



COGSDILL TOOL PRODUCTS, INC.

Burnishing

Burnishing

TOOLS & MACHINES

SIZE

FINISH

WORK HARDEN

IN

SECONDS



Cogsdill

ENGINEERED SPECIALTY TOOLING SOLUTIONS

FOR THE WORLDWIDE MACHINE TOOL INDUSTRIES



In 1914 Stuart A. Cogsdill set up shop in Detroit as a cutting tool regrinding and repair service. He soon began designing and manufacturing special tools for early automotive pioneers such as Henry Ford and the Dodge brothers, who relied on Cogsdill to develop innovative tooling solutions for tough manufacturing problems.

Currently owned and operated by the second and third

generation of Stuart Cogsdill's descendants,

Cogsdill offers its 21st century customers the same commitment that inspired its founder: we will develop and build innovative tooling solutions for your tough manufacturing problems.

Cogsdill has two operating units, one in the United

States and one in the United Kingdom:

■ **Cogsdill Tool Products, Inc. of Camden, South Carolina, USA** – corporate headquarters

■ **Cogsdill-Nuneaton Ltd. of Nuneaton, England** –
subsidiary of Cogsdill Tool Products



TOOLMAKERS
SINCE
1914

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Roller burnishing

overview

Cogsdill Roll-a-Finish tools offer you a fast, clean, and economical method of sizing and finishing metal parts to exacting specifications. The tools can be operated on any spindle. Parts of virtually any configuration and material are accurately sized within "tenths," with surface finishes as fine as 2 micro-inches (0.05 micrometers)... *in seconds!* An additional benefit: roller burnishing work hardens the part surface, producing a dense, compacted, wear-resistant surface for longer part life. Parts are improved, with faster production, and at a lower cost.



size

finish

work harden

in seconds!

Burnishing TOOLS & MACHINES

Universal Burnishing Tools



Turning-Holder Style

Boring-Bar Style

Bearingizing Tools



CX® External Roller Burnishing Machines

External Roll-a-Finish® Tools



Internal Roll-a-Finish® Tools



Diamond Burnishing Tools



We are pleased to offer the widest array of standard burnishing products in the industry, supported by the broadest range of experience in application engineering and custom tool design. Let us provide you with burnishing solutions to meet your sizing and finishing needs, with faster production and at a lower cost.

Roller burnishing overview

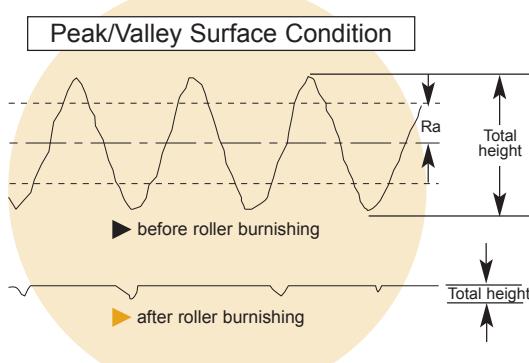
roll • er burn • i • shing defined



→ Roller burnishing is a surface finishing technique in which hardened, highly polished steel rollers are brought into pressure contact with a softer piece part. As the pressure generated through the rollers exceeds the yield point of the piece-part material, the surface is plastically deformed by cold flowing of subsurface material. The result is a mirror-like finish and a tough, work-hardened surface with load-carrying characteristics which make the burnished surface superior to finishes obtained by abrasive metal-removal methods.

A roller burnished surface is smoother and more wear-resistant than an abraded surface of the same profilometer reading. Profilometers measure roughness height. Abrasive finishing processes remove metal by cutting or tearing it away, and while this usually lowers the roughness profile, it leaves sharp projections in the contact plane of the machined surface.

Roller burnishing displaces metal, rather than removing it. Material in microscopic “peaks” on the machined surface is caused to cold flow into the “valleys,” creating a plateau-like profile in which sharpness is reduced or eliminated in the contact plane. A burnished surface is therefore smoother than an abraded surface with the same roughness height measurement. The burnished surface will last longer under working conditions in contact with a mating part.



Process advantages and benefits of burnishing

There are *four primary benefits* of the roller burnishing process:

- 1 Improved surface finish – as fine as 2 to 4 microinch (Ra)
- 2 Improved size control – tolerances within .0005 inch (.01mm) or better
- 3 Increased surface hardness – up to 5 to 10% or more
- 4 Improved fatigue life – as much as 300% or better

Other benefits include:

- Reduced friction
- Reduced noise level
- Enhanced corrosion resistance
- Elimination of tool marks and minor surface imperfections
- Replaces expensive secondary operations, such as grinding, honing, or lapping
- Cleaner than honing or other abrasive operations
- Faster production, at a lower cost, as compared to other finishing processes – parts are sized, finished, and work-hardened... in seconds!



external roller burnishing machines

burnishing tools

diamond

Roll-a-Finish® tools for all types of part configurations

Cogsdill Roll-a-Finish tools are applied to a wide variety of part configurations, including:

- Inside diameters (holes)
- Outside diameters (shafts)
- Flat surfaces
- Tapers
- Spherical surfaces and contours
- Fillets (radii at shoulders)

Standard Roll-a-Finish tools are available from stock for inside diameters from .187 to 4.000 inches (4.75 to 101.6mm), and for outside diameters from .062 to 2.000 inches (1.57 to 50.8mm). The tools are easily adjustable over a typical range of up to .040 inch (1.02mm). Special designs are available for larger and smaller diameters, and for tapers, faces, contours, and virtually any part configuration.

Other Cogsdill burnishing tool products

In addition to Roll-a-Finish tools for IDs, ODs, and special part configurations, Cogsdill offers several other burnishing products and related items, including:

- *Bearingizing Tools*, for burnishing IDs in parts with thin walls or irregular wall thicknesses, or in applications where porosity retention or extremely close tolerances are required
- *CX® External Roller Burnishing Machines*, for sizing, finishing, and work-hardening cylindrical surfaces of any length
- *Diamond Burnishing Tools*, for generating mirror finishes on ODs, large IDs, or faces of virtually any diameter
- *Universal Burnishing Tools*, for burnishing ODs, large IDs, faces, tapers, contours, and irregular surfaces with a single roll
- *The KB Knurling-Burnishing Process*, for salvaging out-of-tolerance bores and shafts: a two-step process using Cogsdill knurling tools and Roll-a-Finish tools

KB
Knurling-Burnishing Process

universal
burnishing
tools

bearingizing
tools



Internal Roll-a-Finish® tools

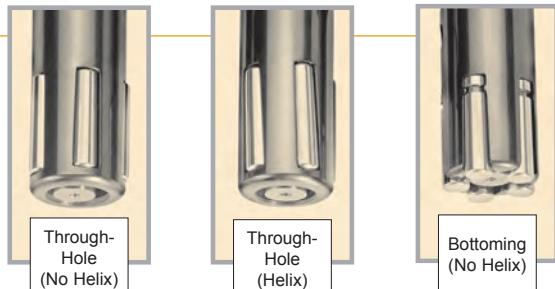
SR Series



Our premier line of internal Roll-a-Finish® tools, designed to suit all applications. Ideal for applications where tool length is restricted by tool changers, turrets, etc.

Offered in *three styles*:

- Through-hole style with no-helix cage (machine-feeding)
- Through-hole style with helix cage (self-feeding)
- Bottoming-style for blind hole, with no-helix cage (machine-feeding)



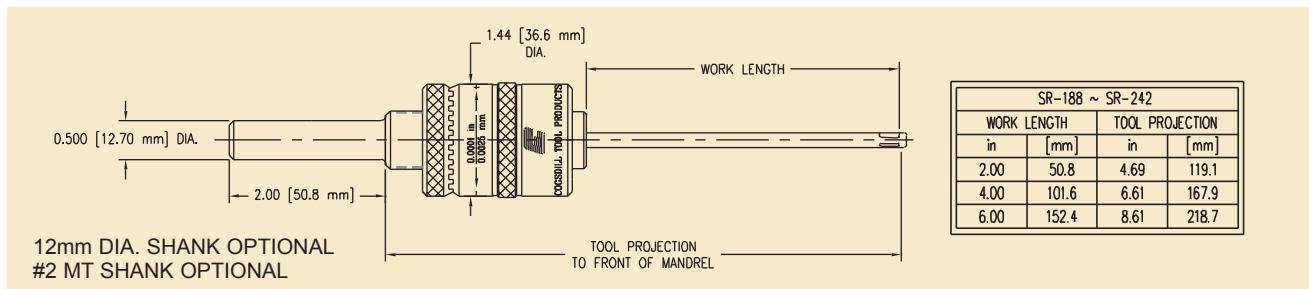
... with up to *four work lengths*:

- Two inch (SR)
- Four inch (SR-4)
- Six inch (SR-6)
- Eight inch (SR-8)

... and *available from stock*:

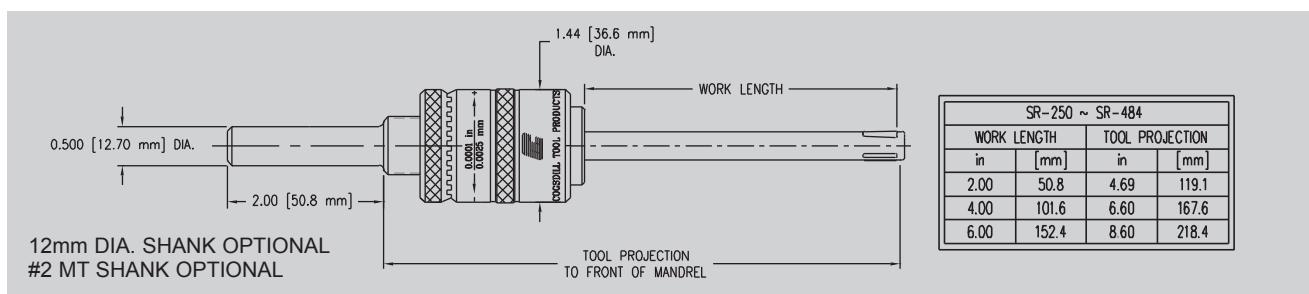
- for hole sizes from .187 to 2.500 inches (4.75 to 63.5mm).
- Tools are adjustable in increments of .0001 inch (.002mm).

Standard tool specifications



"SR" SERIES ROLL-A-FINISH® TOOLS 3/16 TO 1/4 IN. (4.76 TO 6.35mm)

DIAMETER RANGE		TOOL NUMBER		
INCHES	MM	THRU-HOLE (NO HELIX)	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
.187-.195	4.75-4.95	SR-188	SRH-188	_____
.194-.202	4.93-5.13	SR-195	SRH-195	_____
.202-.210	5.13-5.33	SR-203	SRH-203	_____
.210-.218	5.33-5.54	SR-211	SRH-211	_____
.218-.226	5.54-5.74	SR-219	SRH-219	_____
.225-.233	5.72-5.92	SR-226	SRH-226	_____
.233-.241	5.92-6.12	SR-234	SRH-234	_____
.241-.249	6.12-6.32	SR-242	SRH-242	_____

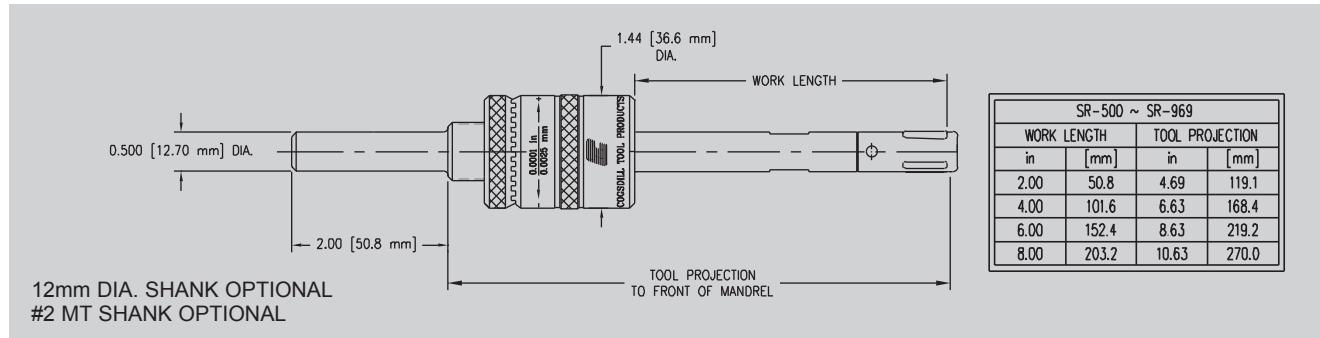


"SR" SERIES ROLL-A-FINISH® TOOLS 1/4 TO 1/2 IN. (6.35 TO 12.70mm)

DIAMETER RANGE		TOOL NUMBER		
INCHES	MM	THRU-HOLE (NO HELIX)	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
.246-.267	6.25-6.78	SR-250	SRH-250	SRB-250
.262-.283	6.65-7.19	SR-266	SRH-266	SRB-266
.277-.298	7.04-7.57	SR-281	SRH-281	SRB-281
.293-.314	7.44-7.98	SR-297	SRH-297	SRB-297
.308-.329	7.82-8.36	SR-312	SRH-312	SRB-312
.324-.345	8.23-8.76	SR-328	SRH-328	SRB-328
.340-.361	8.64-9.17	SR-344	SRH-344	SRB-344
.355-.376	9.02-9.55	SR-359	SRH-359	SRB-359
.371-.392	9.42-9.96	SR-375	SRH-375	SRB-375
.387-.408	9.83-10.36	SR-391	SRH-391	SRB-391
.402-.423	10.21-10.74	SR-406	SRH-406	SRB-406
.418-.439	10.62-11.15	SR-422	SRH-422	SRB-422
.434-.455	11.02-11.56	SR-438	SRH-438	SRB-438
.449-.470	11.40-11.94	SR-453	SRH-453	SRB-453
.465-.486	11.81-12.34	SR-469	SRH-469	SRB-469
.480-.501	12.19-12.73	SR-484	SRH-484	SRB-484

Shanks other than shown above are available upon request.

Standard tool specifications

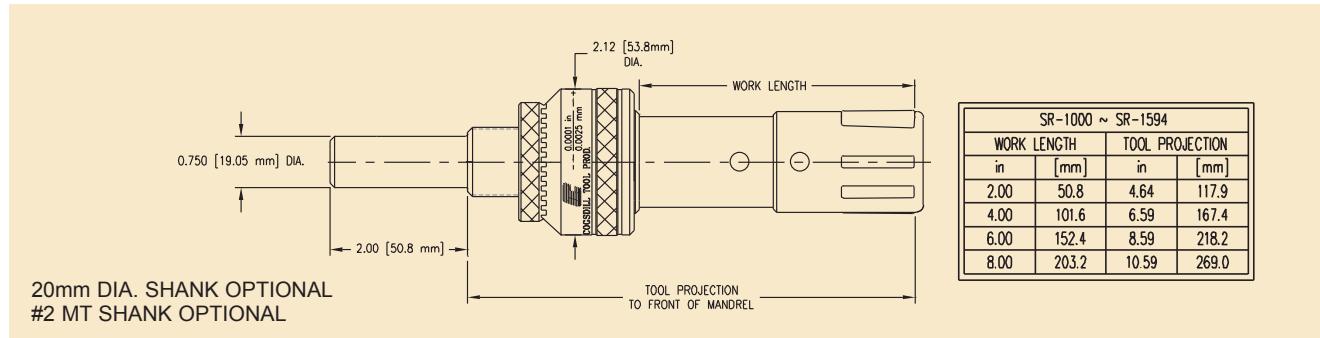


“SR” SERIES ROLL-A-FINISH® TOOLS 1/2 TO 1 IN. (12.70 TO 25.40 mm)

DIAMETER RANGE		TOOL NUMBER		
INCHES	MM	THRU-HOLE (NO HELIX)	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
.496-.537	12.60-13.64	SR-500	SRH-500	SRB-500
.527-.568	13.39-14.43	SR-531	SRH-531	SRB-531
.558-.599	14.17-15.21	SR-562	SRH-562	SRB-562
.590-.631	14.99-16.03	SR-594	SRH-594	SRB-594
.621-662	15.77-16.81	SR-625	SRH-625	SRB-625
.652-693	16.56-17.60	SR-656	SRH-656	SRB-656
.684-.725	17.37-18.42	SR-688	SRH-688	SRB-688
.715-.756	18.16-19.20	SR-719	SRH-719	SRB-719
.746-.787	18.95-19.99	SR-750	SRH-750	SRB-750
.777-.818	19.74-20.78	SR-781	SRH-781	SRB-781
.808-.849	20.52-21.56	SR-812	SRH-812	SRB-812
.840-.881	21.34-22.38	SR-844	SRH-844	SRB-844
.871-.912	22.12-23.16	SR-875	SRH-875	SRB-875
.902-.943	22.91-23.95	SR-906	SRH-906	SRB-906
.934-.975	23.72-24.77	SR-938	SRH-938	SRB-938
.965-1.006	24.51-25.55	SR-969	SRH-969	SRB-969

Shanks other than shown above are available upon request.

Standard tool specifications



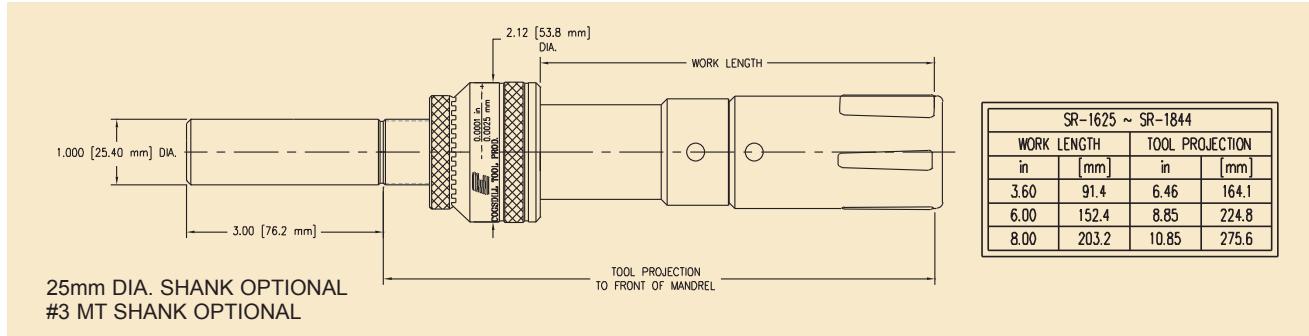
"SR" SERIES ROLL-A-FINISH® TOOLS 1 TO 1-5/8 IN. (25.4 TO 41.28mm)

DIAMETER RANGE		TOOL NUMBER		
INCHES	MM	THRU-HOLE (NO HELIX)	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
.996-1.037	25.30-26.34	SR-1000	SRH-1000	SRB-1000
1.027-1.068	26.09-27.13	SR-1031	SRH-1031	SRB-1031
1.058-1.099	26.87-27.91	SR-1062	SRH-1062	SRB-1062
1.090-1.131	27.69-28.73	SR-1094	SRH-1094	SRB-1094
1.121-1.162	28.47-29.51	SR-1125	SRH-1125	SRB-1125
1.152-1.193	29.26-30.30	SR-1156	SRH-1156	SRB-1156
1.184-1.225	30.07-31.12	SR-1188	SRH-1188	SRB-1188
1.215-1.256	30.86-31.90	SR-1219	SRH-1219	SRB-1219
1.246-1.287	31.65-32.69	SR-1250	SRH-1250	SRB-1250
1.277-1.318	32.44-33.48	SR-1281	SRH-1281	SRB-1281
1.308-1.349	33.22-34.26	SR-1312	SRH-1312	SRB-1312
1.340-1.381	34.04-35.08	SR-1344	SRH-1344	SRB-1344
1.371-1.412	34.82-35.86	SR-1375	SRH-1375	SRB-1375
1.402-1.443	35.61-36.65	SR-1406	SRH-1406	SRB-1406
1.434-1.475	36.42-37.47	SR-1438	SRH-1438	SRB-1438
1.465-1.506	37.21-38.25	SR-1469	SRH-1469	SRB-1469
1.496-1.537	38.00-39.04	SR-1500	SRH-1500	SRB-1500
1.527-1.568	38.79-39.83	SR-1531	SRH-1531	SRB-1531
1.558-1.599	39.57-40.61	SR-1562	SRH-1562	SRB-1562
1.590-1.631	40.39-41.43	SR-1594	SRH-1594	SRB-1594

Shanks other than shown above are available upon request.

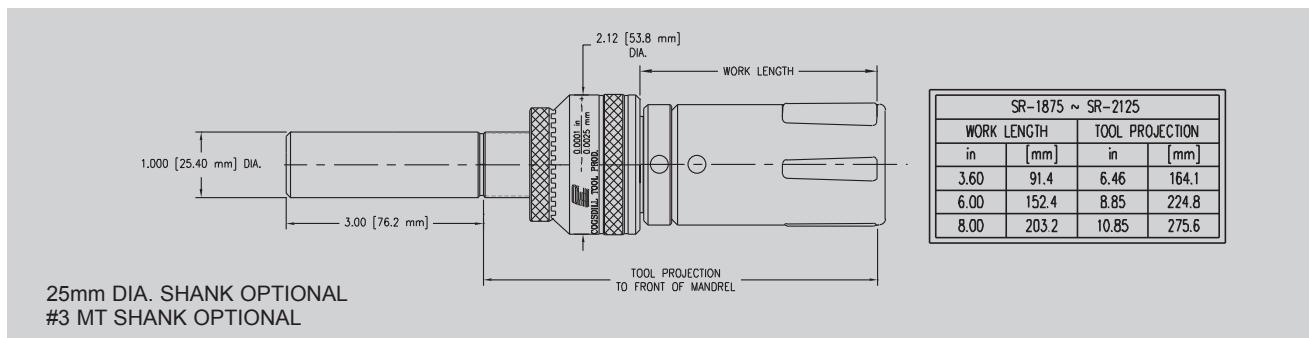
Internal Roll-a-Finish® Tools SR series

Standard Tool specifications



"SR" SERIES ROLL-A-FINISH® TOOLS 1-5/8 TO 1-7/8 IN (41.28 TO 47.63mm)

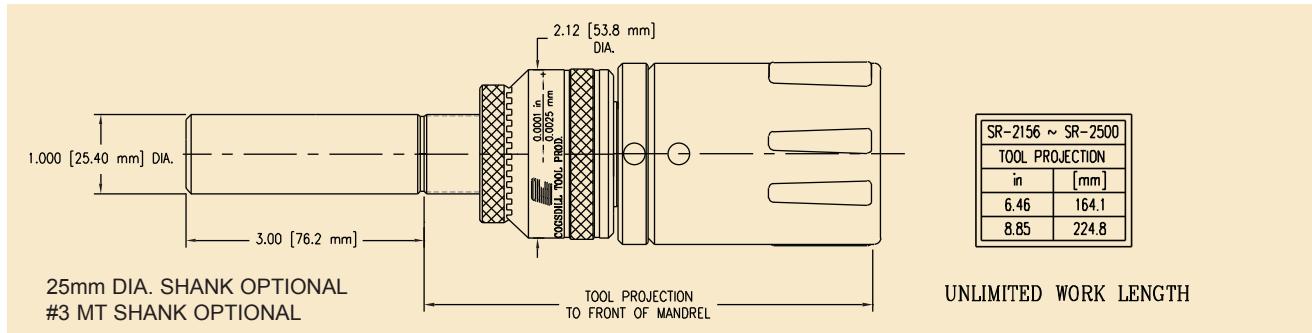
DIAMETER RANGE		TOOL NUMBER		
INCHES	MM	THRU-HOLE (NO HELIX)	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
1.621-1.662	41.17-42.21	SR-1625	SRH-1625	SRB-1625
1.652-1.693	41.96-43.00	SR-1656	SRH-1656	SRB-1656
1.684-1.725	42.77-43.82	SR-1688	SRH-1688	SRB-1688
1.715-1.756	43.56-44.60	SR-1719	SRH-1719	SRB-1719
1.746-1.787	44.35-45.39	SR-1750	SRH-1750	SRB-1750
1.777-1.818	45.14-46.18	SR-1781	SRH-1781	SRB-1781
1.808-1.849	45.92-46.96	SR-1812	SRH-1812	SRB-1812
1.840-1.881	46.74-47.78	SR-1844	SRH-1844	SRB-1844



"SR" SERIES ROLL-A-FINISH® TOOLS 1-7/8 TO 2-5/32 IN. (47.63 TO 54.76mm)

DIAMETER RANGE		TOOL NUMBER		
INCHES	MM	THRU-HOLE (NO HELIX)	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
1.871-1.912	47.52-48.56	SR-1875	SRH-1875	SRB-1875
1.902-1.943	48.31-49.35	SR-1906	SRH-1906	SRB-1906
1.934-1.975	49.12-50.17	SR-1938	SRH-1938	SRB-1938
1.965-2.006	49.91-50.95	SR-1969	SRH-1969	SRB-1969
1.996-2.037	50.70-51.74	SR-2000	SRH-2000	SRB-2000
2.027-2.068	51.49-52.53	SR-2031	SRH-2031	SRB-2031
2.058-2.099	52.27-53.31	SR-2062	SRH-2062	SRB-2062
2.090-2.131	53.09-54.13	SR-2094	SRH-2094	SRB-2094
2.121-2.162	53.87-54.91	SR-2125	SRH-2125	SRB-2125

Standard Tool specifications



"SR" SERIES ROLL-A-FINISH® TOOLS 2-5/32 to 2-1/2 in. (54.76 to 63.5mm)

DIAMETER RANGE		TOOL NUMBER		
INCHES	MM	THRU-HOLE (NO HELIX)	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
2.152-2.193	54.66-55.70	SR-2156	SRH-2156	SRB-2156
2.184-2.225	55.47-56.52	SR-2188	SRH-2188	SRB-2188
2.215-2.256	56.26-57.30	SR-2219	SRH-2219	SRB-2219
2.246-2.287	57.05-58.09	SR-2250	SRH-2250	SRB-2250
2.277-2.318	57.84-58.88	SR-2281	SRH-2281	SRB-2281
2.308-2.349	58.62-59.66	SR-2312	SRH-2312	SRB-2312
2.340-2.381	59.44-60.48	SR-2344	SRH-2344	SRB-2344
2.371-2.412	60.22-61.26	SR-2375	SRH-2375	SRB-2375
2.402-2.443	61.01-62.05	SR-2406	SRH-2406	SRB-2406
2.434-2.475	61.82-62.87	SR-2438	SRH-2438	SRB-2438
2.465-2.506	62.61-63.65	SR-2469	SRH-2469	SRB-2469
2.496-2.537	63.40-64.44	SR-2500	SRH-2500	SRB-2500

Shanks other than shown above are available upon request.

Internal Roll-a-Finish® tools

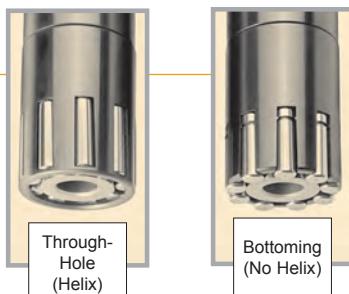
U series

For hole diameters from 2.500 to 4.000 inches (63.5 to 101.6mm). Work length is unlimited; extension adapters can be used to increase work length.



Offered in *two styles*:

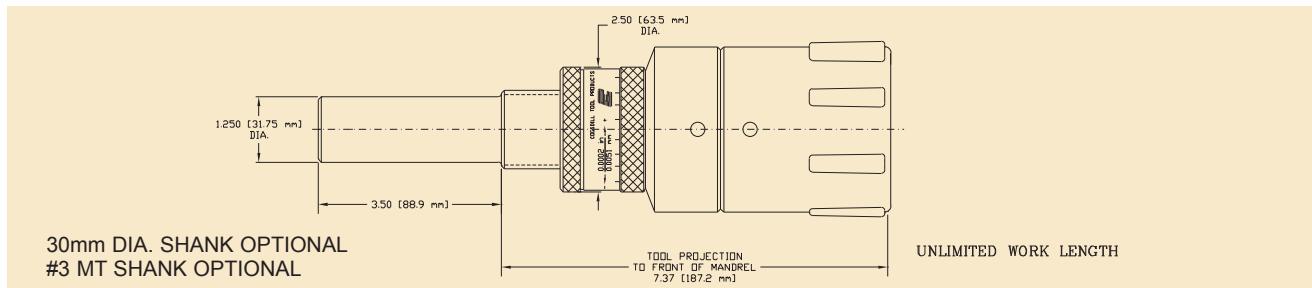
- Through-hole style with helix cage (selffeeding)
- Bottoming-style for blind hole, with no-helix cage (machine-feeding)



...and *available from stock*.

Note: Also available from stock in through-hole, no-helix style.

Standard tool specifications



"U" SERIES ROLL-A-FINISH® TOOLS 2-17/32 TO 4 IN. (64.3 TO 101.6 MM)

DIAMETER RANGE		TOOL NUMBER	
INCHES	MM	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
2.527-2.568	64.19-65.23	U-2531	UB-2531
2.558-2.599	64.97-66.01	U-2562	UB-2562
2.590-2.631	65.79-66.83	U-2594	UB-2594
2.621-2.662	66.57-67.61	U-2625	UB-2625
2.652-2.693	67.36-68.40	U-2656	UB-2656
2.684-2.725	68.17-69.22	U-2688	UB-2688
2.715-2.756	68.96-70.00	U-2719	UB-2719
2.746-2.787	69.75-70.79	U-2750	UB-2750
2.777-2.818	70.54-71.58	U-2781	UB-2781
2.808-2.849	71.32-72.36	U-2812	UB-2812
2.840-2.881	72.14-73.18	U-2844	UB-2844
2.871-2.912	72.92-73.96	U-2875	UB-2875
2.902-2.943	73.71-74.75	U-2906	UB-2906
2.934-2.975	74.52-75.57	U-2938	UB-2938
2.965-3.006	75.31-76.35	U-2969	UB-2969
2.996-3.037	76.10-77.14	U-3000	UB-3000
3.027-3.068	76.89-77.93	U-3031	UB-3031
3.058-3.099	77.67-78.71	U-3062	UB-3062
3.090-3.131	78.49-79.53	U-3094	UB-3094
3.121-3.162	79.27-80.31	U-3125	UB-3125
3.152-3.193	80.06-81.10	U-3156	UB-3156
3.184-3.225	80.87-81.92	U-3188	UB-3188
3.215-3.256	81.66-82.70	U-3219	UB-3219
3.246-3.287	82.45-83.49	U-3250	UB-3250
3.277-3.318	83.24-84.28	U-3281	UB-3281
3.308-3.349	84.02-85.06	U-3312	UB-3312
3.340-3.381	84.84-85.88	U-3344	UB-3344
3.371-3.412	85.62-86.66	U-3375	UB-3375
3.402-3.443	86.41-87.45	U-3406	UB-3406
3.434-3.475	87.22-88.27	U-3438	UB-3438
3.465-3.506	88.01-89.05	U-3469	UB-3469
3.496-3.537	88.80-89.84	U-3500	UB-3500
3.527-3.568	89.59-90.63	U-3531	UB-3531
3.558-3.599	90.37-91.41	U-3562	UB-3562
3.590-3.631	91.19-92.23	U-3594	UB-3594
3.621-3.662	91.97-93.01	U-3625	UB-3625
3.652-3.693	92.76-93.80	U-3656	UB-3656
3.684-3.725	93.57-94.62	U-3688	UB-3688
3.715-3.756	94.36-95.40	U-3719	UB-3719
3.746-3.787	95.15-96.19	U-3750	UB-3750
3.777-3.818	95.94-96.98	U-3781	UB-3781
3.808-3.849	96.72-97.76	U-3812	UB-3812
3.840-3.881	97.54-98.58	U-3844	UB-3844
3.871-3.912	98.32-99.36	U-3875	UB-3875
3.902-3.943	99.11-100.15	U-3906	UB-3906
3.934-3.975	99.92-100.97	U-3938	UB-3938
3.965-4.006	100.71-101.75	U-3969	UB-3969
3.996-4.037	101.50-102.54	U-4000	UB-4000

Shanks other than shown above are available upon request.



Bearingizing tools



The Bearingizer *may* be the tool of choice where the following conditions exist:

- Parts with *thin walls* — Bearingizing eliminates barrel-shaping of the part.
- Parts with *irregular wall thicknesses* — the Bearingizing tool will produce a very round hole, whereas the Roll-a-Finish® tool might generate a slightly egg-shaped hole, due to variations in wall thickness.
- Applications where *porosity* is an issue (e.g., oil-impregnated bearings) — the smaller “footprint” of the Bearingizing roll leaves pores in the surface intact.
- Applications where *very tight tolerances* must be held — the Bearingizer reduces springback in the work surface material. The Bearingizing tool can, in some materials and with proper part preparation, hold size as close as $\pm .0001$ inch (.002mm), while the Roll-a-Finish tool can achieve tolerances of $\pm .00025$ inch (.006mm).

Where the above conditions do *not* exist, the Roll-a-Finish® tool would generally be the tool of choice, for two reasons:

- (1) the relatively wide adjustment range of the Roll-a-Finish tool, which is typically .040 inch (1.01mm), and
- (2) the ease of adjustment, with the castellated adjusting collar on the Roll-a-Finish tool.

The Bearingizing tool features a greater number of rolls, and rolls of a smaller diameter, as compared to the Roll-a-Finish tool, and can only be adjusted by change of rolls. The Bearingizer also requires a closer presize than the Roll-a-Finish tool.

The Bearingizing Tool combines roller burnishing with peening action. As the tool is rotated at a high speed the rolls spin, rise, and fall over a cammed arbor, delivering up to 200,000 rapid fire blows per minute to the work surface. The peaks and valleys of the machined surface are compacted into a smooth, hardened, and ultrafine surface finish.

But where the above conditions *do* exist, the Bearingizing tool should be considered.

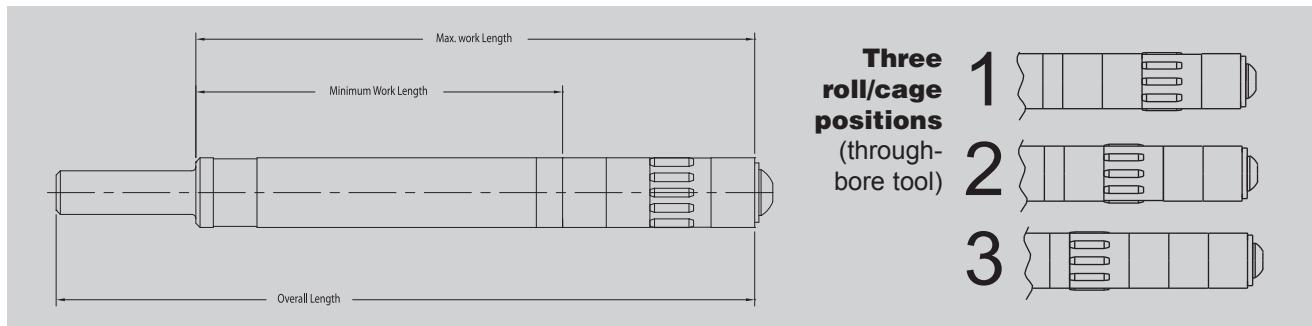
While the Roll-a-Finish Tool increases surface hardness by about 5 to 10%, Bearingizing increases hardness by 10 to 30%, but with less surface penetration.

Tool specifications

Bearingizing tools provide three roll positions over the cammed arbor (see below). When the forward (#1 position) of cam becomes worn, the roll cage can be repositioned to the # 2 and # 3 positions by exchanging positions with the moveable collars. This presents NEW cam surfaces and original BUILD-UP. After all positions

on the cam are worn beyond producing acceptable parts, oversize rolls can be used to further extend tool life. Roll sizes are available in increments of .0001 inch (.0025 mm) and the tool will accommodate a range of roll sizes up to .002 inch (.0508 mm).

For through-hole, semi-bottoming, or bottoming applications.



Bearingizing Tools .188 to 1.250 in. (4.76 to 31.75mm)

NOMINAL TOOL SIZE	BUILD-UP RANGE		CAM DIAMETER		SHANK	OVERALL LENGTH		WORK LENGTH				NO. OF ROLLS	
	INCHES	MM	INCHES	MM		INCHES	MM	INCHES	MM	INCHES	MM		
.188	4.76	.1861	4.727	.1281	3.254	5.5	139.7	2.938	74.61	2.188	55.56	6	
		.1901	4.829			5.5	139.7	2.938	74.61	2.188	55.56	6	
.219	5.56	.2174	5.522	.1594	4.049	6	152.4	3.438	87.31	2.375	60.32	6	
		.2214	5.624			6	152.4	3.438	87.31	2.375	60.32	6	
.236	6	.2343	5.951	.1670	4.242	6	152.4	3.438	87.31	2.375	60.32	6	
		.2383	6.053			6	152.4	3.438	87.31	2.375	60.32	6	
.250	6.35	.2486	6.314	.1806	4.587	6	152.4	3.438	87.31	2.375	60.32	6	
		.2526	6.416			6	152.4	3.438	87.31	2.375	60.32	6	
.276	7	.2743	6.967	.2064	5.243	6	152.4	3.438	87.31	2.313	58.74	6	
		.2783	7.069			6	152.4	3.438	87.31	2.313	58.74	6	
.281	7.14	.2799	7.109	.2119	5.382	6	152.4	3.438	87.31	2.313	58.74	6	
		.2839	7.211			6	152.4	3.438	87.31	2.313	58.74	6	
.313	7.94	.3112	7.904	.2212	5.618	6	152.4	3.438	87.31	2.313	58.74	6	
		.3152	8.006			6	152.4	3.438	87.31	2.313	58.74	6	
.315	8	.3137	7.968	.2238	5.667	.500 in. DIA.	6	152.4	3.438	87.31	2.313	58.74	6
		.3177	8.069			6	152.4	3.438	87.31	2.313	58.74	6	
.343	8.73	.3425	8.700	.2525	6.414	or	7	177.8	4.438	112.71	3.063	77.79	6
		.3465	8.801			7	177.8	4.438	112.71	3.063	77.79	6	
.354	9	.3530	8.966	.2631	6.683	12mm DIA.	7	177.8	4.438	112.71	3.063	77.79	6
		.3570	9.068			7	177.8	4.438	112.71	3.063	77.79	6	
.375	9.53	.3738	9.495	.2518	6.396	7	177.8	4.438	112.71	3.125	79.38	6	
		.3778	9.596			7	177.8	4.438	112.71	3.125	79.38	6	
.394	10	.3965	9.970	.2705	6.871	7	177.8	4.438	112.71	3.125	79.38	6	
		.3925	10.071			7	177.8	4.438	112.71	3.125	79.38	6	
.406	10.32	.4051	10.290	.2831	7.191	8	203.2	5.438	138.11	3.563	90.49	6	
		.4091	10.391			8	203.2	5.438	138.11	3.563	90.49	6	
.433	11	.4320	10.973	.2779	7.059	8	203.2	5.438	138.11	3.688	93.66	6	
		.4360	11.074			8	203.2	5.438	138.11	3.688	93.66	6	
.438	11.11	.4365	11.087	.2825	7.176	8	203.2	5.438	138.11	3.688	93.66	6	
		.4405	11.189			8	203.2	5.438	138.11	3.688	93.66	6	
.469	11.91	.4678	11.882	.3138	7.971	8	203.2	5.438	138.11	3.688	93.66	8	
		.4718	11.984			8	203.2	5.438	138.11	3.688	93.66	8	
.472	12	.4710	11.963	.3174	8.062	8	203.2	5.438	138.11	3.688	93.66	8	
		.4750	12.065			8	203.2	5.438	138.11	3.688	93.66	8	

Tool specifications

Bearingizing tools

Bearingizing Tools .188 to 1.250 in. (4.76 to 31.75mm) *continued*

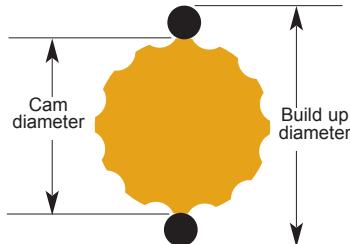
NOMINAL TOOL SIZE		BUILD-UP RANGE		CAM DIAMETER		SHANK	OVERALL LENGTH		WORK LENGTH				NO. OF ROLLS
INCHES	MM	INCHES	MM	INCHES	MM		INCHES	MM	INCHES	MM	INCHES	MM	
.500	12.70	.4990 .5030	12.675 12.776	.3450	8.763	↑	8	203.2	5.438	138.11	3.688	93.66	8
.512	13	.5110 .5150	12.979 13.081	.3568	9.063	.500 in. DIA.	8	203.2	5.438	138.11	3.688	93.66	8
.531	13.49	.5303 .5343	13.470 13.571	.3763	9.558	or	8	203.2	5.438	138.11	3.688	93.66	8
.551	14	.5500 .5540	13.970 14.072	.3962	10.063	12mm DIA.	8	203.2	5.438	138.11	3.688	93.66	8
.563	14.29	.5615 .5655	14.262 14.364	.4075	10.351	↓	8	203.2	5.438	138.11	3.688	93.66	8
.591	15	.5936 .5896	15.077 14.976	.4356	11.064	↑	8	203.2	4.875	123.83	3.125	79.38	8
.594	15.09	.5928 .5968	15.057 15.159	.4388	11.146		8	203.2	4.875	123.83	3.125	79.38	8
.625	15.87	.6240 .6280	15.850 15.951	.4390	15.151		8	203.2	4.875	123.83	3.125	79.38	8
.630	16	.6290 .6330	15.977 16.078	.4439	11.275		8	203.2	4.875	123.83	3.125	79.38	8
.656	16.67	.6553 .6593	16.645 16.746	.4703	11.946		8	203.2	4.875	123.83	3.125	79.38	8
.669	17	.6680 .6720	16.967 17.069	.4833	12.276		8	203.2	4.875	123.83	3.125	79.38	8
.688	17.46	.6865 .6905	17.437 17.539	.5015	12.738		8	203.2	4.875	123.83	3.125	79.38	8
.709	18	.7080 .7120	17.983 18.085	.5227	13.277	.750 in. DIA.	8	203.2	4.875	123.83	3.125	79.38	10
.719	18.26	.7178 .7218	18.232 18.334	.5328	13.533	or	8	203.2	4.875	123.83	3.125	79.38	10
.748	19	.7470 .7510	18.974 19.075	.5620	14.275	20mm DIA.	8	203.2	4.875	123.83	3.125	79.38	10
.750	19.05	.7490 .7530	19.025 19.126	.5640	14.326		8	203.2	4.875	123.83	3.125	79.38	10
.781	19.84	.7803 .7843	19.820 19.921	.5953	15.121		8	203.2	4.875	123.83	3.125	79.38	10
.787	20	.7860 .7900	19.964 20.066	.6014	15.276		8	203.2	4.875	123.83	3.125	79.38	10
.813	20.64	.8115 .8155	20.612 20.714	.6265	15.913		8	203.2	4.875	123.83	3.125	79.38	10
.827	21	.8260 .8300	20.980 21.082	.6408	16.276		8	203.2	4.875	123.83	3.125	79.38	10
.844	21.43	.8428 .8468	21.407 21.509	.5958	15.133		9	228.60	5.875	149.23	3.75	95.25	10
.866	22	.8650 .8690	11.971 22.076	.6181	15.700		9	228.60	5.875	149.23	3.75	95.25	10
.875	22.22	.8740 .8780	22.200 22.301	.6270	15.926	↓	9	228.60	5.875	149.23	3.75	95.25	10
.905	23	.9050 .9090	22.987 23.087	.6583	16.721	↑	10	254.00	6.125	155.58	4.00	101.60	10
.906	23.02	.9053 .9093	22.995 23.096	.6583	16.721		10	254.00	6.125	155.58	4.00	101.60	10
.938	23.81	.9365 .9405	23.787 23.889	.6895	17.513		10	254.00	6.125	155.58	4.00	101.60	10
.945	24	.9440 .9480	23.978 24.078	.6969	17.701	1.000 in. DIA.	10	254.00	6.125	155.58	4.00	101.60	10
.969	24.61	.9678 .9718	24.582 24.684	.7208	18.308	or	10	254.00	6.125	155.58	4.00	101.60	12
.984	25	.9830 .9870	24.968 25.070	.7363	18.702	25mm DIA.	10	254.00	6.125	155.58	4.00	101.60	12
1.000	25.40	.9990 1.0030	25.375 25.476	.7520	19.101		10	254.00	6.125	155.58	4.00	101.60	12
1.063	26.99	1.0615 1.0655	26.962 27.064	.8145	20.688		10	254.00	6.125	155.58	4.00	101.60	12
1.125	28.57	1.1240 1.1280	28.550 28.651	.8770	22.276		10	254.00	6.125	155.58	4.00	101.60	12
1.188	30.16	1.1865 1.1905	30.137 30.239	.9395	23.863		10	254.00	6.125	155.58	4.00	101.60	12
1.250	31.75	1.2490 1.2530	31.725 31.826	.9390	23.851	↓	10	254.00	6.125	155.58	4.00	101.60	14

Shanks other than shown above are available upon request.

Selection & ordering information

To select a tool for the part and material to be Bearingized, determine the proper tool *build-up*. The build-up is the effective tool diameter required to produce a certain size in a given material. It is measured with the rolls diametrically opposed on the high surfaces of the cam.

The build-up is equal to the maximum finished hole diameter plus a spring-back allowance — see chart. The maximum diameter (high side of tolerance) is used to allow for tool wear and still maintain part size within tolerance limits.



Nominal tool sizes

The program is based on nominal diameters of .188 inch (4.76mm) through 1.250 inch (31.75mm). Each tool provides a build-up range of .004 inch (.1016mm). The required build-up must be within the range of the tool size shown — otherwise select an intermediate tool. See ordering information at right.

EXAMPLE

Stainless Steel part .5010/5008 inch (12.725/12.720mm) tolerance	.5010
Add Stainless Steel spring-back allowance	.+0010
Build-up	.5020

Since a .5020 inch (12.75mm) build-up falls within a range of .4990-.5030 inch (12.67-12.78mm), order a nominal .500 inch (12.7mm) through-hole Bearingizing tool and rolls ... or order through-hole Bearingizing tool with .5020 inch (12.75mm) build-up — Cogsdill will furnish proper tool and rolls.

Roll Sizes

To determine the roll size for a standard tool, subtract the cam diameter from the build-up and divide by two (2). This establishes the single roll diameter.

EXAMPLE

Build-up required for part	.5020 inch (12.75mm)
Subtract cam diameter of .500 inch (12.75mm) tool	.3450 inch (8.76mm)
	.1570 inch (3.99mm)
Divided by 2	.1570 inch ÷ 2 = .0785 inch (1.99mm)
Single roll size	.0785 inch (1.99mm)

Order .500 inch (12.7mm)
Bearingizing tool with
.0785 inch (1.99mm) rolls.

Spring-Back Allowances	.188 to .500 (4.76 to 12.7 mm)		.500 & up (12.7 mm & up)	
	IN.	mm	IN.	mm
Stainless	.0008	.0203	.001	.0254
Steel	.0008	.0203	.001	.0254
Cast Iron	.0005	.0127	.0008	.0203
Sintered Iron	.0005	.0127	.0008	.0203
Aluminum	.0002	.0050	.0004	.0102
Brass	.0005	.0127	.0008	.0203
Sintered Bronze	.0001	.0025	.0002	.0051
Oilite	.0001	.0025	.0002	.0051

Note: Above are recommended starting points only. Final build-up can best be determined by actual trial and several extra sets of rolls in increments of .0001 inch (.0025mm) are recommended.

Ordering nominal tool sizes

1 Specify tool size and roll diameter, or specify hole size and material.

2 Specify tool style:through-hole, semi-blind or blind-hole tool. Through-hole tools use chamfered rolls; semi-blind or blind-hole tools use radius rolls. Blind-hole tools have a special roll retainer which permits finishing within .025 inch (.635mm) of the bottom.

3 Extra sets of rolls in increments of .0001 inch (.0025mm) are recommended with initial orders to allow for final size adjustment and compensate for eventual tool wear.



Ordering intermediate and larger tools

Intermediate sizes

Sizes that do not fall within the range of nominal tools are ordered by build-up only. Cogsdill will design tool and specify roll size.

Tools over 1.250 inch (31.75mm) in diameter

Order by build-up diameter. Cogsdill will design tool and specify roll size. We suggest that part print be furnished with inquiry. This will enable Cogsdill engineers to quote on any special features that may be desirable, such as extended front pilot, etc.

Re-ordering tools and parts

Re-order nominal size tools and parts by fractional tool size shown on shank-except roll sizes, which should be determined by the required build-up. Re-order intermediate and larger size tools and parts, including rolls by BT number shown on shank. If cams are worn, larger rolls may be required (available in increments of .0001 inch (.0025mm)). Cogsdill will also re-grind cams and supply rolls to maintain original build-up.

Operation & maintenance

Machines

Any machine capable of rotating the tool — e.g. drill press, speed lathe, or turret lathe — may be used.

Material

Any ductile or malleable material — powdered, laminated, cast, forged, extruded, sintered or hardened (maximum Rc 38) can be bearingized. Steel, stainless, alloy, cast iron, aluminum, copper and brass are examples.

Procedure

Proper part preparation is essential in order to obtain precise results. Cogsdill will recommend the surface preparation and amount of stock to leave for Bearingizing, but some trials may be required to determine these factors for optimum results.

Since the change in dimension is partly governed by the character of the prepared surface, usually coarser preparation will permit a greater change in dimension than is possible with finer preparation. The consistent pattern obtained from boring will produce the best finish.

The other major factor in dimensional change is the ability of

the material to grain-flow without flaking. The total change may vary from .0001 inch (.0025mm) on harder materials to as much as .003 inch (.0762mm) on sintered self-lubricating bushings. Less than .001 inch (.0254mm) stock for Bearingizing generally provides a good starting point for trials.

Tool diameter changes

Bearingizing rolls are manufactured in increments of .0001 inch (.0025mm). Bearingizing Tools are adjustable by roll change only. One set of rolls can be removed and a new set of a different size installed, thus effectively changing the size of the tool — or compensating for tool wear. The working diameter of any tool can be changed over an approximate .004 inch (.1016mm) range by installing different sets of rolls. The rolls are diametrically opposed and available in .0001 inch (.0025mm) increments, therefore the effective tool diameter can be changed in .0002 inch (.0051mm) increments.

Lubrication

For most metals use any standard grade of lightweight, low viscosity lubricating oil, or any mineral, sulphur or soluble oil that is compatible with the alloy or metal to be burnished and is recommended for fine surface finishing.

For aluminum or magnesium alloys, use a highly refined oil-based coolant with low viscosity.

For cast iron a mineral seal or water soluble solution is ideal — flooding the part is recommended.

Cleaning

The Bearingizing tool should be cleaned periodically with a light-bodied oil of about 100 Saybolt universal scale, similar to a light spindle oil. A few drops applied with squirt can or brush to the rolls and cage (with cage stopped) will wash metal dust particles out when tool is operated, keeping the cam surfaces and roll pockets clean.

Speed and feed recommendations

HOLE DIAMETER INCHES	RPM	HOLE DIAMETER		RPM	HOLE DIAMETER		RPM	HOLE DIAMETER		RPM	
		INCHES	MM		INCHES	MM		INCHES	MM		
.188	4.762	8200	.750	19.050	2000	1.750	44.45	875	2.750	69.85	555
.250	6.350	6100	.875	22.225	1800	1.875	47.62	815	2.875	73.02	530
.312	7.937	4900	1.000	25.40	1500	2.000	50.80	765	3.000	76.20	510
.375	9.525	4100	1.125	28.57	1350	2.125	53.97	720	3.500	88.90	435
.437	11.112	3500	1.250	31.75	1200	2.250	57.15	680	4.000	101.60	380
.500	12.700	3100	1.375	34.92	1100	2.375	60.32	645	4.500	114.30	340
.562	14.287	2700	1.500	38.10	1000	2.500	63.50	610	5.000	127.00	305
.625	15.875	2400	1.625	41.27	950	2.625	66.67	580	5.500	139.70	280

FEED-Feed Rate in and out should be quite rapid, 150-250 inches per minute (3.81M-6.35M), rather than slow.

The speeds and feeds recommended are for best tool life.

The same results can be achieved at slower rate, but with some sacrifice of tool life.

External Roll-a-Finish® tools

AEX series



For burnishing the outside diameter of cylindrical parts, such as shafts rotating in bushings or bearings. Provides an ideal surface for grease and oil seals.

Available from stock for nominal diameters from .062 to 2.000 inches (1.57 to 50.8mm)

Offered in *three styles*:

■ **AEX-1**, with a smaller body diameter and shorter overall length suitable for screw machines and automatics. All AEX-1 tools are bottoming-style, designed for machine-feed. Available for nominal diameters from .062 to .625 inch (1.57 to 15.88mm).

■ **AEX-2**, for nominal diameters from .062 to 1.000 inch (1.57 to 25.4mm). Features twice the work length as compared to the AEX-1. Available with machine-feeding cage or with bottoming-style cage.

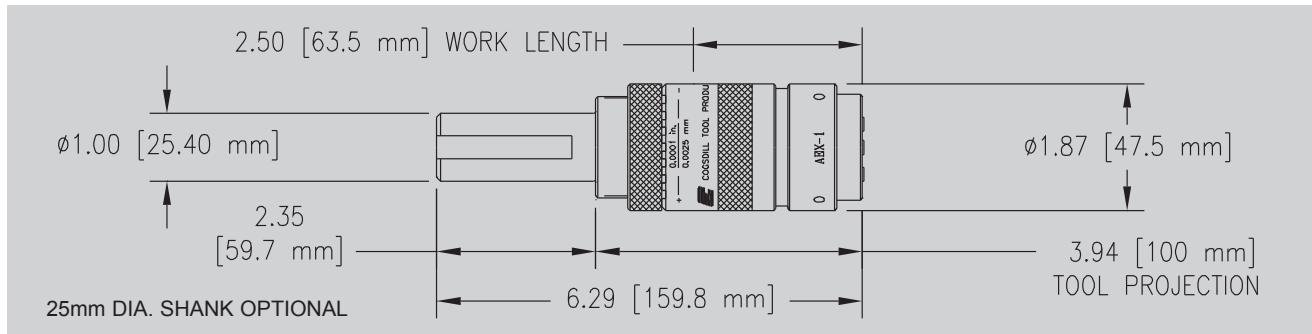
■ **AEX-3**, for nominal diameters from 1.000 to 2.000 inches (25.4 to 50.8mm). Available with machine-feeding cage or with bottoming-style cage.

AEX tools are adjustable in increments of .0001 inch (.002mm).



External Roll-a-Finish® tools AEX series

Standard tool specifications



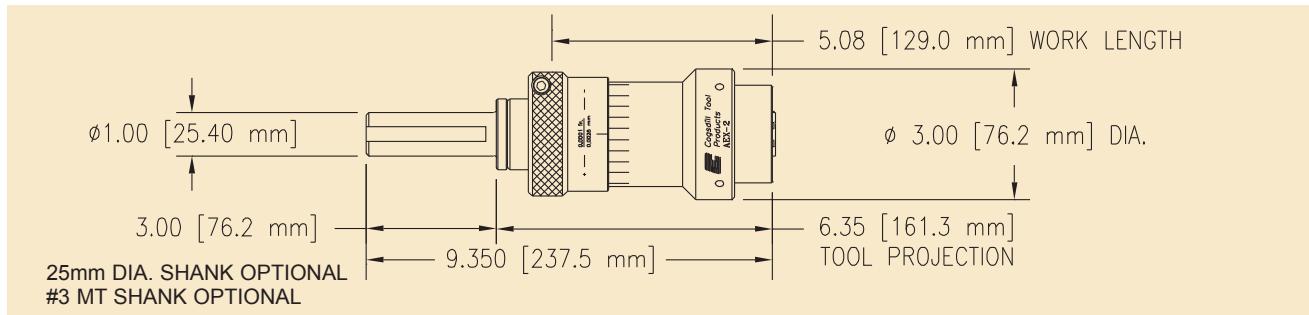
"AEX-1" SERIES ROLL-A-FINISH® TOOLS .062 TO .625 IN. (1.57 TO 15.88 MM)

DIAMETER RANGE		TOOL NUMBER
INCHES	MM	BOTTOMING (NO HELIX)
.043-.064	1.09-1.63	AEX-1-062
.059-.080	1.50-2.03	AEX-1-078
.075-.096	1.91-2.44	AEX-1-094
.090-.111	2.29-2.82	AEX-1-109
.106-.127	2.69-3.23	AEX-1-125
.122-.143	3.10-3.63	AEX-1-141
.137-.158	3.48-4.01	AEX-1-156
.152-.173	3.86-4.39	AEX-1-171
.168-.189	4.27-4.80	AEX-1-187
.184-.205	4.67-5.21	AEX-1-203
.200-.221	5.08-5.61	AEX-1-219
.215-.236	5.46-5.99	AEX-1-234
.231-.252	5.87-6.40	AEX-1-250
.247-.268	6.27-6.81	AEX-1-266
.262-.283	6.65-7.19	AEX-1-281
.278-.299	7.06-7.59	AEX-1-297
.293-.314	7.44-7.98	AEX-1-312
.309-.330	7.85-8.38	AEX-1-328
.325-.346	8.26-8.79	AEX-1-344
.340-.361	8.64-9.17	AEX-1-359
.356-.377	9.04-9.58	AEX-1-375
.372-.393	9.49-9.98	AEX-1-391
.387-.408	9.83-10.36	AEX-1-406
.403-.424	10.24-10.77	AEX-1-422
.418-.439	10.62-11.15	AEX-1-438
.434-.455	11.02-11.56	AEX-1-453
.450-.471	11.43-11.96	AEX-1-469
.465-.486	11.81-12.34	AEX-1-484
.481-.502	12.22-12.75	AEX-1-500
.497-.518	12.62-13.16	AEX-1-516
.512-.533	13.00-13.54	AEX-1-531
.528-.549	13.41-13.94	AEX-1-547
.543-.564	13.79-14.33	AEX-1-562
.559-.580	14.20-14.73	AEX-1-578
.575-.596	14.61-15.14	AEX-1-594
.590-.611	14.99-15.52	AEX-1-609
.606-.627	15.39-15.93	AEX-1-625

Shanks other than shown above are available upon request.

External Roll-a-Finish® tools AEX series

Standard tool specifications



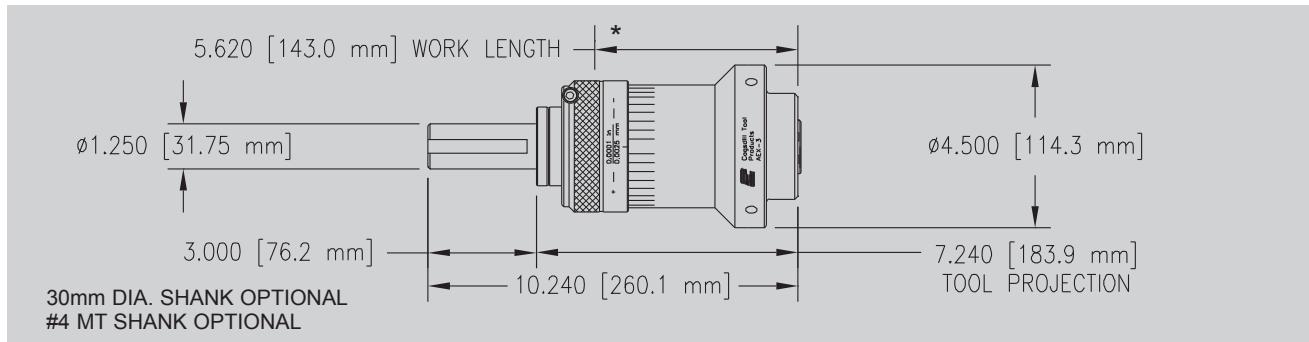
"AEX-2" SERIES ROLL-A-FINISH® TOOLS .062 TO 1.000 IN. (1.57 TO 25.4 MM)

DIAMETER RANGE		TOOL NUMBER	
INCHES	MM	MACHINE-FEED (NO HELIX)	BOTTOMING (NO HELIX)
.045-.066	1.14-1.68	AEX-2-062	AEXB-2-062
.061-.082	1.57-2.08	AEX-2-078	AEXB-2-078
.077-.098	1.96-2.49	AEX-2-094	AEXB-2-094
.092-.113	2.34-2.87	AEX-2-109	AEXB-2-109
.108-.129	2.74-3.28	AEX-2-125	AEXB-2-125
.124-.145	3.15-3.68	AEX-2-141	AEXB-2-141
.139-.160	3.53-4.06	AEX-2-156	AEXB-2-156
.154-.175	3.91-4.45	AEX-2-171	AEXB-2-171
.170-.191	4.32-4.85	AEX-2-187	AEXB-2-187
.186-.207	4.72-5.26	AEX-2-203	AEXB-2-203
.202-.223	5.13-5.66	AEX-2-219	AEXB-2-219
.217-.238	5.51-6.05	AEX-2-234	AEXB-2-234
.233-.254	5.92-6.45	AEX-2-250	AEXB-2-250
.249-.270	6.32-6.86	AEX-2-266	AEXB-2-266
.264-.285	6.71-7.24	AEX-2-281	AEXB-2-281
.280-.301	7.11-7.65	AEX-2-297	AEXB-2-297
.295-.316	7.49-8.03	AEX-2-312	AEXB-2-312
.311-.332	7.90-8.43	AEX-2-328	AEXB-2-328
.327-.348	8.31-8.84	AEX-2-344	AEXB-2-344
.342-.363	8.69-9.22	AEX-2-359	AEXB-2-359
.358-.379	9.09-9.63	AEX-2-375	AEXB-2-375
.374-.395	9.50-10.03	AEX-2-391	AEXB-2-391
.389-.410	9.88-10.41	AEX-2-406	AEXB-2-406
.405-.426	10.29-10.82	AEX-2-422	AEXB-2-422
.420-.441	10.67-11.20	AEX-2-438	AEXB-2-438
.436-.457	11.07-11.61	AEX-2-453	AEXB-2-453
.452-.473	11.48-12.01	AEX-2-469	AEXB-2-469
.467-.488	11.86-12.40	AEX-2-484	AEXB-2-484
.483-.504	12.27-12.80	AEX-2-500	AEXB-2-500
.499-.520	12.67-13.21	AEX-2-516	AEXB-2-516
.514-.535	13.06-13.59	AEX-2-531	AEXB-2-531
.530-.551	13.46-14.00	AEX-2-547	AEXB-2-547
.545-.566	13.84-14.38	AEX-2-562	AEXB-2-562
.561-.582	14.25-14.78	AEX-2-578	AEXB-2-578
.577-.598	14.66-15.19	AEX-2-594	AEXB-2-594
.592-.613	15.04-15.57	AEX-2-609	AEXB-2-609
.608-.629	15.44-15.98	AEX-2-625	AEXB-2-625
.624-.645	15.85-16.38	AEX-2-641	AEXB-2-641
.639-.660	16.23-16.76	AEX-2-656	AEXB-2-656
.655-.676	16.64-17.17	AEX-2-672	AEXB-2-672
.671-.692	17.04-17.58	AEX-2-688	AEXB-2-688
.686-.707	17.42-17.96	AEX-2-703	AEXB-2-703
.702-.723	17.83-18.36	AEX-2-719	AEXB-2-719
.717-.738	18.21-18.75	AEX-2-734	AEXB-2-734
.733-.754	18.62-19.15	AEX-2-750	AEXB-2-750
.749-.770	19.02-19.56	AEX-2-766	AEXB-2-766
.764-.785	19.41-19.94	AEX-2-781	AEXB-2-781
.780-.801	19.81-20.35	AEX-2-797	AEXB-2-797
.795-.816	20.19-20.73	AEX-2-812	AEXB-2-812
.811-.832	20.60-21.13	AEX-2-828	AEXB-2-828
.827-.848	21.00-21.54	AEX-2-844	AEXB-2-844
.842-.863	21.39-21.92	AEX-2-859	AEXB-2-859
.858-.879	21.79-22.33	AEX-2-875	AEXB-2-875
.874-.895	22.20-22.73	AEX-2-891	AEXB-2-891
.889-.910	22.58-23.11	AEX-2-906	AEXB-2-906
.905-.926	22.99-23.52	AEX-2-922	AEXB-2-922
.921-.942	23.39-23.93	AEX-2-938	AEXB-2-938
.936-.957	23.77-24.31	AEX-2-953	AEXB-2-953
.952-.973	24.18-24.71	AEX-2-969	AEXB-2-969
.967-.988	24.56-25.10	AEX-2-984	AEXB-2-984
.983-1.004	24.97-25.50	AEX-2-1000	AEXB-2-1000

Shanks other than shown above are available upon request.

External Roll-a-Finish® tools AEX series

Standard tool specifications



"AEX-3" SERIES ROLL-A-FINISH®TOOLS 1.016 TO 2.000 IN. (25.8 TO 50.8 MM)

DIAMETER RANGE		TOOL NUMBER	
INCHES	MM	MACHINE-FEED (NO HELIX)	BOTTOMING (NO HELIX)
.999-1.020	25.37-25.91	AEX-3-1016	AEXB-3-1016
1.014-1.035	25.76-26.29	AEX-3-1031	AEXB-3-1031
1.030-1.051	26.16-26.70	AEX-3-1047	AEXB-3-1047
1.045-1.066	26.54-27.08	AEX-3-1062	AEXB-3-1062
1.061-1.082	26.95-27.48	AEX-3-1078	AEXB-3-1078
1.077-1.098	27.36-27.89	AEX-3-1094	AEXB-3-1094
1.092-1.113	27.74-28.27	AEX-3-1109	AEXB-3-1109
1.108-1.129	28.14-28.68	AEX-3-1125	AEXB-3-1125
1.124-1.145	28.55-29.08	AEX-3-1141	AEXB-3-1141
1.139-1.160	28.93-29.46	AEX-3-1156	AEXB-3-1156
1.155-1.176	29.34-29.87	AEX-3-1172	AEXB-3-1172
1.170-1.191	29.72-30.25	AEX-3-1188	AEXB-3-1188
1.186-1.207	30.12-30.66	AEX-3-1203	AEXB-3-1203
1.202-1.223	30.53-31.06	AEX-3-1219	AEXB-3-1219
1.217-1.238	30.91-31.45	AEX-3-1234	AEXB-3-1234
1.233-1.254	31.32-31.85	AEX-3-1250	AEXB-3-1250
1.249-1.270	31.72-32.26	AEX-3-1266	AEXB-3-1266
1.264-1.285	32.11-32.69	AEX-3-1281	AEXB-3-1281
1.280-1.301	32.51-33.05	AEX-3-1297	AEXB-3-1297
1.295-1.316	32.89-33.43	AEX-3-1312	AEXB-3-1312
1.311-1.332	33.30-33.83	AEX-3-1328	AEXB-3-1328
1.327-1.348	33.71-34.24	AEX-3-1344	AEXB-3-1344
1.342-1.363	34.09-34.62	AEX-3-1359	AEXB-3-1359
1.358-1.379	34.49-35.03	AEX-3-1375	AEXB-3-1375
1.374-1.395	34.90-35.43	AEX-3-1391	AEXB-3-1391
1.389-1.410	35.28-35.81	AEX-3-1406	AEXB-3-1406
1.405-1.426	35.69-36.22	AEX-3-1422	AEXB-3-1422
1.420-1.441	36.07-36.60	AEX-3-1438	AEXB-3-1438
1.436-1.457	36.47-37.01	AEX-3-1453	AEXB-3-1453
1.452-1.473	36.88-37.41	AEX-3-1469	AEXB-3-1469
1.467-1.488	37.26-37.80	AEX-3-1484	AEXB-3-1484
1.483-1.504	37.67-38.20	AEX-3-1500	AEXB-3-1500
1.499-1.520	38.07-38.61	AEX-3-1516	AEXB-3-1516
1.514-1.535	38.46-38.99	AEX-3-1531	AEXB-3-1531
1.530-1.551	38.86-39.40	AEX-3-1547	AEXB-3-1547
1.545-1.566	39.24-39.78	AEX-3-1562	AEXB-3-1562
1.561-1.582	39.65-40.18	AEX-3-1578	AEXB-3-1578
1.577-1.598	40.06-40.59	AEX-3-1594	AEXB-3-1594
1.592-1.613	40.44-40.97	AEX-3-1609	AEXB-3-1609
1.608-1.629	40.84-41.38	AEX-3-1625	AEXB-3-1625
1.619-1.660	41.12-42.16	AEX-3-1656	AEXB-3-1656
1.651-1.692	41.94-42.98	AEX-3-1688	AEXB-3-1688
1.682-1.723	42.72-43.76	AEX-3-1719	AEXB-3-1719
1.713-1.754	43.51-44.55	AEX-3-1750	AEXB-3-1750
1.744-1.785	44.30-45.34	AEX-3-1781	AEXB-3-1781
1.775-1.816	45.09-46.13	AEX-3-1812	AEXB-3-1812
1.807-1.848	45.90-46.94	AEX-3-1844	AEXB-3-1844
1.838-1.879	46.69-47.73	AEX-3-1875	AEXB-3-1875
1.869-1.910	47.47-48.51	AEX-3-1906	AEXB-3-1906
1.901-1.942	48.29-49.33	AEX-3-1938	AEXB-3-1938
1.932-1.973	49.07-50.11	AEX-3-1969	AEXB-3-1969
1.963-2.004	49.86-50.90	AEX-3-2000	AEXB-3-2000

*Work length for nominal sizes from AEX-3-1719 through AEX-3-2000 is 3.938 in.(100mm).

Shanks other than shown above are available upon request.

Selection & ordering information

Internal Roll-a-Finish® tools

Specify tool number. First select series SR, or U. If helix (self-feeding) cage is desired, add an "H." Add a "B" if a bottoming tool is desired. Next, indicate nominal tool size. (*Examples: SR-500; SRH-750; SRB-1000.*)

If extra work length is desired, designate by adding the suffix -4, -6, or -8. (*Examples: SR-750-4, SRH-750-6, SRB-750-8.*) If no work length is specified, we will supply the shortest work length, which is shown in the respective tool specifications for each series.

When ordering bottoming-style tools, please furnish part print or detailed sketch.

External Roll-a-Finish® tools

When ordering external Roll-a-Finish tools, specify tool number. Add a "B" to the tool number if a bottoming tool is desired.

(*Examples: AEX-1-250; AEXB-2-500; AEX-3-1500.*)

For bottoming-style tools, please furnish part print or detailed sketch.

Replacement parts

For mandrel or race assemblies, specify tool number and description of part. (*Examples: SRH-500 mandrel assembly; AEX-1-375 race assembly.*)

Order individual components by detail number (if known), description, and tool number. (*Example: Detail 13 cage for SR-750.*)*

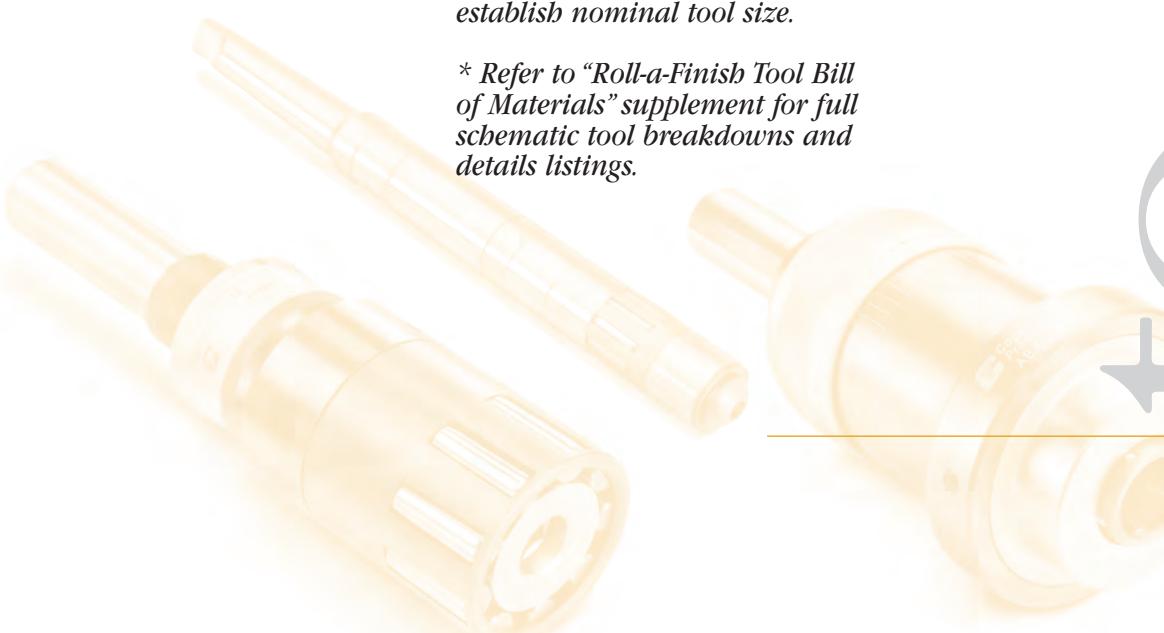
Order replacement rolls in complete sets. (NOTE: Mixing new and used rolls will reduce the effectiveness of the tool.) Specify detail number (if known), description, and tool number. (*Example: Detail 14 set of rolls for SR-1000.*)*

NOTE: Use cage marking to establish nominal tool size.

Bearingizing tools

For tool selection and ordering information for Bearingizing tools and replacement parts, please refer to page 18.

Order
Tool



Part preparation & operating parameters for roller burnishing

Note

The following instructions are intended for use with standard Cogsdill Roll-a-Finish tools. If your tool is a special design, please refer to your tool drawing for special operating parameters.

Machines

Cogsdill Roll-a-Finish tools are extremely versatile. The tool can be used on any type of shop machinery, including lathes, drill presses, machining centers, or any rotating spindle. Standard tools are designed for right-hand rotation, with either tool or part rotating.

Material

Almost any metal, particularly any ductile or malleable metal, such as steel, stainless, alloy, cast iron, aluminum, copper, brass, bronze, etc., may be successfully roller burnished. Hardness should normally be less than 40 on the Rockwell "C" scale. (If hardness exceeds Rc 40 consult Cogsdill's Engineering Department.)

Part preparation

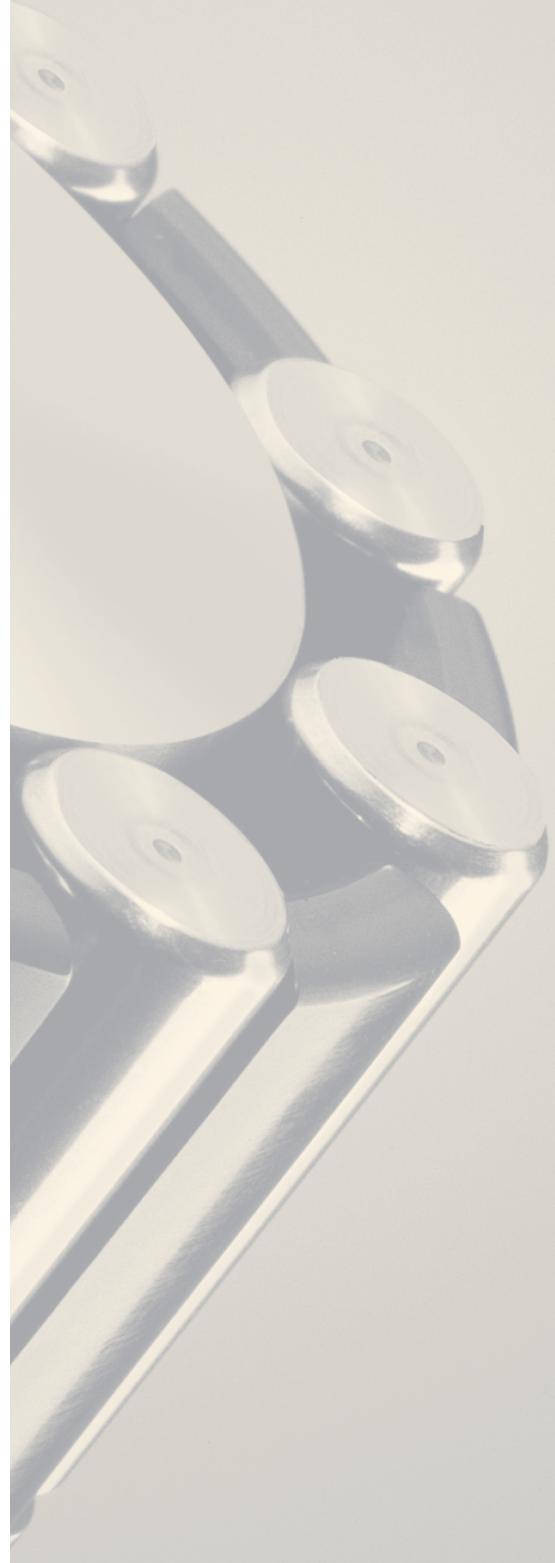
Proper part preparation is essential to obtain optimum results from roller burnishing. Due to the fact that no metal is removed in the process, finish depends upon the existence of a uniform and tearfree surface which will be caused to flow under the pressure exerted through the rolls

An 80-120 microinch surface (2 - 3 micrometers), which is typical of boring or turning, is considered an ideal surface for roller burnishing. This relatively rough prefinish allows the Roll-a-Finish tool to displace a greater amount of material on the surface of the workpiece. It also allows the prefinish tolerance to be much greater than with a smoother prefinish. A smoother prefinish reduces the roller burnishing effect, which means the prefinished size must be much closer to the acceptable tolerance

The ideal prefinish prior to roller burnishing is related to such variables as material, hardness, and tolerance requirements. Final part requirements of size, finish, and hardness will dictate preparation requirements, and some trial runs may be necessary in order to determine the ideal prefinish.

Final size of a workpiece depends upon its initial dimension and surface preparation. A very smooth prefinish cannot be reduced in size as much as a rougher prefinish. Successful results from roller burnishing depend upon the prefinish operation and will vary as shown in the Stock Displacement chart on page 27. The displacement column in the chart shows how much change in size may be expected for each starting or prefinished condition.

If sizing, finishing, and work hardening are to be optimized for a particular application, initial part preparation is critical and fine tool adjustment is necessary.



Part preparation & operating parameters for roller burnishing

Tool adjustment procedure

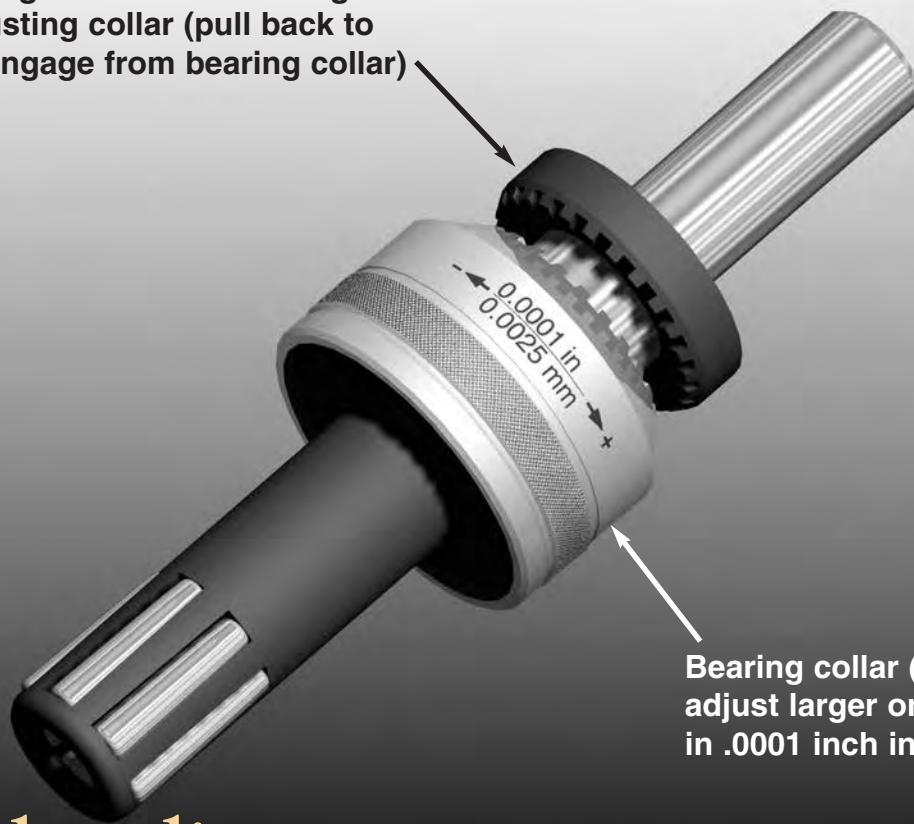
Cogsdill Tool Products manufactures a variety of standard Roll-a-Finish Tools. Although the detail numbers and nomenclature for the adjustment components differ somewhat for the various tool series, the adjustment procedure for all Roll-a-Finish tools is basically the same.

For all SR, U, and AEX-1 tools, a rear castellated adjusting collar interlocks with a threaded and castellated bearing collar to keep the tool in adjustment. In order to adjust the tool, retract the spring-loaded adjusting collar and rotate the threaded bearing collar. This will alter the position of the tapered mandrel or race in relation to the tapered rolls, thereby changing the effective tool

diameter within the specified diameter range. AEX-2 and AEX-3 tools have a locking ring instead of a castellated adjusting collar; tool adjustment requires the use of an Allen wrench. SR and AEX series tools adjust in increments of .0001 inch (.002mm). U series tools adjust in increments of .0002 inch (.005mm.)

Spring-loaded non-rotating adjusting collar (pull back to disengage from bearing collar)

Bearing collar (rotate to adjust larger or smaller in .0001 inch increments)



tool adjustment procedure

Part preparation & operating parameters for roller burnishing

Follow these steps when adjusting a Roll-a-Finish® tool:

- 1 The first step is to rotate the adjustment collar assembly in a plus or minus direction as marked on the tool until the workpiece will just slip over the rolls. This procedure is similar to plug or ring gaging a part. This will set tool working diameter the same as prepared part diameter.
- 2 Retract the tool from the part and increase tool working diameter by approximately .0005 to .001 inch (.01 to .02mm) over the prepared part diameter. On SR and AEX tools, a one-notch change equals .0001 inch (.002mm) diameter change. On U series tools, which are tools over 2.500 inches (63.5mm) in diameter, calibrations are in .0002 inch (.005mm) increments.
- 3 Now, run the first part and check for finish. Readjust tool diameter as necessary to obtain desired surface finish. Several trial runs may be necessary; however, once properly adjusted, only one pass of the tool is required for roller burnishing.
- 4 Measure finished parts for size. The difference between the prefinished and roller burnished sizes represents actual stock displacement. If necessary, modify the prefinished size to allow for more or less stock displacement.
- 5 If the prefinished size is changed, the burnishing tool must be adjusted by the same amount as the cutting tool to produce the desired finish.

Stock displacement

Approximate prefinishes resulting from common machining operations and the probable displacements produced by the roller burnishing process are listed below:

	Prefinish surface	
	Microinches	Micrometers
PREFINISH OPERATION		
Hone	10-20	.25-.50
Grind	20-40	.50-1.00
Ream	40-60	1.00-1.50
Bore, Turn (Medium)	80-100	2.00-3.00
Bore, Turn (Rough)	150-200	3.75-5.00

	Expected displacement by burnishing	
	Inches	Millimeters
PREFINISH OPERATION		
Hone	.0001-.0002	.002-.005
Grind	.0002-.0004	.005-.010
Ream	.0004-.0006	.010-.015
Bore, Turn (Medium)	.0008-.0012	.020-.030
Bore, Turn (Rough)	.0015-.0020	.038-.050

Surface finishes of 10 microinches (.25micrometers) Ra and below are obtainable provided that the prepared surface is uniform and tearfree.

Tool operation

Standard Roll-a-Finish tools are designed for right-hand rotation.

SRH and U tools have cages with roll pockets that are positioned at a slight helix angle so that the tool is self-feeding. SR, AEX, and all bottoming-style tools (SRB, UB, and AEXB) do *not* feature the helix angle on the roll pockets; these tools require machine-feeding.

When the Roll-a-Finish tool reaches the end of the desired roller burnishing length, pull the tool from the bore. This reverse action causes the rolls to collapse slightly in the cage to make withdrawal easy.

Part preparation & operating parameters for roller burnishing

Coolant

For most metals use any standard grade, light-weight, low-viscosity lubricating oil, or any mineral, sulphur, or soluble oil compatible with the metal or alloy to be burnished and recommended for fine surface finishing.

For aluminum or magnesium alloys use a highly refined oil-based coolant with low viscosity.

For cast iron a mineral seal oil is ideal. Flooding the part is recommended.

Filtration of the coolant is highly recommended to remove metal particles and grit.

Maintenance & repair

The Roll-a-Finish tool requires only routine maintenance. For long tool life and optimum performance, tool should be kept free of grit and other foreign matter. Rolls, cage, and mandrel should be examined at regular intervals and replaced when the desired size and finish are no longer obtainable. It is always advisable to replace a complete set of rolls, as there will be some sacrifice of tolerance and finish quality if new and used rolls are mixed.

Tools may be returned to Cogsdill for inspection and reconditioning to return them to original operating performance. Contact Cogsdill's Returns Department for a Return Material Authorization Number to assist us in processing your repair order. We will advise price and delivery before proceeding with the repair.

Interchangeability

Mandrel and race assemblies are interchangeable with tool adjustment assemblies within specified ranges. For example, the "SR"-style tools from .500 to 1.000 inch (12.7 to 25.4mm) have a common adjustment assembly.

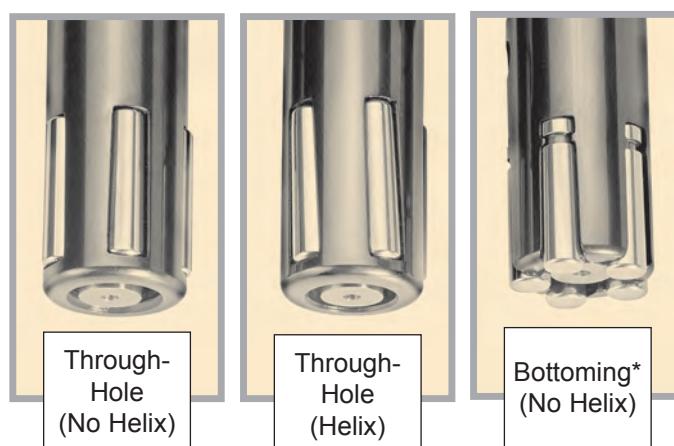
All standard Roll-a-Finish tools .500 inch and above can be changed from through-hole to bottoming by changing cage and rolls.

Speed and feed recommendations for internal Roll-a-Finish tools with self-feeding cages⁽¹⁾

DIAMETER		RPM	FEED PER REVOLUTION	
INCHES	MM		INCHES	MM
.187	4.76	1500-4300	.010-.012	.2540-.3048
.250	6.35	1500-4300	.010-.012	.2540-.3048
.312	7.94	1300-3700	.012-.014	.3048-.3556
.375	9.52	1020-3100	.016-.020	.4064-.5080
.437	11.11	875-2600	.018-.023	.4572-.5842
.500	12.70	765-2300	.018-.023	.4572-.5842
.562	14.28	675-2000	.018-.023	.4572-.5842
.625	15.87	610-1800	.030-.036	.7620-.9144
.750	19.05	505-1500	.030-.036	.7620-.9144
.875	22.22	335-1300	.034-.039	.8636-.9906
1.000	25.40	380-1100	.048-.052	1.219-1.321
1.125	28.57	340-1000	.051-.056	1.295-1.422
1.250	31.75	305-900	.064-.069	1.625-1.752
1.375	34.92	275-825	.077-.082	1.956-2.083
1.500	38.10	255-750	.090-.095	2.286-2.413
1.625	41.27	235-700	.084-.088	2.133-2.235
1.750	44.45	215-650	.097-.101	2.464-2.565
1.875	47.62	205-610	.110-.114	2.794-2.895
2.000	50.80	190-575	.123-.127	3.124-3.226
2.125	53.97	180-540	.136-.141	3.454-3.581
2.250	57.15	170-510	.149-.154	3.785-3.912
2.375	60.32	160-485	.162-.167	4.115-4.242
2.500	63.50	150-460	.175-.180	4.445-4.572
2.625	66.67	145-435	.088-.090	2.235-2.286
2.750	69.85	140-415	.095-.097	2.413-2.464
2.875	73.02	130-400	.101-.102	2.565-2.591
3.000	76.20	125-380	.101-.103	2.565-2.616
3.500	88.90	110-325	.128-.130	3.251-3.302
4.000	101.60	95-285	.154-.156	3.912-3.962

(1) When the self-feeding tool is used with power feed, the feed rate MUST exceed the maximum feed rate (shown at left) for a given size. This prevents the rolls from collapsing in the cage and eliminating the burnishing action.

POWER FEEDING CAGES: The feed rate for "SR" and bottoming-style "B" tools with power-feeding cages must be from .010 IPR (.25mm/rev.) up to the maximum rate (shown at left) for the self-feeding tools for the same diameter.

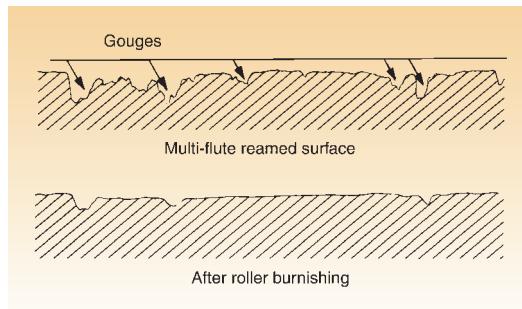
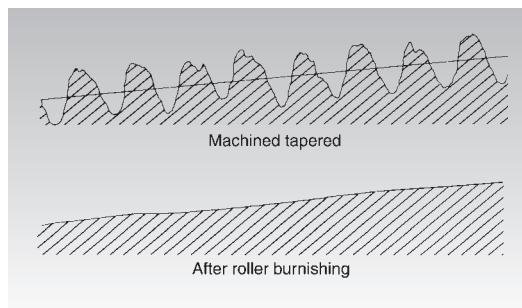
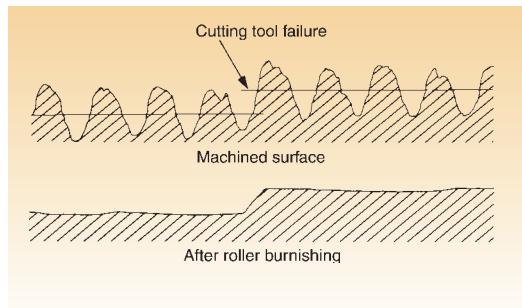


*Mandrel may be cut off if it does not allow full bottoming.

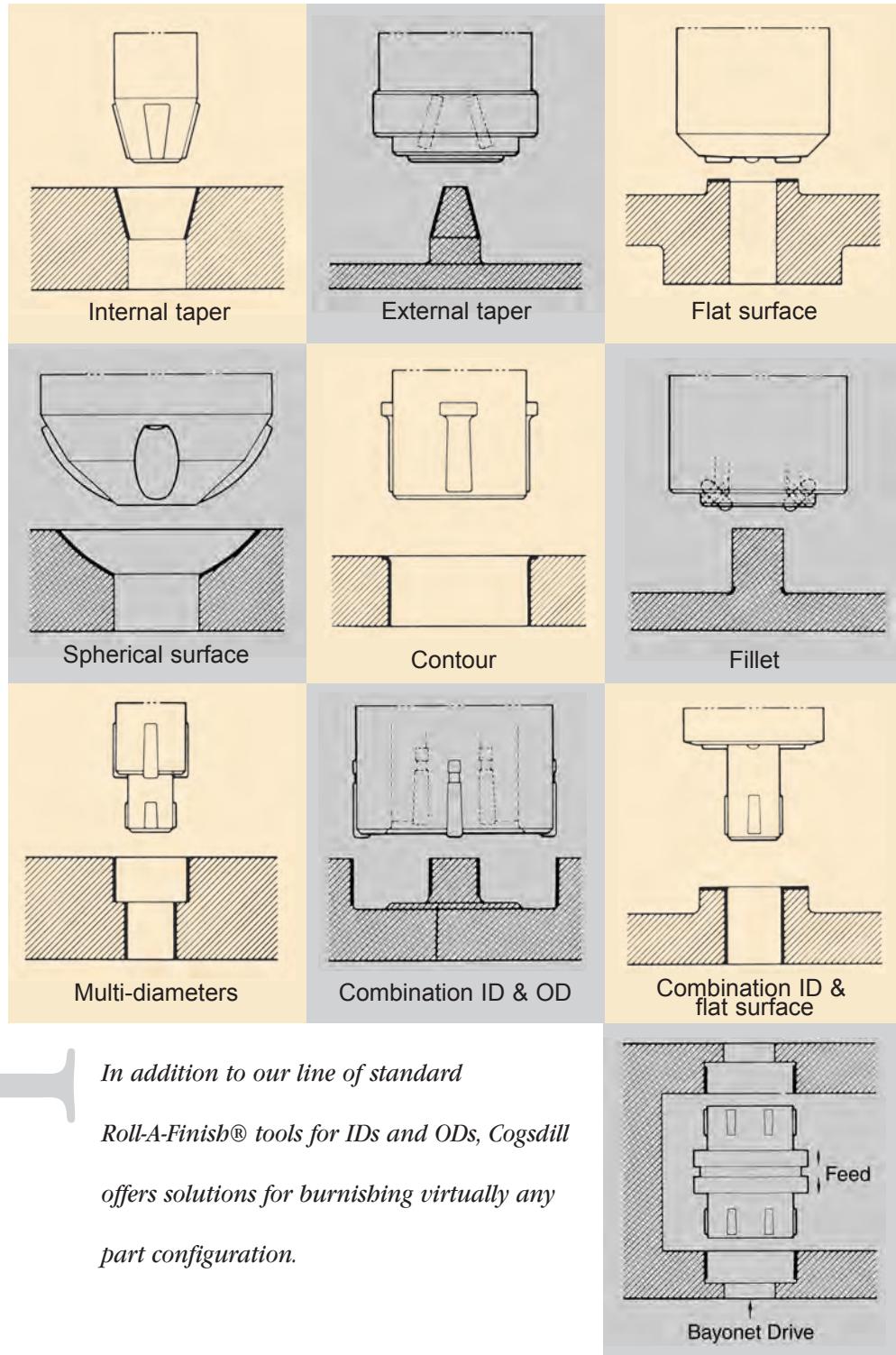
Part preparation & operating parameters for roller burnishing

TROUBLE-SHOOTING GUIDE		
PROBLEM	POSSIBLE CAUSE	SOLUTION
1. FINISH		
A. Scratches	Foreign material Worn rolls.	Clean filter coolant. Inspect – Replace if discolored or marred.
B. Flaking.	Too much interference. Too much friction.	Adjust for less interference More lubricity in coolant.
C. Spiral marks. Residual tool marks.	Premachining too smooth, or not uniform. Not enough burnishing. Roll stuck, or foreign matter stuck in pocket. Roll paths not overlapping. Chips left in bore.	Sharper radius cutting tool, replace or sharpen. Increase feed of cutting tool. Increase tool diameter, pressure support part wall if thin, or consider Bearingizing. Inspect and clean cage, replace if necessary. Decrease feed rate. Flush prior to burnishing.
2. SIZE		
A. Too small or large after burnishing.	Incorrect stock allowance.	Adjust cutting tool (presize) and Roll-a-Finish tool.
B. Bell mouth or taper.	Premachining problem Misalignment. Tool runout. Part has thin wall, irregular geometry, or no support.	Check before burnishing. Correct or use floating holder. Indicate mandrel-repair. Support by fixture or consider Bearingizing.
3. (MISC.)		
A. Rolls hit on entry.	Misalignment. Too much roll projection.	Correct alignment. Chamfer part-if possible. Retain with O'Ring or similar device if a short bore. Use smaller cage, if interchangeable. Or, select a tool with your part size on the higher end of the adjustment range.
B. Can't burnish entire length of bore.	Tool too short. Mandrel hits bottom of bore or fixture.	Use R-style or consider special tool. Grind mandrel tip off, use larger tool size, or consider special tool.

Effects of poorly machined surfaces on burnishing



Special applications & tool designs



Special applications & tool designs

In 1993 Cogsdill Tool Products acquired The Madison Microlle® Product Line. In 2012, Cogsdill acquired the Roll-A-Matic burnishing product line. With the combined experience of over a century of designing and manufacturing burnishing tools and machines, Cogsdill is unquestionably the world leader in special burnishing tool designs and applications engineering.

A few examples of our thousands of special tool designs are shown below:



Where part size varies and surface finish is the primary requirement, expanders, contractors, and compensating tools produce consistently excellent surface finishes.



Air-actuated compensating tool

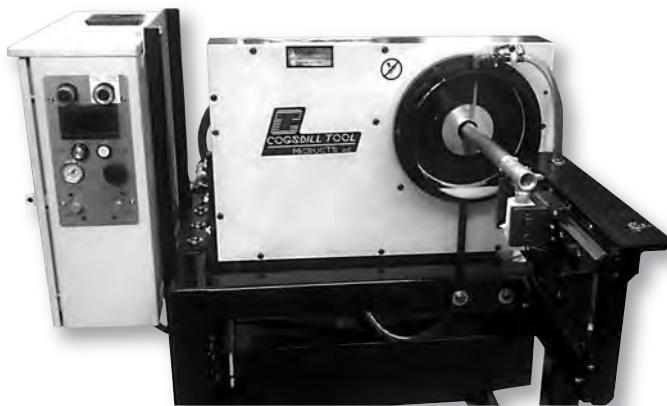
*Send us a part
print or detailed
sketch and request
a quotation.*

CX® machines

External roller burnishing machines

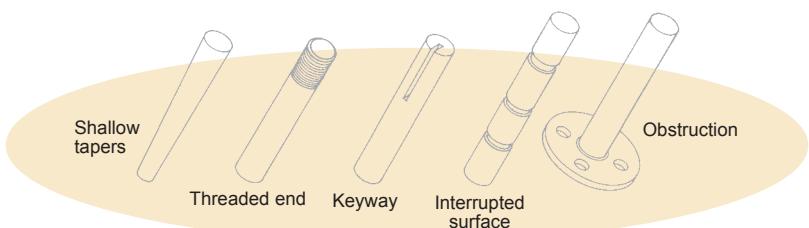


CX-2000



CX-3000

Machines shown above are not to scale.



Shown above are examples of various types of parts which are processed by CX external roller burnishing.

Product features

Versatility

All ductile or malleable metals with hardness up to R/C 40 can be roller burnished. Cylindrical parts of any length, bars, tubing, wire and stranded cable may all be processed with Cogsdill's self-contained, self-feeding roller burnishing machines. A continuously variable speed drive allows the operator to select the optimum production rate for obtaining the desired size and finish. An adjustable tilt base makes it possible to select the ideal feed angle for automatic or manual loading.

Several sub-assembly options are available to suit various application requirements (see page 37, "CX Sub-Assembly Options").

Coolant systems are designed and recommended to supply the necessary part lubrication for burnishing. Part supports, consisting of V-guides faced with teflon, are available for thru-feed applications where long parts require support, or as an aid in workpiece alignment during high production runs. Various power options are available to meet your electrical requirements. The CX-2000 is a heavy duty, high production machine that is ideally used where size or portability is a factor. The CX-3000 is a heavy duty, high production machine designed for permanent installation on the production floor.

These options, combined with the standard features, make the Cogsdill CX machine a useful and versatile machine tool. However, should the wide array of options available with our standard tooling and equipment fail to meet your particular requirements, a variety of special tooling is available on special order. Please submit a part print and request a quotation.

Accurate sizing

Tolerances within .0001 inch (.0025mm) are attainable, depending on variables such as material type, hardness, pre-machining method, and the finish on the part prior to burnishing. A prepared tolerance of .002 inch (.05mm) can usually be reduced by 50 % (.001 inch /.02mm).

Low micro finishing

One pass through a Cogsdill CX machine can quickly reduce a 20-40 microinch Ra (0.5 to 1.0 micrometer) ground surface or an 80-120 microinch (2-3 micrometers)(Ra) turned surface to a mirrorlike 5 microinch (.125 micrometer)(Ra) finish or lower. Parts varying in size as much as .005 inch (.127mm) can be burnished to the same low microfinish with the use of an optional pressure control unit (see Versatility section). The roller burnishing process significantly improves bearing surface over other types of finishing processes and is ideal for shafts running in bushings or oil seals.

Work hardening

Surface hardening of the workpiece is achieved simultaneously with sizing and finishing. With certain materials, increases in surface hardness of up to 3 points on the Rockwell "C" scale are attainable. The smooth, dense, hardened surface produced by the roller burnishing process extends wear life, improves resistance to corrosion and reduces fatigue failures. Friction is also reduced, resulting in noise reduction where shafts are running in bushings.

Appearance improvement

Machined parts (turned or ground) can be roller burnished to lustrous, mirrorlike finishes. Subsequent plating applications will often be improved as roller burnishing removes surface patterns and blemishes resulting from prior machining operations.

Fast processing

Cogsdill CX machines process parts in seconds. Parts are sized, finished and work hardened in one pass. Cylindrical parts of any length are processed at speeds up to 30 feet/minute (9.14 meters/minute).

Roller burnishing can often eliminate time consuming and expensive finishing operations such as grinding or lapping. The result is better quality parts, produced in less time, at a lower cost.

Adjustability

Race assemblies, the working components of the CX machine, are designed to process specific nominal size workpieces. CX-1 race assemblies for diameter range .045 to 1.004 inch (1.15 to 25.50mm) are adjustable in increments of .0001 inch (.0025mm) over a range of .021 inch (.53mm) for each nominal size. CX-2 race assemblies for diameter range .963 to 2.504 inch (25.46 to 63.60mm) are adjustable in increments of .0002 inch (.0051mm) over a range of .041 inch (1.04mm) for each nominal size (see pages 34 and 36 for total range of adjustability for each CX model). Race assemblies are interchangeable within the limits of the operating range for a given model. Changing race assemblies is a 5 minute job requiring little more than the removal of four machine screws.

CX® External roller burnishing machines

CX-2000 External roller burnishing machine



CX-2000

The CX-2000 External Roller Burnishing Machine offers quiet, smooth operation in a rigid and stable machine design. Two models are available: an adjustable speed model, with variable frequency drive and digital speed display; and an economical fixed speed model (which can be adjusted, if necessary). Coolant capability is standard on both models. An optional portable cabinet with integral coolant pump is offered (and recommended).

The CX-2000 uses the same interchangeable race assemblies as

the CX-3000-1 for part diameters from .045 to 1.004 inch (1.15 to 25.50mm).

An easy-access control panel is located on the front of the machine. There are three standard power options: 220V single-phase, 220V three-phase, or 440V three-phase. An adjustable tilt base allows for the ideal feed angle, from horizontal to vertical, for automatic or manual part loading. Optional part supports are available for long parts or for workpiece alignment in high-production runs.

Height: 16 inches (406mm)

Width: 31 inches (787mm)

Depth: 20 inches (508mm)

CX® External roller burnishing machines

CX-2000 External roller burnishing machine



CX-2000 External Roller Burnishing Machine features product design improvements to enhance machine performance.



Interchangeable race assemblies size, finish, and work-harden parts in seconds; through-feed or up to a stop-and release.



Four sub-assembly options enhance machine versatility (interference-to-a-stop shown).



Coolant system lubricates parts and flushes away chips. When optional portable cabinet is purchased, pump comes mounted inside cabinet.

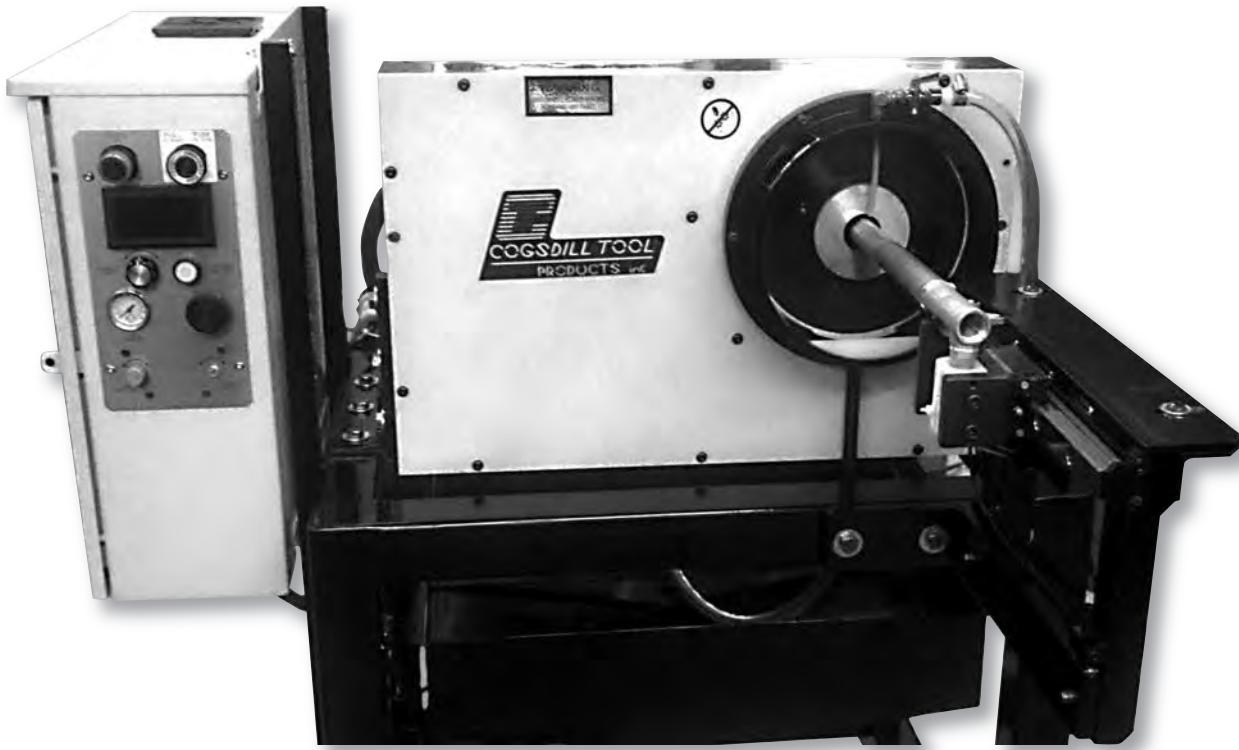


Easy-access control panel is located on the front of the machine.

CX-2000

CX® External roller burnishing machines

CX-3000 External roller burnishing machine



CX-3000

The new CX-3000 External Roller Burnishing Machine replaces the former CX-1 and CX-2 model machines. The CX-3000 is designed for permanent installation on the production floor. The CX-3000 machine is available in two models: the CX-3000-1 for part diameters from .045 to 1.004 inch (1.15 to 25.50mm), and the CX-3000-2 for part diameters from .963 to 2.504 inch (25.46 to 63.60mm). The large part diameter range capacity is accomplished by using one base model machine and two interchangeable spindle assemblies

that can be changed by either the customer or by our trained technicians at our factory.

The CX-3000 machine comes standard as an adjustable speed model with variable frequency drive and digital speed display. A coolant system is also standard on the CX-3000 machine.

An easy-access control panel is located on the front of the machine. An adjustable tilt base for ideal feed angle for automatic or manual part loading is available as an option. Part supports are also available as an option for long parts or for

workpiece alignment in high-production runs.

For additional information or to obtain a quotation on the CX-3000 External Roller Burnishing Machine, please contact Cogsdill or one of our Sales Engineers. Also contact Cogsdill for more information on CX Race Assemblies for part diameters over 1.000 inch (25.4mm).

CX® External roller burnishing machines

CX sub-assembly options

The CX machine is designed for versatility. Four CX sub-assembly options allow almost any part configuration to be burnished. The machine operates in one of two modes: interference or compensating.

In the interference mode, the working diameter is set slightly smaller (about .0005 inch, or .01mm) than the diameter of the workpiece. The interference mode is used to accurately size and finish parts simultaneously in one fast pass.

The air pressure-controlled compensating unit allows the machine to automatically adjust to different part diameters, within a given range, in order to achieve a surface finish which is consistent regardless of variations in part size. The compensating mode is designed for applications where finish, rather than size, is the primary requirement. The compensating unit can accommodate a size variation of up to .005 inch (.13mm) in a single part, or from part to part. It also allows through-feed burnishing of parts with tapers or enlarged sections where the maximum diameter difference is no more than .030 inch (.76mm).

Each of the two modes is available for through-feed burnishing or with an adjustable stop-and-release mechanism for burnishing parts up to shoulders or obstructions.

The four available CX sub-assemblies are as follows:

- Sub-assembly "A":
Interference through-feed
- Sub-assembly "B":
Interference to a stop
- Sub-assembly "C":
Compensating through-feed
- Sub-assembly "E":
Compensating to a stop

CX speed and feed recommendations

The information below is intended as a starting point for selecting the speed and feed rate that will produce optimum results in CX® burnishing. Factors such as material type, part configuration, and coolant must be taken into consideration.

Spindle speed is not a critical factor in the successful operation of CX machines. Roller burnishing tools and machines are very tolerant in regard to the effect of spindle speed on resulting surface finishes.

The feed rates are based on using a stationary cage (the part is free to rotate; the anti-rotation spacer is installed). If the thrust bearing is used (i.e., the part is not allowed to rotate) the feed rate will be approximately 1/2 of the feed rate shown.

CX® Speed and feed recommendations

PART NUMBER	RPM	CX IN./REV.	CX-B IN./REV.	CX-R IN./REV.	CX-RB IN./REV.
CX-062	1800	.063	.031	.053	.029
CX-125	1800	.074	.037	.068	.047
CX-187	1800	.084	.042	.075	.037
CX-250	1800	.094	.047	.085	.042
CX-312	1800	.104	.052	.095	.047
CX-375	1800	.115	.057	.106	.053
CX-438	1400	.145	.072	.133	.066
CX-500	1400	.156	.078	.144	.072
CX-562	1400	.166	.083	.154	.077
CX-625	1200	.176	.088	.164	.082
CX-687	1200	.187	.093	.175	.087
CX-750	1200	.197	.098	.185	.092
CX-812	1000	.220	.111	.208	.104
CX-875	900	.233	.116	.218	.109
CX-934	900	.243	.121	.228	.114
CX-1000	900	.254	.127	.238	.119

The production rate of the machine can be calculated as follows:

$$\text{PRODUCTION} = \frac{\text{FEED RATE}}{\text{IPM}} \times \frac{\text{SPEED OF THE MOTOR}}{\text{RPM}}$$

RACE ASSEMBLY TYPES*: CX: Interference through-feed; CX-B: Interference to a stop; CX-R: Compensating through-feed; CX-RB: Compensating to a stop

*corresponding to sub-assembly options

external roller burnishing machines



CX® External roller burnishing machines

CX® Race Assemblies

The same race assemblies are used for the CX-2000 and the CX-3000-1 external roller burnishing machines. Those race assemblies are shown below, in both interference and compensating styles.

For information on race assemblies for CX-3000-2 machines, contact Customer Service.

INTERFERENCE-STYLE		
PART NUMBER	DIAMETER RANGE	
	IN.	MM
CX-062	.045-.066	1.14-1.68
CX-078	.061-.082	1.55-2.08
CX-094	.077-.098	1.96-2.49
CX-109	.092-.113	2.34-2.87
CX-125	.108-.129	2.74-3.28
CX-141	.124-.145	3.15-3.68
CX-156	.139-.160	3.53-4.06
CX-171	.154-.175	3.91-4.45
CX-187	.170-.191	4.32-4.85
CX-203	.186-.207	4.72-5.26
CX-219	.202-.223	5.13-5.66
CX-234	.217-.238	5.51-6.05
CX-250	.233-.254	5.92-6.45
CX-266	.249-.270	6.32-6.86
CX-281	.264-.285	6.71-7.65
CX-297	.280-.301	7.11-7.65
CX-312	.295-.316	7.49-8.03
CX-328	.311-.332	7.90-8.43
CX-344	.327-.348	8.31-8.84
CX-359	.342-.363	8.69-9.22
CX-375	.358-.379	9.09-9.63
CX-391	.375-.395	9.53-10.03
CX-406	.389-.410	9.88-10.41
CX-422	.405-.426	10.29-10.82
CX-438	.420-.441	10.67-11.2
CX-453	.436-.457	11.07-11.61
CX-469	.452-.473	11.48-12.01
CX-484	.467-.488	11.86-12.4
CX-500	.483-.504	12.27-12.8
CX-516	.499-.520	12.68-13.21
CX-531	.514-.535	13.06-13.59

INTERFERENCE-STYLE		
PART NUMBER	DIAMETER RANGE	
	IN.	MM
CX-547	.530-.551	13.46-14.00
CX-562	.545-.566	13.84-14.38
CX-578	.561-.582	14.25-14.78
CX-594	.577-.598	14.56-15.19
CX-609	.592-.613	15.03-15.57
CX-625	.608-.629	15.44-15.98
CX-641	.624-.645	15.85-16.38
CX-656	.639-.660	16.23-16.76
CX-672	.655-.676	16.64-17.17
CX-688	.671-.692	17.04-17.58
CX-703	.686-.707	17.42-17.96
CX-719	.702-.723	17.83-18.36
CX-734	.717-.738	18.21-18.75
CX-750	.733-.754	18.62-19.15
CX-766	.749-.770	19.03-19.56
CX-781	.764-.785	19.41-19.94
CX-797	.780-.801	19.81-20.35
CX-812	.795-.816	20.19-20.73
CX-828	.811-.832	20.60-21.13
CX-844	.827-.848	21.01-21.54
CX-859	.842-.863	21.39-21.92
CX-875	.858-.879	21.79-22.33
CX-891	.874-.895	22.20-22.73
CX-906	.889-.910	22.58-23.11
CX-922	.905-.926	22.98-23.52
CX-938	.921-.942	23.39-23.93
CX-953	.936-.957	23.77-24.31
CX-969	.952-.973	24.18-24.71
CX-984	.967-.988	24.56-25.10
CX-1000	.983-1.004	24.97-25.50

CX® External roller burnishing machines

COMPENSATING-STYLE

PART NUMBER	DIAMETER RANGE	
	IN.	MM
CX-062	.058-.070	1.47-1.78
CX-078	.074-.095	1.88-2.41
CX-094	.090-.111	2.29-2.82
CX-109	.105-.126	2.67-3.20
CX-125	.121-.142	3.07-3.61
CX-141	.137-.158	3.48-4.01
CX-156	.152-.173	3.86-4.39
CX-171	.167-.188	4.24-4.78
CX-187	.183-.204	4.65-5.18
CX-203	.199-.220	5.06-5.59
CX-219	.215-.236	5.46-5.99
CX-234	.230-.251	5.84-6.38
CX-250	.246-.267	6.25-6.78
CX-266	.262-.283	6.66-7.19
CX-281	.277-.298	7.04-7.57
CX-297	.293-.314	7.44-7.98
CX-312	.308-.329	7.82-8.36
CX-328	.324-.345	8.23-8.76
CX-344	.340-.361	8.64-9.17
CX-359	.355-.376	9.02-9.55
CX-375	.371-.392	9.42-9.96
CX-391	.387-.408	9.83-10.36
CX-406	.402-.423	10.21-10.74
CX-422	.418-.437	10.62-11.10
CX-438	.434-.455	11.02-11.56
CX-453	.449-.470	11.41-11.94
CX-469	.465-.486	11.81-12.34
CX-484	.480-.501	12.19-12.73
CX-500	.496-.517	12.60-13.13
CX-516	.512-.533	13.01-13.54
CX-531	.527-.548	13.39-13.92

PART NUMBER	DIAMETER RANGE	
	IN.	MM
CX-547	.543-.564	13.79-14.33
CX-562	.558-.579	14.17-14.71
CX-578	.574-.595	14.58-15.11
CX-594	.590-.611	14.99-15.52
CX-609	.605-.626	15.37-15.90
CX-625	.612-.642	15.55-16.31
CX-641	.637-.658	16.18-16.71
CX-656	.652-.673	16.56-17.09
CX-672	.668-.689	16.97-17.50
CX-688	.684-.705	17.37-17.91
CX-703	.699-.720	17.76-18.29
CX-719	.715-.736	18.16-18.69
CX-734	.730-.751	18.54-19.08
CX-750	.746-.767	18.95-19.48
CX-766	.762-.783	19.36-19.89
CX-781	.777-.798	19.74-20.27
CX-797	.793-.814	20.14-20.68
CX-812	.808-.829	20.52-21.06
CX-828	.824-.845	20.93-21.46
CX-844	.840-.861	21.34-21.87
CX-859	.855-.876	21.72-22.25
CX-875	.871-.892	22.12-22.66
CX-891	.887-.908	22.53-23.06
CX-906	.902-.923	22.91-23.44
CX-922	.918-.939	23.32-23.85
CX-938	.934-.955	23.72-24.26
CX-953	.949-.970	24.11-24.64
CX-969	.965-.986	24.51-25.04
CX-984	.980-1.001	24.89-25.43
CX-1000	.996-1.017	25.30-25.83

Diamond burnishing tools

For producing low microinch finishes on shafts or faces of any diameter, or on large bores.

- Four designs allow use on most turning machines, manual or CNC
- Replaceable, polished diamond insert
- Adjustable for optimum burnishing pressure



Cogsdill Diamond Burnishing Tools are simple, efficient tools designed to produce mirror-like finishes on a wide range of ferrous and non-ferrous part surfaces on most turning machines.

Set up and cycle times are short, even for unskilled operators. In all cases, the replaceable diamond insert can be changed quickly; on some models without removing the tool holder from the machine.

Four tool designs to suit your application requirements:

- **DB-1** For general purpose machining
- **DB-2** For use where work length is restricted
- **DB-3** and **DB-4** For use on CNC machining centers - the tool holders are offset so that the diamond insert is on center

Diamond burnishing tools

The Cogsdill Diamond Burnishing Tool is designed to produce high quality, low microinch burnished finishes on shafts, large bores, and faces. With most metals, a turned or ground part with a properly prepared 40 to 60 microinch finish can be burnished to a 4 to 8 microinch finish in seconds. Cast iron can usually be burnished to an 8 to 15 microinch finish.

Cogsdill Diamond Burnishing Tools can burnish virtually any size stock; from carbon steels to tool steels, cast iron to alloys, and most ferrous and non-ferrous metals. The premium quality diamond burnishing insert is polished and contoured to provide superior finishes and excellent tool life.

Since set up and operation is relatively simple, no special operator skills are required. Diamond Burnishing Tools are versatile ... various models are designed for use

in the tool post of a manual lathe, automatic, or in CNC equipment. The tools can be used on both large and small diameters, and are ideal for short production runs. The Diamond Burnishing Tool can produce quality finishes on interrupted surfaces, such as a shaft with a keyway or the face of a flange having a series of bolt holes.

While the tool must be used with coolant, no special coolant is required. Straight oils, soluble oils, and synthetic coolants can be used to provide the necessary lubrication.



*Replaceable
diamond insert is
polished and
contoured for
superior finishes
and long tool life.*

diamond
burnishing
tools

How it works

The Cogsdill Diamond Burnishing Tool is mounted in the tool post of the desired machine. The diamond burnishing point is brought into contact with the workpiece at the centerline of the part and perpendicular to the surface being finished. The tool is then fed into the workpiece an additional .002 or .003 inch (.05 or .08mm) to allow the diamond insert to become disengaged from the stop in the holder. The spring, with its preload, forces the diamond against the workpiece. The tool is then fed along the surface of the rotating workpiece to produce a mirrorlike finish.

As a recommended starting point the adjusting screw should be tightened (turn clockwise) until all clearance between the push rod and the spring is removed. Then tighten the screw another 1 to 2 turns which will compress the spring to provide the necessary preload to the diamond insert. This is the

recommended starting point for mild steel. Slight adjustments in the burnishing pressure can be made, if necessary, to achieve the optimum finish. To adjust the burnishing pressure, tighten the adjustment screw to increase pressure or loosen the screw (turn counterclockwise) to reduce the pressure.

The prefinish on most metals should be approximately 40 to 60 R.M.S. for best results. A feed rate of .003 to .004 inches (.076 to .102mm) per revolution at speeds up to 750 surface feet per minute (229 surface meters per minute) is generally recommended when using the Cogsdill Diamond Burnishing Tool.

Normally, after the tool has been set to provide the .002 to .003 inch (.05 to .08mm) "interference", it can be fed onto the rotating work-piece and allowed to feed off. The slight radius of the diamond tip is sufficient to cause the tool to "climb over" the edge of the part and begin its

burnishing action. Likewise, if an interrupted surface is burnished, such as a shaft with a keyway or a flange with bolt holes, the tip of the tool will drop into the interruption but "climb up" the other edge due to the radius on the diamond.

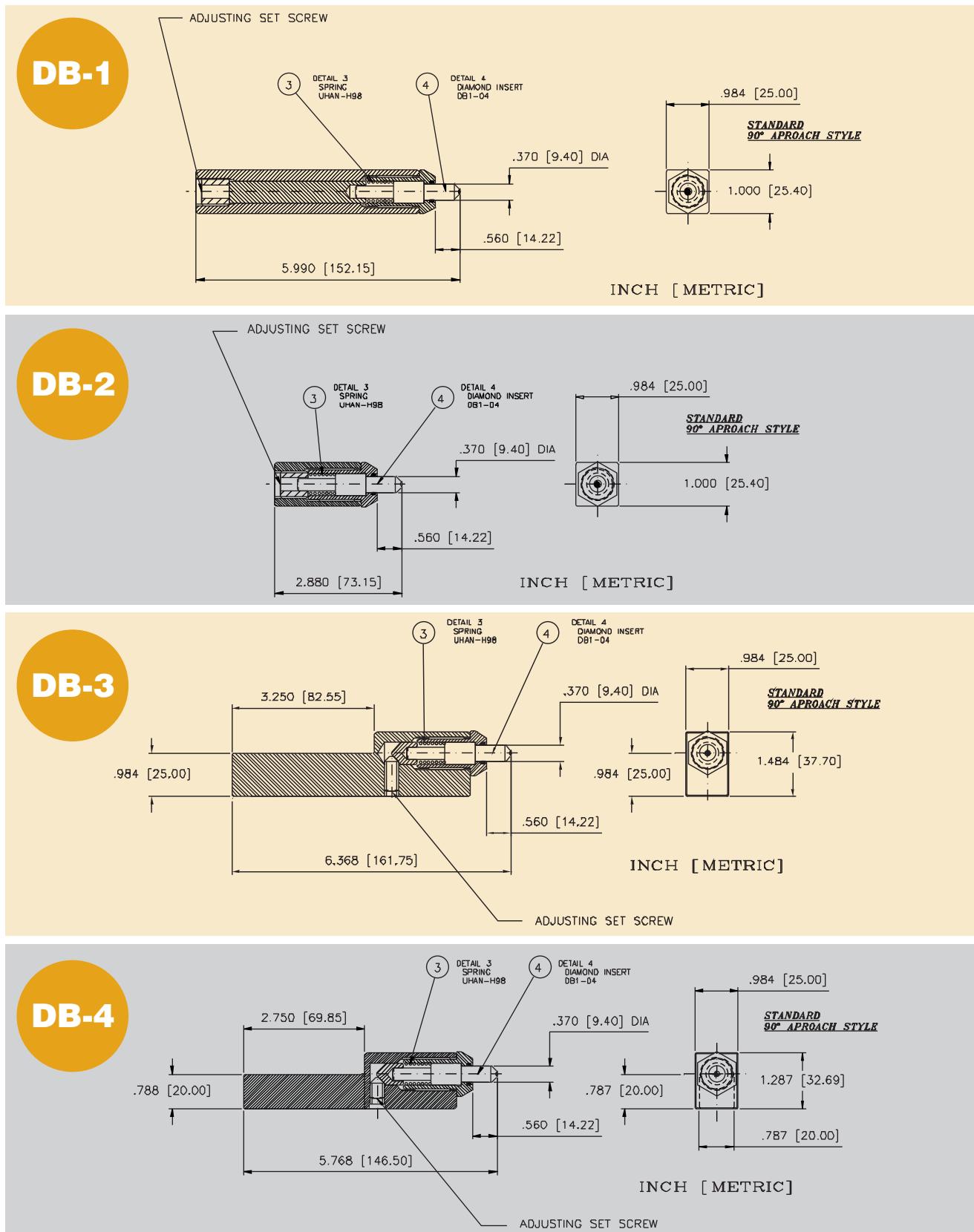
CAUTION: It is important NOT to exceed the recommended amount of interference. An excessive projection of the diamond insert into any surface interruption could cause tool breakage, as the diamond insert could not perform its "climbing" action. (Note: Adjustment of the burnishing force does not affect the amount of interference.)

Note: Diamond burnishing tools do not have the advantage of an overlapping effect as with multi-roll tools, and for this reason slower feed rates and/or multiple passes over the part may be required in order to produce the desired finish.



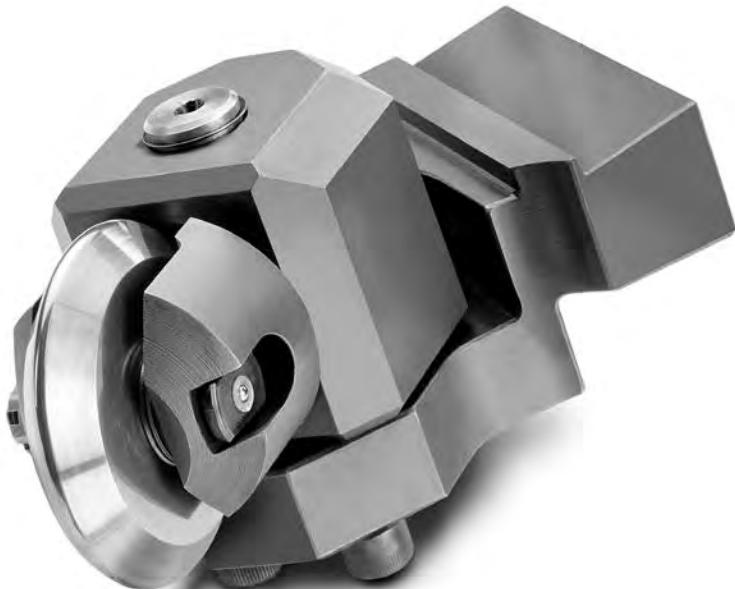
Diamond Burnishing Tools are adjustable for optimum burnishing pressure. For the DB-1 and DB-2 models, the adjustment screw is located in the end of the tool. For models DB-3 and DB-4, the adjustment screw is located on the side of the tool.

Standard tool specifications



Universal™ burnishing tools

*For burnishing shafts, faces, tapers,
contours, and relatively large IDs
(greater than 2.750 inches/69.85mm)*



UBT-T1 indexable turning-holder style burnishing tool

(Left-hand tool shown)



UBT-B1 boring-bar style burnishing tool

Versatility



UBT-B1 burnishing O.D.



UBT-B1 burnishing face



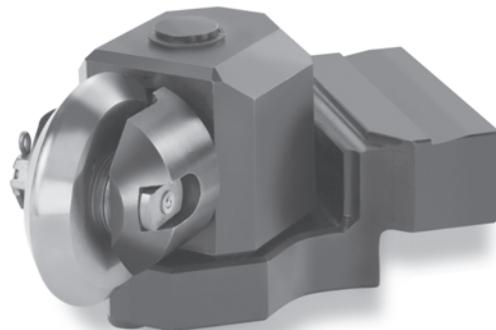
UBT-T1 burnishing taper

(Left-hand tool shown)

Burnish
any size, any
configuration,
on any turning
machine.

Universal™ burnishing tools

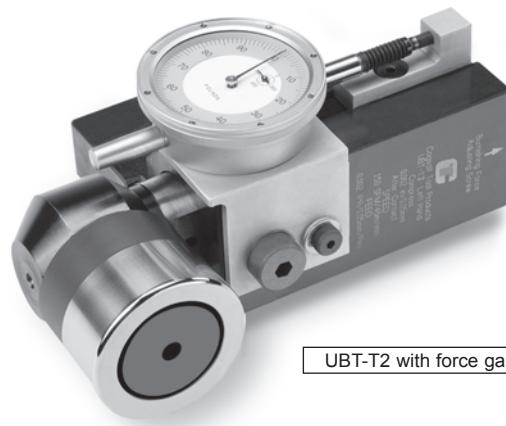
Turning-holder style



UBT-T1



UBT-T2



UBT-T2 with force gauge



UBT-T3

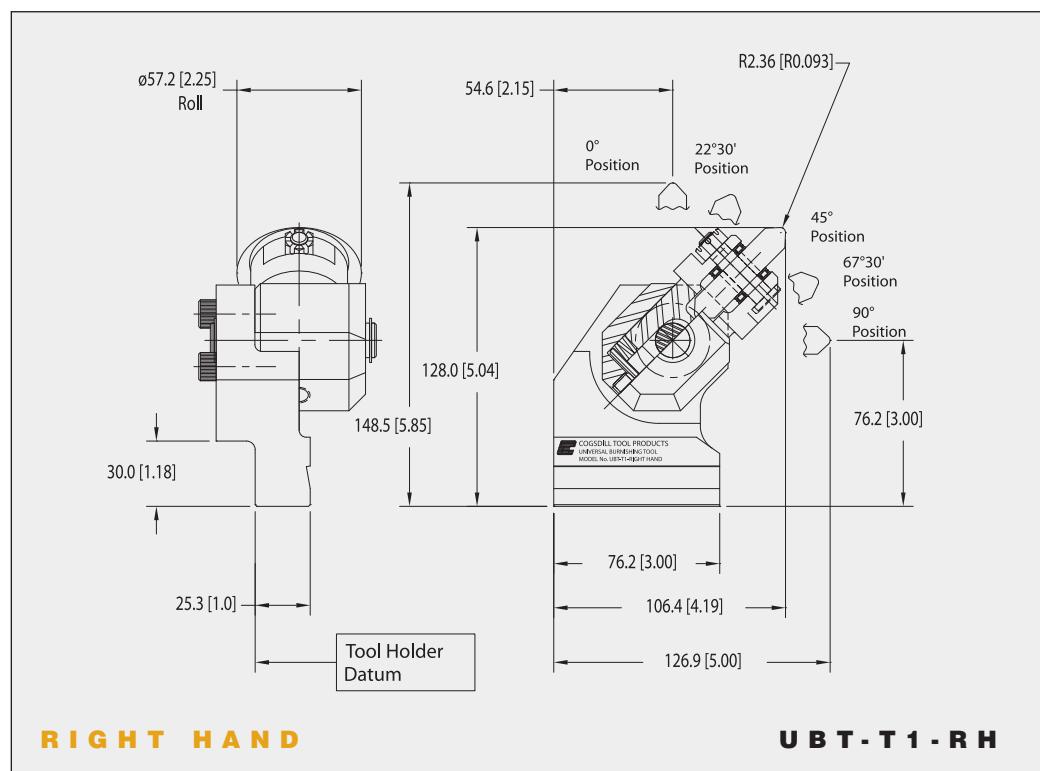
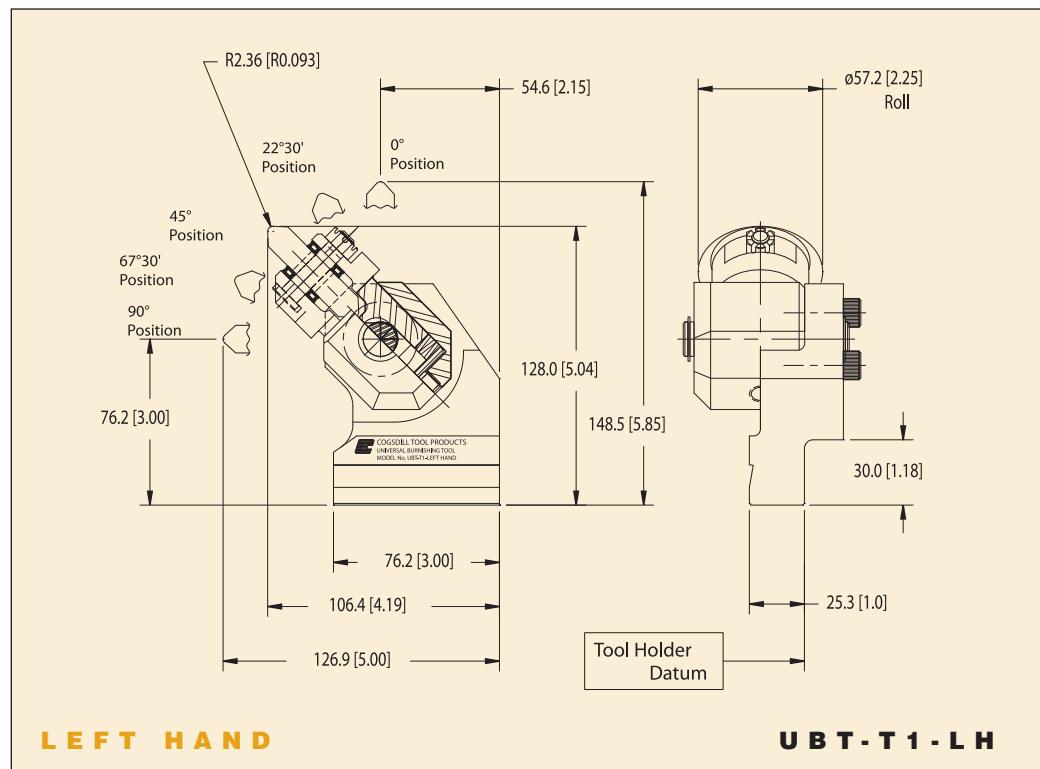
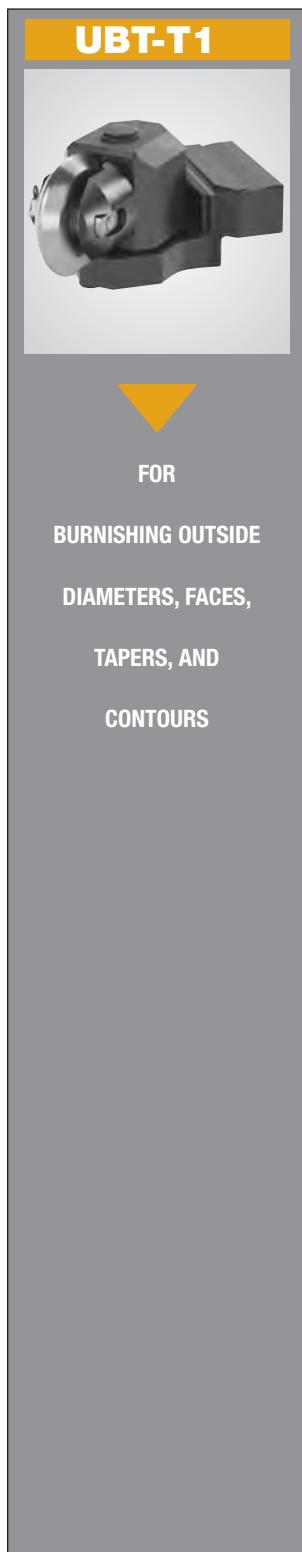
Roll shield not installed



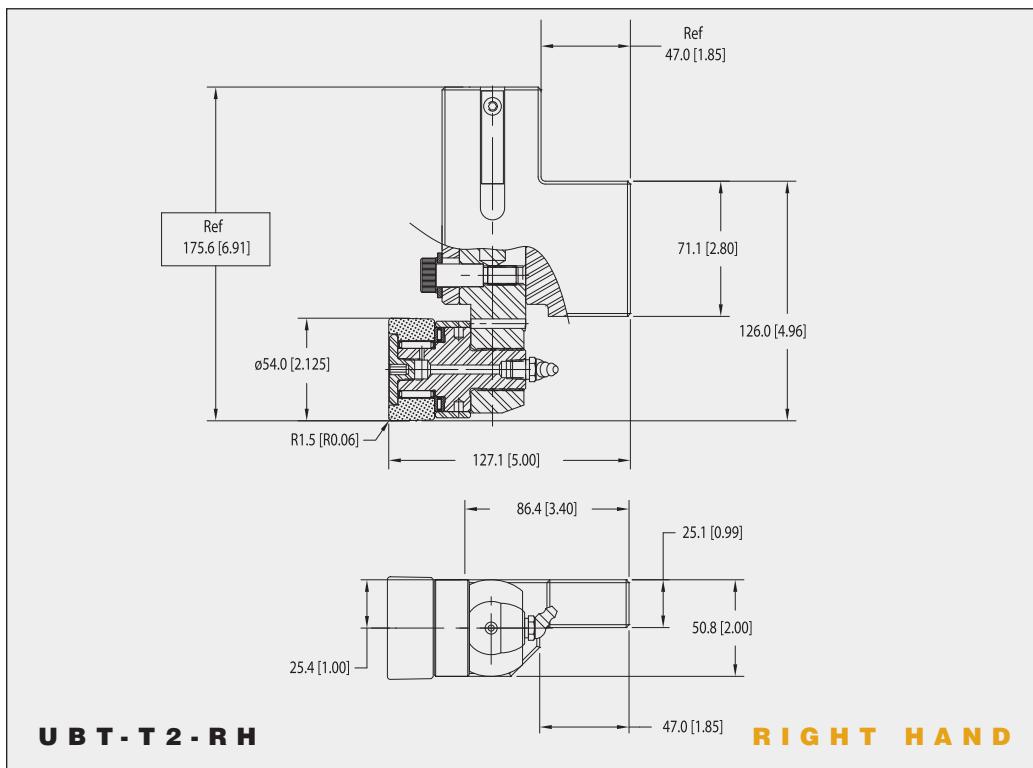
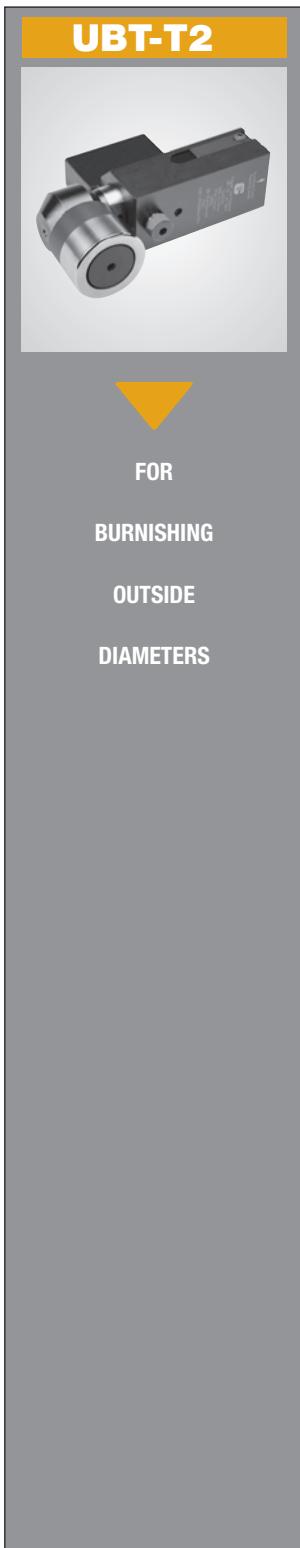
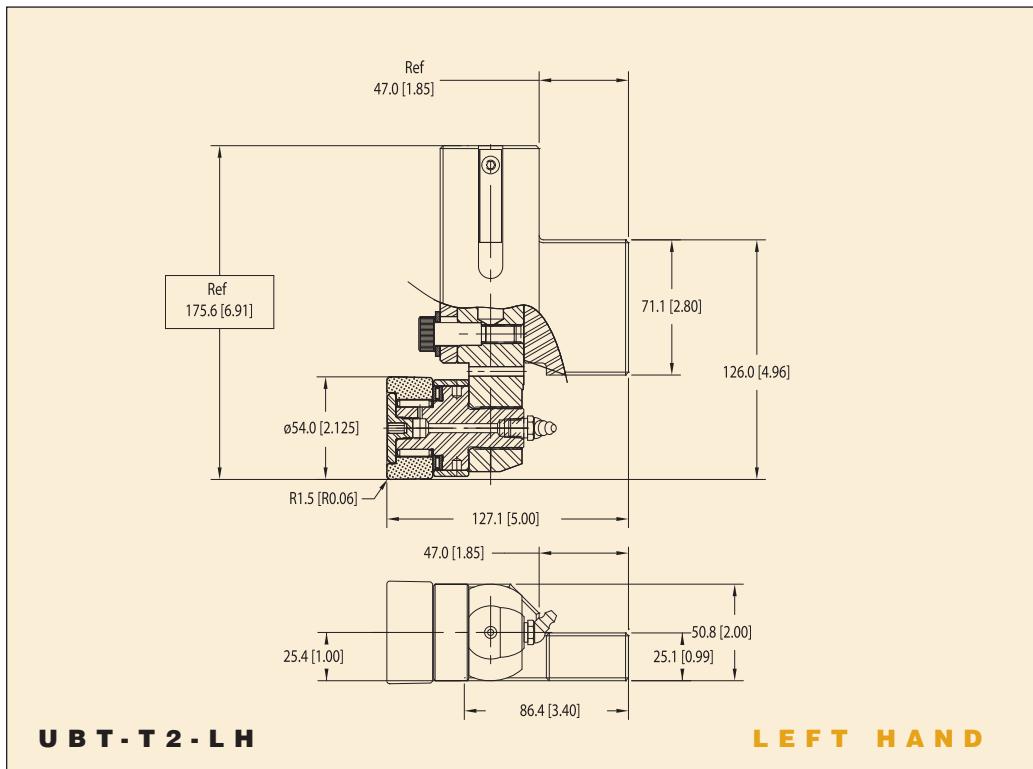
UBT-T3 with force gauge

Roll shield not installed

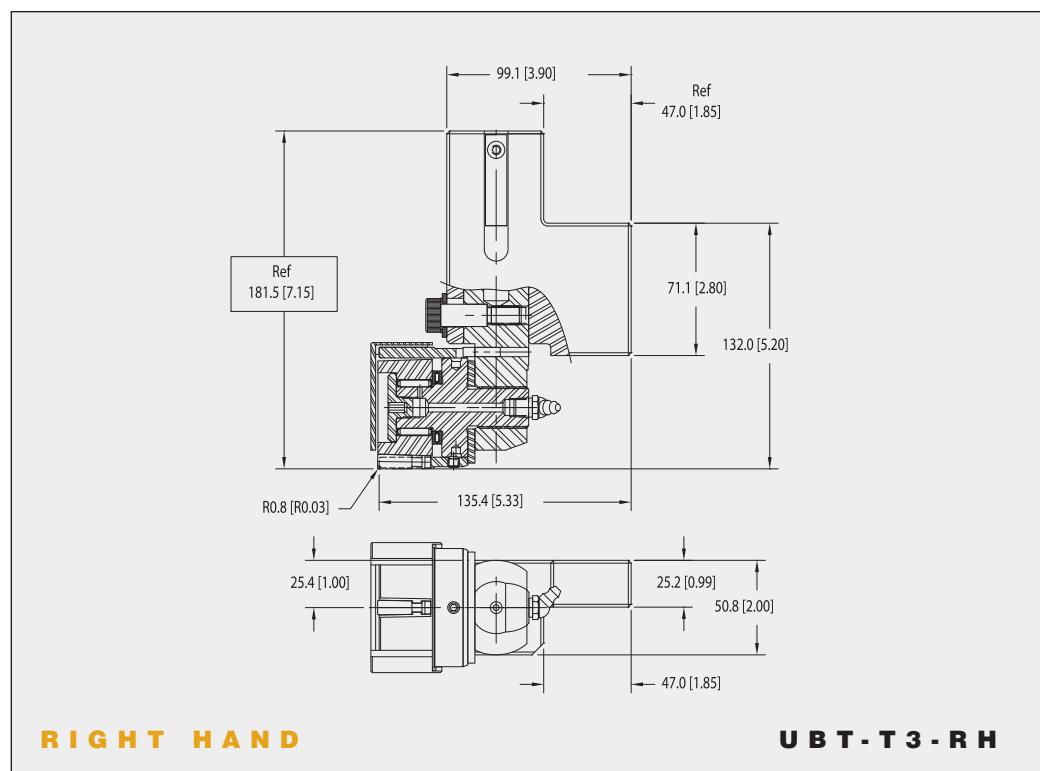
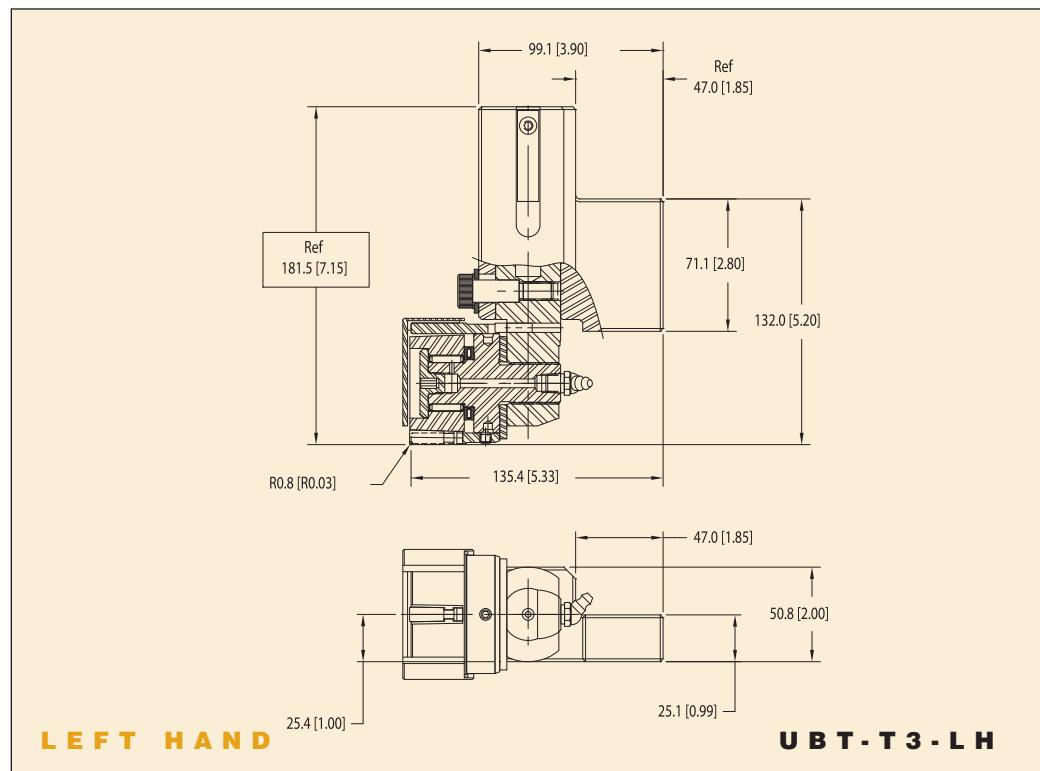
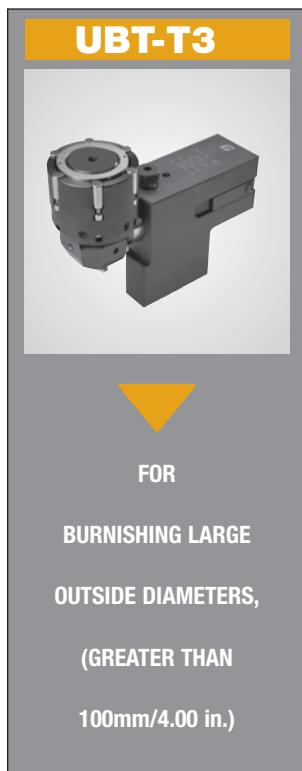
Turning-holder style



Turning-holder style



Turning-holder style



Set-up and operating instructions for UBT-T Tools

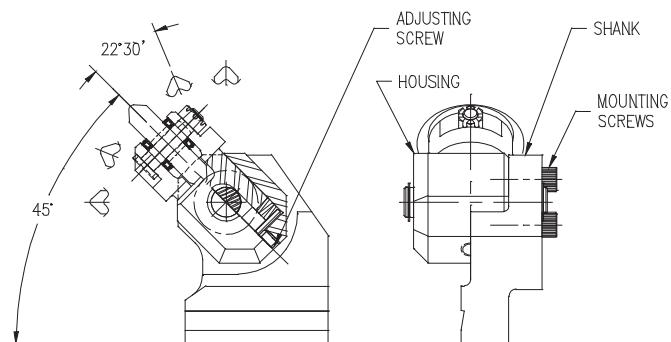
Note: UBT™ single-roll burnishing tools do not have the advantage of an overlapping effect as with multi-roll tools, and for this reason slower feed rates and/or multiple passes over the part may be required in order to produce the desired finish.

UBT-T1 tool set-up

Loosen the load *adjusting screw*. Retighten the *adjusting screw* until it comes into contact with the spring. Continue to tighten screw 1/2 turn past snug. This is a recommended starting point for mild steel.

Adjustments can be made to the burnishing force to achieve optimum finish. Tighten the *adjusting screw* clockwise one turn to increase the burnishing force, or counterclockwise to reduce the force.

Roll orientation is adjustable in 22°-30' increments. Loosen *mounting screws* two turns. Lift *housing* from *shank*. Rotate to desired position, making sure castellations are engaged. Tighten *mounting screws*.

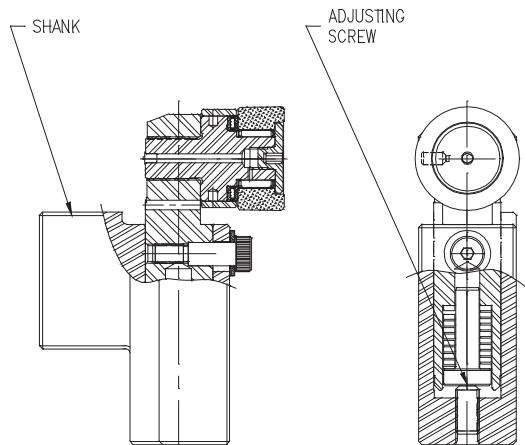


Left hand style shown

UBT-T2 tool set-up

Loosen the load *adjusting screw*. Retighten the *adjusting screw* until it comes into contact with the spring. Continue to tighten screw four turns past snug. This is a recommended starting point for mild steel.

Adjustments can be made to the burnishing force to achieve optimum finish. Tighten the *adjusting screw* clockwise to increase the burnishing force, six turns total, or counterclockwise to reduce the force.



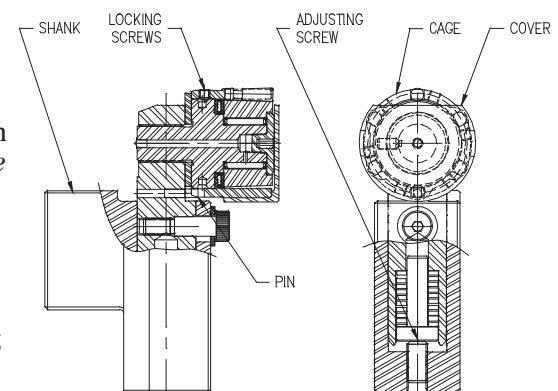
Left hand style shown

UBT-T3 tool set-up

Loosen the load *adjusting screw*. Retighten the *adjusting screw* until it comes into contact with the spring. Continue to tighten screw two turns past snug. This is a recommended starting point for mild steel.

Adjustments can be made to the burnishing force to achieve optimum finish. Tighten the load *adjusting screw* clockwise to increase the burnishing force, six turns total, or counterclockwise to reduce the force.

To index to a new roll station, pull off *cover*. Loosen *locking screws* and slide *cage* forward approximately 0.157 (4.0mm) until it disengages from *pin*. Rotate *cage* approximately 60°, until *pin* aligns with slot in *cage*, and push back. Tighten locking screws and replace *cover* in position shown.



Left hand style shown



UBT-T TOOLS

Set-up and operating instructions for UBT-T tools

UBT-T tool operation

Mount any UBT-T tool in the desired turning station. Use a UBT-T tool that corresponds with the respective turning tool. Bring the tool into contact with the part to be burnished; contact has occurred when you see the mandrel rotating.

Feed the tool another 0.003-0.005 inch (0.08-0.13mm) into the part to provide interference between the roll

and part so that the roll will float in its spring travel. Interference should not be used to increase burnishing force; burnishing force should only be adjusted with the load adjusting screws. This ensures the tool can be fed on/off the part and across interruptions without damage to the tool or workpiece.

For optimum results and long tool

life, coolant is required. Any soluble, synthetic, or straight oil can be used. Whenever possible, and for best results, the tool should be fed towards the spindle when burnishing diameters and towards the centerline when burnishing faces. (Note: UBT-T2 and UBT-T3 tools cannot be used to burnish faces.)

ROLLS FOR UBT-T TOOLS

ITEM NO.	TOOL TYPE	ROLL TYPE & RADIUS
UBT-006	UBT-T1	HARDENED STEEL, .093 IN. (2.36MM)
UBT-007	UBT-T1	HARDENED STEEL, .030 IN. (0.76MM)
UBT-010	UBT-T1	CARBIDE, .093 IN. (2.36MM)
UBT-015	UBT-T2	HARDENED STEEL, .060 IN. (1.52MM)
UBT-016	UBT-T2	CARBIDE, .060 IN. (1.52MM)
6100-708-00312	UBT-T3	HARDENED STEEL, .030 IN. (0.76MM)

Speed and feed recommendations for UBT-T tools

SPEED		FEED	
SFM	M/MIN.	IPR	MM/REV.
750	230	0.001/0.006	0.02/0.15

Lubrication of UBT-T tools

All UBT-T tools should be periodically greased (approximately every 24 hours of operation). We recommend the use of high-quality Lithium complex grease.

UBT-T Tools with force gauge

- Adaptable to all new UBT-T2 and UBT-T3 tools.
- Gauge available in English units (pounds) or metric units (newtons).



UBT-T2 with gauge

COMPLETE TOOL

UBT-T2-LH-GS	LH TOOL W/ENGLISH (POUNDS) GAUGE
UBT-T2-LH-GM	LH TOOL W/METRIC (NEWTONS) GAUGE
UBT-T2-RH-GS	RH TOOL W/ENGLISH (POUNDS) GAUGE
UBT-T2-RH-GM	RH TOOL W/METRIC (NEWTONS) GAUGE

GAUGE ASSEMBLY

UBT-T2-LH-GSA	LH ENGLISH (POUNDS) GAUGE
UBT-T2-LH-GMA	LH METRIC (NEWTONS) GAUGE
UBT-T2-RH-GSA	RH ENGLISH (POUNDS) GAUGE
UBT-T2-RH-GMA	RH METRIC (NEWTONS) GAUGE

LH - LEFT HAND RH - RIGHT HAND



UBT-T3 with gauge

COMPLETE TOOL

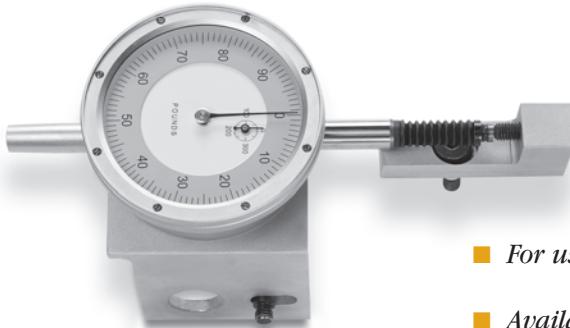
UBT-T3-LH-GS	LH TOOL W/ENGLISH (POUNDS) GAUGE
UBT-T3-LH-GM	LH TOOL W/METRIC (NEWTONS) GAUGE
UBT-T3-RH-GS	RH TOOL W/ENGLISH (POUNDS) GAUGE
UBT-T3-RH-GM	RH TOOL W/METRIC (NEWTONS) GAUGE

GAUGE ASSEMBLY

UBT-T3-LH-GSA	LH ENGLISH (POUNDS) GAUGE
UBT-T3-LH-GMA	LH METRIC (NEWTONS) GAUGE
UBT-T3-RH-GSA	RH ENGLISH (POUNDS) GAUGE
UBT-T3-RH-GMA	RH METRIC (NEWTONS) GAUGE

LH - LEFT HAND RH - RIGHT HAND

UBT-T Tools force gauge assembly



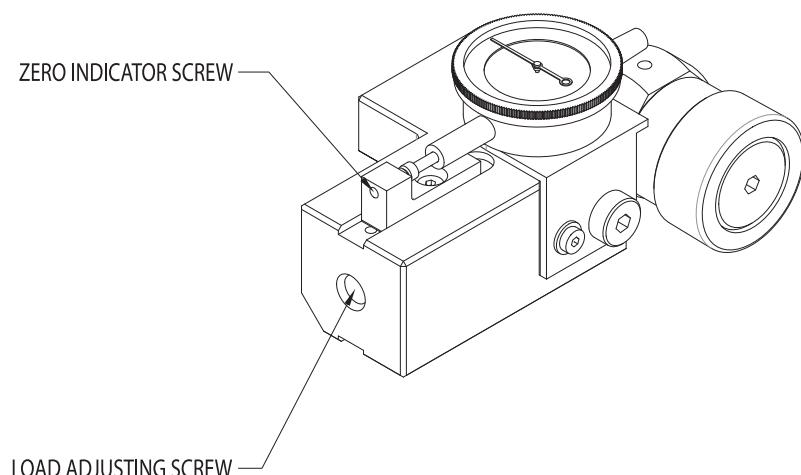
UBT-T force gauge assembly

- For use on UBTT2 and UBTT3 tools.
- Available with English (pounds) or metric (newtons) gauge.
- Two mounting brackets are supplied with the gauge assembly allowing mounting of the gauge on either side of the tool offering optimum viewing of the gauge.

UBT-T force gauge adjustment procedure

UBTT gauge adjustment

- Adjust **load adjusting screw** to touch internal spring.
- Set indicator to "0" with **zero indicator screw**.
- Tighten **load adjusting screw** until desired load is shown on indicator.
- Touch off on part.
- Compress tool onto part approximately 5 pounds (22 newtons) as shown on the indicator.



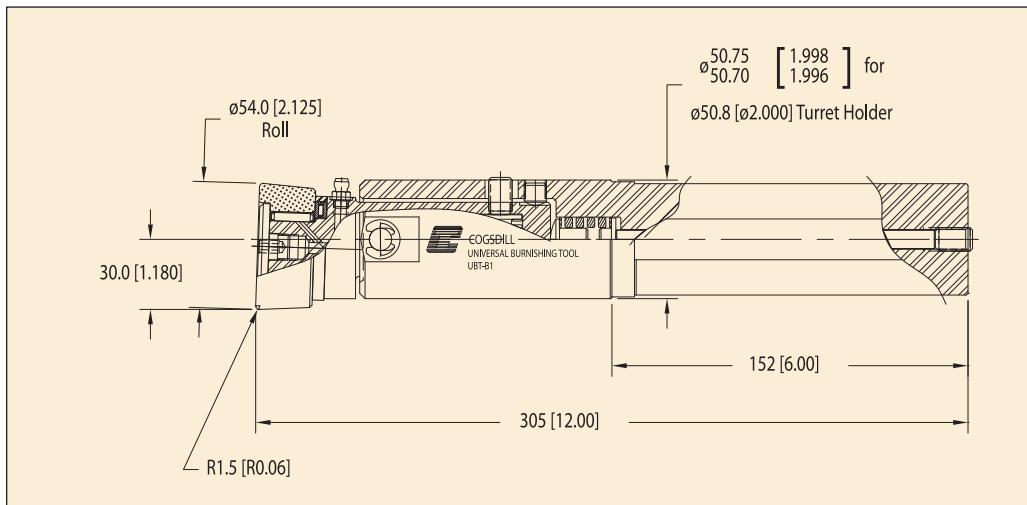
Universal™ burnishing tools

Boring-bar style



| Roll shield installed above

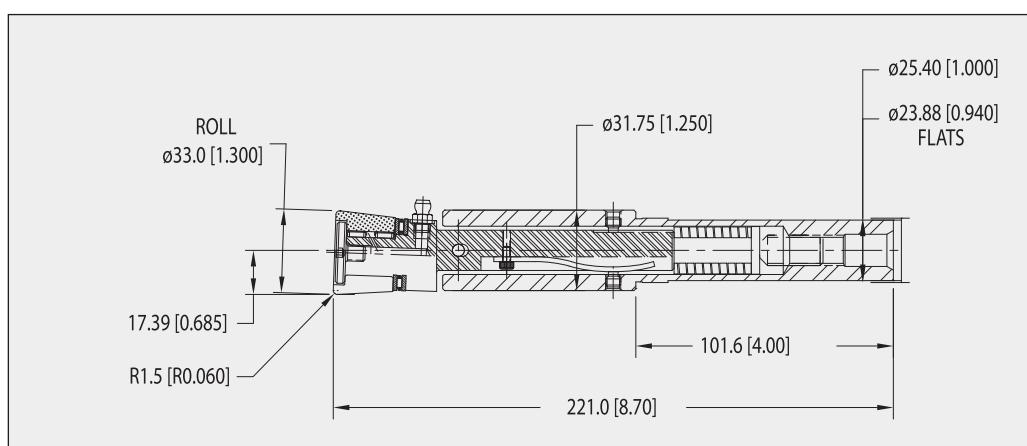
Boring-bar style



UBT-B1



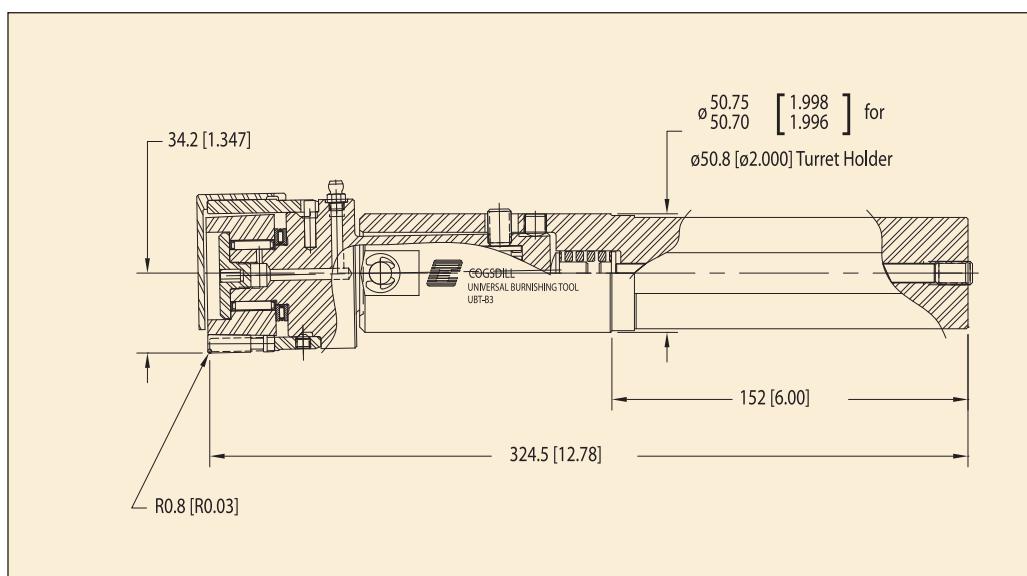
FOR BURNISHING
OUTSIDE DIAMETERS,
FACES, AND LARGE INSIDE
DIAMETERS (ID'S GREATER
THAN 70mm/2.75 in.)



UBT-B2



A SMALLER VERSION
OF THE UBT-B1
(ID'S GREATER THAN
39.6mm/1.56 IN.)



UBT-B3



FOR USE IN SMALLER INSIDE
DIAMETERS (IDS GREATER
THAN 70MM/2.75 IN.) OR ON
LARGE OUTSIDE DIAMETERS
(GREATER THAN
100mm/4.00in.)

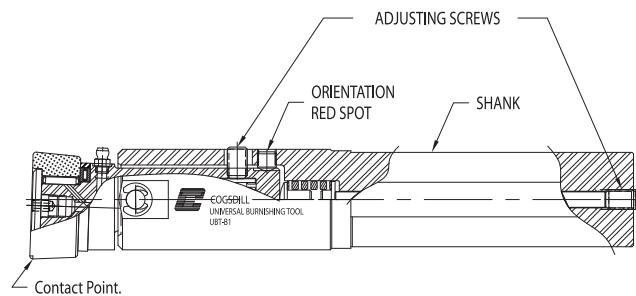
Set-up and operating instructions for UBT-B Tools

Note: UBT™ single-roll burnishing tools do not have the advantage of an overlapping effect as with multi-roll tools, and for this reason slower feed rates and/or multiple passes over the part may be required in order to produce the desired finish.

UBT-B1 tool set-up

Loosen the load *adjusting screws*. Retighten the *adjusting screws* until they come into contact with the spring. Continue to tighten both screws one turn past snug. This is a recommended starting point for mild steel.

Adjustments can be made to the burnishing force to achieve optimum finish. Tighten the *adjusting screws* clockwise to increase the burnishing force, three turns total, or counterclockwise to reduce the force.

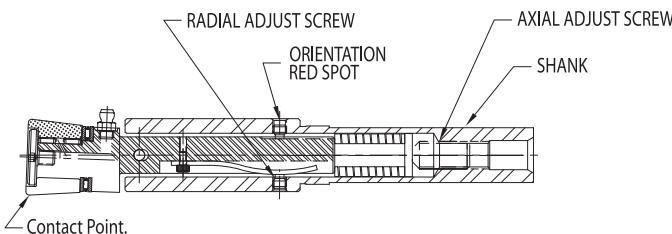


UBT-B2 tool set-up

Loosen the load *adjusting screws*. Retighten the *axial adjusting screw* until it comes into contact with the spring. Continue to tighten three turns past snug. This is a recommended starting point for mild steel.

Tighten the *radial adjusting screw* until it comes into contact with the spring. Continue to tighten 1-1/2 turns past snug. Do not tighten beyond this point; overloading this screw will not allow the tool to float on its spring travel and will impede tool function.

Adjustments can be made to the burnishing force to achieve optimum finish. Tighten the *axial adjusting screw* only. Turn clockwise to increase burnishing force, for a total of 6-1/2 turns, or counterclockwise to reduce the force.

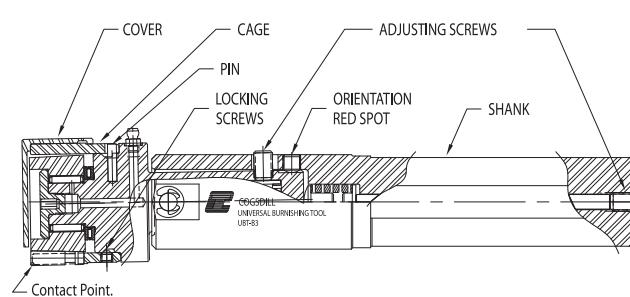


UBT-B3 tool set-up

Loosen the load *adjusting screws*. Retighten the *adjusting screws* until they come into contact with the spring. Continue to tighten both screws one turn past snug. This is a recommended starting point for mild steel.

Adjustments can be made to the burnishing force to achieve optimum finish. Tighten the *adjusting screws* clockwise to increase the burnishing force, for a total of three turns, or counterclockwise to reduce the force.

To index to a new roll station, pull off *cover*. Loosen *locking screws* and slide *cage* forward approximately 0.157 (4.0mm) until it disengages from *pin*. Rotate *cage* approximately 60°, until *pin* aligns with slot in *cage*, and push back. Tighten *locking screws* and replace *cover* in position, exposed *roll* opposite orientation red spot.





Universal™ burnishing tools

UBT-B TOOLS

Set-up and operating instructions for UBT-B tools

UBT-B tool operation

Mount any UBT-B tool in the desired boring bar station. (Note: The red orientation spot *must* be opposite the contact point.) Bring the tool into contact with the part to be burnished.

Feed the tool another 0.003-0.005 inch (0.08-0.13mm) into the part to provide interference between the roll and part so that the roll will float in

its spring travel. Interference should not be used to increase burnishing force; burnishing force should only be adjusted with the load adjusting screws. This ensures the tool can be fed on/off the part and across interruptions without damage to the tool or workpiece.

For optimum results and long tool life, coolant is required. Any soluble,

synthetic, or straight oil can be used. Whenever possible, and for best results, the tool should be fed towards the spindle when burnishing diameters and towards the centerline when burnishing faces. (Note: the UBT-B3 tool cannot be used to burnish faces.)

ROLLS FOR UBT-B TOOLS

ITEM NO.	TOOL TYPE	ROLL TYPE & RADIUS
UBT-001	UBT-B1	HARDENED STEEL, .060 IN. (1.52MM)
UBT-002	UBT-B1	CARBIDE, .060 IN. (1.52MM)
UBT-003	UBT-B1	HARDENED STEEL, .030 IN. (0.76MM)
UBT-018	UBT-B2	HARDENED STEEL, .060 IN. (1.52MM)
UBT-019	UBT-B2	CARBIDE, .060 IN. (1.52MM)
6100-708-00312	UBT-B3	HARDENED STEEL, .030 IN. (0.76MM)

Speed and feed recommendations for UBT-B tools

SPEED	
SFM	M/MIN.
750	230

FEED	
IPR	MM/REV.
0.001/0.006	0.02/0.15

Lubrication of UBT-B tools

All UBT-B tools should be periodically greased (approximately every 24 hours of operation). We recommend the use of high-quality Lithium complex grease.

KB® knurling tools

Salvage out-of-tolerance bores or shafts with the two-step KB® Knurling-Burnishing “scrap saver” process.

Worthless scrap or precision part? The KB “Scrap-Saver” process can make the difference.

Cogsdill’s KB process is an innovative approach to making the diameter of holes smaller and the diameter of shafts larger. The KB process was originally developed for automotive parts rebuilding industries, where out-of-tolerance bores and shafts on parts that were formerly scrapped are salvaged with the KB process. The process is also applied in original equipment manufacturing.



KB knurling tool

Note: KB knurling tool shown above without adjusting screw.

The KB process

KB is Superior to Conventional Salvage Methods

Conventional salvage methods, including spray welding and chrome plating, are expensive, time-consuming, and often produce unsatisfactory results. These metal-adding processes do not deposit a uniform thickness around the circumference of the hole or shaft; they also deposit metal where it is not wanted, and remachining is required. Often remachining is difficult because no qualified-surfaces are available for alignment.

Another approach is to cut away additional metal and install a bushing or sleeve. Additional time and effort is required for machining and finishing the part to bring it within tolerance.

The KB Process eliminates these problems in two quick steps through the use of two tools. The KB Knurling Tool raises the surface of the oversize bore (or undersize shaft). The Roll-a-

Finish Tool roller burnishes the knurled surface to the exact diameter required. (See below, "How It Works.") The entire two-step process can be accomplished in seconds

agent. The grooves are also desirable for the effect of trapping and funneling away foreign matter and grit that might otherwise remain on the bearing surface of the part.

For running fits, the increased contact area diminishes the load carried at any given point on the part surface; this increases the ability of the surface to resist wear. Knurling, like Roller Burnishing, is a metal displacement process, and the work-hardening effect of the tools also contributes to the ability of the Knurled/Burnished surface to resist wear.

The KB Process can result in cost savings in several areas. Machine time can be reduced as much as 10:1. Substantial reductions are achieved in tool cost and tool inventory. Fewer machines and less floor space are required.

Knurling and Burnishing makes holding size easier; this results in savings in inspection time and scrap.

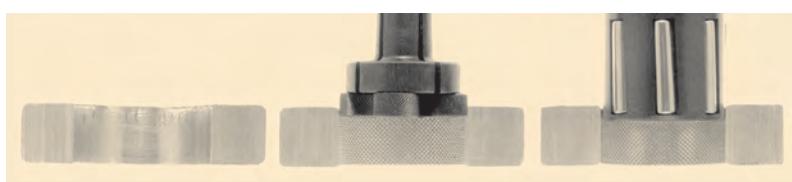
Improved surface characteristics and lower cost

In addition to the benefits of Knurling/Burnishing as a sizing and salvage method, the process results in a series of plateaus on the same plane in the surface of the metal, thus providing increased contact area. Tests by a major auto manufacturer have shown increases in surface holding power of up to 35% over surfaces which are precision bored to receive press-fit bearings. In many cases the finished boring process may be eliminated altogether. The grooves in the Knurled/Burnished surface are ideally suited for use with an adhesive

How it works

Oversize Bore

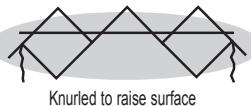
1 Knurl to raise surface



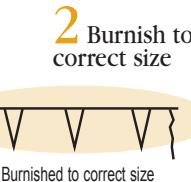
Oversize Bore

Out of tolerance
Surface as machined

1 Knurl to raise surface



2 Burnish to correct size



An oversize bore may be machined out-of-tolerance or made oversize by excessive wear. Here's how the KB Process can salvage this part:

1 — A Cogsdill KB Knurling Tool displaces material on the oversize hole diameter, raising the surface as much as .030 inch (.76mm) in a diamond-shaped knurled pattern. The bore is now undersize.

2 — A Cogsdill Roll-a-Finish Tool cold works the knurled surface, burnishing the hole to correct size.

2
steps

The KB process

Tool operation

Knurling may be performed with either the tool or the part rotating. Any ductile or malleable metal may be knurled including aluminum, brass, bronze, ductile iron, steels (up to 40 Rc) and cast iron (except chilled and white cast). Speeds should approximate drilling speeds, and feed rate starting points can be determined from the table below.

Although hand-fed operations are possible on many machines, power feeding is desirable to obtain a more uniform knurl pattern. Return feeds

may be two to three times the infeed rate.

The operations should be performed under a flood of coolant. A water soluble, high-lubricity oil is recommended. If coolant cannot be used, speeds and feeds should be reduced by two-thirds to ensure reasonable knurl and pin life.

The tools are adjusted using the adjusting screw located in the center of the tool.

Once the tools are set for size, an unskilled operator can obtain consistently good results, even over long work lengths.

Cogsdill knurling tools do not require accurate location, and in most cases it is recommended to have either the tool or part free to float. Each knurling roll depends on the support of the opposing roll to do its work; therefore, the tools are self-centering.

Typical changes in workpiece diameter, after knurling with medium pitch knurling rolls (20 teeth per circular inch), are as follows: for cast iron, .006 inch (.15mm); for steel, .008 inch (.2mm); for bronze, .010 inch (.25mm); and for aluminum, .012 inch (.30mm).

MATERIAL	SPEED		FEED RATE	
	SFPM	SM/MIN.	IPR	MM/REV
Aluminum or brass	200-300	61-91	.030	.76
Leaded steel	125-150	38-46	.030	.76
Soft cast iron carbon steel	80-120	24-37	.018	.46
# 50 cast iron, medium alloy steel	60-90	18-27	.012	.30
# 65 cast iron, alloy steel (35-40 R/C)	25-35	8-11	.008	.20

Knurling rolls

Worn knurling rolls should be replaced in sets. However, if a knurling roll should be damaged, it may be replaced by a new roll of like hand.

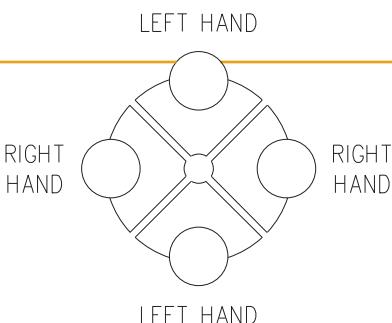
KN-1 and KN-2 knurling rolls are available in medium and coarse pitch; KN-3 rolls are available in medium

pitch only. (Medium is 20 teeth per circular inch, and coarse is 14 teeth per circular inch.) Please specify medium or coarse pitch when ordering. Knurling rolls have knurls set at a 45 degree angle. Special angles and pitches are available on special order.

Special tools

Special Knurling Tools, including external tools, tools for larger diameters, and fully-bottoming tools, are available on special order. When requesting a quotation for a special tool, please furnish the following data:

1. Part description and part number (if any).
2. A blueprint or sketch of your part.
3. Exactly what job is to be performed; i.e. what particular surface of the part is to be knurled.
4. Material type and hardness.
5. If a salvage job is to be performed, advise how much parts are oversized or undersized.
6. Tolerance requirements.
7. Shank requirements.



Cogsdill Knurling Tools require an equal number of left and right hand knurling rolls, placed in opposing stations.

Tool design

Cogsdill Knurling Tools are available for internal applications. External tools are available on special order (see "Special Tools"). All internal Knurling Tools are of similar design with differences only in the number of knurling rolls and the diameter adjustment mechanism.

Small tools from KBN-625 through KBN-1156 are adjusted by turning a hex-head screw in the side of the tool. Tools in this range have two rolls.

The larger internal tools are adjusted by means of a hex-head screw through the center of the tool. The screw is accessible from the front of the tool.

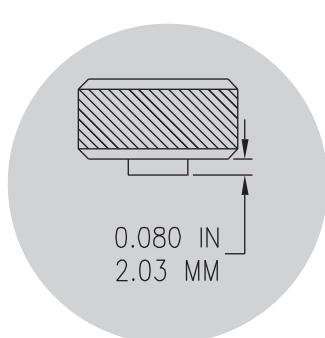
Tools from KBN-1188 through KBN-2969 have four knurling rolls, while those from KBN-3000 through KBN-4000 have six knurling rolls.

All internal Knurling Tools are adjustable over a range of .041 inch (1.04mm), as are Cogsdill Roll-a-Finish tools.

The tool consists of shank, rolls, pins and adjusting screw. Morse taper shanks are standard. The rolls and pins are the only items considered wear parts; these are available from stock. We recommend that at least one spare set of rolls and pins is ordered when a knurling tool is purchased. The pins are retained by a set screw and can be easily removed when it is necessary to replace worn rolls.

All tools are designed for through-hole applications. These tools can also be used on semi-bottoming applications; the tool will work to .080 inch (2.03mm) from the bottom of the bore. Bottoming tools are also available, on special order (see "Special Tools").

knurling
tool
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Tool specifications

Tool No.	Diameter Range		Shank	Overall Length		Pins & Knurls	
	Inches	Millimeters		Inches	MM	Size	Qty. Req.
KBN-625	.621-.662	15.77-16.81	↑	↑	↑	#KN-3	
KBN-656	.652-.693	16.56-17.60				(.312 Inch)	
KBN-688	.684-.725	17.37-18.42					
KBN-719	.715-.756	18.16-19.20				Dia.)	
KBN-750	.746-.787	18.95-19.99				↑	
KBN-781	.777-.818	19.74-20.78					
KBN-812	.808-.849	20.52-21.56					
KBN-844	.840-.881	21.34-22.38					
KBN-875	.871-.912	22.12-23.16					2
KBN-906	.902-.943	22.91-23.95					
KBN-938	.934-.975	23.72-24.77					
KBN-969	.965-1.006	24.51-25.55					
KBN-1000	.996-1.037	25.30-26.34					
KBN-1031	1.027-1.068	26.09-27.13					
KBN-1062	1.058-1.099	26.87-27.91					
KBN-1094	1.090-1.131	27.69-28.73					
KBN-1125	1.121-1.162	28.47-29.51	#2MT	6.75	171.4		
KBN-1156	1.152-1.193	29.26-30.30					↓
KBN-1188	1.184-1.225	30.07-31.12					↑
KBN-1219	1.215-1.256	30.86-31.90					
KBN-1250	1.246-1.287	31.65-32.69					
KBN-1281	1.277-1.318	32.44-33.48					
KBN-1312	1.308-1.349	33.22-34.26					
KBN-1344	1.340-1.381	30.04-35.08				#KN-2	
KBN-1375	1.371-1.412	34.82-35.86				(.375 Inch)	
KBN-1406	1.402-1.443	35.61-36.65				Dia.)	
KBN-1438	1.434-1.475	36.42-37.47					
KBN-1469	1.465-1.506	37.21-38.25					
KBN-1500	1.496-1.537	38.00-39.04					
KBN-1531	1.527-1.568	38.79-39.83					
KBN-1562	1.558-1.599	39.57-40.61					4
KBN-1594	1.590-1.631	40.39-41.43					
KBN-1625	1.621-1.662	41.17-42.21					
KBN-1656	1.652-.1.693	41.96-43.00	↓	↓	↓		
KBN-1688	1.684-1.725	42.77-43.82	↑	↑	↑		
KBN-1719	1.715-1.756	43.56-44.60					
KBN-1750	1.746-1.787	44.35-45.39					
KBN-1781	1.777-1.818	45.14-46.18					
KBN-1812	1.808-18.49	45.92-46.96					
KBN-1844	1.840-1.881	46.74-47.78				↓	
KBN-1875	1.871-1.912	47.52-48.56				↑	
KBN-1906	1.902-1.943	48.31-49.35					
KBN-1938	1.934-1.975	49.12-50.17					
KBN-1969	1.965-2.006	49.91-50.95	#3MT	7.75	196.8		
KBN-2000	1.996-2.037	50.70-51.74					
KBN-2031	2.027-2.068	51.49-52.53					
KBN-2062	2.058-2.099	52.27-53.31				#KN-1	
KBN-2094	2.090-2.131	53.09-54.13				(.750 Inch)	
KBN-2125	2.121-2.162	53.87-54.91				Dia.)	
KBN-2156	2.152-2.193	54.66-55.70					
KBN-2188	2.184-2.225	55.47-56.52					
KBN-2219	2.215-2.256	56.26-57.30					
KBN-2250	2.246-2.287	57.05-58.09					
KBN-2281	2.277-2.318	57.84-58.88					
KBN-2312	2.308-2.349	58.62-59.66	↓	↓	↓	↓	↓

Tool specifications

Tool No.	Diameter Range			Overall Length		Pins & Knurls	
	Inches	Millimeters	Shank	Inches	MM	Size	Qty. Req.
KBN-2344	2.340-2.381	59.44-60.48	↑	↑	↑		
KBN-2375	2.371-2.412	60.22-61.26					
KBN-2406	2.402-2.443	61.01-62.05					
KBN-2438	2.434-2.475	61.82-62.87					
KBN-2469	2.465-2.506	62.61-63.65					
KBN-2500	2.496-2.537	63.40-64.44					
KBN-2531	2.527-2.568	64.19-65.23					
KBN-2562	2.558-2.599	64.97-66.01					
KBN-2594	2.590-2.631	65.79-66.83					
KBN-2625	2.621-2.662	66.57-67.61	#3MT	7.75	196.8		4
KBN-2656	2.652-2.693	67.36-68.40					
KBN-2688	2.684-2.725	68.17-69.22					
KBN-2719	2.715-2.715	68.96-70.00					
KBN-2750	2.746-2.787	69.75-70.79					
KBN-2781	2.777-2.818	70.54-71.58					
KBN-2812	2.808-2.849	71.32-72.36					
KBN-2844	2.840-2.881	72.14-73.18					
KBN-2875	2.871-2.912	71.92-73.96					
KBN-2906	2.902-2.943	73.71-74.75					
KBN-2938	2.934-2.975	74.52-75.57					
KBN-2969	2.965-3.006	75.31-76.35	↓	↓	↓		↓
KBN-3000	2.996-3.037	76.10-77.14	↑	↑	↑		↑
KBN-3031	3.027-3.068	76.89-77.93					
KBN-3062	3.058-3.099	77.67-78.71					
KBN-3094	3.090-3.131	78.49-79.53					
KBN-3125	3.121-3.162	79.27-80.31					
KBN-3156	3.152-3.193	80.06-81.10					
KBN-3188	3.184-3.225	80.87-81.92					
KBN-3219	3.215-3.256	81.66-82.70				#KN-1	
KBN-3250	3.246-3.287	82.45-83.49				(.750 Inch	
KBN-3281	3.277-3.318	83.24-84.28				Dia.)	
KBN-3312	3.308-3.349	84.02-85.06					
KBN-3344	3.340-3.381	84.84-85.88					
KBN-3375	3.371-3.412	85.62-86.66					
KBN-3406	3.402-3.443	86.41-87.45					
KBN-3438	3.434-3.475	87.22-88.27					
KBN-3469	3.465-3.506	88.01-89.05	#4MT	8.75	222.2		6
KBN-3500	3.496-3.537	88.80-89.84					
KBN-3531	3.527-3.568	89.59-90.63					
KBN-3562	3.558-3.599	90.37-91.41					
KBN-3594	3.590-3.631	91.19-92.23					
KBN-3625	3.621-3.662	91.97-93.01					
KBN-3656	3.652-3.693	92.73-93.80					
KBN-3688	3.684-3.725	93.57-94.62					
KBN-3719	3.715-3.756	94.36-95.40					
KBN-3750	3.746-3.787	95.15-96.19					
KBN-3781	3.777-3.818	95.94-96.98					
KBN-3812	3.808-3.849	96.72-97.76					
KBN-3844	3.840-3.881	97.54-98.58					
KBN-3875	3.871-3.912	98.32-99.36					
KBN-3906	3.902-3.943	99.11-100.15					
KBN-3938	3.934-3.975	99.92-100.97					
KBN-3969	3.965-4.006	100.71-100.97					
KBN-4000	3.996-4.037	101.50-102.54		↓	↓	↓	↓



COGSDILL TOOL
products, inc.

Application data sheet
Roller burnishing tools

CUSTOMER _____ DATE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

CONTACT _____ TELEPHONE _____

FAX _____ E-MAIL ADDRESS _____

TITLE _____

SALES AGENT _____ SALESMAN _____

CUSTOMER'S PART _____

PRINTS INCLUDED YES _____ NO _____ LATER _____

PRIMARY OBJECTIVE SIZE _____ FINISH _____ OTHER _____

THROUGH-HOLE OR BLIND BORE? _____

FINISH DIAMETER(S) _____ TOLERANCE(S) _____

SURFACE FINISH REQUIRED _____ in Ra

WHAT IS THE OPERATION PRIOR TO BURNISHING? _____

PRESIZE(S) _____ TOLERANCE(S) _____

PREFINISH _____ in Ra

LENGTH OF BURNISH _____ MATERIAL _____

MATERIAL CONDITION (HARDNESS OR TENSILE STRENGTH) _____

TYPE OF MACHINE TO BE USED _____ TYPE SHANK _____

EXTERNAL OR INTERNAL COOLANT? _____

IS THE TOOL TO BE RUN HORIZONTALLY OR VERTICALLY? _____

AUTOMATIC TOOL CHANGER? YES _____ NO _____

WEIGHT RESTRICTION _____

TOOL LENGTH RESTRICTION _____

ARE THERE RESTRICTIONS ON DIAMETER OR LENGTH? (Fixture interference, shoulder, groove, keyway, etc.)

PRODUCTION REQUIREMENT _____

ADDITIONAL COMMENTS _____

Fax or mail to:

FAX (803) 438-5263
Cogsdill Tool Products, Inc.
P.O. Box 7007
Camden, SC 29021
ATTN: CUSTOMER SERVICE

IMPORTANT

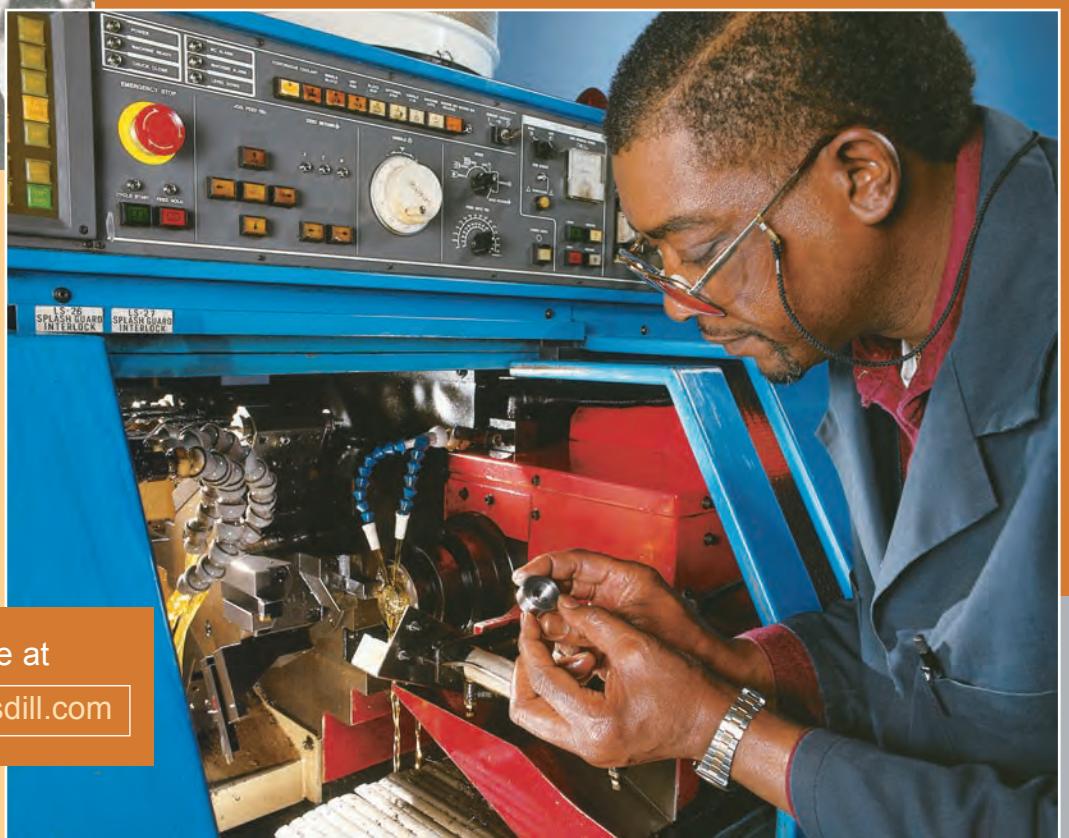
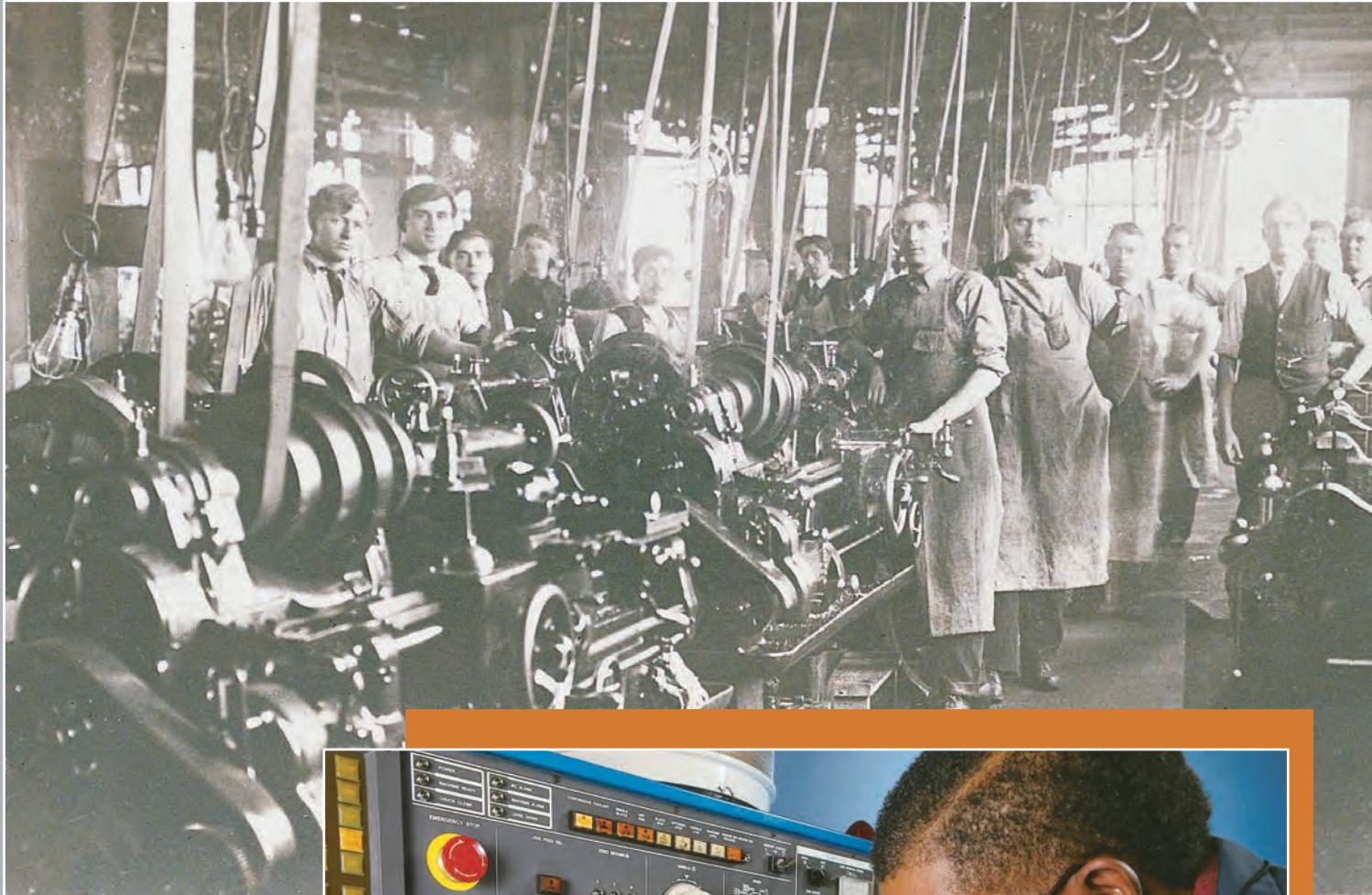
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MUST BE SUPPLIED.



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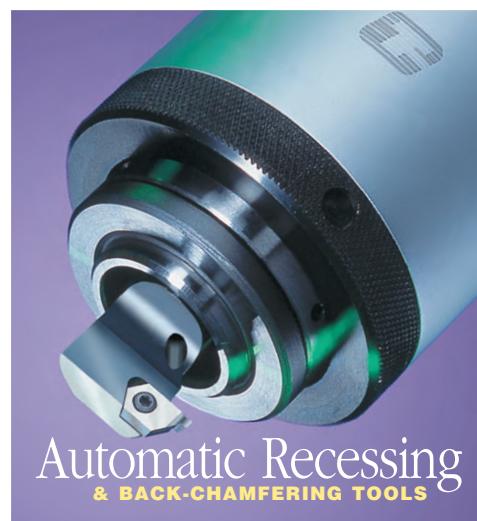
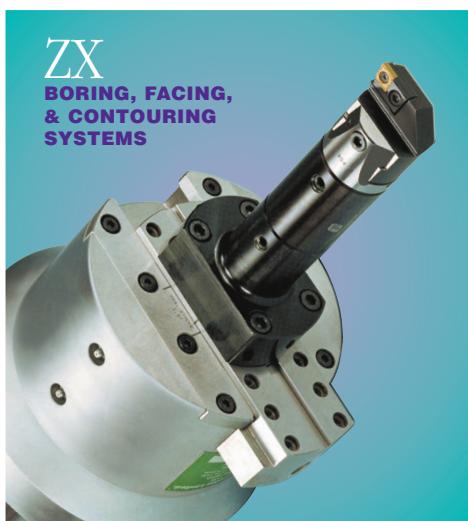
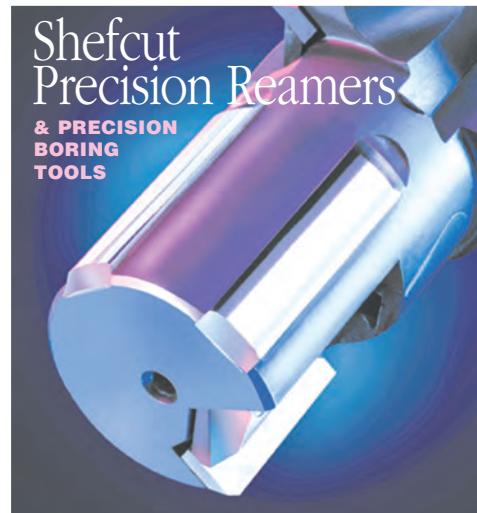
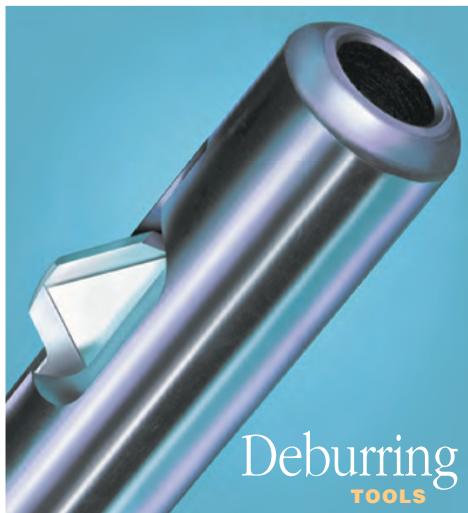
toolmakers

since 1914



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FOR ADDITIONAL INFORMATION

CATALOG NO. 500 U.S. 05-14