
Custom Tools to Print



SINGLE POINT

Special Threading Tools for Bone Screws
Special Threading Tools for Bone Plates
Special Forms
Modified Groove Specials
Face Grooving
Buttress
ACME & Stub ACME
Custom Tools to Print

Please contact our engineering department for more information: (805) 584-9495

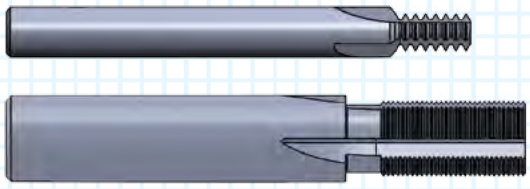
Scientific Cutting Tools, Inc.
www.sct-usa.com sales@sct-usa.com
(805) 584-9495 Fax: (805) 584-9629
(800) 383-2244 Fax: (888) 728-3295

MORE FROM SCT: MODIFICATIONS

MODIFICATIONS ON MANY STANDARD TOOLS

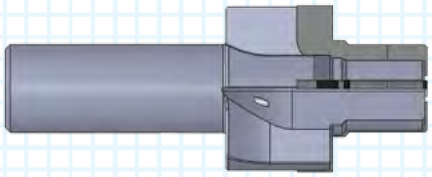
Scientific Cutting Tools can modify many standard tools with fast turn around: most items within 5 working days. Modifications can help specific cutting needs for better function such as decreased tool pressure, helping prevent potential breakage, accessibility issues such as length or depth of cut.

- **Fast turnaround - most within 5 working days**
- **Optimizes tool for the task**
- **Many modifying options available**
- **For Thread Mills, Port Tools, and Single Point Tools**



THREAD MILLS MODIFIED (1-2 Working Days)

- Reduce length-of-cut to increase strength
- Resharpen and recoat thread mills **(2-3 weeks)**
- Neck back thread mills for greater depth of cut



PORT TOOLS MODIFIED (3-5 Working Days)

- Reduce spot face diameter
- Reduce length of minor thread diameter
- Shorten reamer or cut off solid pilot

SINGLE POINT MODIFIED (3-5 Working Days)

- Lengthen tool reach on groove tools or boring bars
- Add chip curls to boring bars
- Modify cutting depth or width on groove tools

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805.584.9495 FAX 805.584.9629

800.383.2244 FAX 888.728.3295

sales@sct-usa.com

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The SCT Guarantee

Our pride in workmanship assures product quality every time

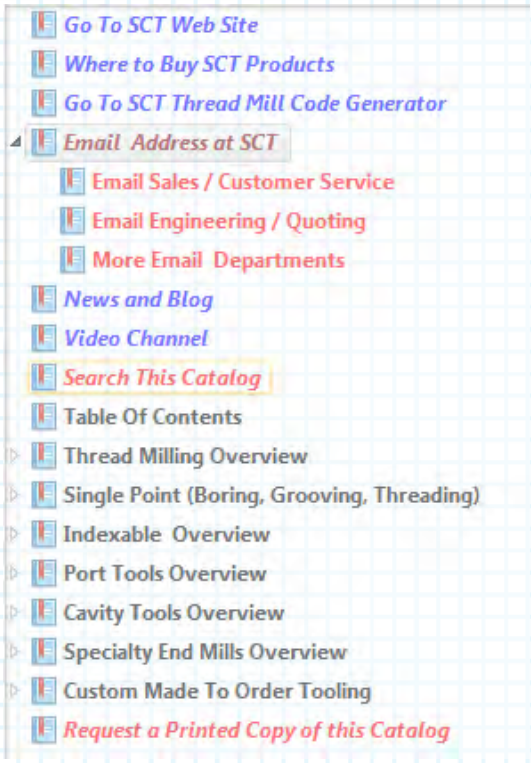
THE CUTTING EDGE

NOTES

How to use the Interactive catalog

Scientific Cutting Tools 2015 Product Catalog was Designed with You in Mind.
It has hundreds of interactive features and shortcuts to help you find what you are looking for.

BookMarks:



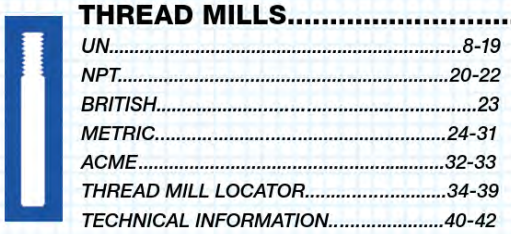
Blue Bookmarks take you to the appropriate web location.
Example: Where to buy our products. The latest news.

Red Bookmarks performs special functions like prepare an email to be sent to our engineering or sales department, open up a search window within the catalog to search for specific products.

Black Bookmarks take you to specific locations within the catalog like the table of contents or a product section.

So take a moment and explore all of the bookmarks.
Feedback is always welcomed

Hyperlinks:



Hyperlinks are just shortcuts to move around the catalog. For example, in the table of contents. If you take your cursor and touch on the page numbers. It will take you immediately to those pages. The section tabs will jump you from section to section there are hundreds of hyperlinks throughout the catalog.

On the products overview pages simply touch on the product you want to go to it, it will jump to the appropriate pages.

So take a moment and explore all of the hyperlinks and bookmarks. Feedback is always welcomed

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