

Burnishing

Burnishing
TOOLS & MACHINES

contents

2	OVERVIEW OF ROLLER BURNISHING
6	INTERNAL ROLLER BURNISHING TOOLS
6	SR Series Roll-a-Finish® Tools
12	R Series Roll-a-Finish® Tools
17	U Series Roll-a-Finish® Tools
19	Bearingizing Tools
24	EXTERNAL ROLLER BURNISHING TOOLS
24	AEX Series Roll-a-Finish® Tools
28	ROLL-A-FINISH® TOOL SELECTION AND ORDERING
29	PART PREPARATION AND OPERATING PARAMETERS
34	SPECIAL APPLICATIONS AND TOOL DESIGNS
36	CX® EXTERNAL ROLLER BURNISHING MACHINES
42	SINGLE CONTACT BURNISHING TOOLS
42	Diamond Burnishing Tools
46	Universal™ Burnishing Tools
50	KB® KNURLING-BURNISHING PROCESS
56	BURNISHING APPLICATION DATA SHEET

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.



Burnishing TOOLS & MACHINES

Universal Burnishing Tools



Boring-Bar Style



Turning-Holder 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.*

COGSDILL TOOL PRODUCTS, INC.

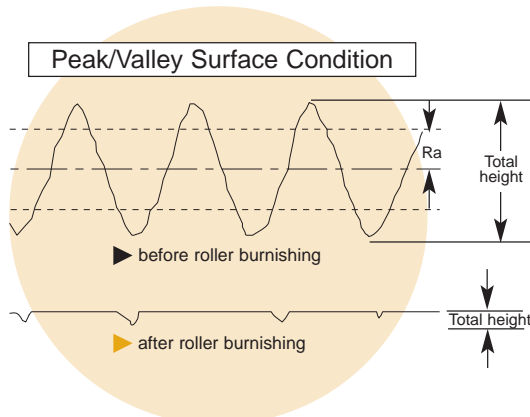
Burnishing products shown here are *not* to scale.



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 sub-surface 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!

CX
external roller burnishing machines

burnishing
diamond 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 .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

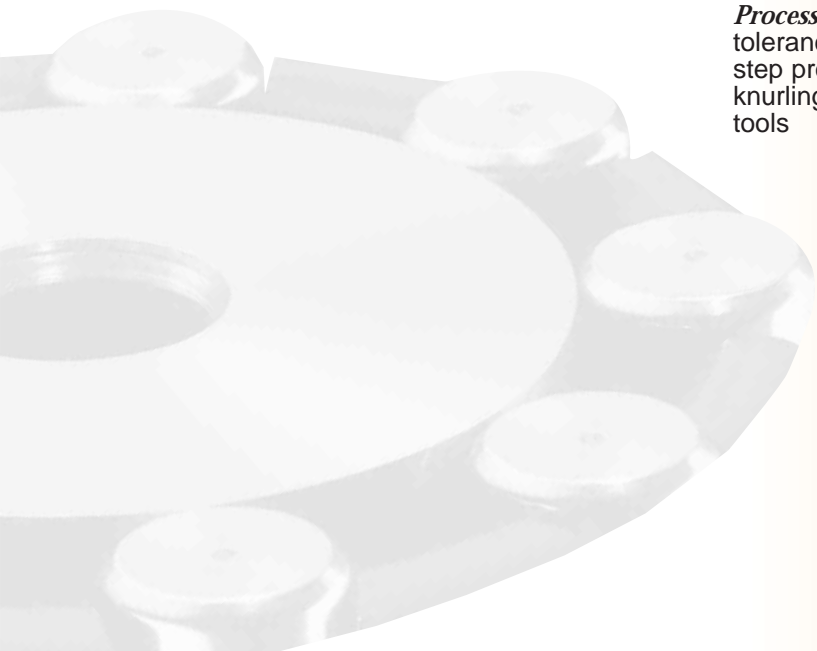
In addition to Roll-a-Finish tools for IDs, ODs, and special part configurations, Cogsdill offers several other burnishing products and related items, including:

- **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)



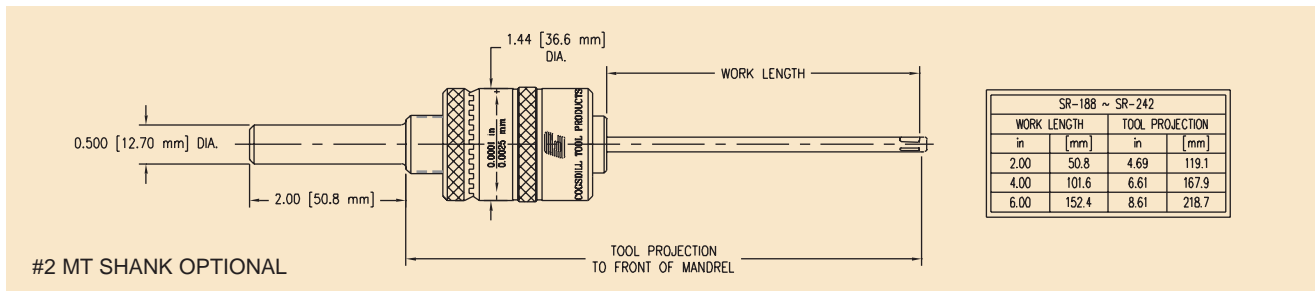
... with up to *four work lengths*:

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

...and *available from stock*:

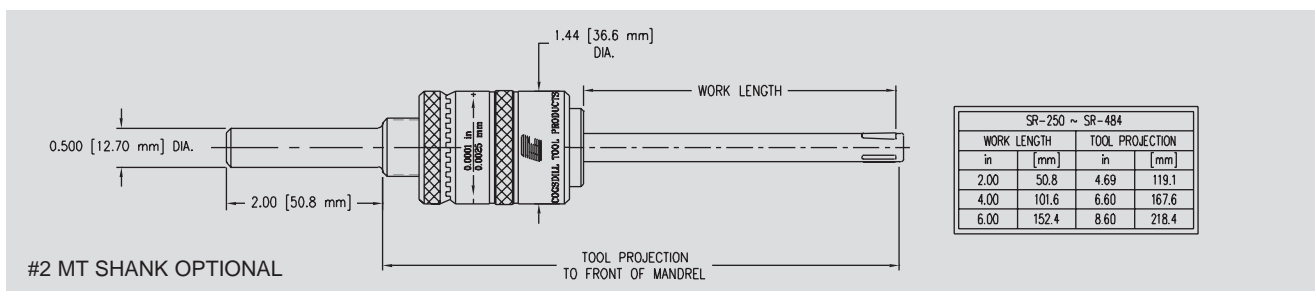
- for hole sizes from .187 to 2.500 inches (4.75 to 63.5mm).
- Tools are adjustable in increments of .0001 inch (.002mm).

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	_____

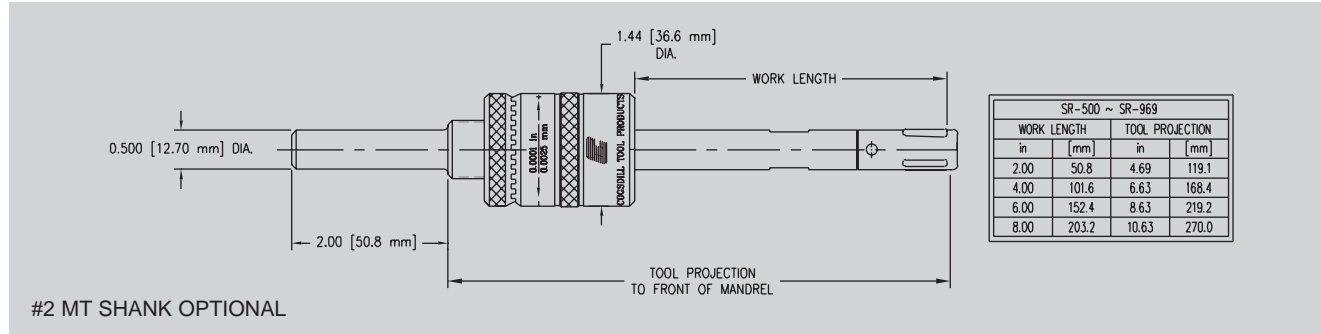


“SR” SERIES ROLL-A-FINISH® TOOLS 1/4 TO 1/2 IN. (6.35 TO 12.70mm)

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

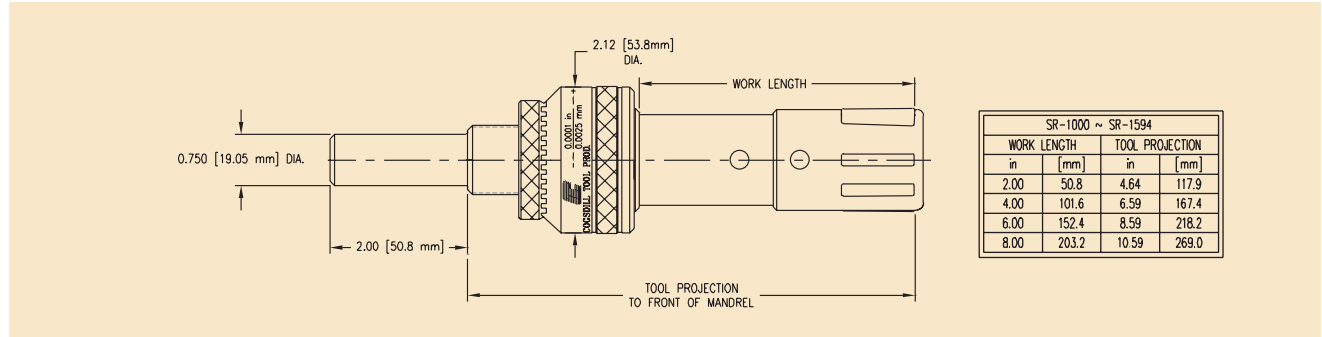


“SR” SERIES ROLL-A-FINISH® TOOLS 1/2 TO 1 IN. (12.70 TO 25.40 mm)

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

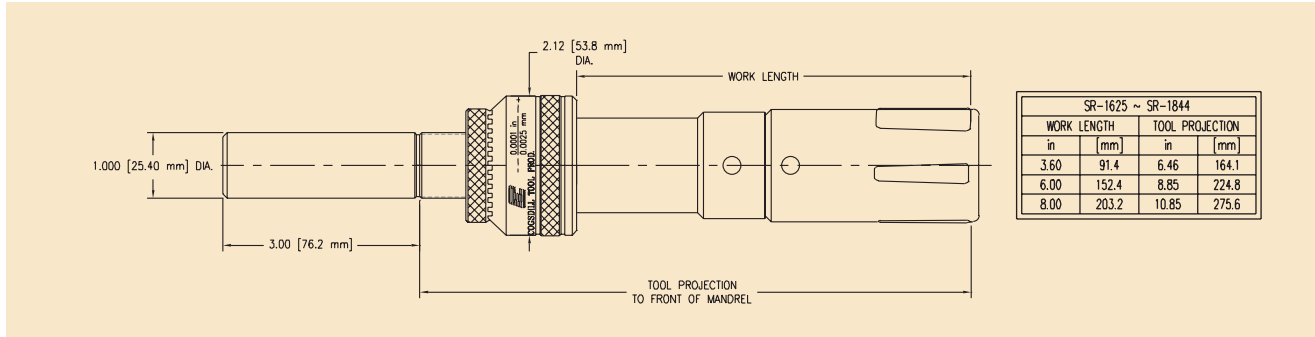


“SR” SERIES ROLL-A-FINISH® TOOLS 1 TO 1-5/8 IN. (25.4 TO 41.28mm)

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

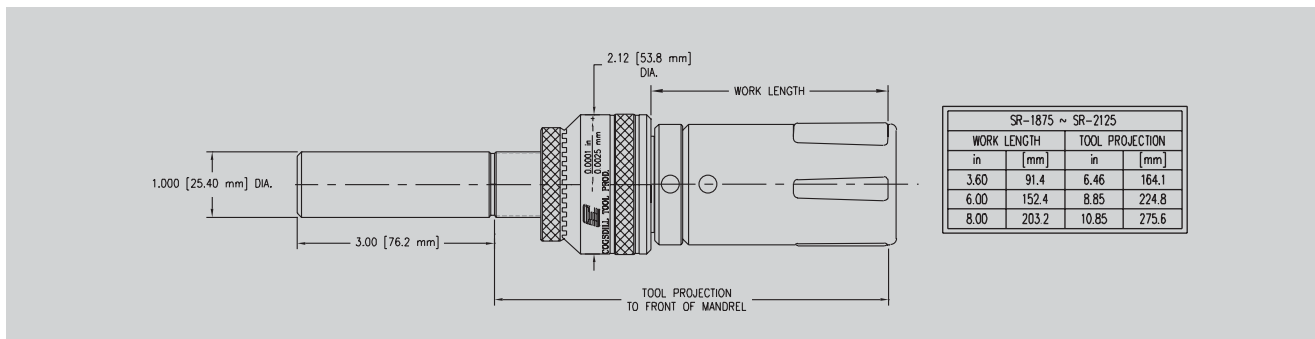
Shanks other than shown above are available upon request.

Standard Tool specifications



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

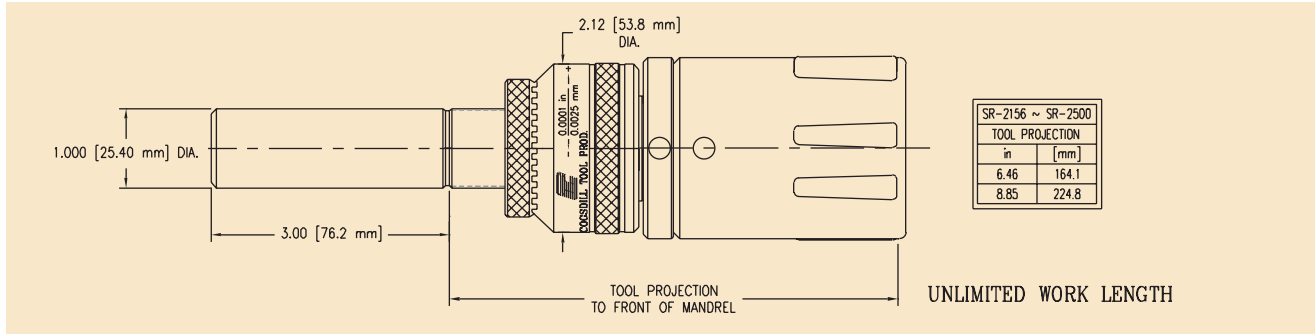
DIAMETER RANGE		TOOL NUMBER		
INCHES	MM	THRU-HOLE (NO HELIX)	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
1.621-1.662	41.17-42.21	SR-1625	SRH-1625	SRB-1625
1.652-1.693	41.96-43.00	SR-1656	SRH-1656	SRB-1656
1.684-1.725	42.77-43.82	SR-1688	SRH-1688	SRB-1688
1.715-1.756	43.56-44.60	SR-1719	SRH-1719	SRB-1719
1.746-1.787	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

R series

For use where tool length is not restricted.



Offered in *two styles*:

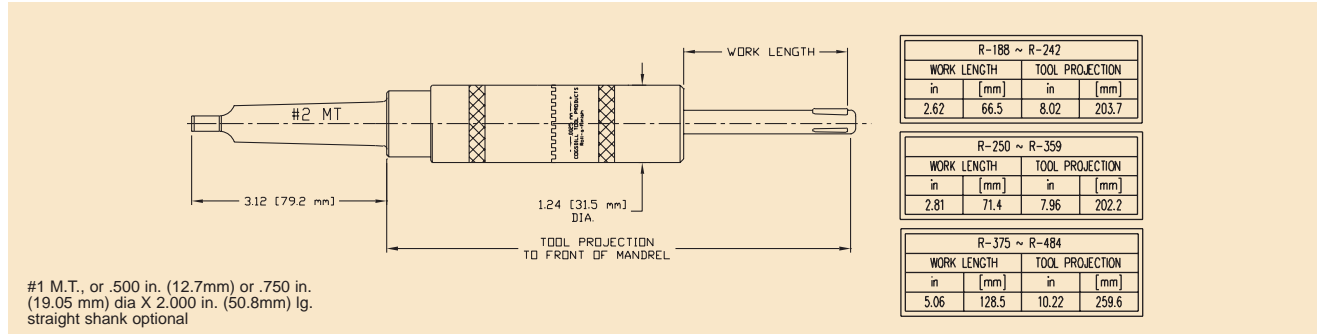
- Through-hole style with helix cage (self-feeding)
- Bottoming-style for blind hole, with no-helix cage (machine-feeding)



...and in *two work lengths*:

- Standard length (R)
- Eight inch (R-8)

Standard tool specifications

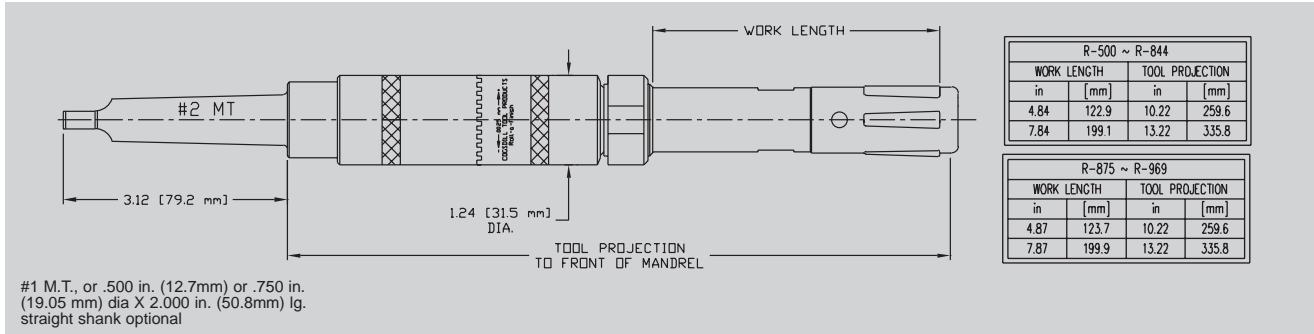


“R” SERIES ROLL-A-FINISH® TOOLS 3/16 TO 1/2 IN. (4.76 TO 12.7 MM)

DIAMETER RANGE		TOOL NUMBER	
INCHES	MM	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
.187-.195	4.75-4.95	R-188	—
.194-.202	4.93-5.13	R-195	—
.202-.210	5.13-5.33	R-203	—
.210-.218	5.33-5.54	R-211	—
.218-.226	5.54-5.74	R-219	—
.225-.233	5.72-5.92	R-226	—
.223-.241	5.92-6.12	R-234	—
.241-.249	6.12-6.32	R-242	—
.246-.267	6.25-6.78	R-250	RB-250
.262-.283	6.65-7.19	R-266	RB-266
.277-.298	7.04-7.57	R-281	RB-281
.293-.314	7.44-7.98	R-297	RB-297
.308-.329	7.82-8.36	R-312	RB-312
.324-.345	8.23-8.76	R-328	RB-328
.340-.361	8.64-9.17	R-344	RB-344
.355-.376	9.02-9.55	R-359	RB-359
.371-.392	9.42-9.96	R-375	RB-375
.387-.408	9.83-10.36	R-391	RB-391
.402-.423	10.21-10.74	R-406	RB-406
.418-.439	10.62-11.15	R-422	RB-422
.434-.455	11.02-11.56	R-438	RB-438
.449-.470	11.40-11.94	R-453	RB-453
.465-.486	11.81-12.34	R-469	RB-469
.480-.501	12.19-12.73	R-484	RB-484

Shanks other than shown above are available upon request.

Standard tool specifications

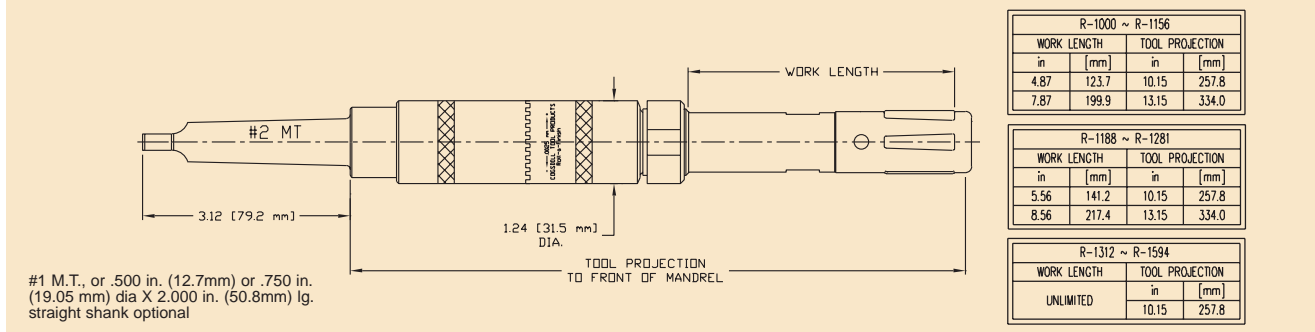


“R” SERIES ROLL-A-FINISH® TOOLS 1/2 TO 1 IN. (12.7 TO 25.4mm)

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

Shanks other than shown above are available upon request.

Standard tool specifications

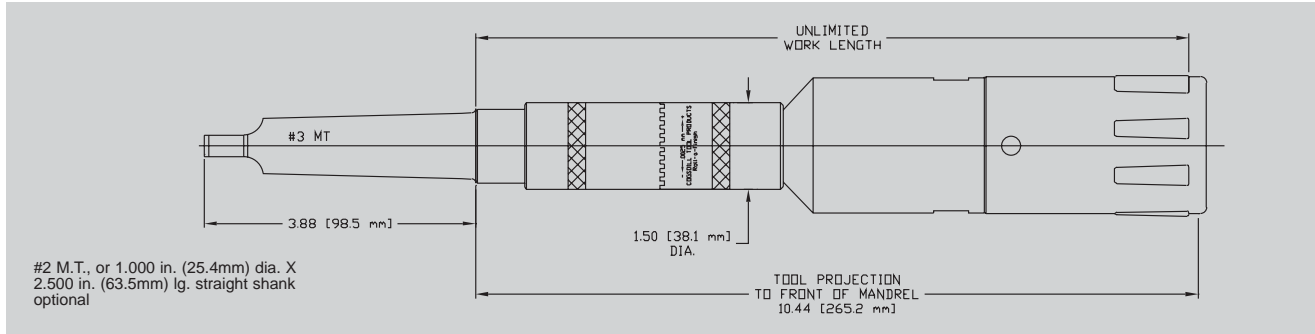


“R” SERIES ROLL-A-FINISH[®] TOOLS 1 TO 1-5/8 IN. (25.4 TO 41.28mm)

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

Shanks other than shown above are available upon request.

Standard tool specifications



“R” SERIES ROLL-A-FINISH® TOOLS 1-5/8 TO 2-1/2 IN (41.28 TO 63.5mm)

DIAMETER RANGE		TOOL NUMBER	
INCHES	MM	THRU-HOLE (HELIX)	BOTTOMING (NO HELIX)
1.621-1.662	41.17-42.21	R-1625	RB-1625
1.652-1.693	41.96-43.00	R-1656	RB-1656
1.684-1.725	42.77-43.82	R-1688	RB-1688
1.715-1.756	43.56-44.60	R-1719	RB-1719
1.746-1.787	44.35-45.39	R-1750	RB-1750
1.777-1.818	45.14-46.18	R-1781	RB-1781
1.808-1.849	45.92-46.96	R-1812	RB-1812
1.840-1.881	46.74-47.78	R-1844	RB-1844
1.871-1.912	47.52-48.56	R-1875	RB-1875
1.902-1.943	48.31-49.35	R-1906	RB-1906
1.934-1.975	49.12-50.17	R-1938	RB-1938
1.965-2.006	49.91-50.95	R-1969	RB-1969
1.996-2.037	50.70-51.74	R-2000	RB-2000
2.027-2.068	51.49-52.53	R-2031	RB-2031
2.058-2.099	52.27-53.31	R-2062	RB-2062
2.090-2.131	53.09-54.13	R-2094	RB-2094
2.121-2.162	53.87-54.91	R-2125	RB-2125
2.152-2.193	54.66-55.70	R-2156	RB-2156
2.184-2.225	55.47-56.52	R-2188	RB-2188
2.215-2.256	56.26-57.30	R-2219	RB-2219
2.246-2.287	57.05-58.09	R-2250	RB-2250
2.277-2.318	57.84-58.88	R-2281	RB-2281
2.308-2.349	58.62-59.66	R-2312	RB-2312
2.340-2.381	59.44-60.48	R-2344	RB-2344
2.371-2.412	60.22-61.26	R-2375	RB-2375
2.402-2.443	61.01-62.05	R-2406	RB-2406
2.434-2.475	61.82-62.87	R-2438	RB-2438
2.465-2.506	62.61-63.65	R-2469	RB-2469
2.496-2.537	63.40-64.44	R-2500	RB-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.



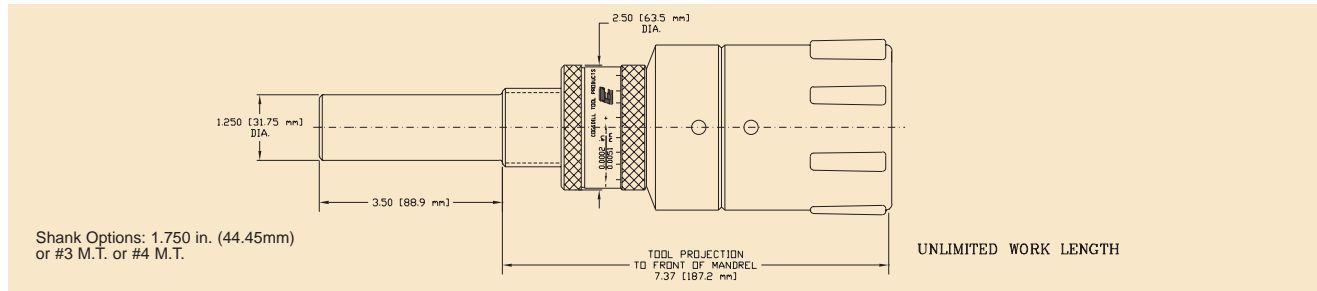
Offered in *two styles:*

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



...and *available from stock.*

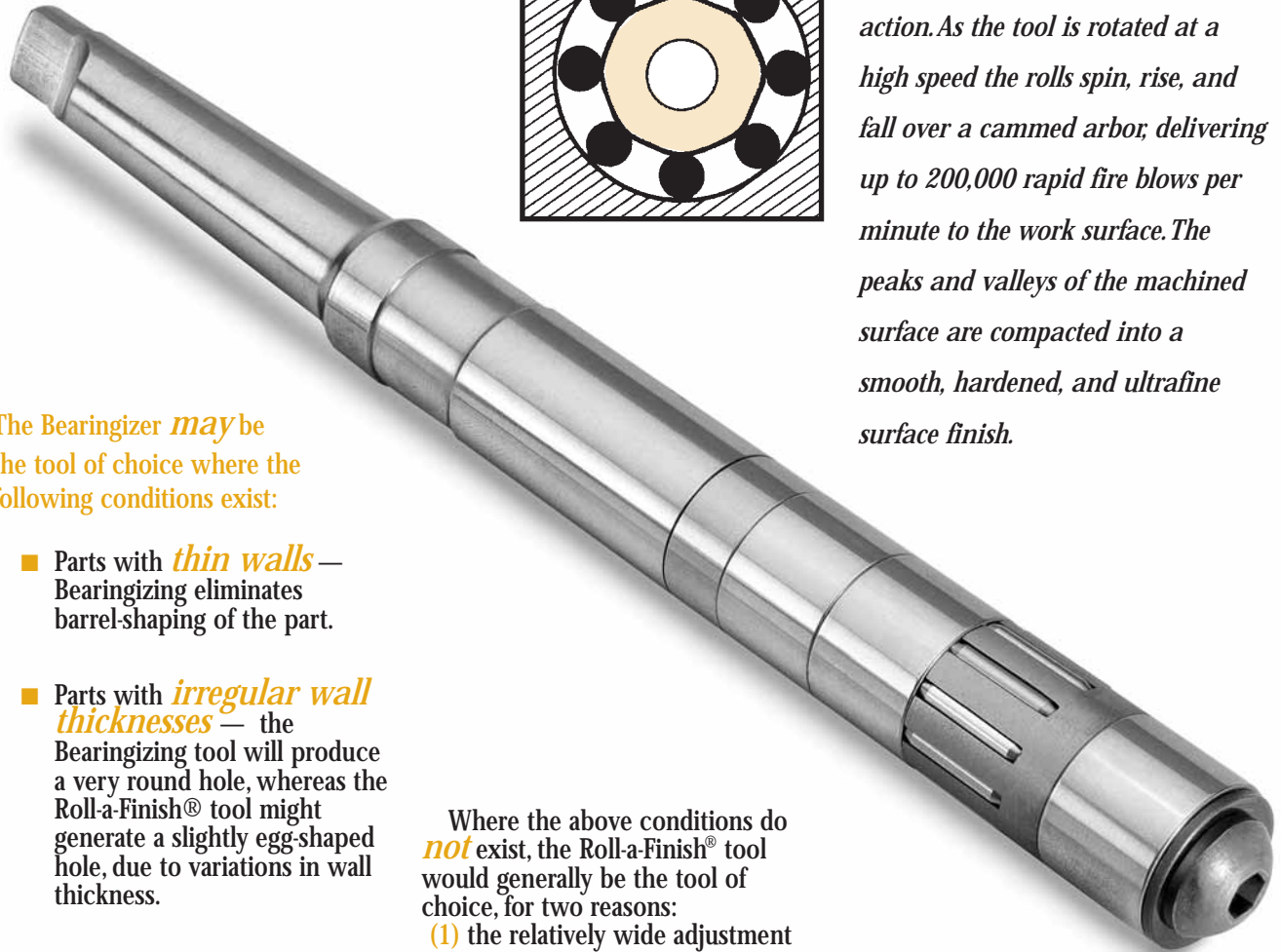
Standard tool specifications



“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

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.

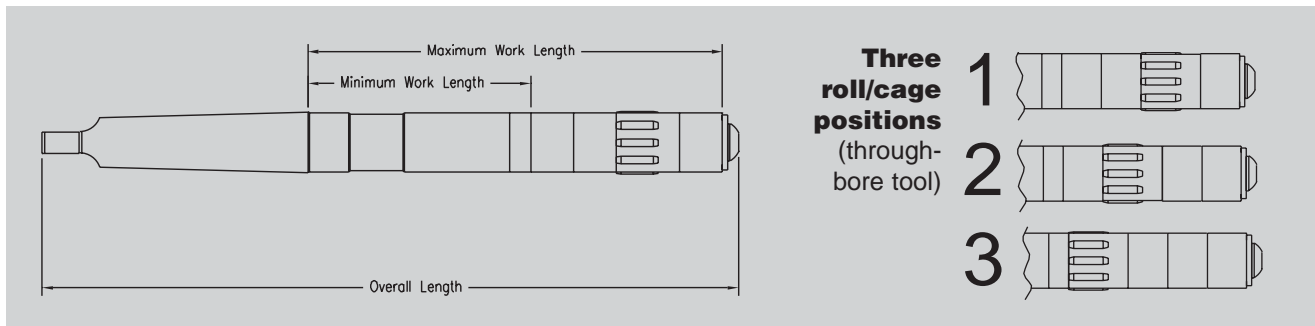
While the Roll-a-Finish Tool increases surface hardness by about 5 to 10%, Bearingizing increases hardness by 10 to 30%, but with less surface penetration.

Standard 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	MAXIMUM		MINIMUM		
									INCHES	MM	INCHES	MM	
.188	4.76	.1861 .1901	4.727 4.829	.1281	3.254	# 1 MT	5.5	139.7	2.938	74.61	2.188	55.56	6
.219	5.56	.2174 .2214	5.522 5.624	.1594	4.049	# 1 MT	5.5	139.7	2.938	74.61	2.188	55.56	6
.236	6	.2343 .2383	5.951 6.053	.1670	4.242	# 1 MT	6	152.4	3.438	87.31	2.375	60.32	6
.250	6.35	.2486 .2526	6.314 6.416	.1806	4.587	# 1 MT	6	152.4	3.438	87.31	2.375	60.32	6
.276	7	.2743 .2783	6.967 7.069	.2064	5.243	# 1 MT	6	152.4	3.438	87.31	2.313	58.74	6
.281	7.14	.2799 .2839	7.109 7.211	.2119	5.382	# 1 MT	6	152.4	3.438	87.31	2.313	58.74	6
.313	7.94	.3112 .3152	7.904 8.006	.2212	5.618	# 1 MT	6	152.4	3.438	87.31	2.313	58.74	6
.315	8	.3137 .3177	7.968 8.069	.2238	5.667	# 1 MT	6	152.4	3.438	87.31	2.313	58.74	6
.343	8.73	.3425 .3465	8.700 8.801	.2525	6.414	# 1 MT	7	177.8	4.438	112.71	3.063	77.79	6
.354	9	.3530 .3570	8.966 9.068	.2631	6.683	# 1 MT	7	177.8	4.438	112.71	3.063	77.79	6
.375	9.53	.3738 .3778	9.495 9.596	.2518	6.396	# 1 MT	7	177.8	4.438	112.71	3.125	79.38	6
.394	10	.3965 .3925	9.970 10.071	.2705	6.871	# 1 MT	7	177.8	4.438	112.71	3.125	79.38	6
.406	10.32	.4051 .4091	10.290 10.391	.2831	7.191	# 1 MT	8	203.2	5.438	138.11	3.563	90.49	6
.433	11	.4320 .4360	10.973 11.074	.2779	7.059	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	6
.438	11.11	.4365 .4405	11.087 11.189	.2825	7.176	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	6
.469	11.91	.4678 .4718	11.882 11.984	.3138	7.971	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	8
.472	12	.4710 .4750	11.963 12.065	.3174	8.062	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	8

Standard tool specifications

Bearingizing tools

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

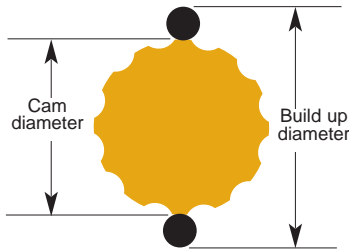
NOMINAL TOOL SIZE		BUILD-UP RANGE		CAM DIAMETER		SHANK	OVERALL LENGTH		WORK LENGTH				NO. OF ROLLS
INCHES	MM	INCHES	MM	INCHES	MM		INCHES	MM	MAXIMUM		MINIMUM		
									INCHES	MM	INCHES	MM	
.500	12.70	.4990 .5030	12.675 12.776	.3450	8.763	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	8
.512	13	.5110 .5150	12.979 13.081	.3568	9.063	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	8
.531	13.49	.5303 .5343	13.470 13.571	.3763	9.558	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	8
.551	14	.5500 .5540	13.970 14.072	.3962	10.063	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	8
.563	14.29	.5615 .5655	14.262 14.364	.4075	10.351	# 1 MT	8	203.2	5.438	138.11	3.688	93.66	8
.591	15	.5936 .5896	15.077 14.976	.4356	11.064	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	8
.594	15.09	.5928 .5968	15.057 15.159	.4388	11.146	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	8
.625	15.87	.6240 .6280	15.850 15.951	.4390	11.151	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	8
.630	16	.6290 .6330	15.977 16.078	.4439	11.275	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	8
.656	16.67	.6553 .6593	16.645 16.746	.4703	11.946	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	8
.669	17	.6680 .6720	16.967 17.069	.4833	12.276	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	8
.688	17.46	.6865 .6905	17.437 17.539	.5015	12.738	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	8
.709	18	.7080 .7120	17.983 18.085	.5227	13.277	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	10
.719	18.26	.7178 .7218	18.232 18.334	.5328	13.533	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	10
.748	19	.7470 .7510	18.974 19.075	.5620	14.275	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	10
.750	19.05	.7490 .7530	19.025 19.126	.5640	14.326	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	10
.781	19.84	.7803 .7843	19.820 19.921	.5953	15.121	#2 MT	8	203.2	4.875	123.83	3.125	79.38	10
.787	20	.7860 .7900	19.964 20.066	.6014	15.276	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	10
.813	20.64	.8115 .8155	20.612 20.714	.6265	15.913	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	10
.827	21	.8260 .8300	20.980 21.082	.6408	16.276	# 2 MT	8	203.2	4.875	123.83	3.125	79.38	10
.844	21.43	.8428 .8468	21.407 21.509	.5958	15.133	# 2 MT	9	228.60	5.875	149.23	3.75	95.25	10
.866	22	.8650 .8690	11.971 22.076	.6181	15.700	# 2 MT	9	228.60	5.875	149.23	3.75	95.25	10
.875	22.22	.8740 .8780	22.200 22.301	.6270	15.926	# 2 MT	9	228.60	5.875	149.23	3.75	95.25	10
.905	23	.9050 .9090	22.987 23.087	.6583	16.721	# 3 MT	10	254.00	6.125	155.58	4.00	101.60	10
.906	23.02	.9053 .9093	22.995 23.096	.6583	16.721	# 3 MT	10	254.00	6.125	155.58	4.00	101.60	10
.938	23.81	.9365 .9405	23.787 23.889	.6895	17.513	# 3 MT	10	254.00	6.125	155.58	4.00	101.60	10
.945	24	.9440 .9480	23.978 24.078	.6969	17.701	# 3 MT	10	254.00	6.125	155.58	4.00	101.60	10
.969	24.61	.9678 .9718	24.582 24.684	.7208	18.308	# 3 MT	10	254.00	6.125	155.58	4.00	101.60	12
.984	25	.9830 .9870	24.968 25.070	.7363	18.702	# 3 MT	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	# 3 MT	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	# 3 MT	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	# 3 MT	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	# 3 MT	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	# 4 MT	11	279.40	6.125	155.58	4.00	101.60	14

Tools for hole diameters from 1.250 to 2.000 inches (31.75 to 50.8mm) are non-stocked standards; tools above 2.000 (50.8mm) are special. 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.



Standard tool sizes

Tools are stocked in diameters of .187 inch (4.7625mm) through 2.000 inch (50.80mm). 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 non-stocked 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 standard .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 $\div 2 = .0785$ inch (1.99mm)
 Single roll size .0785 inch (1.99mm)

Order .500 inch (12.77mm) 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

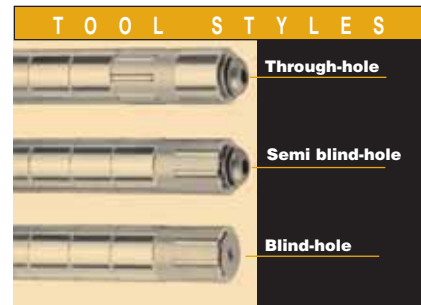
Note: Above are recommended starting points only. Final build-up can best be determined by actual trial and several extra sets of rolls in increments of .0001 inch (.0025mm) are recommended.

Ordering stocked tools

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 (.002mm) are recommended with initial orders to allow for final size adjustment and compensate for eventual tool wear.



Ordering non-stocked tools

Intermediate sizes

Sizes that do not fall within the range of stocked 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 stocked tools and parts by fractional tool size shown on shank — except roll sizes, which should be determined by the required build-up. Re-order non-stocked 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. (Refer to preceding page “Ordering Stocked Tools.”)

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		RPM	HOLE DIAMETER		RPM	HOLE DIAMETER		RPM	HOLE DIAMETER		RPM
INCHES	MM		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.