

2026

Precision Metal Finishing Tools

Precision Tool Crib

Elliott Tool Technologies

INTERNAL RECESSING UNIT

MACHINE INTERNAL GROOVES IN **ONE** **OPERATION**

PAGE 92

THE HEAT FREE ADVANTAGE

OF MECHANICAL JOINING
IN AEROSPACE

PAGE 82

THE IMPACT OF BURNISHING EXOTIC MATERIALS

PAGE 24



A History of Innovation

1892 - PRESENT

130+ Years Of Experience

WHY CHOOSE ELLIOTT TOOL?

In September 1892, an inventor and manufacturer named Gustav Wiedeke began a small manufacturing business in a modest building at the rear of his Dayton, Ohio home. Today, over 100 years later, Wiedeke Dayton has become Elliott Tool Technologies Ltd. due to Mr. Wiedeke's efforts.

The Wiedeke business continued to operate as a family enterprise for the next 32 years. By this time, Wiedeke products had earned a worldwide reputation for excellence in the industries they served. Wiedeke tools were innovative enough to be covered by various patents and trademarks.

In 1916, William Elliott also recognized the need and opportunity in the industry for efficient tube cleaning equipment. Operating plants in both Ohio and Pennsylvania, the company went through several company name iterations (Lagonda Springfield and Elliott Springfield) and eventually became known as the Elliott Company. By the late 1960's, Elliott Company also enjoyed a worldwide reputation for its cleaning and turbo-machinery products. And in 1969, acquired the Gustav Wiedeke Company.

Today we are a private company known as Elliott Tool Technologies. Boasting self directed work teams, exceptional customer service, and a continued commitment to produce tube tools Gustav Wiedeke and William Swan Elliott would be proud of.

Elliott Tool Technologies is proud to represent more than 130 years of manufacturing, sales, and engineering experience.



1892

Gustav Wiedeke begins a small manufacturing business in Dayton, OH.

1969

Elliott Company acquires the Gustav Wiedeke Company.

1916

William Elliott founds Elliott Company and starts selling tube tools.

2026

Now known as Elliott Tool Technologies, we are proud to represent over 130 years of manufacturing excellence

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FEATURED ARTICLES



The Heat Free Advantage of Mechanical Joining in Aerospace

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The Impact of Burnishing Exotic Materials

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Introduction to Burnishing

MATERIAL TYPE, HARDNESS, AND SURFACE FINISH

Material Type & Hardness

Burnishing is most suitable for metals up to 40 HRC but harder metals can be burnished in special cases. While harder materials decrease tool life faster, burnishing tools have a well-known reputation for longevity. The components on burnishing tools that wear the most can be replaced without replacing the entire tool.

STOCK ALLOWANCE

Stock allowances are based on an 80 to 180 microinch surface finish consisting of uniform peaks and valleys. The amount of stock allowance varies with job conditions, material properties, wall thickness, nature of the machined surface and quality of surface finish desired. Figures shown are a starting point for part preparation.

HIGH DUCTILITY MATERIALS

Up to 50% elongation and less than Rc32

Includes:

- annealed steel
- stainless steel
- aluminum
- brass bronze
- malleable iron

LOW DUCTILITY MATERIALS

Less than 20% elongation and a maximum hardness of Rc40

Includes:

- gray iron
- nodular iron
- heat-treated steel
- magnesium alloys
- hard copper alloys

	Workpiece Size Range	Stock Allowance (in)	Stock Allowance (mm)	Pre-Burnished Finish (μ in)	Pre-Burnished Finish (μ mm)	Burnished Finish (μ in)	Burnished Finish (μ mm)
High Ductility	0.125 - 0.484" (3.91 - 12.29mm)	0.0004 - 0.0007	0.0100 - 0.0180	80-125	2.0 - 3.1	4-10	0.10 - 0.25
	0.500 - 1.000" (12.70 - 25.40mm)	0.0007 - 0.0015	0.0180 - 0.0380	60-125	1.5 - 3.1	4-10	0.10 - 0.25
	1.031 - 2.000" (26.19 - 50.80mm)	0.0010 - 0.0020	0.0240 - 0.0510	60-125	1.5 - 3.1	4-10	0.10 - 0.25
	2.031 - 6.500" (51.59 - 165.10mm)	0.0015 - 0.0030	0.0380 - 0.0760	60-200	1.5 - 3.0	4-10	0.10 - 0.25
Low Ductility	0.125 - 0.484" (3.91 - 12.29mm)	0.0004 - 0.0007	0.0100 - 0.0178	80-100	2.0 - 2.5	12-24	0.30 - 0.60
	0.500 - 1.000" (12.70 - 25.40mm)	0.0007 - 0.0015	0.0180 - 0.0250	90-125	2.3 - 3.1	12-24	0.30 - 0.60
	1.031 - 2.000" (26.19 - 50.80mm)	0.0010 - 0.0020	0.0250 - 0.0380	125-180	3.1 - 4.5	12-24	0.30 - 0.60
	2.031 - 6.500" (51.59 - 165.10mm)	0.0015 - 0.0030	0.0380 - .0510	120-200	3.0 - 5.0	12-24	0.30 - 0.60

Surface Finish

In manufacturing, there are many processes that can impact the performance of a part. From the design itself to the machining method used, there are many variables at play. One critical step in this process is the ending surface finish of the part. Not only does surface finish impact the aesthetics of the part, but it also plays a large role in part performance and efficiency.

WHAT IS SURFACE FINISH?

Surface finish is the measurement of a material's texture and is made up of three key parts: lay, waviness, and roughness.

- **Lay** describes the direction of the surface pattern on the material and is generally a result of the manufacturing process used.
- **Waviness** refers to large irregularities or deviations on the surface of the material
- **Roughness**, like waviness, evaluates smaller irregularities in material and is used to calculate its smoothness

Depending on the end use of the part, the acceptable range for surface finish will vary, however, most machined workpieces will require a lower finish. For example, mating surfaces or parts that will interact with others while in operation will utilize a lower finish. This is to help reduce friction and increase efficiency of the part.

BURNISHING FOR SURFACE FINISH

In production work involving surface textures having a 100 to 125 microinch machined finish, burnishing tools can produce a **2 to 16 microinch finish in a single pass**.

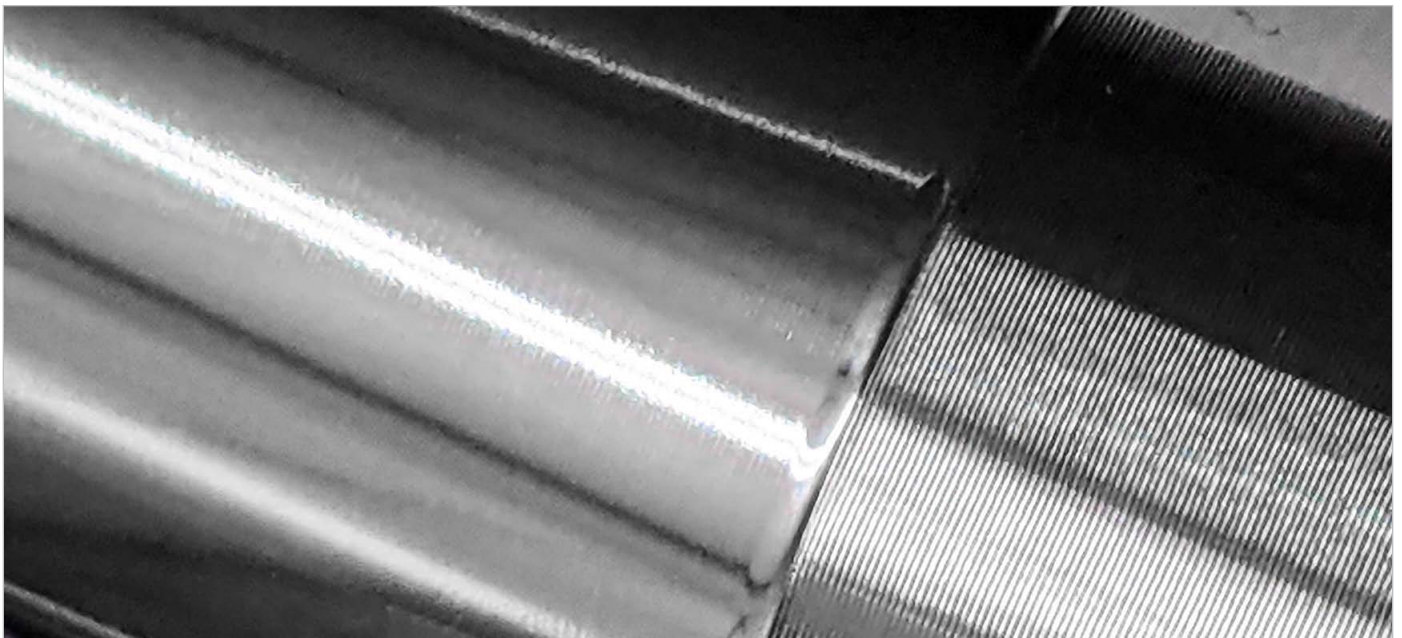
In bronze, aluminum and steel, readings of 2 to 8 microinch can be achieved with a burnishing tool. In cast iron, a 12 to 24 micro-inch finish can be expected.

Varying surface finishes are obtained in the machining of mating parts. Machined surfaces result in a loose fit on mating parts. Surfaces which have been roller burnished have a higher bearing capacity and abrasion resistance. Roller burnishing improves this fit by providing a larger contact area between the surfaces.

Pistons, valves, cylinders and other parts with similar functions require continuous lubrication.

Roller burnishing will leave valleys in the surface of these parts, which act as oil reservoirs, extending part life. This can be achieved by controlling the burnishing size and hole size. Roller burnishing has resulted in product improvement and cost savings to the hydraulic cylinder industry.

Heat, resulting from friction, has a direct effect on surface finish. This temperature rise causes dimensional changes that can have an adverse effect on the function of the parts. By roller burnishing, it is possible to reduce friction by up to 30%. The electric motor industry, among others, has derived great benefits from roller burnishing to reduce noise levels in moving parts.



Introduction to Burnishing

BURNISHING PREPARATION

Several factors should be considered in preparation of the workpiece – feed pattern, cutting tool geometry, material type and hardness, and stock allowance.

Tool Geometry

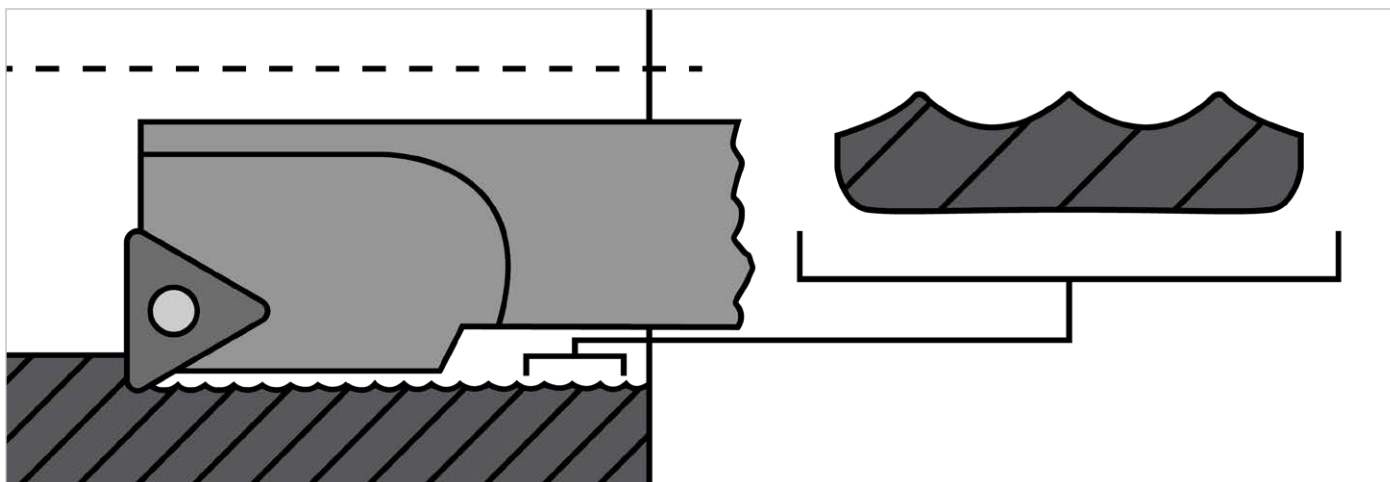
Most high ductility materials can start with a machined finish of 60-100Ra, but for lower ductility materials a smoother starting finish may be required depending on the success criteria of the application.

To prepare the surface using an insert, we recommend a .032" TNR non-wiper insert with a minimum back taper of 5 degrees, or a reamer.

Feed Pattern

A peak and valley effect generated by the cutting tool is an ideal surface finish for roller burnishing.

An extremely smooth bore is not required to perform roller burnishing. However, gouges and tears in the surface caused by the drilling or reaming operation and/ or the single point turning will be very difficult to roller burnish. These gouges and tears will cause a change in the surface finish, as well as a change in the diameter. Deep gouges will remain visible after the burnishing operation.



Introduction to Burnishing

RECOMMENDED FEEDS & SPEEDS

Workpieces should be machined to a finish of 60µin Ra to 125µin Ra.

A finer machined surface is required before the burnishing operation with less ductile materials, such as cast iron and heat treated steel above Rc35. Ductile materials, such as brass, aluminum and annealed steels, can have a rougher machined surface. Very finely machined surfaces can accept only a slight size change when burnished. Some 25% to 50% less material can be displaced from a reamed surface versus a surface machined with a single point tool. Tools with non-feed cages (full bottom tools) must always be machine fed.

Feeds can be adjusted upward 25% to 50%.

Inch	Metric	Inch/Rev	Metric/Rev	Speed RPM
0.154 - 0.246	3.910 - 6.250	0.005 - 0.009	0.127 - 0.229	1500 to 3000
0.247 - 0.371	6.270 - 9.420	0.008 - 0.012	0.203 - 0.305	1500 to 3000
0.372 - 0.495	9.450 - 12.570	0.012 - 0.019	0.305 - 0.483	1000 to 2000
0.496 - 0.620	12.600 - 15.750	0.014 - 0.020	0.356 - 0.508	1000 to 2000
0.621 - 0.745	15.770 - 18.920	0.019 - 0.027	0.482 - 0.686	600 to 1200
0.746 - 0.870	18.950 - 22.100	0.022 - 0.035	0.559 - 0.889	600 to 1200
0.871 - 0.995	22.120 - 25.270	0.025 - 0.037	0.635 - 0.940	600 to 1200
0.996 - 1.245	25.300 - 31.620	0.032 - 0.049	0.813 - 1.245	300 to 600
1.246 - 1.495	31.650 - 37.970	0.048 - 0.071	1.219 - 1.803	300 to 600
1.496 - 1.745	38.000 - 44.320	0.056 - 0.084	1.422 - 2.134	200 to 400
1.746 - 1.995	44.350 - 50.670	0.057 - 0.086	1.448 - 2.184	200 to 400
1.996 - 2.245	50.700 - 57.020	0.070 - 0.105	1.778 - 2.667	200 to 400
2.246 - 2.495	57.050 - 63.370	0.075 - 0.112	1.905 - 2.845	170 to 340
2.496 - 2.745	63.400 - 69.720	0.082 - 0.124	2.082 - 3.150	170 to 340
2.746 - 2.995	69.750 - 76.070	0.054 - 0.080	1.372 - 2.032	170 to 340
2.996 - 3.245	76.100 - 82.420	0.056 - 0.084	1.422 - 2.134	120 to 240
3.246 - 3.495	82.450 - 88.770	0.061 - 0.091	1.549 - 2.311	120 to 240
3.496 - 3.745	88.800 - 95.120	0.074 - 0.104	1.880 - 2.642	100 to 200
3.746 - 3.995	95.150 - 101.470	0.078 - 0.116	1.981 - 2.946	100 to 200
3.996 - 4.245	101.500 - 107.820	0.081 - 0.121	2.057 - 3.073	100 to 200

Machine settings are approximate. Always set the machine faster than the feed rate of the burnishing tool.

ID Multi-Roll Burnishing Tool

SIZE RANGE:

0.157" – 6.500"
(3.91 – 165.10mm)

HOLE TYPE:

Blind, Bottom, and
Through

APPLICATION:

Hole Sizing, Finishing,
and Hardening

FINISH RANGE:

4 – 24 μ in.
(0.10 – 0.60 μ mm)

A Faster & More Accurate Method For Hole Finishing

Elliott's multi-roller ID burnishing tools deliver superior results for sizing, finishing, and hardening internal holes and bores.

Eliminating costly secondary processes such as grinding and honing, the ID burnishing tool uses compressive forces to cold work the metal, resulting in a smooth surface finish.

FEATURES AND BENEFITS:

One Step Operation

Produce a 4 – 8 Ra surface finish in one pass.

Accurate Sizing

Precision tools allow for minute 0.0001" adjustments, producing accurate hole sizing.

Lower Production Costs

Eliminate costly secondary operations such as grinding, honing, and polishing.

Suit A Variety Of Hole Styles

Through, blind, and bottom style rolls allow the tool to get as close to the bottom of the bore as necessary.

Increase Part Life

Increased surface hardness from cold working the material makes it less susceptible to wear and tear, prolonging the life of the part.

Better Part Performance

A smooth hole finish reduces the amount of friction generated while in use, preventing premature failure or excess wear on the part.

SPARES:

- Cages
- Mandrels
- Rolls



ID Multi-Roll Burnishing Tool

STANDARD SIZES & SERIES

STANDARD SIZES & SERIES

ID Multi-Roller tools are divided into multiple series, each containing a range of standard diameter sizes for holes ranging from 0.157" to 6.500" (3.912 to 165.100mm).

Custom sizes are available.

Tool Series	Size Range (Inches)	Size Range (Metric)
5418	0.154 - 0.501	3.912 - 12.725
5419	0.496 - 0.662	12.598 - 16.815
5433	0.652 - 0.974	16.561 - 24.740
5444	0.964 - 1.224	24.486 - 31.090
5405	1.214 - 1.724	30.839 - 35.865
5406	1.402 - 1.849	35.611 - 46.965
5407	1.839 - 2.224	46.711 - 56.490
5408	2.214 - 2.724	56.236 - 69.190
5409	2.714 - 3.349	68.936 - 85.065
5610	3.339 - 4.099	84.811 - 104.115
5611	4.089 - 5.037	103.861 - 127.940
5612	5.027 - 5.537	127.686 - 140.640
5613	5.527 - 6.537	140.386 - 166.040

THE ID MULTI-ROLLER BURNISHING TOOL

consists of a cage, which retains a series of precision tapered rolls rotating around and bearing on an inversely tapered mandrel.

Within the work-piece, the tool is sized so that the roll develops a pressure that exceeds the yield point of the softer work-piece.



ID Multi-Roll Burnishing Tool

TOOL STYLES & CLEARANCE

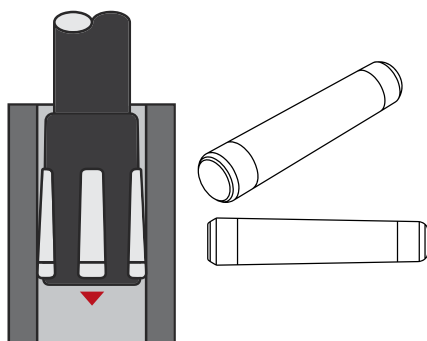
What is Clearance?

Clearance is the amount of space under the tool required to ensure the machine will not wreck. Each tool style and the diameters within each style require different clearance amounts.

The ID Multi-Roll Tool is available in 3 different styles.

THROUGH STYLE

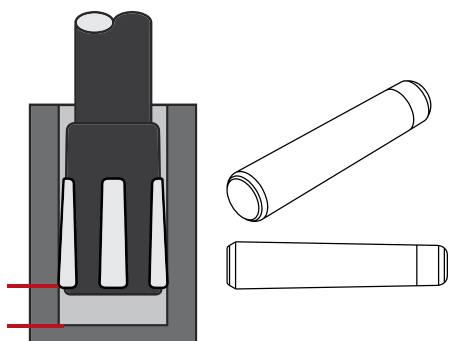
Rolls with greater radius relief are used for through holes. These tools are self-feeding and a release clearance is required. These rolls are interchangeable between blind and through cages.



Tool Size Range	Minimum Clearance
0.154 - 0.630	N/A
0.621 - 0.662	0.218
0.652 - 0.974	0.265
0.964 - 1.849	0.281
1.839 - 3.349	0.312
3.339 - 6.531	0.350

BLIND STYLE

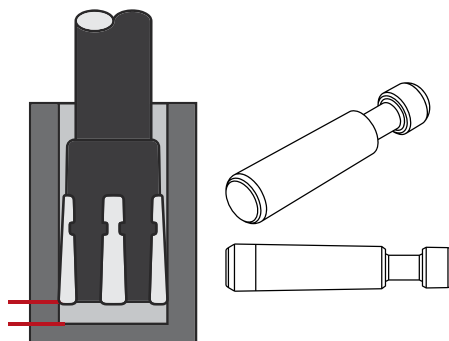
Blind rolls burnish closer to the bottom of a hole than through rolls. These rolls are interchangeable between blind and through cages.



Tool Size Range	Minimum Clearance
0.154 - 0.630	0.093
0.621 - 0.974	0.125
0.964 - 1.849	0.141
1.839 - 3.349	0.156
3.339 - 6.537	0.187

BOTTOMING STYLE

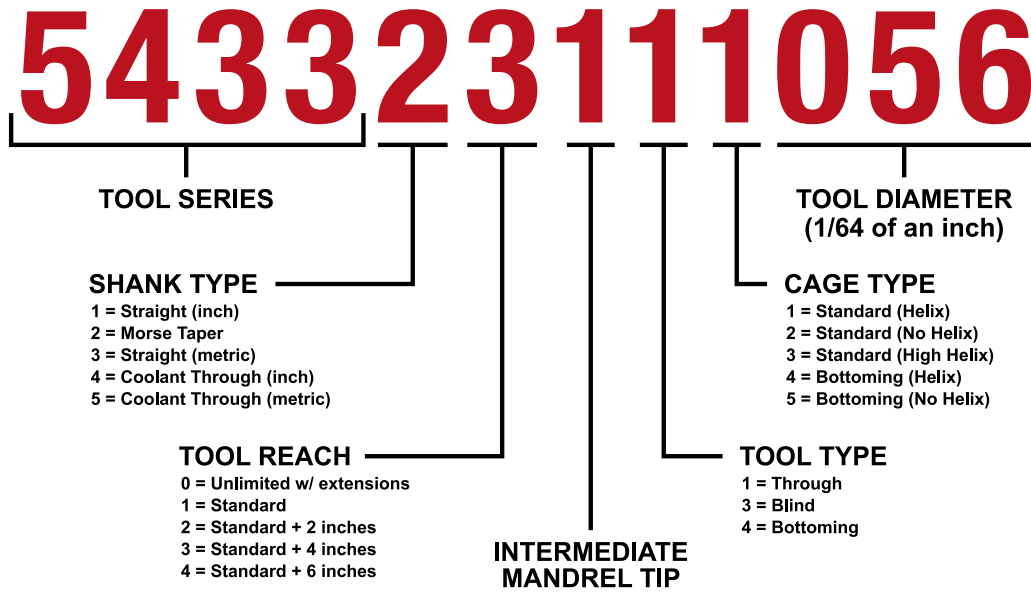
Used in blind hole applications to burnish as close as possible to the bottom of the bore. These rolls are not interchangeable between blind and through cages.



Tool Size Range	Minimum Clearance
0.154 - 0.251	-
0.247 - 0.630	0.035
0.621 - 6.537	0.062

ID Multi-Roll Burnishing Tool

PART NUMBER SEQUENCE & INTERMEDIATE MANDRELS



INTERMEDIATE MANDRELS

Most “bottoming” style applications will require an intermediate mandrel

If the bore being burnished is more than a (.006”-.008” deviation from the nominal value of the tool, an intermediate mandrel will be required for adjustment to size.

Example:

1.266 (Size of Bore)
 1.250 (Nominal Tool Diameter)
0.016 (Diameter Difference)

Could Use Intermediate Sizes:

#4 (.008-.016)
 #5 (.012-.020)
 #6 (.016-.024)

Tool Nominal Diameter	Adjustment Range with Intermediate Sizes (Above Nominal Size)								Intermediate Mandrel Tip Size
	Bottoming Tools				Through & Blind Tools				
	Inches		Metric		Inches		Metric		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
0.187” (4.750mm)					(-0.003) 0.000 0.003	0.001 0.004 0.007	(-0.076) 0.000 0.076	0.025 0.102 0.178	1 2 3
					0.003 0.006 0.009 0.012	0.007 0.010 0.013 0.015	0.076 0.152 0.229 0.305	0.178 0.254 0.330 0.381	3 4 5 6
0.193” (4.750mm)									
0.203 - 0.234” (5.156 - 5.944mm)					(-0.003) 0.000 0.003 0.006 0.009 0.012	0.001 0.001 0.007 0.010 0.013 0.015	(-0.076) 0.000 0.076 0.152 0.229 0.305	0.025 0.025 0.178 0.254 0.330 0.381	1 2 3 4 5 6
0.250 - 0.484” (6.350 - 12.294mm)	(-0.003) 0.000 0.003 0.006 0.009 0.012	0.001 0.001 0.007 0.010 0.013 0.015	(-0.076) 0.000 0.076 0.152 0.229 0.305	0.025 0.025 0.178 0.254 0.330 0.381	(-0.003) 0.000 0.003 0.006 0.009 0.012	0.001 0.001 0.007 0.010 0.013 0.015	(-0.076) 0.000 0.076 0.152 0.229 0.305	0.025 0.025 0.178 0.254 0.330 0.381	1 2 3 4 5 6
0.500” + (12.700mm +)	(-0.004) 0.000 0.004 0.008 0.012 0.016 0.020 0.024	(-0.001) 0.003 0.007 0.011 0.015 0.019 0.023 0.027	(-0.102) 0.000 0.102 0.203 0.305 0.406 0.508 0.610	0.025 0.076 0.178 0.280 0.381 0.482 0.584 0.686	(-0.004) 0.000 0.004 0.008 0.012 0.016 0.020 0.024	0.004 0.008 0.012 0.016 0.020 0.024 0.032	(-0.102) 0.000 0.102 0.203 0.305 0.406 0.508 0.610	0.102 0.203 0.305 0.406 0.508 0.610 0.711 0.813	1 2 3 4 5 6 7 8
The seventh digit in the Tool Breakdown will indicate the “Mandrel Tip”									

The seventh digit in the Tool Breakdown will indicate the “Mandrel Tip”



SCAN TO SEE THE ID MULTI-ROLL
BURNISHING TOOL TECH MANUAL

Burnishing vs. Traditional Finishing Methods



WHAT IS METAL FINISHING?

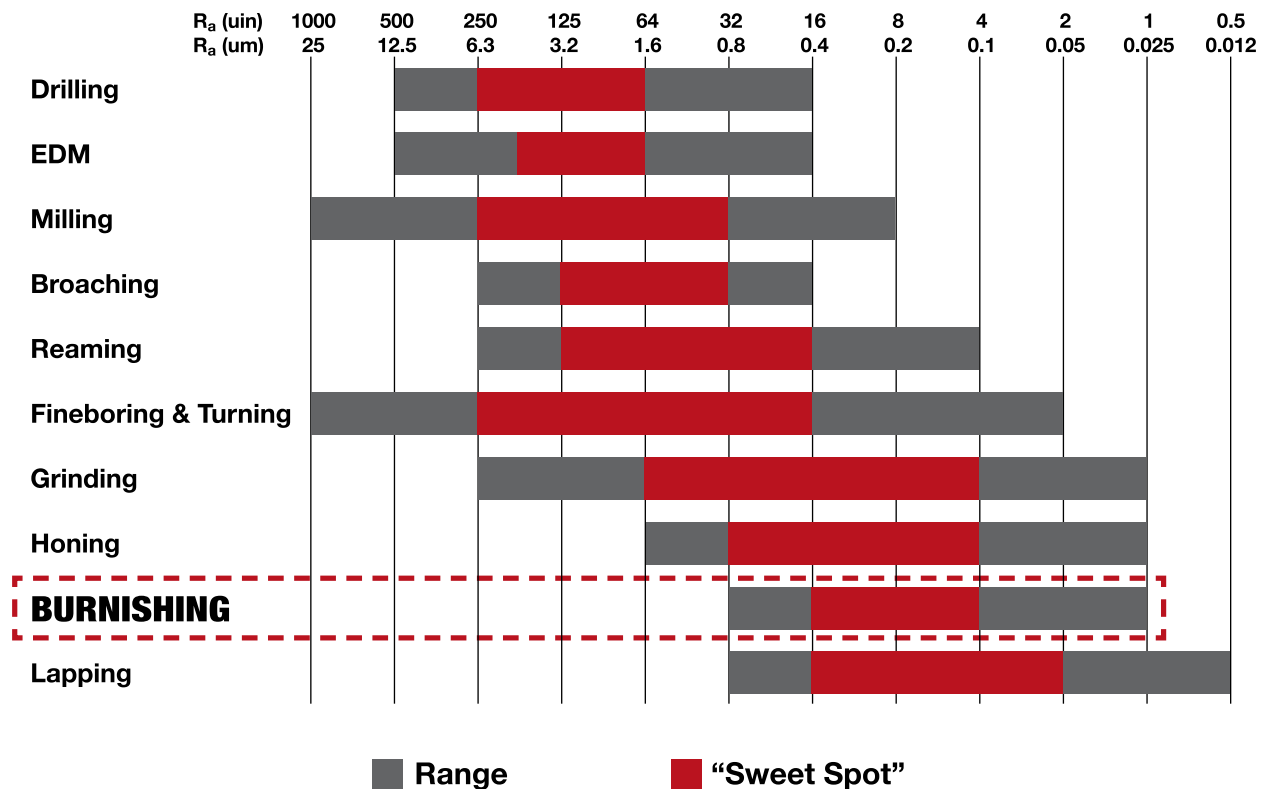
Metal Finishing refers to a wide range of processes that are aimed towards improving performance and minimizing wear over time. This can include everything from cleaning, to deburring, to surface finishing, depending on the part and end use application.

Traditional Finishing Methods

When talking about metal finishing, there are several specialized processes that have been around for a very long time. Grinding, Lapping, and Honing are some of the most common methods when trying to produce a smooth surface finish. As it sounds, grinding is the process of shaping the outer surface of a part using a grinding wheel. The benefit of grinding is that it's simple to do, however, there are limits on the shape and size of the part that can be run. Since this process relies on a central axis of rotation it only works with cylindrical surfaces. Additionally, the smaller the part, the more challenging it is to set-up correctly, making it more effective on larger surfaces.

Lapping is another common method of metal surface finishing and is a process where two surfaces are rubbed together with a loose abrasive between them. Generally used on flat surfaces, lapping has the ability to produce a very fine surface finish.

Lastly, honing is a process that sizes and finishes the interior of bores or tubing. This is typically done with honing stones and follows grinding, boring, and drilling operations. While lapping and honing produce high quality results, they are incredibly tedious and time consuming processes. Additionally, due to the specialized equipment required, many customers end up having to out-source parts which can add cost and lead time.



Burnishing

While traditional finishing methods are effective, they are not very efficient. In many cases, these processes require multiple operations and set-ups to achieve the desired finish and results. This means there's a lot of cost and downtime to change over parts. Additionally, more specialized processes like lapping and honing often require an outside vendor which adds cost and lead-time to manufacturing. Many shops are looking for ways to reduce the number of operations required to save on cost, as well as increase production. Burnishing is an effective and efficient alternative that often eliminates the need for secondary processes entirely.

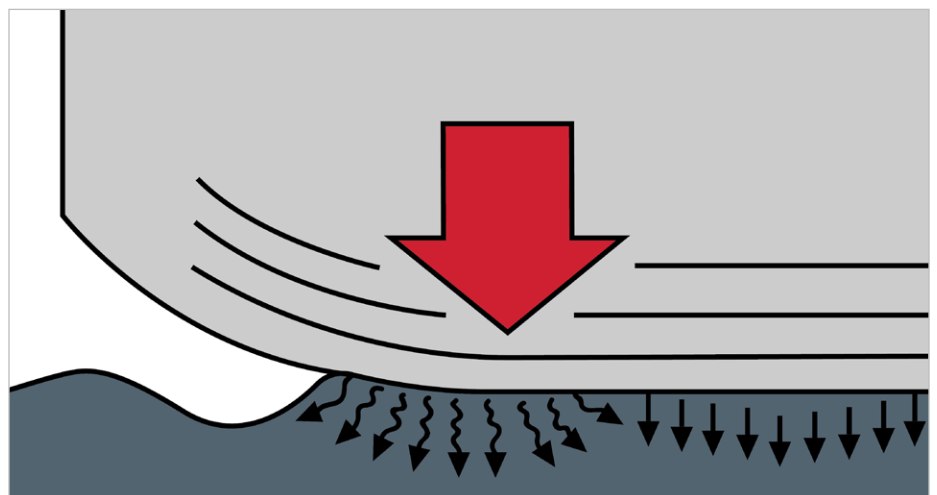
WHAT IS BURNISHING?

Burnishing is a machining process that cold works the metal without removing material. Rather it compresses or "irons-out" the peaks of a metal surface into the valleys, resulting in a uniform surface. Depending on the application, a burnishing tool uses either 1 or multiple rolls to exert pressure on the workpiece. This condenses the grain structure of the metal and causes it to elastically deform until it achieves a smooth surface finish. In addition to creating a smooth finish,

burnishing also increases the material's resistance to wear by hardening the surface of the workpiece. This results in better part life, as well as, better abrasion, and in some cases corrosion resistance.

In general, most ductile metals can be burnished and achieve a low finish. This includes stainless steel, titanium, aluminum, Inconel, etc. The ending finish will depend on the material and starting finish of the part.

Overall, there are many different existing methods for surface finishing. grinding, lapping, and honing are some of the most common methods used today to achieve finer finishes. While these methods can produce a high-quality finish, they are often high cost and outsourced to a vendor who has specialized equipment. In order to achieve the same fine finishes in house without secondary operations, many shops are turning towards burnishing applications. This allows customers to achieve specified finishes in one.



Benefits & Advantages of Burnishing

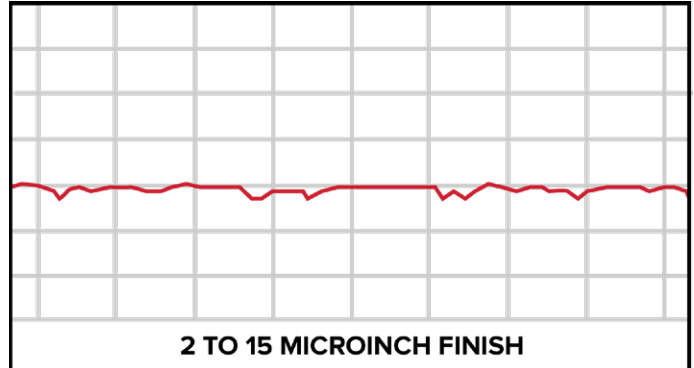
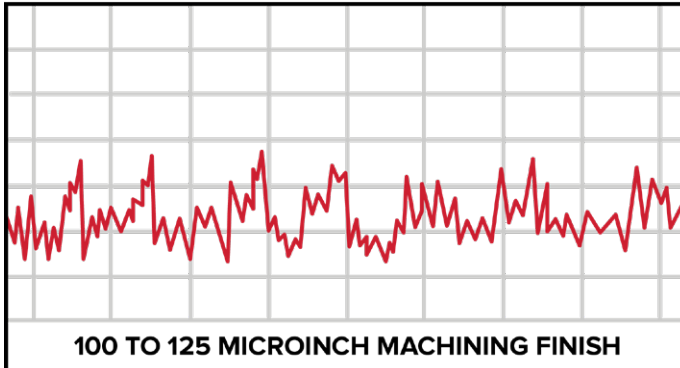
Burnishing can achieve a high quality finish which eliminates the need for secondary operations such as grinding, honing and lapping.

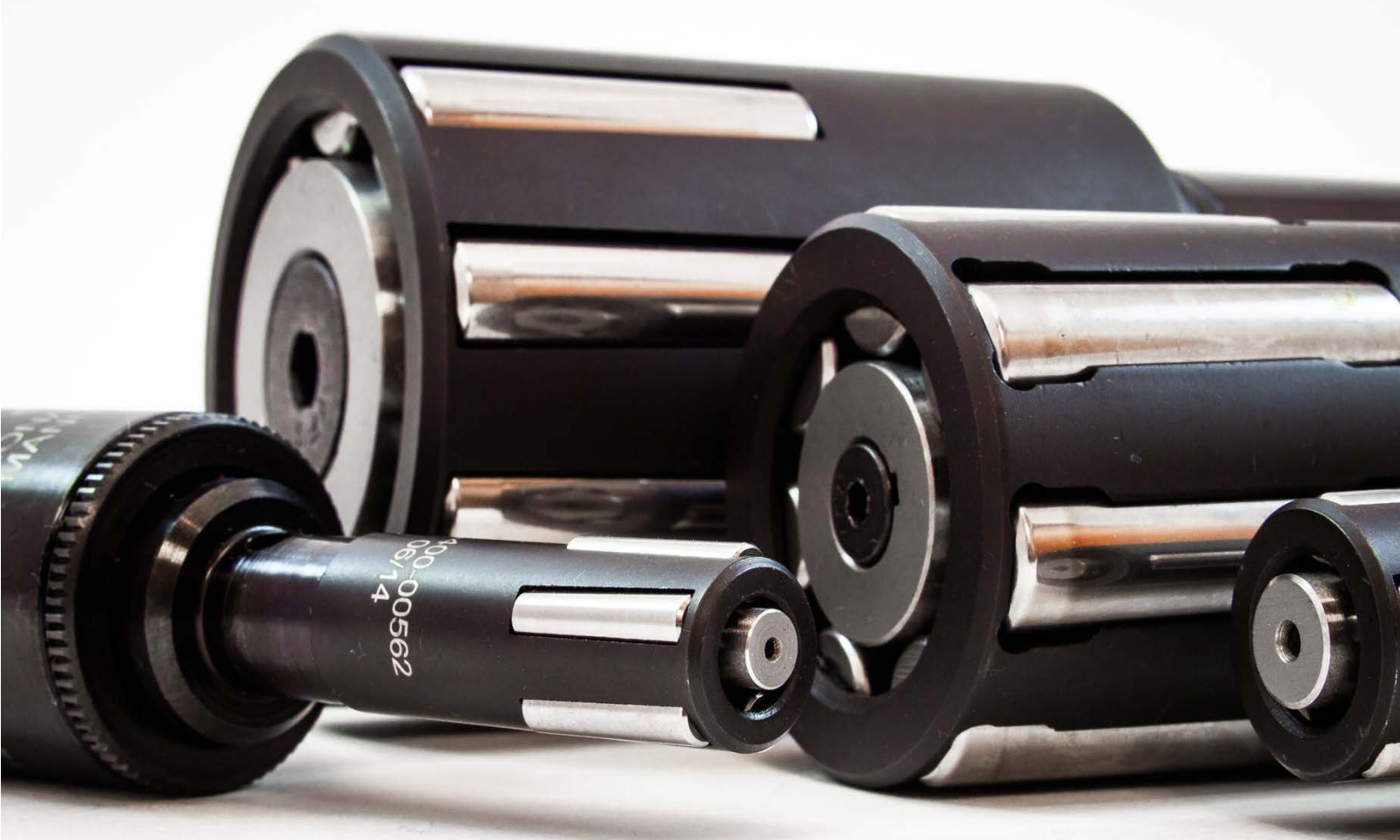
The low microinch finish, combined with a hardened and denser surface, substan-

tially increases part wear, life and corrosion resistance. The added strength improves the part's fatigue resistance, resulting in decreased failures.

Other benefits include better mating parts, higher bearing capacity, abrasion and cor-

rosion resistance, noise level reduction, stress and friction resistance, heat reduction, fatigue reduction, visual defect elimination, and surface porosity reduction.





CUSTOM BURNISHING SOLUTIONS

BUILT FOR YOUR APPLICATION

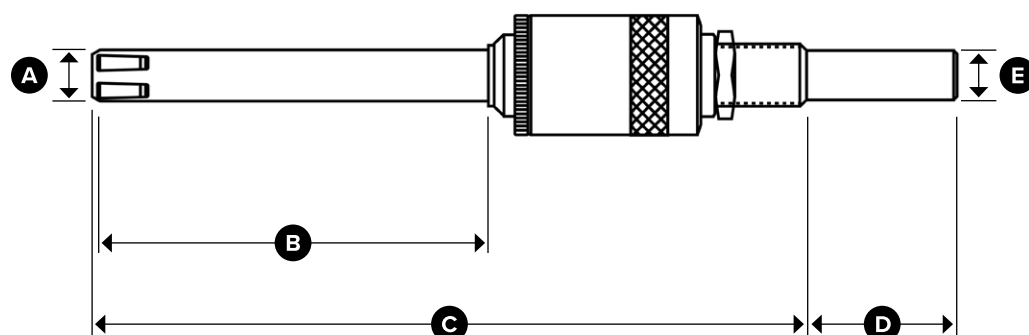
Every bore is different. Elliott's engineering team works directly with customers to design and build custom burnishing solutions for non-standard bore sizes, unusual geometries, and demanding material requirements.



**CONTACT US TODAY TO
REQUEST SPECIAL TOOLING**

5418 Series ID Burnishing Tool

0.154" - 0.501" (3.912MM - 12.725MM)



(D) Shank Length

1.50" (38.10mm)

(E) Shank Diameter

1	0.500" straight shank
2	#1 Morse Taper
3	12mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A short reach, 0.193" diameter blind style tool with a 0.500" straight shank, is part number **5418-111-31011**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach 1.625" (41.275mm) (C) Gage Length 5.000" (127.00mm)		(B) Max Burnishing Reach 3.625" (92.075mm) (C) Gage Length 7.000" (177.80mm)		(B) Max Burnishing Reach 5.625" (142.875mm) (C) Gage Length 9.000" (228.60mm)	
		Blind	Bottoming	Blind	Bottoming	Blind	Bottoming
0.154" - 0.166" (3.912 - 4.216mm)	0.157" (3.988mm)	5418-*11-31008	-	-	-	-	-
0.164" - 0.176" (4.166 - 4.470mm)	0.167" (4.242mm)	5418-*11-31009	-	-	-	-	-
0.174" - 0.186" (4.420 - 4.724mm)	0.177" (4.496mm)	5418-*11-31010	-	-	-	-	-
0.184" - 0.193" (4.674 - 4.902mm)	0.187" (4.750mm)	5418-*11-31012	-	5418-*21-31012	-	5418-*31-31012	-
0.190" - 0.203" (4.826 - 5.156mm)	0.193" (4.902mm)	5418-*11-31011	-	5418-*21-31011	-	5418-*31-31011	-
0.200" - 0.220" (5.080 - 5.588mm)	0.203" (5.156mm)	5418-*11-31013	-	5418-*21-31013	-	5418-*31-31013	-
0.215" - 0.235" (5.461 - 5.969mm)	0.218" (5.537mm)	5418-*11-31014	-	5418-*21-31014	-	5418-*31-31014	-
0.231" - 0.251" (5.867 - 6.375mm)	0.234" (5.944mm)	5418-*11-31015	-	5418-*21-31015	-	5418-*31-31015	-

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.
Remaining sizes and styles located on next page.

5418 Series ID Burnishing Tool

0.154" - 0.501" (3.912MM - 12.725MM)

5418 SERIES ID BURNISHING TOOL

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach 1.625" (41.275mm) (C) Gage Length 5.000" (127.00mm)		(B) Max Burnishing Reach 3.625" (92.075mm) (C) Gage Length 7.000" (177.80mm)		(B) Max Burnishing Reach 5.625" (142.875mm) (C) Gage Length 9.000" (228.60mm)	
		Blind	Bottoming	Blind	Bottoming	Blind	Bottoming
0.247" - 0.267" (6.274 - 6.782mm)	0.250" (6.350mm)	5418-*11-31016	5418-*12-45016	5418-*21-31016	5418-*22-45016	5418-*31-31016	5418-*32-45016
0.262" - 0.282" (6.655 - 7.163mm)	0.265" (6.731mm)	5418-*11-31017	5418-*12-45017	5418-*21-31017	5418-*22-45017	5418-*31-31017	5418-*32-45017
0.278" - 0.298" (7.061 - 7.569mm)	0.281" (7.137mm)	5418-*11-31018	5418-*12-45018	5418-*21-31018	5418-*22-45018	5418-*31-31018	5418-*32-45018
0.293" - 0.313" (7.442 - 7.950mm)	0.296" (7.518mm)	5418-*11-31019	5418-*12-45019	5418-*21-31019	5418-*22-45019	5418-*31-31019	5418-*32-45019
0.309" - 0.329" (7.849 - 8.357mm)	0.312" (7.925mm)	5418-*11-31020	5418-*12-45020	5418-*21-31020	5418-*22-45020	5418-*31-31020	5418-*32-45020
0.325" - 0.345" (8.255 - 8.763mm)	0.328" (8.331mm)	5418-*11-31021	5418-*12-45021	5418-*21-31021	5418-*22-45021	5418-*31-31021	5418-*32-45021
0.340" - 0.360" (8.636 - 9.144mm)	0.343" (8.712mm)	5418-*11-31022	5418-*12-45022	5418-*21-31022	5418-*22-45022	5418-*31-31022	5418-*32-45022
0.356" - 0.376" (9.042 - 9.550mm)	0.359" (9.119mm)	5418-*11-31023	5418-*12-45023	5418-*21-31023	5418-*22-45023	5418-*31-31023	5418-*32-45023
0.372" - 0.392" (9.449 - 9.957mm)	0.375" (9.525mm)	5418-*11-31024	5418-*12-45024	5418-*21-31024	5418-*22-45024	5418-*31-31024	5418-*32-45024
0.387" - 0.407" (9.830 - 10.338mm)	0.390" (9.906mm)	5418-*11-31025	5418-*12-45025	5418-*21-31025	5418-*22-45025	5418-*31-31025	5418-*32-45025
0.403" - 0.423" (10.236 - 10.744mm)	0.406" (10.312mm)	5418-*11-31026	5418-*12-45026	5418-*21-31026	5418-*22-45026	5418-*31-31026	5418-*32-45026
0.418" - 0.438" (10.617 - 11.125mm)	0.421" (10.693mm)	5418-*11-31027	5418-*12-45027	5418-*21-31027	5418-*22-45027	5418-*31-31027	5418-*32-45027
0.434" - 0.454" (11.024 - 11.532mm)	0.437" (11.100mm)	5418-*11-31028	5418-*12-45028	5418-*21-31028	5418-*22-45028	5418-*31-31028	5418-*32-45028
0.450" - 0.470" (11.430 - 11.938mm)	0.453" (11.506mm)	5418-*11-31029	5418-*12-45029	5418-*21-31029	5418-*22-45029	5418-*31-31029	5418-*32-45029
0.465" - 0.485" (11.811 - 12.319mm)	0.468" (11.887mm)	5418-*11-31030	5418-*12-45030	5418-*21-31030	5418-*22-45030	5418-*31-31030	5418-*32-45030
0.481" - 0.501" (12.217 - 12.725mm)	0.484" (12.294mm)	5418-*11-31031	5418-*12-45031	5418-*21-31031	5418-*22-45031	5418-*31-31031	5418-*32-45031
*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.							

5418 Series - Rolls

0.154" - 0.501" (3.912MM - 12.725MM)

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.015)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
0.157" (3.988mm)	-	-	3	5100-704-00049	-	-
0.167" (4.242mm)	-	-	3	5100-704-00049	-	-
0.177" (4.496mm)	-	-	3	5100-704-00049	-	-
0.187" (4.750mm)	-	-	5	5100-704-00062	-	-
0.193" (4.902mm)	-	-	5	5100-704-00062	-	-
0.203" (5.156mm)	-	-	5	5100-704-00062	-	-
0.218" (5.537mm)	-	-	5	5100-704-00070	-	-
0.234" (5.944mm)	-	-	5	5100-704-00070	-	-
0.250" (6.350mm)	-	-	5	5100-704-00078	3	5100-708-00093
0.265" (6.731mm)	-	-	5	5100-704-00078	3	5100-708-00093
0.281" (7.137mm)	-	-	5	5100-704-00086	3	5100-708-00093
0.296" (7.518mm)	-	-	5	5100-704-00086	3	5100-708-00093
0.312" (7.925mm)	-	-	5	5100-704-00093	3	5100-708-00093
0.328" (8.331mm)	-	-	5	5100-704-00093	3	5100-708-00093
0.343" (8.712mm)	-	-	5	5100-704-00109	3	5100-708-00093
0.359" (9.119mm)	-	-	5	5100-704-00109	3	5100-708-00109
0.375" (9.525mm)	-	-	5	5100-704-00109	3	5100-708-00125
0.390" (9.906mm)	-	-	5	5100-704-00109	3	5100-708-00125
0.406" (10.312mm)	-	-	5	5100-704-00125	3	5100-708-00125
0.421" (10.693mm)	-	-	5	5100-704-00125	3	5100-708-00125
0.437" (11.100mm)	-	-	5	5100-704-00125	3	5100-708-00125
0.453" (11.506mm)	-	-	5	5100-704-00148	3	5100-708-00156
0.468" (11.887mm)	-	-	5	5100-704-00148	3	5100-708-00156
0.484" (12.294mm)	-	-	5	5100-704-00148	3	5100-708-00156

5418 Series - Mandrels & Cages

0.154" - 0.501" (3.912MM - 12.725MM)

5418 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Max Burnishing Reach: 1.625" (41.275mm)			
	Mandrel Tip Part #		Cage Part #	
	Blind	Bottoming	Blind	Bottoming
0.157" (3.988mm)	5418-031-10008	-	5301-011-10008	-
0.167" (4.242mm)	5418-031-10009	-	5301-011-10009	-
0.177" (4.496mm)	5418-031-10010	-	5301-011-10010	-
0.187" (4.750mm)	5418-031-10012	-	5301-011-10012	-
0.193" (4.902mm)	5418-031-10012	-	5301-011-10011	-
0.203" (5.156mm)	5418-031-10013	-	5301-011-10013	-
0.218" (5.537mm)	5418-031-10013	-	5301-011-10014	-
0.234" (5.944mm)	5418-031-10015	-	5301-011-10015	-
0.250" (6.350mm)	5418-031-10015	5418-032-10012	5301-011-10016	5301-015-10016
0.265" (6.731mm)	5418-031-10017	5418-032-10013	5301-011-10017	5301-015-10017
0.281" (7.137mm)	5418-031-10017	5418-032-10015	5301-011-10018	5301-015-10018
0.296" (7.518mm)	5418-031-10019	5418-032-10017	5301-011-10019	5301-015-10019
0.312" (7.925mm)	5418-031-10019	5418-032-10019	5301-011-10020	5301-015-10020
0.328" (8.331mm)	5418-031-10021	5418-032-10021	5301-011-10021	5301-015-10021
0.343" (8.712mm)	5418-031-10019	5418-032-10022	5301-011-10022	5301-015-10022
0.359" (9.119mm)	5418-031-10021	5418-032-10021	5301-011-10023	5301-015-10023
0.375" (9.525mm)	5318-031-10024	5418-032-10019	5301-011-10024	5301-015-10024
0.390" (9.906mm)	5318-031-10025	5418-032-10021	5301-011-10025	5301-015-10025
0.406" (10.312mm)	5318-031-10024	5318-032-10024	5301-011-10026	5301-015-10026
0.421" (10.693mm)	5318-031-10025	5318-032-10025	5301-011-10027	5301-015-10027
0.437" (11.100mm)	5318-031-10028	5318-032-10028	5301-011-10028	5301-015-10028
0.453" (11.506mm)	5318-031-10024	5418-032-10021	5301-011-10029	5301-015-10029
0.468" (11.887mm)	5318-031-10025	5318-032-10024	5301-011-10030	5301-015-10030
0.484" (12.294mm)	5318-031-10028	5318-032-10025	5301-011-10031	5301-015-10031

If an Intermediate Mandrel is required, see page 11.

5418 Series - Mandrels & Cages

0.154" - 0.501" (3.912MM - 12.725MM)

Tool Nominal Diameter	Max Burnishing Reach: 3.625" (92.075mm)			
	Mandrel Tip Part #		Cage Part #	
	Blind	Bottoming	Blind	Bottoming
0.157" (3.988mm)	-	-	-	-
0.167" (4.242mm)	-	-	-	-
0.177" (4.496mm)	-	-	-	-
0.187" (4.750mm)	5418-031-20012	-	5301-011-20012	-
0.193" (4.902mm)	5418-031-20012	-	5301-011-20011	-
0.203" (5.156mm)	5418-031-20013	-	5301-011-20013	-
0.218" (5.537mm)	5418-031-20013	-	5301-011-20014	-
0.234" (5.944mm)	5418-031-20015	-	5301-011-20015	-
0.250" (6.350mm)	5418-031-20015	5418-032-20012	5301-011-20016	5301-015-20016
0.265" (6.731mm)	5418-031-20017	5418-032-20013	5301-011-20017	5301-015-20017
0.281" (7.137mm)	5418-031-20017	5418-032-20015	5301-011-20018	5301-015-20018
0.296" (7.518mm)	5418-031-20019	5418-032-20017	5301-011-20019	5301-015-20019
0.312" (7.925mm)	5418-031-20019	5418-032-20019	5301-011-20020	5301-015-20020
0.328" (8.331mm)	5418-031-20021	5418-032-20021	5301-011-20021	5301-015-20021
0.343" (8.712mm)	5418-031-20019	5418-032-20022	5301-011-20022	5301-015-20022
0.359" (9.119mm)	5418-031-20021	5418-032-20021	5301-011-20023	5301-015-20023
0.375" (9.525mm)	5318-031-20024	5418-032-20019	5301-011-20024	5301-015-20024
0.390" (9.906mm)	5318-031-20025	5418-032-20021	5301-011-20025	5301-015-20025
0.406" (10.312mm)	5318-031-20024	5318-032-20024	5301-011-20026	5301-015-20026
0.421" (10.693mm)	5318-031-20025	5318-032-20025	5301-011-20027	5301-015-20027
0.437" (11.100mm)	5318-031-20028	5318-032-20028	5301-011-20028	5301-015-20028
0.453" (11.506mm)	5318-031-20024	5418-032-20021	5301-011-20029	5301-015-20029
0.468" (11.887mm)	5318-031-20025	5318-032-20024	5301-011-20030	5301-015-20030
0.484" (12.294mm)	5318-031-20028	5318-032-20025	5301-011-20031	5301-015-20031
If an Intermediate Mandrel is required, see page 11.				

5418 Series - Mandrels & Cages

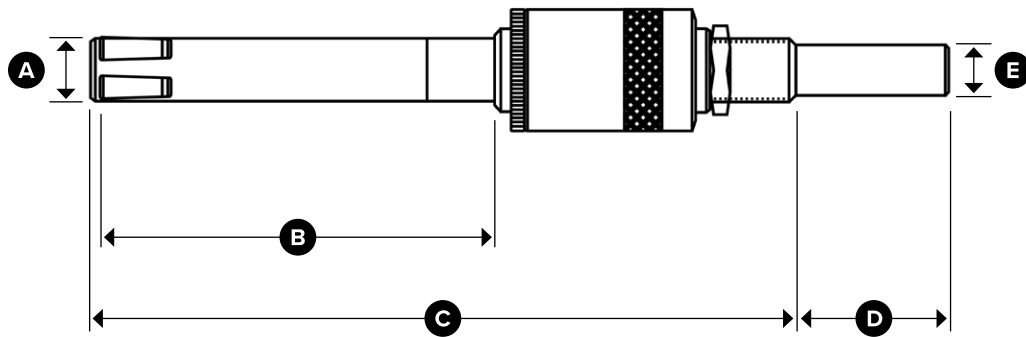
0.154" - 0.501" (3.912MM - 12.725MM)

5418 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Max Burnishing Reach: 5.625" (142.875mm)			
	Mandrel Tip Part #		Cage Part #	
	Blind	Bottoming	Blind	Bottoming
0.157" (3.988mm)	-	-	-	-
0.167" (4.242mm)	-	-	-	-
0.177" (4.496mm)	-	-	-	-
0.187" (4.750mm)	5418-031-30012	-	5301-011-30012	-
0.193" (4.902mm)	5418-031-30012	-	5301-011-30011	-
0.203" (5.156mm)	5418-031-30013	-	5301-011-30013	-
0.218" (5.537mm)	5418-031-30013	-	5301-011-30014	-
0.234" (5.944mm)	5418-031-30015	-	5301-011-30015	-
0.250" (6.350mm)	5418-031-30015	5418-032-30012	5301-011-30016	5301-015-30016
0.265" (6.731mm)	5418-031-30017	5418-032-30013	5301-011-30017	5301-015-30017
0.281" (7.137mm)	5418-031-30017	5418-032-30015	5301-011-30018	5301-015-30018
0.296" (7.518mm)	5418-031-30019	5418-032-30017	5301-011-30019	5301-015-30019
0.312" (7.925mm)	5418-031-30019	5418-032-30019	5301-011-30020	5301-015-30020
0.328" (8.331mm)	5418-031-30021	5418-032-30021	5301-011-30021	5301-015-30021
0.343" (8.712mm)	5418-031-30019	5418-032-30022	5301-011-30022	5301-015-30022
0.359" (9.119mm)	5418-031-30021	5418-032-30021	5301-011-30023	5301-015-30023
0.375" (9.525mm)	5318-031-30024	5418-032-30019	5301-011-30024	5301-015-30024
0.390" (9.906mm)	5318-031-30025	5418-032-30021	5301-011-30025	5301-015-30025
0.406" (10.312mm)	5318-031-30024	5318-032-30024	5301-011-30026	5301-015-30026
0.421" (10.693mm)	5318-031-30025	5318-032-30025	5301-011-30027	5301-015-30027
0.437" (11.100mm)	5318-031-30028	5318-032-30028	5301-011-30028	5301-015-30028
0.453" (11.506mm)	5318-031-30024	5418-032-30021	5301-011-30029	5301-015-30029
0.468" (11.887mm)	5318-031-30025	5318-032-30024	5301-011-30030	5301-015-30030
0.484" (12.294mm)	5318-031-30028	5318-032-30025	5301-011-30031	5301-015-30031
If an Intermediate Mandrel is required, see page 11.				

5419 Series ID Burnishing Tool

0.496" - 0.662" (12.598MM - 16.815MM)



(D) Shank Length

1.50" (38.10mm)

(E) Shank Diameter

1	0.500" straight shank
2	#1 Morse Taper
3	12mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A long reach, 0.562" diameter blind style tool with a 12mm straight shank, is part number **5419-331-31036**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach 1.875" (47.625mm) (C) Gage Length 4.930" (125.220mm)			(B) Max Burnishing Reach 3.875" (98.425mm) (C) Gage Length 6.930" (176.020mm)		
		Through	Blind	Bottoming	Through	Blind	Bottoming
0.496" - 0.537" (12.598 - 13.640mm)	0.500" (12.700mm)	-	5419-*11-31032	5419-*12-45032	-	5419-*21-31032	5419-*22-45032
0.527" - 0.568" (13.386 - 14.427mm)	0.531" (13.487mm)	-	5419-*11-31034	5419-*12-45034	-	5419-*21-31034	5419-*22-45034
0.558" - 0.599" (14.173 - 15.215mm)	0.562" (14.275mm)	-	5419-*11-31036	5419-*12-45036	-	5419-*21-31036	5419-*22-45036
0.589" - 0.630" (14.961 - 16.002mm)	0.593" (15.062mm)	-	5419-*11-31038	5419-*12-45038	-	5419-*21-31038	5419-*22-45038
0.621" - 0.662" (15.773 - 16.815mm)	0.625" (15.875mm)	5419-*11-11040	5419-*11-31040	5419-*12-45040	5419-*21-11040	5419-*21-31040	5419-*22-45040

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach 5.875" (149.225mm) (C) Gage Length 8.930" (226.820mm)			(B) Max Burnishing Reach 7.875" (200.025mm) (C) Gage Length 10.930" (277.622mm)		
		Through	Blind	Bottoming	Through	Blind	Bottoming
0.496" - 0.537" (12.598 - 13.640mm)	0.500" (12.700mm)	-	5419-*31-31032	5419-*32-45032	-	5419-*41-31032	5419-*42-45032
0.527" - 0.568" (13.386 - 14.427mm)	0.531" (13.487mm)	-	5419-*31-31034	5419-*32-45034	-	5419-*41-31034	5419-*42-45034
0.558" - 0.599" (14.173 - 15.215mm)	0.562" (14.275mm)	-	5419-*31-31036	5419-*32-45036	-	5419-*41-31036	5419-*42-45036
0.589" - 0.630" (14.961 - 16.002mm)	0.593" (15.062mm)	-	5419-*31-31038	5419-*32-45038	-	5419-*41-31038	5419-*42-45038
0.621" - 0.662" (15.773 - 16.815mm)	0.625" (15.875mm)	5419-*31-11040	5419-*31-31040	5419-*32-45040	5419-*41-11040	5419-*41-31040	5419-*42-45040

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5419 Series - Rolls, Cages, & Mandrels

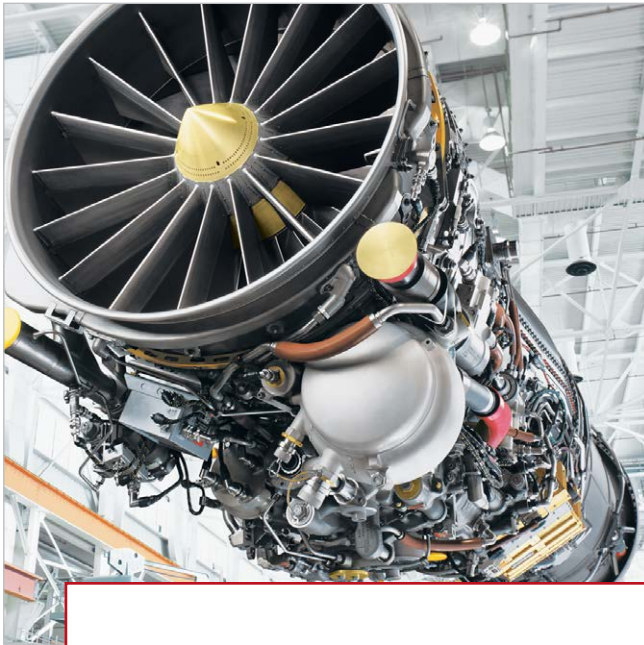
0.496" - 0.662" (12.598MM - 16.815MM)

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.015)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
0.500" (12.700mm)	-	-	5	5100-704-00156	5	5100-708-00156
0.531" (13.487mm)	-	-	5	5100-704-00156	5	5100-708-00156
0.562" (14.275mm)	-	-	5	5100-704-00172	5	5100-708-00172
0.593" (15.062mm)	-	-	5	5100-704-00172	5	5100-708-00172
0.625" (15.875mm)	5	5100-701-00187	5	5100-704-00187	5	5100-708-00187*
*R.032						

Tool Nominal Diameter	Max Burnishing Reach: 1.875" (47.625mm)				Max Burnishing Reach: 3.875" (98.425mm)			
	Mandrel Tip Part #		Cage Part #		Mandrel Tip Part #		Cage Part #	
	Blind	Bottoming	Blind	Bottoming	Blind	Bottoming	Blind	Bottoming
0.500" (12.700mm)	5319-031-10032	5319-032-10032	-	-	5319-031-20032	5319-032-20032	5151-400-00500	5135-400-00500
0.531" (13.487mm)	5319-031-10034	5319-032-10034	-	-	5319-031-20034	5319-032-20034	5151-400-00531	5135-400-00531
0.562" (14.275mm)	5319-031-10034	5319-032-10034	-	-	5319-031-20034	5319-032-20034	5151-400-00562	5135-400-00562
0.593" (15.062mm)	5319-031-10038	5319-032-10038	-	-	5319-031-20038	5319-032-20038	5151-400-00593	5135-400-00593
0.625" (15.875mm)	5319-031-10038	5319-032-10038	-	-	5319-031-20038	5319-032-20038	5151-400-00625	5135-400-00625
If an Intermediate Mandrel is required, see page 11.								

Tool Nominal Diameter	Max Burnishing Reach: 5.875" (149.225mm)				Max Burnishing Reach: 7.875" (200.025mm)			
	Mandrel Tip Part #		Cage Part #		Mandrel Tip Part #		Cage Part #	
	Blind	Bottoming	Blind	Bottoming	Blind	Bottoming	Blind	Bottoming
0.500" (12.700mm)	5319-031-30032	5319-032-30032	-	-	5319-031-40032	5319-032-40032	-	-
0.531" (13.487mm)	5319-031-30034	5319-032-30034	-	-	5319-031-40034	5319-032-40034	-	-
0.562" (14.275mm)	5319-031-30034	5319-032-30034	-	-	5319-031-40034	5319-032-40034	-	-
0.593" (15.062mm)	5319-031-30038	5319-032-30038	-	-	5319-031-40038	5319-032-40038	-	-
0.625" (15.875mm)	5319-031-30038	5319-032-30038	-	-	5319-031-40038	5319-032-40038	-	-
If an Intermediate Mandrel is required, see page 11.								

The Impact of Burnishing Exotic Materials



BURNISHING STANDS AS A HIGHLY EFFECTIVE

finishing method for a wide range of ductile materials, enhancing surface finish, hardness, and fatigue life. However, the inherent properties of the workpiece material play a significant role in the burnishing outcome. When venturing into the realm of exotic materials, particularly those prevalent in demanding sectors like medical devices, aerospace, and specialized industries, specific considerations become paramount. Titanium, specialized Stainless Steels, and Inconel are among the most commonly encountered exotic alloys, each presenting unique challenges and opportunities for the burnishing process.

Inconel and Stainless Steel Alloys: Favorable Candidates for Burnishing

Inconel and stainless steel alloys generally respond well to the burnishing process. Their material properties, including their inherent ductility and work-hardening characteristics, contribute to successful surface refinement.

KEY CONSIDERATIONS FOR INCONEL AND STAINLESS STEEL:

Tooling Preference: A carbide roll tool is often the preferred choice for burnishing these materials. Its robust nature and ability to withstand significant pressure make it well-suited for the task.
Minimal Special Set-Up: Typically, no additional special set-up or accessories are required beyond the standard burnishing setup, simplifying the process.

Work Hardening and Tool Life: While these materials burnish effectively, they are also prone to work hardening more quickly than some other ductile metals. This accelerated work hardening can lead to a reduced lifespan for the carbide roll tool. Quantifying the exact impact on tool life can be challenging and often depends on the specific alloy, workpiece geometry, burnishing parameters, and desired finish. Monitoring tool wear and planning for more frequent tool maintenance or replacement may be necessary.

Titanium: A Unique Challenge for Burnishing

Titanium, despite its widespread use in high-performance applications, generally presents difficulties when it comes to burnishing. The primary reason for this lies in the material's tendency to interact with the burnishing tool. While the tool will still densify and smooth the surface, it will appear cloudy due to the material stuck to the roll.

CHALLENGES WITH BURNISHING TITANIUM:

- **Material Pick-Up:** The rolls on the burnishing tool tend to pick up titanium material from the part. This phenomenon, often referred to as “galling” or “material transfer,” leads to an inconsistent and undesirable finish. Instead of a smooth, uniform surface, the part may exhibit blemishes, streaks, or an uneven texture.
- **Surface Degradation:** The material pick-up can compromise the integrity of both the part’s surface and the burnishing tool, potentially leading to premature tool wear or damage.

Due to these challenges, conventional burnishing methods are often not recommended for titanium. Alternative finishing processes or highly specialized burnishing techniques and tool coatings might be explored, though they often come with their own set of complexities and costs.



General Recommendations and Best Practices

Regardless of the exotic material being considered, a methodical approach is crucial for successful burnishing.

Test on Scrap Pieces: When working with any new or unfamiliar material, it is highly recommended to conduct preliminary tests on scrap material or test pieces. This allows for a controlled environment to experiment with different burnishing parameters, such as pressure, feed rate, and spindle speed, without risking valuable production parts.

Dialing In Parameters: Testing enables you to “dial in” the optimal setup, ensuring the desired surface finish, hardness, and

dimensional accuracy are achieved before transitioning to production workpieces. This iterative process minimizes trial-and-error on actual parts and reduces potential scrap.

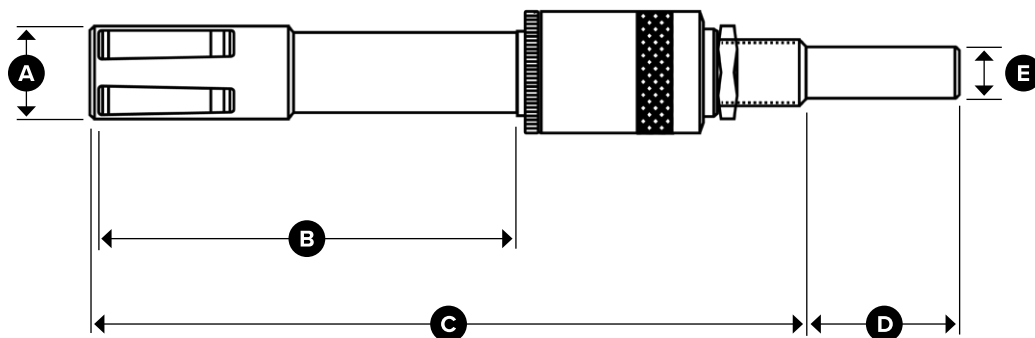
Consult Application Specialists: For detailed guidance on set-up procedures, troubleshooting, or optimizing burnishing parameters for specific exotic materials, contacting the equipment manufacturer’s applications team is invaluable. Their expertise can provide tailored recommendations and insights to overcome unique material challenges.

In conclusion, while burnishing offers significant advantages for surface enhancement, its application to exotic materials necessitates careful consideration of material properties. Inconel and certain stainless steels are generally amenable to the process. Titanium, however, presents distinct challenges due to material pick-up. By embracing testing and leveraging expert guidance, manufacturers can navigate the complexities of burnishing exotic materials to achieve optimal results.



5433 Series ID Burnishing Tool

0.652" - 0.974" (16.561MM - 24.740MM)



(D) Shank Length

1.50" (38.10mm)

(E) Shank Diameter

1	0.500" straight shank
2	#1 Morse Taper
3	12mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A medium reach, 0.781" diameter bottoming style tool with a 0.500" straight shank, is part number **5433-122-45050**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach 1.625" (41.275mm) (C) Gage Length 5.038" (127.97mm)			(B) Max Burnishing Reach 3.625" (92.075mm) (C) Gage Length 7.038" (178.77mm)			(B) Max Burnishing Reach 5.625" (142.875mm) (C) Gage Length 9.038" (229.57mm)		
		Through	Blind	Bottoming	Through	Blind	Bottoming	Through	Blind	Bottoming
0.652" - 0.693" (16.651 - 17.602mm)	0.656" (16.662mm)	5433-*11-11042	5433-*11-31042	5433-*12-45042	5433-*21-11042	5433-*21-31042	5433-*22-45042	5433-*31-11042	5433-*31-31042	5433-*32-45042
0.683" - 0.724" (17.348 - 18.390mm)	0.687" (17.450mm)	5433-*11-11044	5433-*11-31044	5433-*12-45044	5433-*21-11044	5433-*21-31044	5433-*22-45044	5433-*31-11044	5433-*31-31044	5433-*32-45044
0.714" - 0.755" (18.136 - 19.177mm)	0.718" (18.237mm)	5433-*11-11046	5433-*11-31046	5433-*12-45046	5433-*21-11046	5433-*21-31046	5433-*22-45046	5433-*31-11046	5433-*31-31046	5433-*32-45046
0.746" - 0.787" (18.948 - 19.990mm)	0.750" (19.050mm)	5433-*11-11048	5433-*11-31048	5433-*12-45048	5433-*21-11048	5433-*21-31048	5433-*22-45048	5433-*31-11048	5433-*31-31048	5433-*32-45048
0.777" - 0.818" (19.736 - 20.777mm)	0.781" (19.837mm)	5433-*11-11050	5433-*11-31050	5433-*12-45050	5433-*21-11050	5433-*21-31050	5433-*22-45050	5433-*31-11050	5433-*31-31050	5433-*32-45050
0.808" - 0.849" (20.523 - 21.565mm)	0.812" (20.625mm)	5433-*11-11052	5433-*11-31052	5433-*12-45052	5433-*21-11052	5433-*21-31052	5433-*22-45052	5433-*31-11052	5433-*31-31052	5433-*32-45052
0.839" - 0.880" (21.311 - 22.352mm)	0.843" (21.412mm)	5433-*11-11054	5433-*11-31054	5433-*12-45054	5433-*21-11054	5433-*21-31054	5433-*22-45054	5433-*31-11054	5433-*31-31054	5433-*32-45054
0.871" - 0.912" (22.123 - 23.165mm)	0.875" (22.225mm)	5433-*11-11056	5433-*11-31056	5433-*12-45056	5433-*21-11056	5433-*21-31056	5433-*22-45056	5433-*31-11056	5433-*31-31056	5433-*32-45056
0.902" - 0.943" (22.911 - 23.952mm)	0.906" (23.012mm)	5433-*11-11058	5433-*11-31058	5433-*12-45058	5433-*21-11058	5433-*21-31058	5433-*22-45058	5433-*31-11058	5433-*31-31058	5433-*32-45058
0.933" - 0.974" (23.698 - 24.740mm)	0.937" (23.800mm)	5433-*11-11060	5433-*11-31060	5433-*12-45060	5433-*21-11060	5433-*21-31060	5433-*22-45060	5433-*31-11060	5433-*31-31060	5433-*32-45060

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5433 Series - Rolls, Mandrels, & Cages

0.652" - 0.974" (16.561MM - 24.740MM)

5433 SERIES ID BURNISHING TOOL

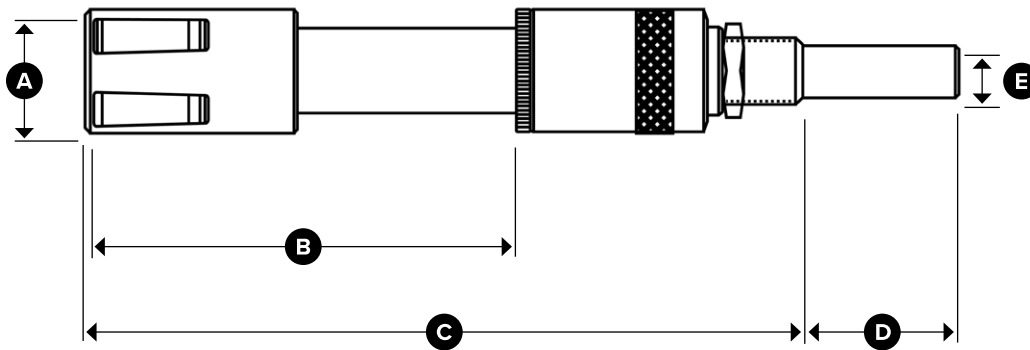
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
0.656" (16.662mm)	5	5100-701-00187	5	5100-704-00187	5	5100-708-00187
0.687" (17.450mm)	5	5100-701-00187	5	5100-704-00187	5	5100-708-00187
0.718" (18.237mm)	5	5100-701-00218	5	5100-704-00218	5	5100-708-00218
0.750" (19.050mm)	5	5100-701-00218	5	5100-704-00218	5	5100-708-00218
0.781" (19.837mm)	5	5100-701-00218	5	5100-704-00218	5	5100-708-00218
0.812" (20.625mm)	5	5100-701-00218	5	5100-704-00218	5	5100-708-00218
0.843" (21.412mm)	5	5100-701-00218	5	5100-704-00218	5	5100-708-00218
0.875" (22.225mm)	5	5100-701-00265	5	5100-704-00265	5	5100-708-00265
0.906" (23.012mm)	5	5100-701-00265	5	5100-704-00265	5	5100-708-00265
0.937" (23.800mm)	5	5100-701-00265	5	5100-704-00265	5	5100-708-00265

Tool Nominal Diameter	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
0.656" (16.662mm)	5333-031-00042	5333-032-00042	5403-011-00042	5403-015-00042
0.687" (17.450mm)	5333-031-00044	5333-032-00044	5403-011-00044	5403-015-00044
0.718" (18.237mm)	5333-031-00042	5333-032-00042	5403-011-00046	5403-015-00046
0.750" (19.050mm)	5333-031-00044	5333-032-00044	5403-011-00048	5403-015-00048
0.781" (19.837mm)	5333-031-00050	5333-032-00050	5403-011-00050	5403-015-00050
0.812" (20.625mm)	5333-031-00052	5333-032-00052	5403-011-00052	5403-015-00052
0.843" (21.412mm)	5333-031-00054	5333-032-00054	5403-011-00054	5403-015-00054
0.875" (22.225mm)	5333-031-00050	5333-032-00050	5403-011-00056	5403-015-00056
0.906" (23.012mm)	5333-031-00052	5333-032-00052	5403-011-00058	5403-015-00058
0.937" (23.800mm)	5333-031-00054	5333-032-00054	5403-011-00060	5403-015-00060

If an Intermediate Mandrel is required, see page 11.

5444 Series ID Burnishing Tool

0.964" - 1.224" (24.486MM - 31.090MM)



(D) Shank Length

1.50" (38.10mm)

(E) Shank Diameter

1	0.500" straight shank
2	#1 Morse Taper
3	12mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A long reach, 1.125" diameter through style tool with a #1 Morse Taper shank, is part number **5444-231-11072**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach 1.875" (47.625mm) (C) Gage Length 4.930" (125.22mm)			(B) Max Burnishing Reach 3.875" (98.425mm) (C) Gage Length 6.930" (176.02mm)			(B) Max Burnishing Reach 5.875" (149.225mm) (C) Gage Length 8.930" (226.82mm)		
		Through	Blind	Bottoming	Through	Blind	Bottoming	Through	Blind	Bottoming
0.964" - 1.005" (24.486 - 25.527mm)	0.968" (24.587mm)	5444-*11-11062	5444-*11-31062	5444-*12-45062	5444-*21-11062	5444-*21-31062	5444-*22-45062	5444-*31-11062	5444-*31-31062	5444-*32-45062
0.996" - 1.037" (25.298 - 26.340mm)	1.000" (25.400mm)	5444-*11-11064	5444-*11-31064	5444-*12-45064	5444-*21-11064	5444-*21-31064	5444-*22-45064	5444-*31-11064	5444-*31-31064	5444-*32-45064
1.027" - 1.068" (26.086 - 27.127mm)	1.031" (26.187mm)	5444-*11-11066	5444-*11-31066	5444-*12-45066	5444-*21-11066	5444-*21-31066	5444-*22-45066	5444-*31-11066	5444-*31-31066	5444-*32-45066
1.058" - 1.099" (26.873 - 27.915mm)	1.062" (26.975mm)	5444-*11-11068	5444-*11-31068	5444-*12-45068	5444-*21-11068	5444-*21-31068	5444-*22-45068	5444-*31-11068	5444-*31-31068	5444-*32-45068
1.089" - 1.130" (27.661 - 28.702mm)	1.093" (27.762mm)	5444-*11-11070	5444-*11-31070	5444-*12-45070	5444-*21-11070	5444-*21-31070	5444-*22-45070	5444-*31-11070	5444-*31-31070	5444-*32-45070
1.121" - 1.162" (28.473 - 29.515mm)	1.125" (28.575mm)	5444-*11-11072	5444-*11-31072	5444-*12-45072	5444-*21-11072	5444-*21-31072	5444-*22-45072	5444-*31-11072	5444-*31-31072	5444-*32-45072
1.152" - 1.193" (29.261 - 30.302mm)	1.156" (29.362mm)	5444-*11-11074	5444-*11-31074	5444-*12-45074	5444-*21-11074	5444-*21-31074	5444-*22-45074	5444-*31-11074	5444-*31-31074	5444-*32-45074
1.183" - 1.224" (30.048 - 31.090mm)	1.187" (30.150mm)	5444-*11-11076	5444-*11-31076	5444-*12-45076	5444-*21-11076	5444-*21-31076	5444-*22-45076	5444-*31-11076	5444-*31-31076	5444-*32-45076

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5444 Series - Rolls, Mandrels, & Cages

0.964" - 1.224" (24.486MM - 31.090MM)

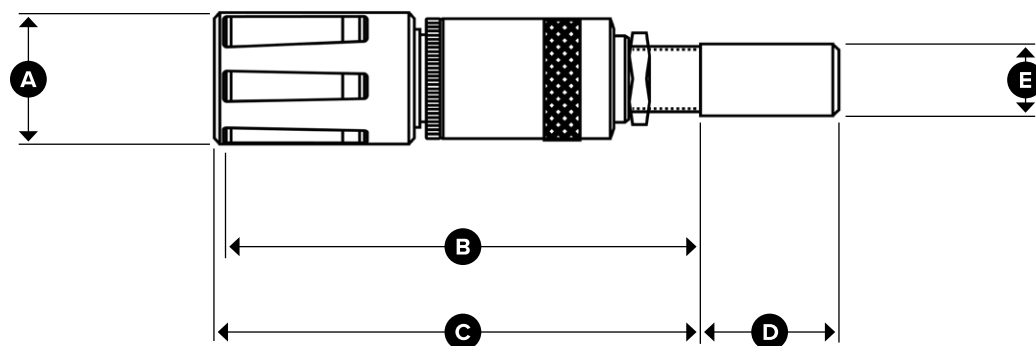
5444 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
0.968" (24.587mm)	5	5100-701-00265	5	5100-704-00265	5	5100-708-00265
1.000" (25.400mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.031" (26.187mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.062" (26.975mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.093" (27.762mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.125" (28.575mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.156" (29.362mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.187" (30.150mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312

Tool Nominal Diameter	Mandrel Tip Part #		Cage Part #	
	Through & Blind	Bottoming	Through & Blind	Bottoming
0.968" (24.587mm)	5344-031-00062	5344-032-00062	5404-011-00062	5404-015-00062
1.000" (25.400mm)	5344-031-00064	5344-032-00064	5404-011-00064	5404-015-00064
1.031" (26.187mm)	5344-031-00066	5344-032-00066	5404-011-00066	5404-015-00066
1.062" (26.975mm)	5344-031-00068	5344-032-00068	5404-011-00068	5404-015-00068
1.093" (27.762mm)	5344-031-00070	5344-032-00070	5404-011-00070	5404-015-00070
1.125" (28.575mm)	5344-031-00066	5344-032-00066	5404-011-00072	5404-015-00072
1.156" (29.362mm)	5344-031-00068	5344-032-00068	5404-011-00074	5404-015-00074
1.187" (30.150mm)	5344-031-00070	5344-032-00070	5404-011-00076	5404-015-00076
If an Intermediate Mandrel is required, see page 11.				

5405 Series ID Burnishing Tool

1.214" - 1.412" (30.826MM - 35.865MM)



(D) Shank Length

1.50" (38.10mm)

(E) Shank Diameter

1	0.750" straight shank
2	#2 Morse Taper
3	16mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 1.281" diameter blind style tool with a 0.750" straight shank, is part number **5405-101-31082**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 5.188" (131.76mm)		
		Through	Blind	Bottoming
1.214" - 1.255" (30.836 - 31.877mm)	1.218" (30.937mm)	5405-*01-11078	5405-*01-31078	5405-*02-45078
1.246" - 1.287" (31.648 - 32.690mm)	1.250" (31.750mm)	5405-*01-11080	5405-*01-31080	5405-*02-45080
1.277" - 1.318" (32.436 - 33.477mm)	1.281" (32.537mm)	5405-*01-11082	5405-*01-31082	5405-*02-45082
1.308" - 1.349" (33.223 - 34.265mm)	1.312" (33.325mm)	5405-*01-11084	5405-*01-31084	5405-*02-45084
1.339" - 1.380" (34.011 - 35.052mm)	1.343" (34.112mm)	5405-*01-11086	5405-*01-31086	5405-*02-45086
1.371" - 1.412" (34.823 - 35.865mm)	1.375" (34.925mm)	5405-*01-11088	5405-*01-31088	5405-*02-45088

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5405 Series - Rolls, Mandrels, & Cages

1.214" - 1.412" (30.826MM - 35.865MM)

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
1.218" (30.937mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.250" (31.750mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.281" (32.537mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.312" (33.325mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.343" (34.112mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.375" (34.925mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
1.218" (30.937mm)	5305-031-00078	5305-032-00078	5405-011-00078	5405-015-00078
1.250" (31.750mm)	5305-031-00080	5305-032-00080	5405-011-00080	5405-015-00080
1.281" (32.537mm)	5305-031-00082	5305-032-00082	5405-011-00082	5405-015-00082
1.312" (33.325mm)	5305-031-00078	5305-032-00078	5405-011-00084	5405-015-00084
1.343" (34.112mm)	5305-031-00080	5305-032-00080	5405-011-00086	5405-015-00086
1.375" (34.925mm)	5305-031-00082	5305-032-00082	5405-011-00088	5405-015-00088
If an Intermediate Mandrel is required, see page 11.				

Tube Sheet Holes in Data Centers

IN THE DEMANDING WORLD OF DATA CENTERS,

where uptime and efficiency are of utmost importance, every aspect of the cooling system has to function perfectly. Heat exchangers and air coolers are critical components in managing the high heat load generated by server racks. Ensuring the integrity of these components, especially in mechanical joints, requires strong attention to detail. One process that is emerging as a trend is the precision finishing of the tube sheet hole ID.

Precision Finishing Methods

LIMITS TO TRADITIONAL FINISHING

For decades, reaming and honing have been common practice for finishing tube sheet holes. The honing process involves using a sanding stone in a medium that abrasively scratches and wears away the material to produce the desired finer finish. While effective, the process is also inefficient and laborious. The honing process can be time-consuming, requiring a lot of effort to produce the required finish, especially if done manually. This process is also very messy. A lot of material is produced that is scattered all over the workpiece, requiring a lot of cleaning to ensure that no material is left behind.

WHY ID BURNISHING IS A SUPERIOR ALTERNATIVE

An effective alternative to honing is the use of a burnishing tool for precision finishing. ID burnishing operates very differently. Instead of removing material, it uses pressure to displace and compress the material's surface layer. This results in a much nicer finish but, more importantly, delivers mechanical advantages.

One of the most significant benefits is the increase in surface hardness of the material. This surface densification dramatically improves the component's wear resistance, providing a tougher hole ID. Furthermore, ID burnishing is highly precise, offering an added advantage of holding a tight tolerance. This precise process means there is virtually no risk of exceeding the specified tube sheet hole size, which is an important factor in maintaining a high-integrity mechanical joint.



Preventing Corrosion and Enhancing Joint Integrity in Data Centers

The finishing of tube sheet hole IDs is ideal for components operating in corrosive environments, where the primary goal is not just aesthetic finish, but the prevention of premature wear and corrosion. The densification achieved through burnishing is believed to play a crucial role in maintaining consistent wall reduction during the tube expansion process, which, in turn, helps to reduce the likelihood of over-expansion—a common cause of joint failure.

Data centers have increasingly mandated specific finishing requirements for their cooling equipment. This is partly due to the need to combat corrosion in cooling systems, which are often wet and chemically treated. Additionally, the industry's shift toward high-performance materials has led to the adoption of burnishing. It has proven significantly easier to achieve the required finish on exotic materials with a burnishing tool than with a traditional reamer, which can struggle due to the specific metal properties.

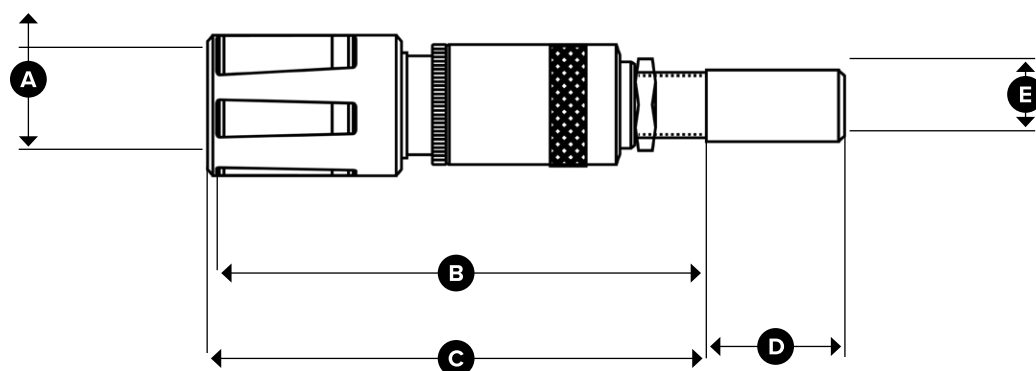


CONCLUSION

Many new, high-efficiency exchangers are requiring finer tube sheet hole finishes and a higher surface hardness to ensure longevity and corrosion resistance. ID burnishing provides a more durable, precise, and hardened surface, extending the life of the critical mechanical joint between the tube and the tube sheet. This process can significantly lower the risk of premature failure in critical applications like data centers. The use of ID burnishing for precision finishing is a necessary step in the evolution of manufacturing to satisfy the extreme requirements of today's computing infrastructure.

5406 Series ID Burnishing Tool

1.402" - 1.849" (35.611MM - 46.965MM)



(D) Shank Length

1.50" (38.10mm)

(E) Shank Diameter

1	0.750" straight shank
2	#2 Morse Taper
3	16mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 1.593" diameter bottoming style tool with a #2 Morse Taper shank, is part number **5406-202-45102**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 5.188" (131.76mm)		
		Through	Blind	Bottoming
1.402" - 1.443" (35.611 - 36.652mm)	1.406" (35.712mm)	5406-*01-11090	5406-*01-31090	5406-*02-45090
1.433" - 1.474" (36.938 - 37.440mm)	1.437" (36.500mm)	5406-*01-11092	5406-*01-31092	5406-*02-45092
1.464" - 1.505" (37.186 - 38.227mm)	1.468" (37.287mm)	5406-*01-11094	5406-*01-31094	5406-*02-45094
1.496" - 1.537" (37.998 - 38.040mm)	1.500" (38.100mm)	5406-*01-11096	5406-*01-31096	5406-*02-45096
1.527" - 1.568" (38.786 - 39.827mm)	1.531" (38.887mm)	5406-*01-11098	5406-*01-31098	5406-*02-45098
1.558" - 1.599" (39.573 - 40.615mm)	1.562" (39.675mm)	5406-*01-11100	5406-*01-31100	5406-*02-45100
1.589" - 1.630" (40.361 - 41.402mm)	1.593" (40.462mm)	5406-*01-11102	5406-*01-31102	5406-*02-45102
1.621" - 1.662" (41.173 - 42.215mm)	1.625" (41.275mm)	5406-*01-11104	5406-*01-31104	5406-*02-45104
1.652" - 1.693" (41.961 - 43.002mm)	1.656" (42.062mm)	5406-*01-11106	5406-*01-31106	5406-*02-45106
1.683" - 1.724" (42.748 - 43.790mm)	1.687" (42.850mm)	5406-*01-11108	5406-*01-31108	5406-*02-45108
1.714" - 1.755" (43.536 - 44.577mm)	1.718" (43.637mm)	5406-*01-11110	5406-*01-31110	5406-*02-45110
1.746" - 1.787" (44.348 - 45.390mm)	1.750" (44.450mm)	5406-*01-11112	5406-*01-31112	5406-*02-45112
1.777" - 1.818" (45.136 - 46.177mm)	1.781" (45.237mm)	5406-*01-11114	5406-*01-31114	5406-*02-45114
1.808" - 1.849" (45.923 - 46.965mm)	1.812" (46.025mm)	5406-*01-11116	5406-*01-31116	5406-*02-45116

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5406 Series - Rolls, Mandrels, & Cages

1.402" - 1.849" (35.611MM - 46.965MM)

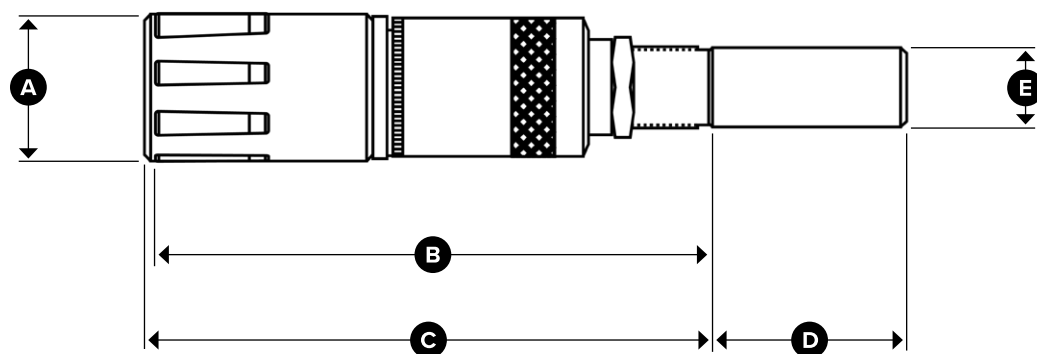
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
1.406" (35.712mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.437" (36.500mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.468" (37.287mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.500" (38.100mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.531" (38.887mm)	7	5100-701-00406	7	5100-704-00406	5	5100-708-00406
1.562" (39.675mm)	7	5100-701-00406	7	5100-704-00406	5	5100-708-00406
1.593" (40.462mm)	7	5100-701-00406	7	5100-704-00406	5	5100-708-00406
1.625" (41.275mm)	7	5100-701-00406	7	5100-704-00406	5	5100-708-00406
1.656" (42.062mm)	7	5100-701-00406	7	5100-704-00406	5	5100-708-00406
1.687" (42.850mm)	7	5100-701-00468	7	5100-704-00468	5	5100-708-00468
1.718" (43.637mm)	7	5100-701-00468	7	5100-704-00468	5	5100-708-00468
1.750" (44.450mm)	7	5100-701-00468	7	5100-704-00468	5	5100-708-00468
1.781" (45.237mm)	7	5100-701-00468	7	5100-704-00468	5	5100-708-00468
1.812" (46.025mm)	7	5100-701-00468	7	5100-704-00468	5	5100-708-00468

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
1.406" (35.712mm)	5305-031-00090	5305-032-00090	5406-011-00090	5406-015-00090
1.437" (36.500mm)	5305-031-00092	5305-032-00092	5406-011-00092	5406-015-00092
1.468" (37.287mm)	5305-031-00094	5305-032-00094	5406-011-00094	5406-015-00094
1.500" (38.100mm)	5305-031-00096	5305-032-00096	5406-011-00096	5406-015-00096
1.531" (38.887mm)	5305-031-00080	5305-032-00080	5406-011-00098	5406-015-00098
1.562" (39.675mm)	5305-031-00082	5305-032-00082	5406-011-00100	5406-015-00100
1.593" (40.462mm)	5305-031-00090	5305-032-00090	5406-011-00102	5406-015-00102
1.625" (41.275mm)	5305-031-00092	5305-032-00092	5406-011-00104	5406-015-00104
1.656" (42.062mm)	5305-031-00094	5305-032-00094	5406-011-00106	5406-015-00106
1.687" (42.850mm)	5305-031-00082	5305-032-00082	5406-011-00108	5406-015-00108
1.718" (43.637mm)	5305-031-00090	5305-032-00090	5406-011-00110	5406-015-00110
1.750" (44.450mm)	5305-031-00092	5305-032-00092	5406-011-00112	5406-015-00112
1.781" (45.237mm)	5305-031-00094	5305-032-00094	5406-011-00114	5406-015-00114
1.812" (46.025mm)	5305-031-00096	5305-032-00096	5406-011-00116	5406-015-00116

If an Intermediate Mandrel is required, see page 11.

5407 Series ID Burnishing Tool

1.839" - 2.224" (46.711MM - 56.490MM)



(D) Shank Length

2.50" (63.50mm)

(E) Shank Diameter

1	1.000" straight shank
2	#3 Morse Taper
3	25mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 1.937" diameter bottoming style tool with a 25mm straight shank, is part number **5407-302-45124**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 7.188" (182.50mm)		
		Through	Blind	Bottoming
1.839" - 1.880" (46.711 - 47.752mm)	1.843" (46.812mm)	5407-*01-11118	5407-*01-31118	5407-*02-45118
1.871" - 1.912" (47.523 - 48.565mm)	1.875" (47.625mm)	5407-*01-11120	5407-*01-31120	5407-*02-45120
1.902" - 1.943" (48.311 - 49.352mm)	1.906" (48.412mm)	5407-*01-11122	5407-*01-31122	5407-*02-45122
1.934" - 1.974" (49.124 - 50.140mm)	1.937" (49.200mm)	5407-*01-11124	5407-*01-31124	5407-*02-45124
1.964" - 2.005" (49.886 - 50.927mm)	1.968" (49.987mm)	5407-*01-11126	5407-*01-31126	5407-*02-45126
1.996" - 2.037" (50.698 - 51.740mm)	2.000" (50.800mm)	5407-*01-11128	5407-*01-31128	5407-*02-45128
2.027" - 2.068" (51.486 - 52.527mm)	2.031" (51.587mm)	5407-*01-11130	5407-*01-31130	5407-*02-45130
2.058" - 2.099" (52.273 - 53.315mm)	2.062" (52.375mm)	5407-*01-11132	5407-*01-31132	5407-*02-45132
2.089" - 2.130" (53.061 - 54.102mm)	2.093" (53.162mm)	5407-*01-11134	5407-*01-31134	5407-*02-45134
2.121" - 2.162" (53.873 - 54.915mm)	2.125" (53.975mm)	5407-*01-11136	5407-*01-31136	5407-*02-45136
2.152" - 2.193" (54.661 - 55.702mm)	2.156" (54.762mm)	5407-*01-11138	5407-*01-31138	5407-*02-45138
2.183" - 2.224" (55.448 - 56.490mm)	2.187" (55.550mm)	5407-*01-11140	5407-*01-31140	5407-*02-45140

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5407 Series - Rolls, Mandrels, & Cages

1.839" - 2.224" (46.711MM - 56.490MM)

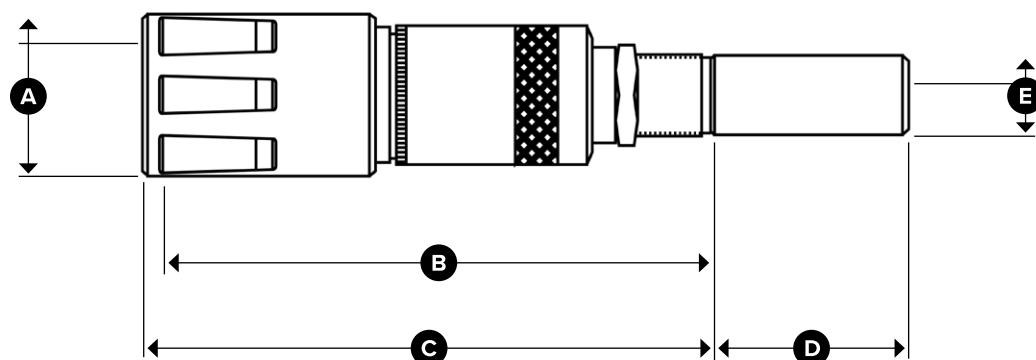
5407 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
1.843" (46.812mm)	9	5100-701-00312	9	5100-704-00312	7	5100-708-00312
1.875" (47.625mm)	9	5100-701-00312	9	5100-704-00312	7	5100-708-00312
1.906" (48.412mm)	9	5100-701-00312	9	5100-704-00312	7	5100-708-00312
1.937" (49.200mm)	9	5100-701-00312	9	5100-704-00312	7	5100-708-00312
1.968" (49.987mm)	9	5100-701-00312	9	5100-704-00312	7	5100-708-00312
2.000" (50.800mm)	9	5100-701-00312	9	5100-704-00312	7	5100-708-00312
2.031" (51.587mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.062" (52.375mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.093" (53.162mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.125" (53.975mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.156" (54.762mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.187" (55.550mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
1.843" (46.812mm)	5307-031-00118	5307-032-00118	5407-011-00118	5407-015-00118
1.875" (47.625mm)	5307-031-00120	5307-032-00120	5407-011-00120	5407-015-00120
1.906" (48.412mm)	5307-031-00122	5307-032-00122	5407-011-00122	5407-015-00122
1.937" (49.200mm)	5307-031-00124	5307-032-00124	5407-011-00124	5407-015-00124
1.968" (49.987mm)	5307-031-00126	5307-032-00126	5407-011-00126	5407-015-00126
2.000" (50.800mm)	5307-031-00128	5307-032-00128	5407-011-00128	5407-015-00128
2.031" (51.587mm)	5307-031-00118	5307-032-00118	5407-011-00130	5407-015-00130
2.062" (52.375mm)	5307-031-00120	5307-032-00120	5407-011-00132	5407-015-00132
2.093" (53.162mm)	5307-031-00122	5307-032-00122	5407-011-00134	5407-015-00134
2.125" (53.975mm)	5307-031-00124	5307-032-00124	5407-011-00136	5407-015-00136
2.156" (54.762mm)	5307-031-00126	5307-032-00126	5407-011-00138	5407-015-00138
2.187" (55.550mm)	5307-031-00128	5307-032-00128	5407-011-00140	5407-015-00140
If an Intermediate Mandrel is required, see page 11.				

5408 Series ID Burnishing Tool

2.214" - 2.724" (56.236MM - 69.190MM)



(D) Shank Length

2.50" (63.50mm)

(E) Shank Diameter

1	1.000" straight shank
2	#3 Morse Taper
3	25mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 2.437" diameter through style tool with a #3 Morse Taper shank, is part number **5408-201-11156**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 7.188" (182.50mm)		
		Through	Blind	Bottoming
2.214" - 2.255" (56.236 - 57.277mm)	2.218" (56.337mm)	5408-*01-11142	5408-*01-31142	5408-*02-45142
2.246" - 2.287" (57.048 - 58.090mm)	2.250" (57.150mm)	5408-*01-11144	5408-*01-31144	5408-*02-45144
2.277" - 2.318" (57.836 - 58.877mm)	2.281" (57.937mm)	5408-*01-11146	5408-*01-31146	5408-*02-45146
2.308" - 2.349" (58.623 - 59.665mm)	2.312" (58.725mm)	5408-*01-11148	5408-*01-31148	5408-*02-45148
2.339" - 2.380" (59.411 - 60.452mm)	2.343" (59.512mm)	5408-*01-11150	5408-*01-31150	5408-*02-45150
2.371" - 2.412" (60.223 - 61.265mm)	2.375" (60.325mm)	5408-*01-11152	5408-*01-31152	5408-*02-45152
2.402" - 2.443" (61.011 - 62.052mm)	2.406" (61.112mm)	5408-*01-11154	5408-*01-31154	5408-*02-45154
2.433" - 2.474" (61.798 - 62.840mm)	2.437" (61.900mm)	5408-*01-11156	5408-*01-31156	5408-*02-45156
2.464" - 2.505" (62.586 - 63.627mm)	2.468" (62.687mm)	5408-*01-11158	5408-*01-31158	5408-*02-45158
2.496" - 2.537" (63.398 - 64.440mm)	2.500" (63.500mm)	5408-*01-11160	5408-*01-31160	5408-*02-45160
2.527" - 2.568" (64.186 - 65.227mm)	2.531" (64.287mm)	5408-*01-11162	5408-*01-31162	5408-*02-45162
2.558" - 2.599" (64.973 - 66.015mm)	2.562" (65.075mm)	5408-*01-11164	5408-*01-31164	5408-*02-45164
2.589" - 2.630" (65.761 - 66.802mm)	2.593" (65.862mm)	5408-*01-11166	5408-*01-31166	5408-*02-45166
2.621" - 2.662" (66.573 - 67.615mm)	2.625" (66.675mm)	5408-*01-11168	5408-*01-31168	5408-*02-45168
2.652" - 2.693" (67.361 - 68.402mm)	2.656" (67.462mm)	5408-*01-11170	5408-*01-31170	5408-*02-45170
2.683" - 2.724" (68.148 - 69.190mm)	2.687" (68.250mm)	5408-*01-11172	5408-*01-31172	5408-*02-45172

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5408 Series - Rolls, Mandrels, & Cages

2.214" - 2.724" (56.236MM - 69.190MM)

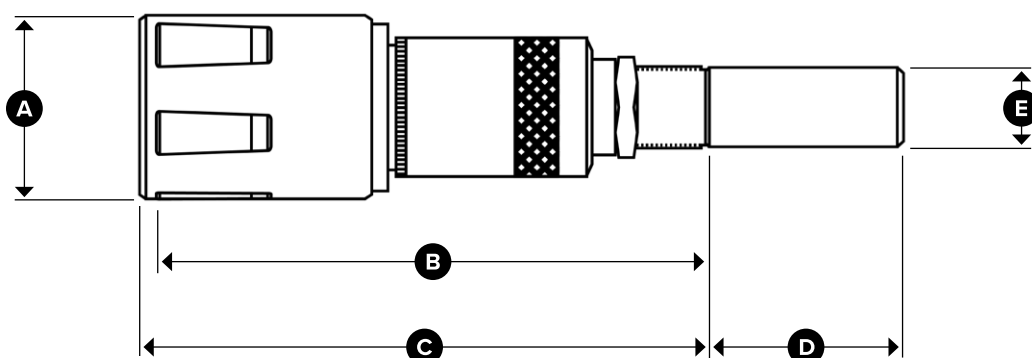
5408 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
2.218" (56.337mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.250" (57.150mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.281" (57.937mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.312" (58.725mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.343" (59.512mm)	9	5100-701-00468	9	5100-704-00468	7	5100-708-00468
2.375" (60.325mm)	9	5100-701-00468	9	5100-704-00468	7	5100-708-00468
2.406" (61.112mm)	9	5100-701-00468	9	5100-704-00468	7	5100-708-00468
2.437" (61.900mm)	9	5100-701-00468	9	5100-704-00468	7	5100-708-00468
2.468" (62.687mm)	9	5100-701-00468	9	5100-704-00468	7	5100-708-00468
2.500" (63.500mm)	9	5100-701-00468	9	5100-704-00468	7	5100-708-00468
2.531" (64.287mm)	9	5100-701-00468	9	5100-704-00468	7	5100-708-00468
2.562" (65.075mm)	9	5100-701-00468	9	5100-704-00468	7	5100-708-00468
2.593" (65.862mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.625" (66.675mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.656" (67.462mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.687" (68.250mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
2.218" (56.337mm)	5308-031-00142	5308-032-00142	5408-011-00142	5408-015-00142
2.250" (57.150mm)	5308-031-00144	5308-032-00144	5408-011-00144	5408-015-00144
2.281" (57.937mm)	5308-031-00146	5308-032-00146	5408-011-00146	5408-015-00146
2.312" (58.725mm)	5308-031-00148	5308-032-00148	5408-011-00148	5408-015-00148
2.343" (59.512mm)	5308-031-00142	5308-032-00142	5408-011-00150	5408-015-00150
2.375" (60.325mm)	5308-031-00144	5308-032-00144	5408-011-00152	5408-015-00152
2.406" (61.112mm)	5308-031-00146	5308-032-00146	5408-011-00154	5408-015-00154
2.437" (61.900mm)	5308-031-00148	5308-032-00148	5408-011-00156	5408-015-00156
2.468" (62.687mm)	5308-031-00158	5308-032-00158	5408-011-00158	5408-015-00158
2.500" (63.500mm)	5308-031-00160	5308-032-00160	5408-011-00160	5408-015-00160
2.531" (64.287mm)	5308-031-00162	5308-032-00162	5408-011-00162	5408-015-00162
2.562" (65.075mm)	5308-031-00164	5308-032-00164	5408-011-00164	5408-015-00164
2.593" (65.862mm)	5308-031-00158	5308-032-00158	5408-011-00166	5408-015-00166
2.625" (66.675mm)	5308-031-00160	5308-032-00160	5408-011-00168	5408-015-00168
2.656" (67.462mm)	5308-031-00162	5308-032-00162	5408-011-00170	5408-015-00170
2.687" (68.250mm)	5308-031-00164	5308-032-00164	5408-011-00172	5408-015-00172

5409 Series ID Burnishing Tool

2.714" - 3.349" (68.936MM - 85.065MM)



(D) Shank Length

2.50" (63.50mm)

(E) Shank Diameter

1	1.000" straight shank
2	#3 Morse Taper
3	25mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 2.906" diameter blind style tool with a 1.000" straight shank, is part number **5409-101-31186**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 7.188" (182.50mm)		
		Through	Blind	Bottoming
2.714" - 2.755" (68.936 - 69.977mm)	2.718" (69.037mm)	5409-*01-11174	5409-*01-31174	5409-*02-45174
2.746" - 2.787" (69.748 - 70.790mm)	2.750" (69.850mm)	5409-*01-11176	5409-*01-31176	5409-*02-45176
2.277" - 2.818" (70.536 - 71.577mm)	2.781" (70.637mm)	5409-*01-11178	5409-*01-31178	5409-*02-45178
2.808" - 2.849" (71.323 - 72.365mm)	2.812" (71.425mm)	5409-*01-11180	5409-*01-31180	5409-*02-45180
2.839" - 2.880" (72.111 - 73.152mm)	2.843" (72.212mm)	5409-*01-11182	5409-*01-31182	5409-*02-45182
2.871" - 2.912" (72.923 - 73.965mm)	2.875" (73.025mm)	5409-*01-11184	5409-*01-31184	5409-*02-45184
2.902" - 2.943" (73.711 - 74.752mm)	2.906" (73.812mm)	5409-*01-11186	5409-*01-31186	5409-*02-45186
2.933" - 2.974" (74.498 - 75.540mm)	2.937" (74.600mm)	5409-*01-11188	5409-*01-31188	5409-*02-45188
2.964" - 3.005" (75.286 - 76.327mm)	2.968" (75.387mm)	5409-*01-11190	5409-*01-31190	5409-*02-45190

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.
Remaining sizes and styles located on next page.

5409 Series ID Burnishing Tool

2.714" - 3.349" (68.936MM - 85.065MM)

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions		
		(C) Gage Length: 7.188" (182.50mm)		
		Through	Blind	Bottoming
2.996" - 3.037" (76.098 - 77.140mm)	3.000" (76.200mm)	5409-*01-11192	5409-*01-31192	5409-*02-45192
3.027" - 3.068" (76.886 - 77.927mm)	3.031" (76.987mm)	5409-*01-11194	5409-*01-31194	5409-*02-45194
3.058" - 3.099" (77.673 - 78.715mm)	3.062" (77.775mm)	5409-*01-11196	5409-*01-31196	5409-*02-45196
3.089" - 3.130" (78.461 - 79.502mm)	3.093" (78.562mm)	5409-*01-11198	5409-*01-31198	5409-*02-45198
3.121" - 3.162" (79.273 - 80.315mm)	3.125" (79.375mm)	5409-*01-11200	5409-*01-31200	5409-*02-45200
3.152" - 3.193" (80.061 - 81.102mm)	3.156" (80.162mm)	5409-*01-11202	5409-*01-31202	5409-*02-45202
3.183" - 3.224" (80.848 - 81.890mm)	3.187" (80.950mm)	5409-*01-11204	5409-*01-31204	5409-*02-45204
3.214" - 3.255" (81.636 - 82.677mm)	3.218" (81.737mm)	5409-*01-11206	5409-*01-31206	5409-*02-45206
3.246" - 3.287" (82.448 - 83.490mm)	3.250" (82.550mm)	5409-*01-11208	5409-*01-31208	5409-*02-45208
3.277" - 3.318" (83.236 - 84.277mm)	3.281" (83.337mm)	5409-*01-11210	5409-*01-31210	5409-*02-45210
3.308" - 3.349" (84.023 - 85.065mm)	3.312" (84.125mm)	5409-*01-11212	5409-*01-31212	5409-*02-45212
*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.				

5409 Series - Rolls

2.714" - 3.349" (68.936MM - 85.065MM)

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
2.718" (69.037mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.750" (69.850mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.781" (70.637mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.812" (71.425mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.843" (72.212mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.875" (73.025mm)	9	5100-701-00531	9	5100-704-00531	7	5100-708-00531
2.906" (73.812mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
2.937" (74.600mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
2.968" (75.387mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
3.000" (76.200mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
3.031" (76.987mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
3.062" (77.775mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
3.093" (78.562mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
3.125" (79.375mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
3.156" (80.162mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
3.187" (80.950mm)	9	5100-701-00625	9	5100-704-00625	7	5100-708-00625
3.218" (81.737mm)	9	5100-701-00687	9	5100-704-00687	7	5100-708-00687
3.250" (82.550mm)	9	5100-701-00687	9	5100-704-00687	7	5100-708-00687
3.281" (83.337mm)	9	5100-701-00687	9	5100-704-00687	7	5100-708-00687
3.312" (84.125mm)	9	5100-701-00687	9	5100-704-00687	7	5100-708-00687

5409 Series - Mandrels & Cages

2.714" - 3.349" (68.936MM - 85.065MM)

5409 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
2.718" (69.037mm)	5309-031-00174	5309-032-00174	5409-011-00174	5409-015-00174
2.750" (69.850mm)	5309-031-00176	5309-032-00176	5409-011-00176	5409-015-00176
2.781" (70.637mm)	5309-031-00178	5309-032-00178	5409-011-00178	5409-015-00178
2.812" (71.425mm)	5309-031-00180	5309-032-00180	5409-011-00180	5409-015-00180
2.843" (72.212mm)	5309-031-00182	5309-032-00182	5409-011-00182	5409-015-00182
2.875" (73.025mm)	5309-031-00184	5309-032-00184	5409-011-00184	5409-015-00184
2.906" (73.812mm)	5309-031-00174	5309-032-00174	5409-011-00186	5409-015-00186
2.937" (74.600mm)	5309-031-00176	5309-032-00176	5409-011-00188	5409-015-00188
2.968" (75.387mm)	5309-031-00178	5309-032-00178	5409-011-00190	5409-015-00190
3.000" (76.200mm)	5309-031-00180	5309-032-00180	5409-011-00192	5409-015-00192
3.031" (76.987mm)	5309-031-00182	5309-032-00182	5409-011-00194	5409-015-00194
3.062" (77.775mm)	5309-031-00184	5309-032-00184	5409-011-00196	5409-015-00196
3.093" (78.562mm)	5309-031-00198	5309-032-00198	5409-011-00198	5409-015-00198
3.125" (79.375mm)	5309-031-00200	5309-032-00200	5409-011-00200	5409-015-00200
3.156" (80.162mm)	5309-031-00202	5309-032-00202	5409-011-00202	5409-015-00202
3.187" (80.950mm)	5309-031-00204	5309-032-00204	5409-011-00204	5409-015-00204
3.218" (81.737mm)	5309-031-00198	5309-032-00198	5409-011-00206	5409-015-00206
3.250" (82.550mm)	5309-031-00200	5309-032-00200	5409-011-00208	5409-015-00208
3.281" (83.337mm)	5309-031-00202	5309-032-00202	5409-011-00210	5409-015-00210
3.312" (84.125mm)	5309-031-00204	5309-032-00204	5409-011-00212	5409-015-00212
If an Intermediate Mandrel is required, please reference the Intermediate Mandrel table on page 11				

The Power of Roller Burnishing



IN MANUFACTURING,

enhanced part durability is a constant pursuit. Roller burnishing is a powerful technique to achieve this goal. By densifying and hardening the outer surface of a component, roller burnishing significantly improves its resistance to wear and premature failure, extending its operational lifespan and boosting overall performance. This process fundamentally alters the material's properties, leading to tangible improvements in durability and reliability.

What is Roller Burnishing?

Roller burnishing is a cold working process that improves the surface finish and mechanical properties of part without removing material. This process involves applying pressure to a surface, resulting in a cold worked layer that offers several advantages including wear resistance, performance, and part life.

Improve Wear Resistance

HIGHER SURFACE HARDNESS

Burnishing is a machining process that cold works the metal without removing material. Rather it compresses or “irons-out” the peaks of a metal surface into the valleys, resulting in a uniform surface. One benefit of cold working material is that it causes the metal's crystal structure to be distorted and rearranged, ultimately increasing the surface hardness of the material. As a result, the higher hardness provides an increased resistance to abrasion and wear.

REDUCES FRICTION

A smoother surface finish will make a part less susceptible to wear, as it reduces friction. Friction is a force that resists relative motion between two surfaces that come in contact. Lower friction means less force is required to move one surface over another, reducing the amount of material that is worn away in operation. Additionally, less friction lowers operating temperatures, preventing premature failure of the part.

Enhance Performance

Similar to wear resistance, the cold-worked layer produced during burnishing can also provide fatigue and corrosion resistance.

REDUCE STRESS CONCENTRATIONS

Stress concentrations are localized areas where stress is particularly high. These areas of stress can result in fatigue cracks, leading to premature failure of the part. Burnishing can help to reduce stress concentrations by smoothing out surface irregularities and refining the grain structure of the material. This provides fatigue resistance for the part. Burnishing can also be used to prestress the material. Prestressing machined parts involves applying controlled pre-compression to critical areas of a part to enhance its strength, fatigue resistance, and dimensional stability under operational loads. This technique is especially relevant in high-stress applications, such as aerospace, automotive, and heavy machinery, where parts are subjected to intense, repetitive loads.



CORROSION RESISTANCE

Burnishing produces a smoother surface finish, reducing the likelihood of corrosion in some materials. A rougher surface provides a larger surface area for corrosive substances to come into contact with. Additionally, rough surfaces are more likely to have crevices and trap fluids which can create localized corrosive environments. A smoother surface, on the other hand, minimizes the area exposed to the environment and is less likely to retain fluid, reducing the potential for corrosion.

and lifespan of various components. By creating a hardened, wear-resistant surface layer, reducing friction, and improving fatigue and corrosion resistance, roller burnishing offers a multitude of benefits for manufacturers across industries. From automotive and aerospace to machinery and consumer goods, the application of roller burnishing can lead to improved product reliability, reduced maintenance costs, and increased customer satisfaction.

Stronger, Longer Lasting Parts

Overall, roller burnishing is a versatile finishing process that offers significant benefits to a wide range of automotive components. By increasing surface hardness, improving surface finish, and reducing stress concentrations, roller burnishing enhances durability, reliability, and performance. From crankshafts to bearing surfaces, this process plays a vital role in ensuring the longevity and efficiency of automotive systems. As the automotive industry continues to evolve, roller burnishing will remain a valuable tool for improving component part quality and vehicle performance.

Increase Part Life

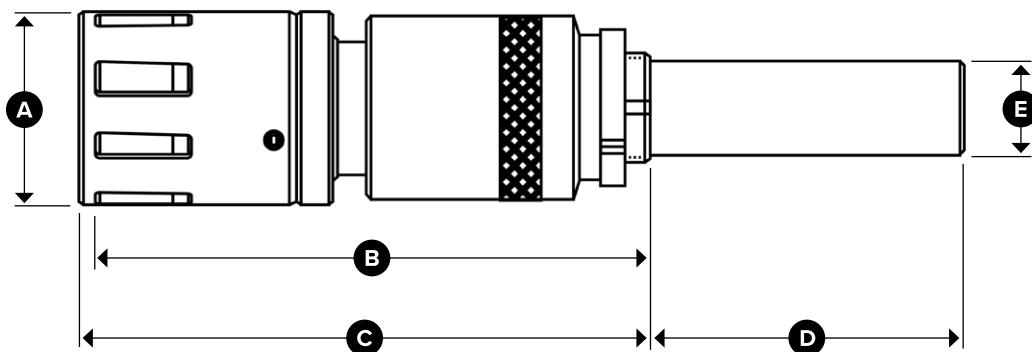
Increased part life is largely due to a combination of the elements listed above. Burnishing's ability to improve wear resistance, reduce fatigue, and minimize the likelihood of corrosion all contribute to reduced part maintenance. Parts with enhanced wear resistance and performance can operate for longer periods of time without failure, increasing the overall life of the part.

Roller burnishing stands as a versatile and effective cold working process that significantly enhances the performance



5610 Series ID Burnishing Tool

3.339" - 4.099" (84.811MM - 104.115MM)



(D) Shank Length

5.00" (127.00mm)

(E) Shank Diameter

1	1.500" straight shank
2	#4 Morse Taper
3	40mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 3.375" diameter bottoming style tool with a 1.000" straight shank, is part number **5610-102-45216**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 9.125" (231.78mm)		
		Through	Blind	Bottoming
3.339" - 3.380" (84.811 - 85.852mm)	3.343" (84.912mm)	5610-*01-11214	5610-*01-31214	5610-*02-45214
3.371" - 3.412" (85.623 - 86.665mm)	3.375" (85.725mm)	5610-*01-11216	5610-*01-31216	5610-*02-45216
3.402" - 3.443" (86.411 - 87.452mm)	3.406" (86.512mm)	5610-*01-11218	5610-*01-31218	5610-*02-45218
3.433" - 3.474" (87.198 - 88.240mm)	3.437" (87.300mm)	5610-*01-11220	5610-*01-31220	5610-*02-45220
3.464" - 3.505" (87.986 - 89.027mm)	3.468" (88.087mm)	5610-*01-11222	5610-*01-31222	5610-*02-45222
3.496" - 3.537" (88.798 - 89.840mm)	3.500" (88.900mm)	5610-*01-11224	5610-*01-31224	5610-*02-45224
3.527" - 3.568" (89.586 - 90.627mm)	3.531" (89.687mm)	5610-*01-11226	5610-*01-31226	5610-*02-45226
3.558" - 3.599" (90.373 - 91.415mm)	3.562" (90.475mm)	5610-*01-11228	5610-*01-31228	5610-*02-45228
3.589" - 3.630" (91.161 - 92.202mm)	3.593" (91.262mm)	5610-*01-11230	5610-*01-31230	5610-*02-45230
3.621" - 3.662" (91.973 - 93.015mm)	3.625" (92.075mm)	5610-*01-11232	5610-*01-31232	5610-*02-45232

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.
Remaining sizes and styles located on next page.

5610 Series ID Burnishing Tool

3.339" - 4.099" (84.811MM - 104.115MM)

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions		
		(C) Gage Length: 9.125" (231.78mm)		
		Through	Blind	Bottoming
3.652" - 3.693" (92.761 - 93.802mm)	3.656" (92.862mm)	5610-*01-11234	5610-*01-31234	5610-*02-45234
3.683" - 3.724" (93.548 - 94.590mm)	3.687" (93.650mm)	5610-*01-11236	5610-*01-31236	5610-*02-45236
3.714" - 3.755" (94.336 - 95.377mm)	3.718" (94.437mm)	5610-*01-11238	5610-*01-31238	5610-*02-45238
3.746" - 3.787" (95.148 - 96.190mm)	3.750" (95.250mm)	5610-*01-11240	5610-*01-31240	5610-*02-45240
3.777" - 3.818" (95.936 - 96.977mm)	3.781" (96.037mm)	5610-*01-11242	5610-*01-31242	5610-*02-45242
3.808" - 3.849" (96.723 - 97.65mm)	3.812" (96.825mm)	5610-*01-11244	5610-*01-31244	5610-*02-45244
3.839" - 3.880" (97.511 - 98.552mm)	3.843" (97.612mm)	5610-*01-11246	5610-*01-31246	5610-*02-45246
3.871" - 3.912" (98.323 - 99.365mm)	3.875" (98.425mm)	5610-*01-11248	5610-*01-31248	5610-*02-45248
3.902" - 3.943" (99.111 - 100.152mm)	3.906" (99.212mm)	5610-*01-11250	5610-*01-31250	5610-*02-45250
3.933" - 3.974" (99.898 - 100.940mm)	3.937" (100.000mm)	5610-*01-11252	5610-*01-31252	5610-*02-45252
3.964" - 4.005" (100.686 - 101.727mm)	3.968" (100.787mm)	5610-*01-11254	5610-*01-31254	5610-*02-45254
3.996" - 4.037" (101.498 - 102.540mm)	4.000" (101.600mm)	5610-*01-11256	5610-*01-31256	5610-*02-45256
4.027" - 4.068" (102.286 - 103.327mm)	4.031" (102.387mm)	5610-*01-11258	5610-*01-31258	5610-*02-45258
4.058" - 4.099" (103.073 - 104.115mm)	4.062" (103.175mm)	5610-*01-11260	5610-*01-31260	5610-*02-45260
*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.				

5610 Series - Rolls

3.339" - 4.099" (84.811MM - 104.115MM)

5410 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
3.343" (84.912mm)	11	5100-701-00468	11	5100-704-00468	11	5100-708-00468
3.375" (85.725mm)	11	5100-701-00468	11	5100-704-00468	11	5100-708-00468
3.406" (86.512mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.437" (87.300mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.468" (88.087mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.500" (88.900mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.531" (89.687mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.562" (90.475mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.593" (91.262mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.625" (92.075mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.656" (92.862mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.687" (93.650mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.718" (94.437mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.750" (95.250mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.781" (96.037mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.812" (96.825mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.843" (97.612mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.875" (98.425mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.906" (99.212mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.937" (100.000mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
3.968" (100.787mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.000" (101.600mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.031" (102.387mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.062" (103.175mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531

5610 Series - Mandrels & Cages

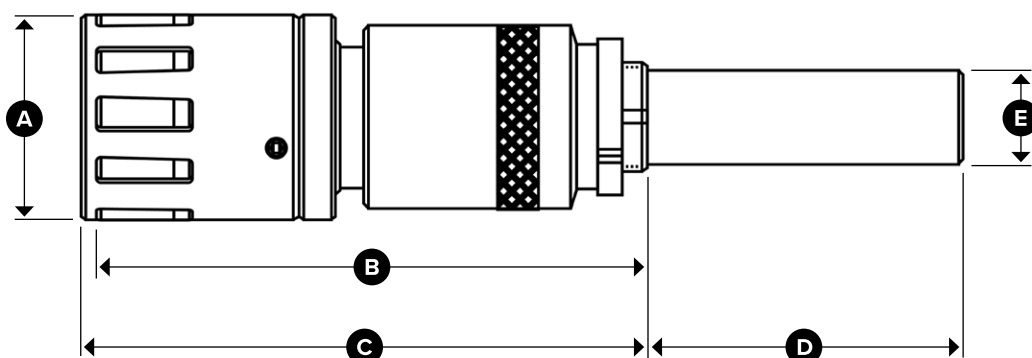
3.339" - 4.099" (84.811MM - 104.115MM)

5410 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
3.343" (84.912mm)	5155-059-10001	5155-059-10002	5610-011-00214	5610-015-00214
3.375" (85.725mm)	5155-060-10001	5155-060-10002	5610-011-00216	5610-015-00216
3.406" (86.512mm)	5155-061-10001	5155-061-10002	5610-011-00218	5610-015-00218
3.437" (87.300mm)	5155-062-10001	5155-062-10002	5610-011-00220	5610-015-00220
3.468" (88.087mm)	5155-063-10001	5155-063-10002	5610-011-00222	5610-015-00222
3.500" (88.900mm)	5155-064-10001	5155-064-10002	5610-011-00224	5610-015-00224
3.531" (89.687mm)	5155-065-10001	5155-065-10002	5610-011-00226	5610-015-00226
3.562" (90.475mm)	5155-066-10001	5155-066-10002	5610-011-00228	5610-015-00228
3.593" (91.262mm)	5155-067-10001	5155-067-10002	5610-011-00230	5610-015-00230
3.625" (92.075mm)	5155-068-10001	5155-068-10002	5610-011-00232	5610-015-00232
3.656" (92.862mm)	5155-069-10001	5155-069-10002	5610-011-00234	5610-015-00234
3.687" (93.650mm)	5155-070-10001	5155-070-10002	5610-011-00236	5610-015-00236
3.718" (94.437mm)	5155-071-10001	5155-071-10002	5610-011-00238	5610-015-00238
3.750" (95.250mm)	5155-072-10001	5155-072-10002	5610-011-00240	5610-015-00240
3.781" (96.037mm)	5155-073-10001	5155-073-10002	5610-011-00242	5610-015-00242
3.812" (96.825mm)	5155-074-10001	5155-074-10002	5610-011-00244	5610-015-00244
3.843" (97.612mm)	5155-075-10001	5155-075-10002	5610-011-00246	5610-015-00246
3.875" (98.425mm)	5155-076-10001	5155-076-10002	5610-011-00248	5610-015-00248
3.906" (99.212mm)	5155-077-10001	5155-077-10002	5610-011-00250	5610-015-00250
3.937" (100.000mm)	5155-078-10001	5155-078-10002	5610-011-00252	5610-015-00252
3.968" (100.787mm)	5155-079-10001	5155-079-10002	5610-011-00254	5610-015-00254
4.000" (101.600mm)	5155-080-10001	5155-080-10002	5610-011-00256	5610-015-00256
4.031" (102.387mm)	5155-081-10001	5155-081-10002	5610-011-00258	5610-015-00258
4.062" (103.175mm)	5155-082-10001	5155-082-10002	5610-011-00260	5610-015-00260
If an Intermediate Mandrel is required, see page 11.				

5611 Series ID Burnishing Tool

4.089" - 5.037" (103.861MM - 127.940MM)



(D) Shank Length

5.00" (127.00mm)

(E) Shank Diameter

1	1.500" straight shank
2	#4 Morse Taper
3	40mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 4.250" diameter bottoming style tool with a 40mm straight shank, is part number **5611-302-45272**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 9.125" (231.78mm)		
		Through	Blind	Bottoming
4.089" - 4.130" (103.861 - 104.902mm)	4.093" (103.920mm)	5611-*01-11262	5611-*01-31262	5611-*02-45262
4.121" - 4.162" (104.673 - 105.715mm)	4.125" (104.775mm)	5611-*01-11264	5611-*01-31264	5611-*02-45264
4.152" - 4.193" (105.461 - 106.502mm)	4.156" (105.562mm)	5611-*01-11266	5611-*01-31266	5611-*02-45266
4.183" - 4.224" (106.248 - 107.290mm)	4.187" (106.350mm)	5611-*01-11268	5611-*01-31268	5611-*02-45268
4.214" - 4.255" (107.036 - 108.077mm)	4.218" (107.137mm)	5611-*01-11270	5611-*01-31270	5611-*02-45270
4.246" - 4.287" (107.848 - 108.890mm)	4.250" (107.950mm)	5611-*01-11272	5611-*01-31272	5611-*02-45272
4.277" - 4.318" (108.636 - 109.677mm)	4.281" (108.737mm)	5611-*01-11274	5611-*01-31274	5611-*02-45274
4.308" - 4.349" (109.423 - 110.465mm)	4.312" (109.525mm)	5611-*01-11276	5611-*01-31276	5611-*02-45276
4.339" - 4.380" (110.211 - 111.252mm)	4.343" (110.312mm)	5611-*01-11278	5611-*01-31278	5611-*02-45278
4.371" - 4.412" (111.023 - 112.065mm)	4.375" (111.125mm)	5611-*01-11280	5611-*01-31280	5611-*02-45280
4.402" - 4.443" (111.811 - 112.852mm)	4.406" (111.912mm)	5611-*01-11282	5611-*01-31282	5611-*02-45282
4.433" - 4.474" (112.589 - 113.640mm)	4.437" (112.700mm)	5611-*01-11284	5611-*01-31284	5611-*02-45284

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

Remaining sizes and styles located on next page.

5611 Series ID Burnishing Tool

4.089" - 5.037" (103.861MM - 127.940MM)

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 9.125" (231.78mm)		
		Through	Blind	Bottoming
4.464" - 4.505" (113.386 - 114.427mm)	4.468" (113.487mm)	5611-*01-11286	5611-*01-31286	5611-*02-45286
4.496" - 4.537" (114.198 - 115.240mm)	4.500" (114.300mm)	5611-*01-11288	5611-*01-31288	5611-*02-45288
4.527" - 4.568" (114.986 - 116.027mm)	4.531" (115.087mm)	5611-*01-11290	5611-*01-31290	5611-*02-45290
4.558" - 4.599" (115.773 - 116.815mm)	4.562" (115.875mm)	5611-*01-11292	5611-*01-31292	5611-*02-45292
4.589" - 4.630" (116.561 - 117.602mm)	4.593" (116.662mm)	5611-*01-11294	5611-*01-31294	5611-*02-45294
4.621" - 4.662" (117.373 - 118.415mm)	4.625" (117.475mm)	5611-*01-11296	5611-*01-31296	5611-*02-45296
4.652" - 4.693" (118.161 - 119.202mm)	4.656" (118.262mm)	5611-*01-11298	5611-*01-31298	5611-*02-45298
4.683" - 4.724" (118.948 - 119.990mm)	4.687" (119.050mm)	5611-*01-11300	5611-*01-31300	5611-*02-45300
4.714" - 4.755" (119.736 - 120.777mm)	4.718" (119.837mm)	5611-*01-11302	5611-*01-31302	5611-*02-45302
4.746" - 4.787" (120.548 - 121.590mm)	4.750" (120.650mm)	5611-*01-11304	5611-*01-31304	5611-*02-45304
4.777" - 4.818" (121.336 - 122.377mm)	4.781" (121.437mm)	5611-*01-11306	5611-*01-31306	5611-*02-45306
4.808" - 4.849" (122.123 - 123.165mm)	4.812" (122.225mm)	5611-*01-11308	5611-*01-31308	5611-*02-45308
4.839" - 4.880" (122.911 - 123.952mm)	4.843" (123.012mm)	5611-*01-11310	5611-*01-31310	5611-*02-45310
4.871" - 4.912" (123.723 - 124.765mm)	4.875" (123.825mm)	5611-*01-11312	5611-*01-31312	5611-*02-45312
4.902" - 4.943" (124.511 - 125.552mm)	4.906" (124.612mm)	5611-*01-11314	5611-*01-31314	5611-*02-45314
4.933" - 4.974" (125.298 - 126.340mm)	4.937" (125.400mm)	5611-*01-11316	5611-*01-31316	5611-*02-45316
4.964" - 5.005" (126.086 - 127.127mm)	4.968" (126.187mm)	5611-*01-11318	5611-*01-31318	5611-*02-45318
4.996" - 5.037" (126.898 - 127.940mm)	5.000" (127.000mm)	5611-*01-11320	5611-*01-31320	5611-*02-45320

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5611 Series - Rolls

4.089" - 5.037" (103.861MM - 127.940MM)

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
4.093" (103.92mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.125" (104.775mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.156" (105.562mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.187" (106.350mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.218" (107.137mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.250" (107.950mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.281" (108.737mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.312" (109.525mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.343" (110.312mm)	11	5100-701-00531	11	5100-704-00531	11	5100-708-00531
4.375" (111.125mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.406" (111.912mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.437" (112.700mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.468" (113.487mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.500" (114.300mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.531" (115.087mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.562" (115.875mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.593" (116.662mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.625" (117.475mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.656" (118.262mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.687" (119.050mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.718" (119.837mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.750" (120.650mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.781" (121.437mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.812" (122.225mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.843" (123.012mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.875" (123.825mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.906" (124.612mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.937" (125.400mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
4.968" (126.187mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.000" (127.000mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531

5611 Series - Mandrels & Cages

4.089" - 5.037" (103.861MM - 127.940MM)

5411 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
4.093" (103.92mm)	5155-083-10001	5155-083-10002	5611-011-00262	5611-015-00262
4.125" (104.775mm)	5155-084-10001	5155-084-10002	5611-011-00264	5611-015-00264
4.156" (105.562mm)	5155-085-10001	5155-085-10002	5611-011-00266	5611-015-00266
4.187" (106.350mm)	5155-086-10001	5155-086-10002	5611-011-00268	5611-015-00268
4.218" (107.137mm)	5155-087-10001	5155-087-10002	5611-011-00270	5611-015-00270
4.250" (107.950mm)	5155-088-10001	5155-088-10002	5611-011-00272	5611-015-00272
4.281" (108.737mm)	5155-089-10001	5155-089-10002	5611-011-00274	5611-015-00274
4.312" (109.525mm)	5155-090-10001	5155-090-10002	5611-011-00276	5611-015-00276
4.343" (110.312mm)	5155-091-10001	5155-091-10002	5611-011-00278	5611-015-00278
4.375" (111.125mm)	5155-092-10001	5155-092-10002	5611-011-00280	5611-015-00280
4.406" (111.912mm)	5155-093-10001	5155-093-10002	5611-011-00282	5611-015-00282
4.437" (112.700mm)	5155-094-10001	5155-094-10002	5611-011-00284	5611-015-00284
4.468" (113.487mm)	5155-095-10001	5155-095-10002	5611-011-00286	5611-015-00286
4.500" (114.300mm)	5155-096-10001	5155-096-10002	5611-011-00288	5611-015-00288
4.531" (115.087mm)	5155-097-10001	5155-097-10002	5611-011-00290	5611-015-00290
4.562" (115.875mm)	5155-098-10001	5155-098-10002	5611-011-00292	5611-015-00292
4.593" (116.662mm)	5155-099-10001	5155-099-10002	5611-011-00294	5611-015-00294
4.625" (117.475mm)	5155-100-10001	5155-100-10002	5611-011-00296	5611-015-00296
4.656" (118.262mm)	5155-101-10001	5155-101-10002	5611-011-00298	5611-015-00298
4.687" (119.050mm)	5155-102-10001	5155-102-10002	5611-011-00300	5611-015-00300
4.718" (119.837mm)	5155-103-10001	5155-103-10002	5611-011-00302	5611-015-00302
4.750" (120.650mm)	5155-104-10001	5155-104-10002	5611-011-00304	5611-015-00304
4.781" (121.437mm)	5155-105-10001	5155-105-10002	5611-011-00306	5611-015-00306
4.812" (122.225mm)	5155-106-10001	5155-106-10002	5611-011-00308	5611-015-00308
4.843" (123.012mm)	5155-107-10001	5155-107-10002	5611-011-00310	5611-015-00310
4.875" (123.825mm)	5155-108-10001	5155-108-10002	5611-011-00312	5611-015-00312
4.906" (124.612mm)	5155-109-10001	5155-109-10002	5611-011-00314	5611-015-00314
4.937" (125.400mm)	5155-110-10001	5155-110-10002	5611-011-00316	5611-015-00316
4.968" (126.187mm)	5155-111-10001	5155-111-10002	5611-011-00318	5611-015-00318
5.000" (127.000mm)	5155-112-10001	5155-112-10002	5611-011-00320	5611-015-00320
If an Intermediate Mandrel is required, see page 11.				

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WHAT TRAINING COVERS

BUILT AROUND YOUR OPERATORS AND YOUR PROCESS

01

TOOL SETUP & ADJUSTMENTS

Proper setup, sizing, and pre-run checks specific to your metal finishing tools and machining.

02

APPLICATION BEST PRACTICES

Process parameters, speeds, and material-specific considerations for consistent, repeatable results.

03

TROUBLESHOOTING

How to identify and resolve common issues before they affect part quality or tool life.

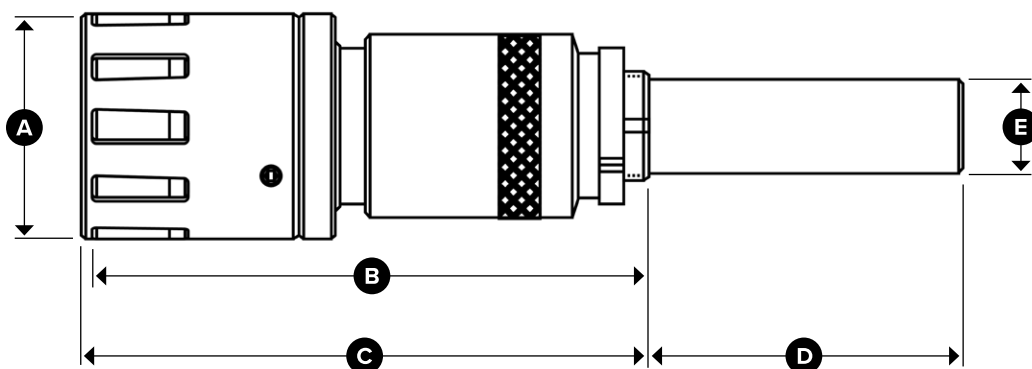
04

TOOL MAINTENANCE & CARE

Cleaning, inspection, and storage practices that extend tool life and protect your investment.

5612 Series ID Burnishing Tool

5.027" - 5.537" (127.686MM - 140.640MM)



(D) Shank Length

5.00" (127.00mm)

(E) Shank Diameter

1	1.500" straight shank
2	#4 Morse Taper
3	40mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 5.187" diameter through style tool with a 1.500" straight shank, is part number **5612-101-11332**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions (C) Gage Length: 9.125" (231.78mm)		
		Through	Blind	Bottoming
5.027" - 5.068" (127.686 - 128.727mm)	5.031" (127.787mm)	5612-*01-11322	5612-*01-31322	5612-*02-45322
5.058" - 5.099" (128.473 - 129.515mm)	5.062" (128.575mm)	5612-*01-11324	5612-*01-31324	5612-*02-45324
5.089" - 5.130" (129.261 - 130.302mm)	5.093" (129.362mm)	5612-*01-11326	5612-*01-31326	5612-*02-45326
5.121" - 5.162" (130.073 - 131.115mm)	5.125" (130.175mm)	5612-*01-11328	5612-*01-31328	5612-*02-45328
5.152" - 5.193" (130.861 - 131.902mm)	5.156" (130.962mm)	5612-*01-11330	5612-*01-31330	5612-*02-45330
5.183" - 5.224" (131.648 - 132.690mm)	5.187" (131.750mm)	5612-*01-11332	5612-*01-31332	5612-*02-45332
5.214" - 5.255" (132.436 - 133.477mm)	5.218" (132.537mm)	5612-*01-11334	5612-*01-31334	5612-*02-45334
5.246" - 5.287" (133.248 - 134.290mm)	5.250" (133.350mm)	5612-*01-11336	5612-*01-31336	5612-*02-45336
5.277" - 5.318" (134.036 - 135.077mm)	5.281" (134.137mm)	5612-*01-11338	5612-*01-31338	5612-*02-45338
5.308" - 5.349" (134.823 - 135.865mm)	5.312" (134.925mm)	5612-*01-11340	5612-*01-31340	5612-*02-45340
5.339" - 5.380" (135.611 - 136.652mm)	5.343" (135.712mm)	5612-*01-11342	5612-*01-31342	5612-*02-45342
5.371" - 5.412" (136.423 - 137.465mm)	5.375" (136.525mm)	5612-*01-11344	5612-*01-31344	5612-*02-45344
5.402" - 5.443" (137.211 - 138.252mm)	5.406" (137.312mm)	5612-*01-11346	5612-*01-31346	5612-*02-45346
5.433" - 5.474" (137.998 - 139.040mm)	5.437" (138.100mm)	5612-*01-11348	5612-*01-31348	5612-*02-45348
5.464" - 5.505" (138.786 - 139.827mm)	5.468" (138.887mm)	5612-*01-11350	5612-*01-31350	5612-*02-45350
5.496" - 5.537" (139.598 - 140.640mm)	5.500" (139.700mm)	5612-*01-11352	5612-*01-31352	5612-*02-45352

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5612 Series - Rolls, Mandrels, & Cages

5.027" - 5.537" (127.686MM - 140.640MM)

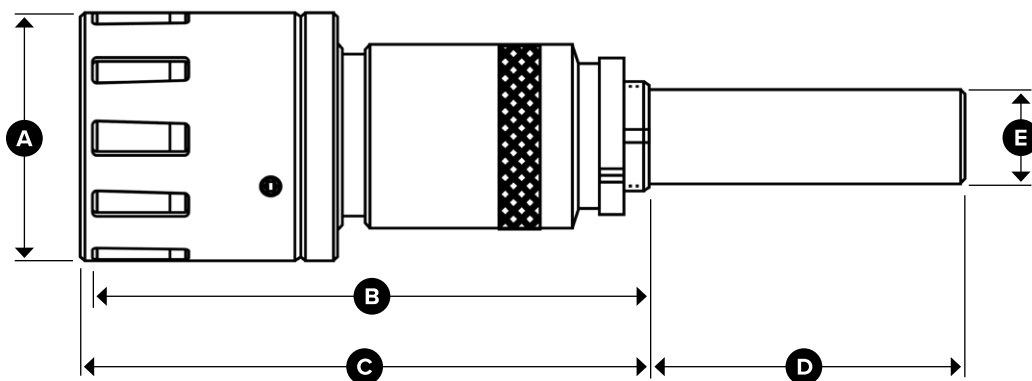
5612 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
5.031" (127.787mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.062" (128.575mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.093" (129.362mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.125" (130.175mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.156" (130.962mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.187" (131.750mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.218" (132.537mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.250" (133.350mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.281" (134.137mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.312" (134.925mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.343" (135.712mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.375" (136.525mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.406" (137.312mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.437" (138.100mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.468" (138.887mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.500" (139.700mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
5.031" (127.787mm)	5155-113-10001	5155-113-10002	5612-011-00322	5612-015-00322
5.062" (128.575mm)	5155-114-10001	5155-114-10002	5612-011-00324	5612-015-00324
5.093" (129.362mm)	5155-115-10001	5155-115-10002	5612-011-00326	5612-015-00326
5.125" (130.175mm)	5155-116-10001	5155-116-10002	5612-011-00328	5612-015-00328
5.156" (130.962mm)	5155-117-10001	5155-117-10002	5612-011-00330	5612-015-00330
5.187" (131.750mm)	5155-118-10001	5155-118-10002	5612-011-00332	5612-015-00332
5.218" (132.537mm)	5155-119-10001	5155-119-10002	5612-011-00334	5612-015-00334
5.250" (133.350mm)	5155-120-10001	5155-120-10002	5612-011-00336	5612-015-00336
5.281" (134.137mm)	5155-121-10001	5155-121-10002	5612-011-00338	5612-015-00338
5.312" (134.925mm)	5155-122-10001	5155-122-10002	5612-011-00340	5612-015-00340
5.343" (135.712mm)	5155-123-10001	5155-123-10002	5612-011-00342	5612-015-00342
5.375" (136.525mm)	5155-124-10001	5155-124-10002	5612-011-00344	5612-015-00344
5.406" (137.312mm)	5155-125-10001	5155-125-10002	5612-011-00346	5612-015-00346
5.437" (138.100mm)	5155-126-10001	5155-126-10002	5612-011-00348	5612-015-00348
5.468" (138.887mm)	5155-127-10001	5155-127-10002	5612-011-00350	5612-015-00350
5.500" (139.700mm)	5155-128-10001	5155-128-10002	5612-011-00352	5612-015-00352
If an Intermediate Mandrel is required, see page 11.				

5613 Series ID Burnishing Tool

5.527" - 6.537" (140.386MM - 166.040MM)



(D) Shank Length

5.00" (127.00mm)

(E) Shank Diameter

1	1.500" straight shank
2	#4 Morse Taper
3	40mm straight shank

When determining tool number, replace the * with the number determined in the Shank Diameter Table (E).

Example: A standard reach 5.813" diameter blind style tool with a #4 Morse Taper shank, is part number **5613-201-31372**

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions		
		(C) Gage Length: 9.125" (231.78mm)		
		Through	Blind	Bottoming
5.527" - 5.568" (140.386 - 141.427mm)	5.531" (140.487mm)	5613-*01-11354	5613-*01-31354	5613-*02-45354
5.559" - 5.600" (141.199 - 142.240mm)	5.563" (141.300mm)	5613-*01-11356	5613-*01-31356	5613-*02-45356
5.590" - 5.631" (141.986 - 143.027mm)	5.594" (142.088mm)	5613-*01-11358	5613-*01-31358	5613-*02-45358
5.621" - 5.662" (142.773 - 143.815mm)	5.625" (142.875mm)	5613-*01-11360	5613-*01-31360	5613-*02-45360
5.652" - 5.693" (143.561 - 144.602mm)	5.656" (143.662mm)	5613-*01-11362	5613-*01-31362	5613-*02-45362
5.684" - 5.725" (144.374 - 145.415mm)	5.688" (144.475mm)	5613-*01-11364	5613-*01-31364	5613-*02-45364
5.715" - 5.756" (145.161 - 146.202mm)	5.719" (145.263mm)	5613-*01-11366	5613-*01-31366	5613-*02-45366
5.746" - 5.787" (145.948 - 146.990mm)	5.750" (146.050mm)	5613-*01-11368	5613-*01-31368	5613-*02-45368
5.777" - 5.818" (146.736 - 147.778mm)	5.781" (146.837mm)	5613-*01-11370	5613-*01-31370	5613-*02-45370
5.809" - 5.850" (147.549 - 148.590mm)	5.813" (147.650mm)	5613-*01-11372	5613-*01-31372	5613-*02-45372
5.840" - 5.881" (148.336 - 149.377mm)	5.844" (148.438mm)	5613-*01-11374	5613-*01-31374	5613-*02-45374
5.871" - 5.912" (149.123 - 150.165mm)	5.875" (149.225mm)	5613-*01-11376	5613-*01-31376	5613-*02-45376

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.
Remaining sizes and styles located on next page.

5613 Series ID Burnishing Tool

5.527" - 6.537" (140.386MM - 166.040MM)

5613 SERIES ID BURNISHING TOOL

Tool Size Range*	(A) Tool Nominal Diameter	(B) Max Burnishing Reach: Controlled by tool length or shank extensions		
		(C) Gage Length: 9.125" (231.78mm)		
		Through	Blind	Bottoming
5.902" - 5.943" (149.911 - 150.952mm)	5.906" (150.012mm)	5613-*01-11378	5613-*01-31378	5613-*02-45378
5.934" - 5.975" (150.724 - 151.765mm)	5.938" (150.825mm)	5613-*01-11380	5613-*01-31380	5613-*02-45380
5.965" - 6.006" (151.511 - 152.552mm)	5.969" (151.613mm)	5613-*01-11382	5613-*01-31382	5613-*02-45382
5.996" - 6.037" (152.298 - 153.340mm)	6.000" (152.400mm)	5613-*01-11384	5613-*01-31384	5613-*02-45384
6.027" - 6.068" (153.086 - 154.127mm)	6.031" (153.187mm)	5613-*01-11386	5613-*01-31386	5613-*02-45386
6.059" - 6.100" (153.899 - 154.940mm)	6.063" (154.000mm)	5613-*01-11388	5613-*01-31388	5613-*02-45388
6.090" - 6.131" (154.686 - 155.727mm)	6.094" (154.788mm)	5613-*01-11390	5613-*01-31390	5613-*02-45390
6.121" - 6.162" (155.473 - 165.515mm)	6.125" (155.575mm)	5613-*01-11392	5613-*01-31392	5613-*02-45392
6.152" - 6.193" (156.261 - 157.302mm)	6.156" (156.362mm)	5613-*01-11394	5613-*01-31394	5613-*02-45394
6.184" - 6.225" (157.074 - 158.115mm)	6.188" (157.175mm)	5613-*01-11396	5613-*01-31396	5613-*02-45396
6.215" - 6.256" (157.861 - 158.902mm)	6.219" (157.963mm)	5613-*01-11398	5613-*01-31398	5613-*02-45398
6.246" - 6.287" (158.648 - 159.690mm)	6.250" (158.750mm)	5613-*01-11400	5613-*01-31400	5613-*02-45400
6.277" - 6.318" (159.436 - 160.477mm)	6.281" (159.537mm)	5613-*01-11402	5613-*01-31402	5613-*02-45402
6.309" - 6.350" (160.249 - 161.290mm)	6.313" (160.350mm)	5613-*01-11404	5613-*01-31404	5613-*02-45404
6.340" - 6.381" (161.036 - 161.077mm)	6.344" (161.138mm)	5613-*01-11406	5613-*01-31406	5613-*02-45406
6.371" - 6.412" (161.823 - 162.865mm)	6.375" (161.925mm)	5613-*01-11408	5613-*01-31408	5613-*02-45408
6.402" - 6.443" (161.619 - 163.652mm)	6.406" (162.712mm)	5613-*01-11410	5613-*01-31410	5613-*02-45410
6.434" - 6.475" (163.424 - 164.465mm)	6.438" (163.525mm)	5613-*01-11412	5613-*01-31412	5613-*02-45412
6.465" - 6.506" (164.211 - 165.252mm)	6.469" (164.313mm)	5613-*01-11414	5613-*01-31414	5613-*02-45414
6.496" - 6.537" (164.998 - 166.040mm)	6.500" (165.100mm)	5613-*01-11416	5613-*01-31416	5613-*02-45416

*An Intermediate Mandrel may be required to reach full tool range. Please see the Intermediate Mandrel table on page 11.

5613 Series - Rolls

5.527" - 6.537" (140.386MM - 166.040MM)

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll (R.032)	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
5.531" (140.487mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.563" (141.300mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.594" (142.088mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.625" (142.875mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.656" (143.662mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.688" (144.475mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.719" (145.263mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.750" (146.050mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.781" (146.837mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.815" (147.650mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.844" (148.438mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.875" (149.225mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.906" (150.012mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.938" (150.825mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
5.969" (151.615mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.000" (152.400mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.031" (153.187mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.063" (154.000mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.094" (154.788mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.125" (155.575mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.156" (156.362mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.188" (157.175mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.219" (157.963mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.250" (158.750mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.281" (159.537mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.315" (160.350mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.344" (161.158mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.375" (161.925mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.406" (162.712mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.438" (163.525mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.469" (164.315mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531
6.500" (165.100mm)	15	5100-701-00531	15	5100-704-00531	15	5100-708-00531

5613 Series - Mandrels & Cages

5.527" - 6.537" (140.386MM - 166.040MM)

5613 SERIES ID BURNISHING TOOL

Tool Nominal Diameter	Max Burnishing Reach: Controlled by tool length or shank extensions			
	Mandrel Tip Part #		Cage Part #	
	Blind & Through	Bottoming	Blind & Through	Bottoming
5.531" (140.487mm)	5155-129-10001	5155-129-10002	5613-011-00354	5613-015-00354
5.563" (141.300mm)	5155-130-10001	5155-130-10002	5613-011-00356	5613-015-00356
5.594" (142.088mm)	5155-131-10001	5155-131-10002	5613-011-00358	5613-015-00358
5.625" (142.875mm)	5155-132-10001	5155-132-10002	5613-011-00360	5613-015-00360
5.656" (143.662mm)	5155-133-10001	5155-133-10002	5613-011-00362	5613-015-00362
5.688" (144.475mm)	5155-134-10001	5155-134-10002	5613-011-00364	5613-015-00364
5.719" (145.263mm)	5155-135-10001	5155-135-10002	5613-011-00366	5613-015-00366
5.750" (146.050mm)	5155-136-10001	5155-136-10002	5613-011-00368	5613-015-00368
5.781" (146.837mm)	5155-137-10001	5155-137-10002	5613-011-00370	5613-015-00370
5.813" (147.650mm)	5155-138-10001	5155-138-10002	5613-011-00372	5613-015-00372
5.844" (148.438mm)	5155-139-10001	5155-139-10002	5613-011-00374	5613-015-00374
5.875" (149.225mm)	5155-140-10001	5155-140-10002	5613-011-00376	5613-015-00376
5.906" (150.012mm)	5155-141-10001	5155-141-10002	5613-011-00378	5613-015-00378
5.938" (150.825mm)	5155-142-10001	5155-142-10002	5613-011-00380	5613-015-00380
5.969" (151.613mm)	5155-143-10001	5155-143-10002	5613-011-00382	5613-015-00382
6.000" (152.400mm)	5155-144-10001	5155-144-10002	5613-011-00384	5613-015-00384
6.031" (153.187mm)	5155-145-10001	5155-145-10002	5613-011-00386	5613-015-00386
6.063" (154.000mm)	5155-146-10001	5155-146-10002	5613-011-00388	5613-015-00388
6.094" (154.788mm)	5155-147-10001	5155-147-10002	5613-011-00390	5613-015-00390
6.125" (155.575mm)	5155-148-10001	5155-148-10002	5613-011-00392	5613-015-00392
6.156" (156.362mm)	5155-149-10001	5155-149-10002	5613-011-00394	5613-015-00394
6.188" (157.175mm)	5155-150-10001	5155-150-10002	5613-011-00396	5613-015-00396
6.219" (157.963mm)	5155-151-10001	5155-151-10002	5613-011-00398	5613-015-00398
6.250" (158.750mm)	5155-152-10001	5155-152-10002	5613-011-00400	5613-015-00400
6.281" (159.537mm)	5155-153-10001	5155-153-10002	5613-011-00402	5613-015-00402
6.313" (160.350mm)	5155-154-10001	5155-154-10002	5613-011-00404	5613-015-00404
6.344" (161.138mm)	5155-155-10001	5155-155-10002	5613-011-00406	5613-015-00406
6.375" (161.925mm)	5155-156-10001	5155-156-10002	5613-011-00408	5613-015-00408
6.406" (162.712mm)	5155-157-10001	5155-157-10002	5613-011-00410	5613-015-00410
6.438" (163.525mm)	5155-158-10001	5155-158-10002	5613-011-00412	5613-015-00412
6.469" (164.313mm)	5155-159-10001	5155-159-10002	5613-011-00414	5613-015-00414
6.500" (165.100mm)	5155-160-10001	5155-160-10002	5613-011-00416	5613-015-00416
If an Intermediate Mandrel is required, see page 11.				

Compact Burnishing Tool

Fine Finishes, Even With Limited Space

Compact Burnishing Tools are designed for applications where the machine working envelope is limited, making them ideal for Swiss-style turning centers or a Swiss-style machines.

Compact Burnishing Tools yield the same results as their standard equivalent, including accurate sizing, fine surface finishes, and work hardening of the material. Designed to be mounted in a gang slide or directly into a tool block, we have something for every machine style.

FEATURES AND BENEFITS:

Flexible Sizing

ID Multi-Roll styles can down to 4mm in standard designs

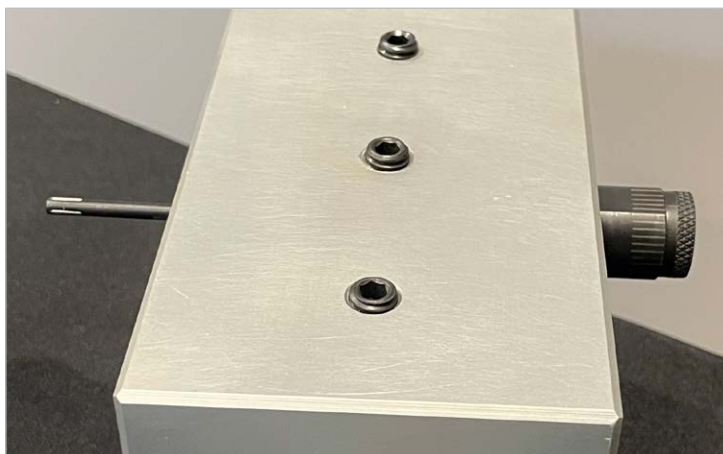
Ideal for Swiss-Type Machines

Designed for applications where the working envelope is limited.

Style Options

Available in ID Multi-Roll and stick style.

Any 5418 Series tool can be made as a 5918 Series.



THE 5918 SERIES model locates the tool body completely inside the tool block, allowing adjustment knob to protrude from rear of tool block. This allows the burnishing tool size to be fine tuned without removing it from the tool block.

OD Multi-Roll Burnishing Tool

APPLICATION:

OD Finishing

FINISH RANGE:

4 – 24 μ in. (0.10 – 0.60 μ mm)

Faster, Precise OD Finishing

The multi-roll OD burnishing tools deliver superior results for sizing, finishing, and hardening external surfaces and tube ends.

Eliminating costly secondary processes such as grinding and honing, the OD burnishing tool uses compressive forces to cold work the metal, resulting in a smooth surface finish.

FEATURES AND BENEFITS:**One Step Operation**

Produce a 4 – 8 Ra surface finish in one pass.

Accurate Sizing

Precision tools allow for minute 0.0001" adjustments, producing accurate sizing.

Lower Production Costs

Eliminate costly secondary operations such as grinding, honing, and polishing.

Increase Part Life

Increased surface hardness from cold working the material makes it less susceptible to wear and tear, prolonging the life of the part.

Better Part Performance

A smooth hole finish reduces the amount of friction generated while in use, preventing premature failure or excess wear on the part.

Great For Small Diameters

Create a smooth, uniform finish on smaller diameter parts that are prone to deformation.

**SPARES:**

- Rolls
- Cage
- Mandrel

OD Carbide Roll Burnishing Tool

ROLL RADIUS:	ROLL TYPES:	APPLICATION:	FINISH RANGE:
0.032" – 0.125" (0.787 – 3.175 mm)	Standard Carbide Roll, Top Hat Roll	External Diameters, Tapers, Radii, Faces, and Bores	4 – 24 μ in. (0.10 – 0.60 μ mm)

Superior Surface Finishes In A Single Operation

Elliott's Outside Diameter (OD) Carbide Roll Burnishing Tool is designed to create extremely fine finishes.

This versatile tool is capable of burnishing external diameters, tapers, radii, faces, and large internal bores up to 1" deep.

FEATURES AND BENEFITS:

One Step Operation

Produce a 4 – 8 Ra surface finish in one pass.

Dual Spring Design

The tool's innovative spring system enables both the entire head assembly and the carbide roll to deflect independently, ensuring optimal performance on various surfaces

Lower Production Costs

Eliminate costly secondary operations such as grinding, honing, and polishing

Unmatched Versatility

Great for a wide range of applications and materials, providing flexibility and adaptability for diverse applications.

Increase Part Life

Increased surface hardness from cold working the material makes it less susceptible to wear and tear, prolonging the life of the part.

Easy To Use

Easy to use and maintain, requiring minimal operator training.

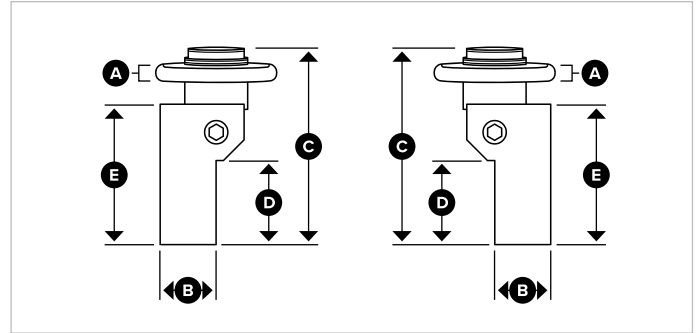
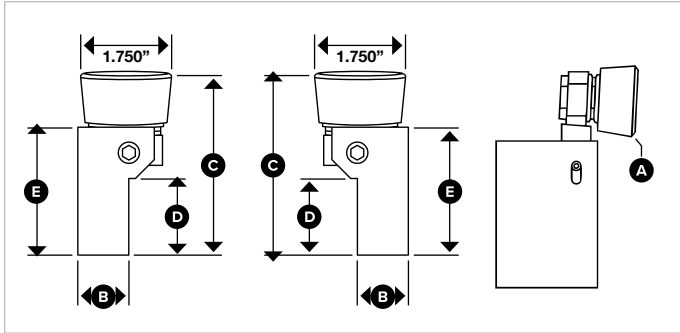
SPARES:

- Rolls
- Axle
- Bearing
- Washers



OD Carbide Roll Burnishing Tool

STANDARD TOOL STYLES & SIZES



STANDARD STYLE

Tool Number	Left or Right Hand	Roll Radius (A)	Shank Size (B)	Overall Height (C)	Clamping Height (D)	Block Height (E)
S2302-00	Left	0.032"	0.750"	3.250"	1.250"	2.250"
S2306-00	Right	0.032"	0.750"	3.250"	1.250"	2.250"
S2427-00	Left	0.093"	0.750"	3.500"	1.250"	2.250"
S2488-00	Right	0.093"	0.750"	3.250"	1.250"	2.250"
S2075-00	Left	0.032"	1.000"	3.500"	1.500"	2.500"
S2121-00	Right	0.032"	1.000"	3.500"	1.500"	2.500"
S2548-00	Left	0.062"	1.000"	3.500"	1.500"	2.500"
S2549-00	Right	0.062"	1.000"	3.500"	1.500"	2.500"
S2233-00	Left	0.093"	1.000"	3.500"	1.500"	2.500"
S2327-00	Right	0.093"	1.000"	3.500"	1.500"	2.500"
S2313-00	Left	0.032"	1.250"	3.500"	1.500"	2.500"
S2384-00	Right	0.032"	1.250"	3.500"	1.500"	2.500"
S2302-00M	Left	0.813mm	19.05mm	82.55mm	31.75mm	57.15mm
S2306-00M	Right	0.813mm	19.05mm	82.55mm	31.75mm	57.15mm
S2427-00M	Left	2.36mm	19.05mm	88.90mm	31.75mm	57.15mm
S2488-00M	Right	2.36mm	19.05mm	82.55mm	31.75mm	57.15mm
S2075-00M	Left	0.787mm	25mm	88.90mm	38.10mm	63.50mm
S2121-00M	Right	0.787mm	25mm	88.90mm	38.10mm	63.50mm
S2548-00M	Left	1.570mm	25mm	88.90mm	38.10mm	63.50mm
S2549-00M	Right	1.570mm	25mm	88.90mm	38.10mm	63.50mm
S2233-00M	Left	2.360mm	25mm	88.90mm	38.10mm	63.50mm
S2327-00M	Right	2.360mm	25mm	88.90mm	38.10mm	63.50mm
S2313-00M	Left	0.81mm	31.75mm	88.90mm	38.10mm	63.50mm
S2384-00M	Right	0.81mm	31.75mm	88.90mm	38.10mm	63.50mm

TOP HAT STYLE

Tool Number	Left or Right Hand	Roll Radius (A)	Shank Size (B)	Overall Height (C)	Clamping Height (D)	Block Height (E)
5900-100-81223	Left	0.125"	0.750"	3.203	1.245	2.250
5900-100-81452	Right	0.125"	0.750"	3.203	1.245	2.250
5900-100-80477	Left	0.125"	1.000"	3.450"	1.500"	2.500"
5900-100-80558	Right	0.125"	1.000"	3.450"	1.500"	2.500"
CB253-00	Left	0.125"	1.250"	3.452	1.500	2.500
CB340-00	Right	0.125"	1.250"	3.500	1.500	2.500
5900-100-81223M	Left	3.17mm	20mm	81.36mm	31.62mm	57.15mm
5900-100-81452M	Right	3.17mm	20mm	81.36mm	31.62mm	57.15mm
5900-100-80477M	Left	3.175mm	25.40mm	87.63mm	38.10mm	63.50mm
5900-100-80558M	Right	3.175mm	25.40mm	87.63mm	38.10mm	63.50mm
CB253-00M	Left	3.17mm	32mm	87.69mm	38.10mm	63.50mm
CB253-00M	Right	3.17mm	32mm	88.90mm	38.10mm	63.50mm

SPARE PARTS

Part Number	Description
S2075-05	R.031" Carbide Roll
S2430-05	R.062" Carbide Roll
S2233-05	R.093" Carbide Roll
5900-700-80282	R.125" Carbide Roll
S2289-05	R.031" Carbide Roll
S2289-05A	R.093" Carbide Roll
S2075RA	R.031" Carbide Roll/Axle Assembly
S2430RA	R.062" Carbide Roll/Axle Assembly
S2233RA	R.093" Carbide Roll/Axle Assembly
5900-700-80282RA	R.125" Carbide Roll/Axle Assembly
S2289RA	R.031" Carbide Roll/Axle Assembly

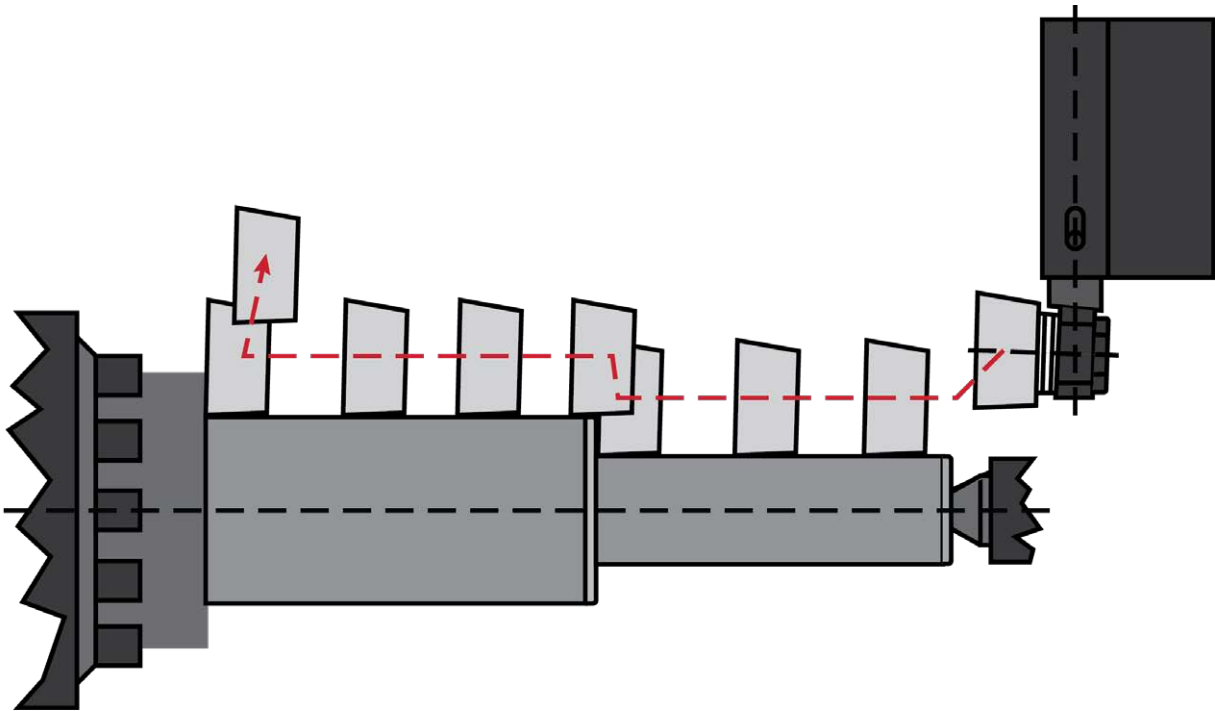
OD Carbide Roll Burnishing Tool

TOOL OPERATION PROCEDURE & ROLL PATH

OD CARBIDE ROLL BURNISHING TOOL

One series of springs, located in the shank, allows the entire head assembly to deflect when the carbide roll is pushed against a surface. A second spring, located behind the carbide roll, allow the carbide roll to deflect when the tool is fed directly into a face surface or shoulder.

PART PREPARATION:	SPEED:	COOLANT PREPARATION:	FEED RATE:	Ensure bearings are sufficiently greased at all times.
60 - 100 Ra uin	400 to 800 surface ft. per min (1200 max)	Cutting Oil or Water Soluble Coolant (6% - 10% Concentration)	0.002 / 0.006	



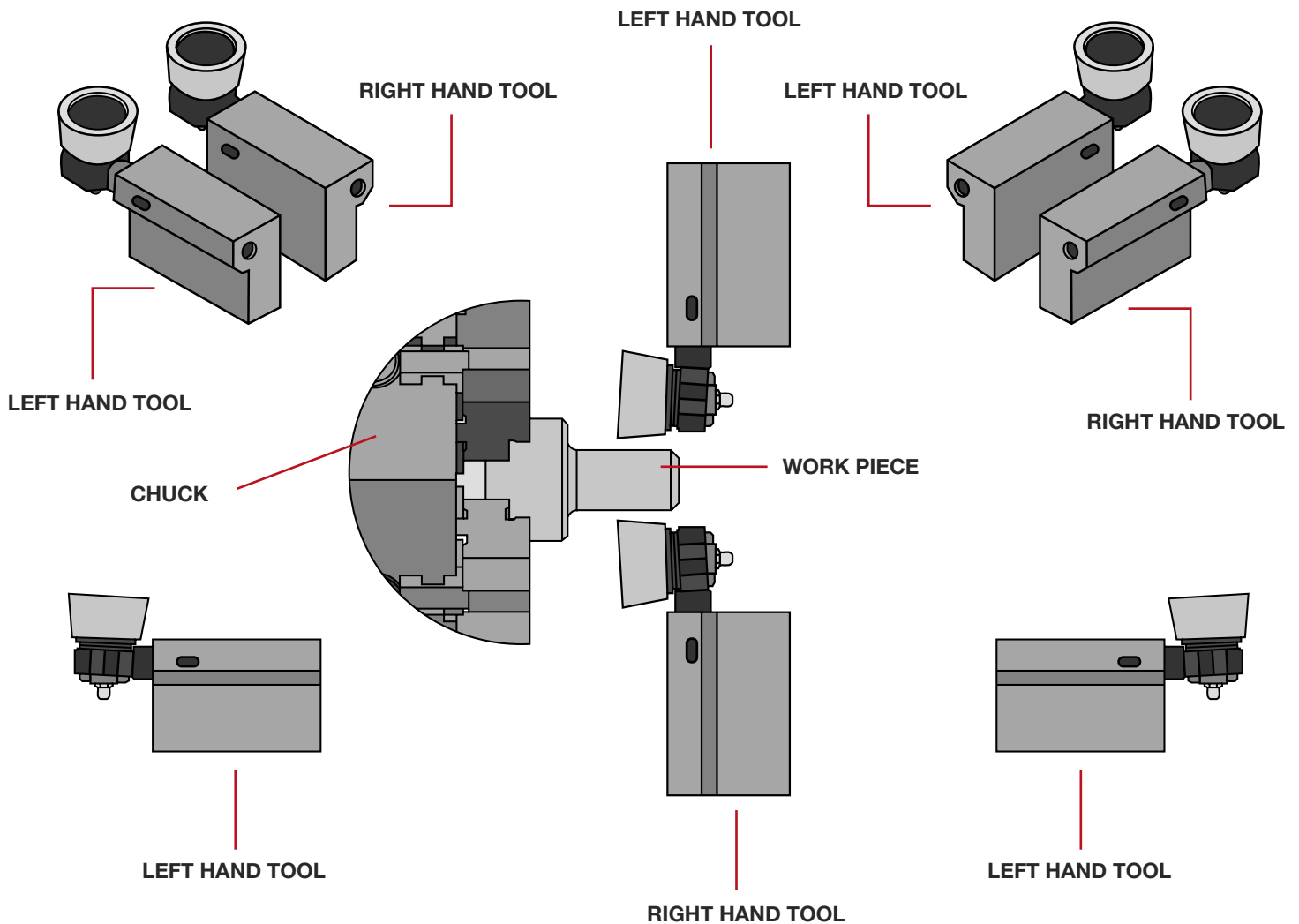
SCAN TO SEE THE OD CARBIDE ROLL
BURNISHING TOOL **TECH MANUAL**

OD Carbide Roll Burnishing Tool

TOOL DIRECTION GUIDE

The OD carbide roll burnishing tool is designed to run on the centerline of your spindle. Depending on the orientation of your lathe machine/turret, this may require a left or right handed tool. See below to visualize the tool's orientation.

Remember burnishing is occurring at the largest diameter of the roll and is most commonly traveling in the direction of this leading edge. In some instances, however, the tool may travel in the opposite direction. Most simply, imagine "being the part" in the chuck spindle. If the tool is coming towards you on the left side, it is a left hand tool. If the tool is coming towards you on the right side, then it is a right hand tool.



OD Carbide Roll vs. OD Multi-Roll Burnishing



WHEN IT COMES TO ACHIEVING A SMOOTH, WORK-HARDENED FINISH

on the exterior of a part, manufacturers have several tooling options. Two prominent choices are the OD carbide roll burnishing tool and the OD multi-roll tool, each with distinct advantages and ideal applications. Understanding these differences is key to optimizing your process for efficiency, precision, and cost-effectiveness.

OD Multi-Roll Tools: Speed and Precision for Specific Applications

OD multi-roll tools are characterized by their ability to deploy multiple rolls simultaneously to work on a specific area of the part. This design inherently offers a faster cycle time due to the distributed workload.

KEY ADVANTAGES OF OD MULTI-ROLL TOOLS:

Exceptional Precision and Tight Tolerances: These tools are typically adjusted to the desired finished size before being run, making them ideal for applications where extremely tight tolerances are required. The pre-set nature ensures consistent results.

Reduced Deformation on Small or Thin Parts: For parts with smaller diameters (around 1/2 inch or less) or thinner walls, multi-roll tools are particularly effective. The balanced pressure exerted by multiple rolls helps to prevent material deformation, which can be a significant concern with other tooling methods.

Faster Cycle Times: As multiple rolls work concurrently, the overall time required to burnish a specific area is reduced, leading to increased throughput.

CONSIDERATIONS AND LIMITATIONS OF OD MULTI-ROLL TOOLS:

Limited Burnishing Length: A notable disadvantage is that multi-roll tools can only burnish a set part length, and there's a restriction on how long the rolls can extend. Consequently, they are generally used to finish the end of a part rather than the entire surface.

Specialized and More Expensive: Due to their custom and specialized nature, multi-roll tools tend to be more expensive upfront. This investment is typically justified when high-volume production of specific, tightly tolerance parts is required.

OD Carbide Roll Tools: Versatility and Durability for Diverse Applications

In contrast, the single-point OD carbide roll burnishing tool offers a high degree of versatility and adaptability, making it a popular choice for a broader range of applications.

KEY ADVANTAGES OF OD CARBIDE ROLL BURNISHING TOOLS:

Exceptional Versatility and Adaptability: This tool is designed to follow the path of the machined surface, allowing it to accommodate different part lengths and geometries. It's not limited by a specific size or part design.

Ideal for Longer or Larger Parts: The single-point nature makes it well-suited for burnishing the entire surface of longer or larger parts, where the limited reach of multi-roll tools would be a hindrance.

Broad Application Across Product Lines: Since it's not custom-designed for a specific part, a single carbide roll tool can

be used across different product lines. This reduces the need to purchase and set up multiple specialized tools, offering significant cost savings in the long run.

Durability and Extended Life: The carbide roll is exceptionally durable and can be reground after extensive use. This ability to be reconditioned extends the tool's lifespan significantly, offering additional value before a new replacement is required.



Feature	OD Multi-Roll	OD Carbide Roll
Cycle Time	Faster for specific areas	Slower for specific areas, but adaptable to length
Tolerance Holding	Excellent for tight tolerances (pre-set)	Good, follows finished surface
Part Size/Thickness	Ideal for smaller diameter parts (1/2" or less depending on material)	Excellent for complex geometries
Burnishing Length	Working length built into the tool	Accommodates different part lengths
Versatility	Defined diametrical working range & working reach.	Highly versatile, usable across product lines
Durability	Component design allows for replacement to keep the tool in good working order for a long period of time	Highly durable, can be reground for extended life

Making the Right Choice

In conclusion, the decision between an OD carbide roll burnishing tool and an OD multi-roll tool hinges on your specific manufacturing needs:

Choose an OD multi-roll tool if: You require extremely tight tolerances, prioritize the fastest possible cycle time for a specific, limited burnishing area (e.g., the end of a shaft), and have high-volume production justifying the specialized investment.

Opt for an OD carbide roll tool if: You need a versatile solution for a variety of part sizes and lengths, desire the flexibility to use one tool across multiple product lines, or require a durable tool that offers extended life through reconditioning.

By carefully evaluating these factors, you can select the burnishing tool that best optimizes your production process for efficiency, quality, and cost-effectiveness.

ID/OD Carbide Roll Burnishing Tool

ROLL RADIUS:	EFFECTIVE REACH:	APPLICATION:	FINISH RANGE:
0.032" – 0.093" (0.787 – 2.360 mm))	3.10" – 12.0" (78.74 – 304.80 mm)	External Diameters and Internal Bores	4 – 24 μ in. (0.10 – 0.60 μ mm)

Transform Your Turning Center Into a Fine Finishing Machine

ID/OD Carbide Burnishing Tools are designed to produce a smooth finish on both internal (ID) and external (OD) surfaces.

This versatile tool is capable of burnishing external diameters and large internal bores to a depth of 12".

FEATURES AND BENEFITS:

One Step Operation

Produce a 4 – 8 Ra surface finish in one pass.

Dual Spring Design

The tool's innovative spring system enables both the entire head assembly and the carbide roll to deflect independently, ensuring optimal performance on various surfaces.

Lower Production Costs

Eliminate costly secondary operations such as grinding, honing, and polishing.

Unmatched Versatility

Great for a wide range of applications and materials, providing flexibility and adaptability for diverse applications.

Increase Part Life

Increased surface hardness from cold working the material makes it less susceptible to wear and tear, prolonging the life of the part.

Easy To Use

Easy to use and maintain, requiring minimal operator training.

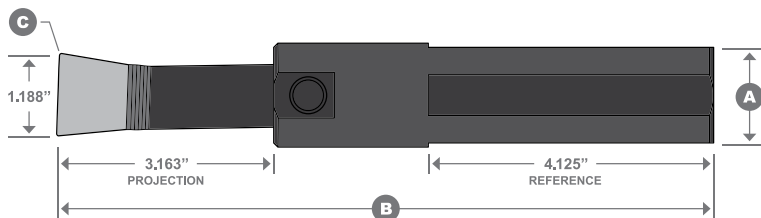
SPARES:

- Rolls
- Axle
- Bearing



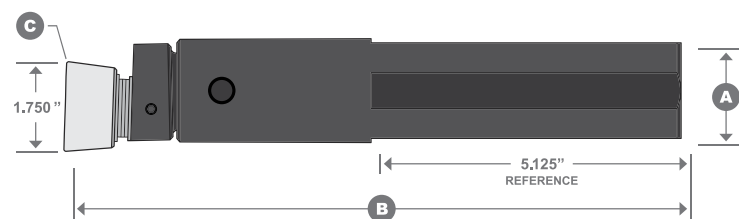
ID/OD Carbide Roll Burnishing Tool

STANDARD TOOL STYLES & SIZES



S2289-00

Designed to burnish parts with a bore diameter between 1.375" – 2.500" and to a depth of 3.000".



S2320-00

Designed to burnish parts with a bore diameter 2.375" and larger and to a depth of 8.000".

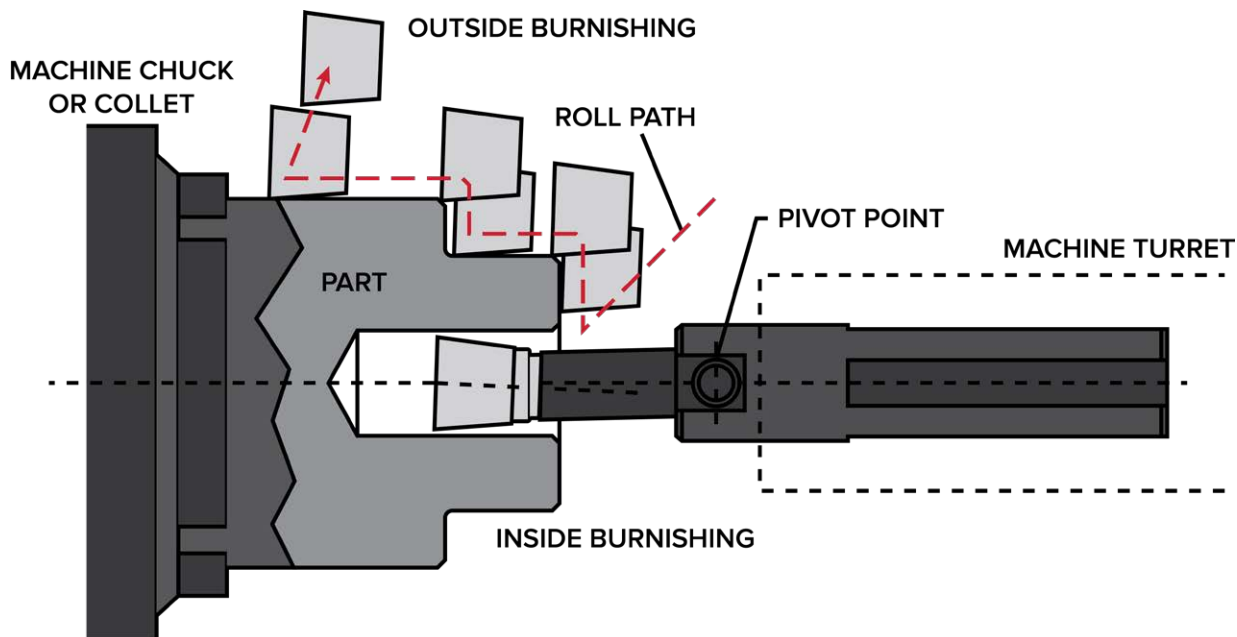
Tool Number	Shank Size (A)	Overall Length (B)	Effective Reach	Roll Radius (C)
S2289-00	1.500"	9.500" (241.300mm)	3.100" (78.740mm)	0.032" (0.787mm)
S2289-00M	40mm	9.500" (241.300mm)	3.100" (78.740mm)	0.032" (0.787mm)
S2289A00	1.500"	9.500" (241.300mm)	3.100" (78.740mm)	0.093" (2.360mm)
S2289A00M	40mm	9.500" (241.300mm)	3.100" (78.740mm)	0.093" (2.360mm)
S2289B00	1.500"	9.500" (241.300mm)	3.100" (78.740mm)	0.062" (1.570mm)
S2289B00M	40mm	9.500" (241.300mm)	3.100" (78.740mm)	0.062" (1.570mm)
S2320-00	2.000"	12.000" (304.800mm)	6.000" (152.400mm)	0.032" (0.787mm)
S2320-00M	50mm	12.000" (304.800mm)	6.000" (152.400mm)	0.032" (0.787mm)
S2340-00	2.000"	12.000" (304.800mm)	6.000" (152.400mm)	0.093" (2.360mm)
S2340-00M	50mm	12.000" (304.800mm)	6.000" (152.400mm)	0.093" (2.360mm)
CB127-00	2.000"	12.000" (304.800mm)	6.000" (152.400mm)	0.062" (1.570mm)
CB127-00M	50mm	12.000" (304.800mm)	6.000" (152.400mm)	0.062" (1.570mm)
S2320A00	2.000"	18.000" (457.200mm)	12.000" (304.800mm)	0.032" (0.787mm)
S2320A00M	50mm	18.000" (457.200mm)	12.000" (304.800mm)	0.032" (0.787mm)
CB168-00	2.000"	18.000" (457.200mm)	12.000" (304.800mm)	0.062" (1.570mm)
CB168-00M	50mm	18.000" (457.200mm)	12.000" (304.800mm)	0.062" (1.570mm)
S2340A00	2.000"	18.000" (457.200mm)	12.000" (304.800mm)	0.093" (2.360mm)
S2340A00M	50mm	18.000" (457.200mm)	12.000" (304.800mm)	0.093" (2.360mm)

ID/OD Carbide Roll Burnishing Tool

TOOL OPERATION PROCEDURE & ROLL PATH

One series of springs, located in the shank, allows the entire head assembly to deflect when the carbide roll is pushed against a surface. A second spring, located behind the carbide roll, allow the carbide roll to deflect when the tool is fed directly into a face surface or shoulder.

PART PREPARATION:	SPEED:	COOLANT PREPARATION:	FEED RATE:	Ensure bearings are sufficiently greased at all times.
60 - 100 Ra uin	400 to 800 surface ft. per min (1200 max)	Cutting Oil or Water Soluble Coolant (6% - 10% Concentration)	0.002 / 0.006	



SCAN TO SEE THE OD/ID CARBIDE ROLL
BURNISHING TOOL **TECH MANUAL**

Diamond Burnishing Tool

APPLICATION:	MACHINE COMPATIBILITY:	STYLES:	FINISH RANGE:
External Diameters and Internal Bores	Manual Lathes and Turning	Boring Bar & Stick	2 – 32 μ in. Ra (0.05 – 0.08 μ mm Ra)

Economical Solution For A Superior Mirror-Like Finish

Diamond burnishing tools are designed for linear applications and used in lathes and similar machines.

The diamond burnishing tools feature replaceable diamond stems in two different styles, making it a cost efficient method to produce an ultra-smooth surface finish on linear surfaces. Great for required surface finishes and surface hardening of bores.

FEATURES AND BENEFITS:

One Step Operation

Produce a 2 - 32 Ra surface finish in one pass.

Replaceable Diamond Stems

With two styles of replaceable diamond stems, it offers a cost-effective solution for achieving ultra-smooth surface finishes.

Versatile Design

Available in a range of styles to suit various applications, including slim-line square, offset, on-center, and boring bar.

Convenient Kits

Available in ready to use kits, that include a complete tool, spare diamond stem, spring, and allen key for easy maintenance and replacement.

Increase Part Life

Increased surface hardness from cold working the material makes it less susceptible to wear and tear, prolonging the life of the part.

Easy To Use

Easy to use and maintain, requiring minimal operator training.

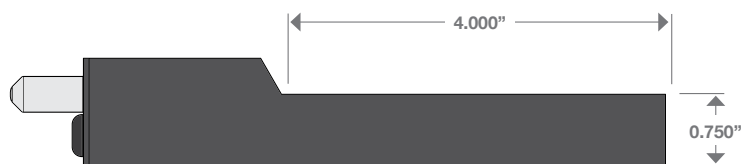
SPARES:

- Diamond Stem



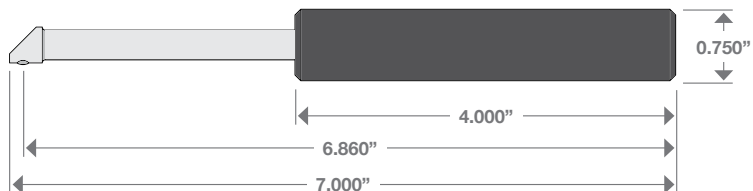
Diamond Burnishing Tool

STANDARD TOOL STYLES & SIZES



STICK STYLE (S2300-00)

The stick design makes the tool ideal for smaller lathes and allows for close approaches. The offset design sets the tool on correct centerline.



BORING BAR STYLE (S2295-00)

The boring-bar style is designed for lathes or turning centers to provide an improved surface finish in bores from 0.500" to 1.375" diameter x 2.800" deep. This tool can be used on most metals with a hardness below Rc40.

STANDARD DIAMOND BURNISHING TOOLS

Tool Number	Description
S2300-00	0.750" square with offset tool holder
S2300-00M	20mm shank with offset tool holder
S2300A00	1.000" square with offset tool holder
S2300A00M	25mm square with offset tool holder
S2300M00	1.000" x 25mm square shank with diamond on center
S2295-00	Boring Bar Style with .750" Square Shank

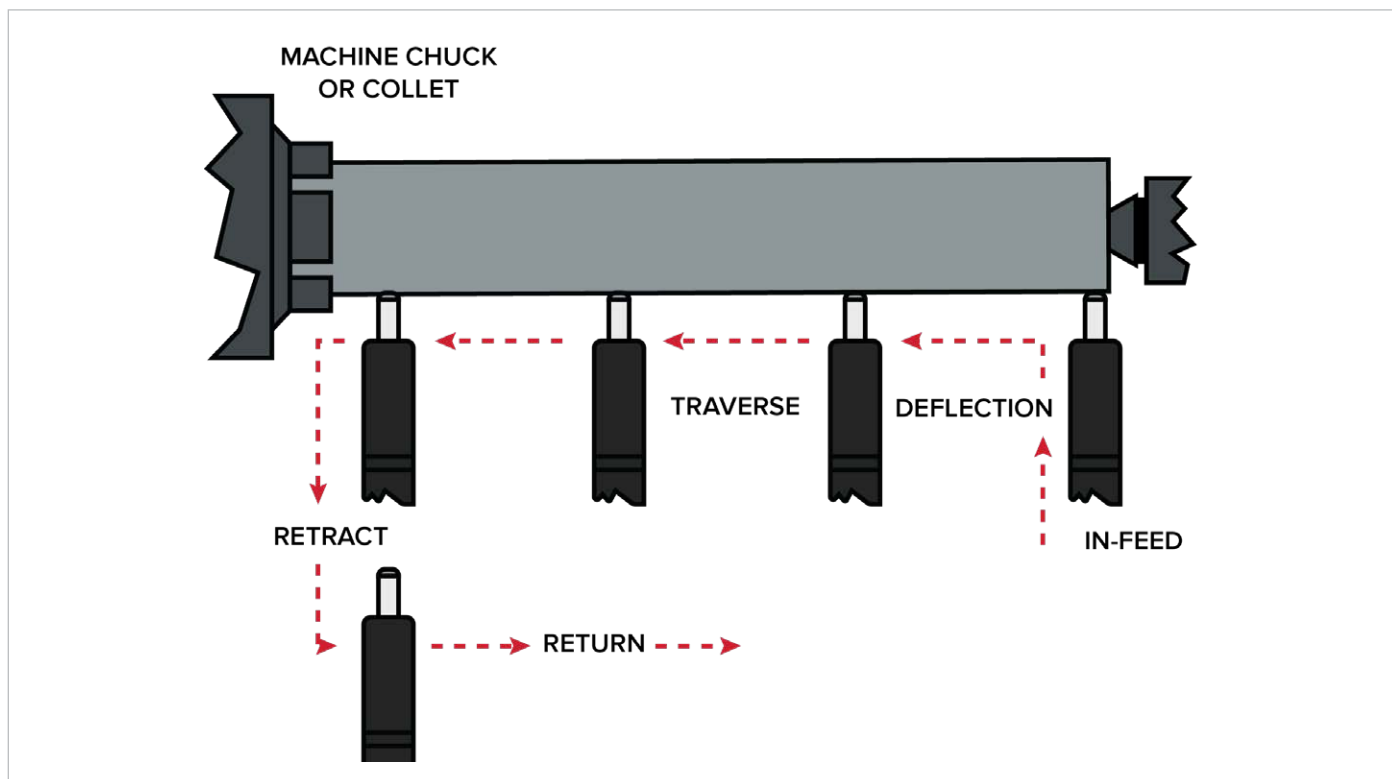
REPLACEMENT PARTS

Complete Tool	Diamond Stem	Spring	Screw
S2300-00	S375D1	S375-4-165	P8597-2N
S2300A00	S375D1	S375-4-165	P8597-2N
S2300B00	S375D1	S375-4-165	P8597-2N
S2300M00	S375D1	S375-4-165	128Y
S2295-00	S2295D1	-	548H
S2300-00M	S375D1	S375-4-165	P8597-2N
S2300A00M	S375D1	S375-4-165	P8597-2N
S2300B00M	S375D1	S375-4-165	P8597-2N

Diamond Burnishing Tool

TOOL OPERATION PROCEDURE & ROLL PATH

PART PREPARATION:	SPEED:	COOLANT PREPARATION:	FEED RATE:
60 - 100 Ra uin	250 to 500 surface ft.per min (750 max)	Cutting Oil or Water Soluble Coolant (6% - 10% Concentration)	0.003"/0.004"

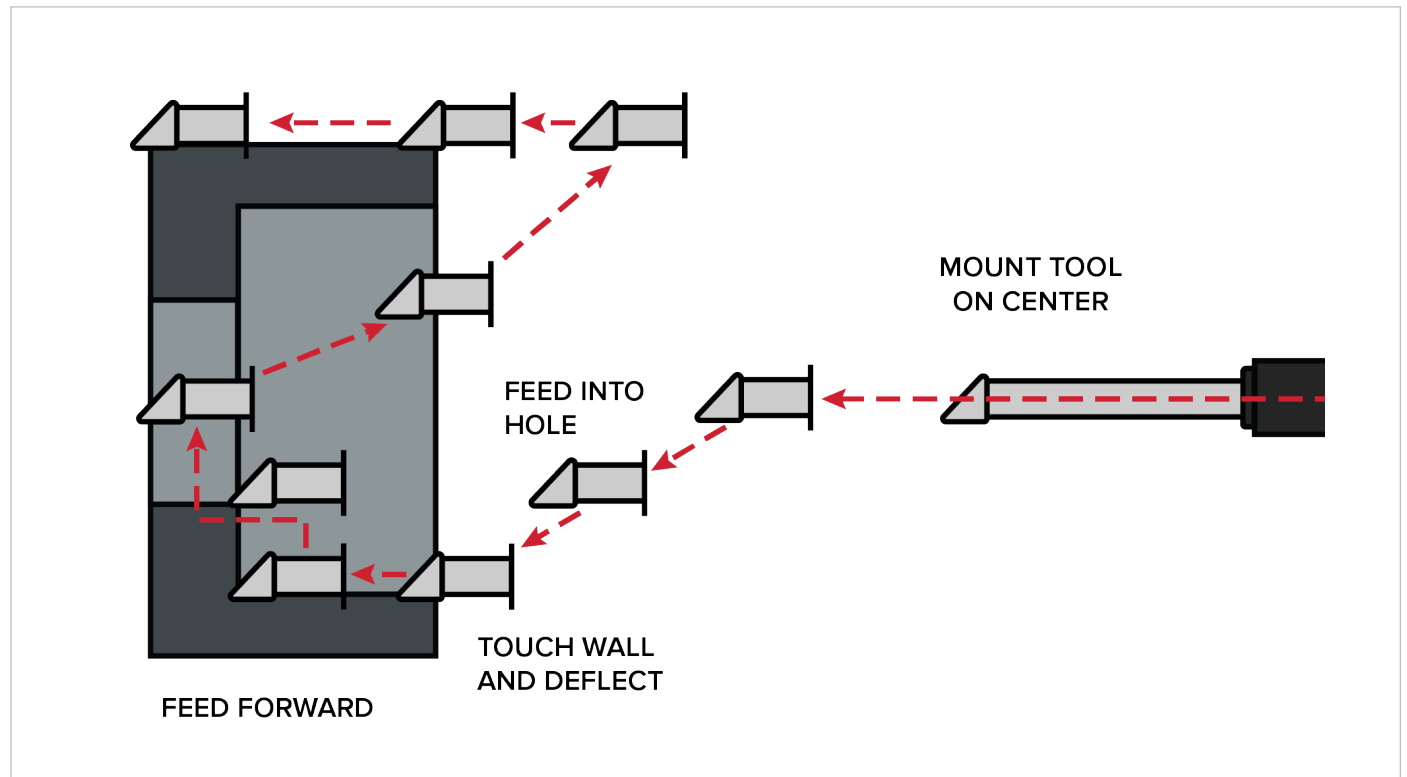


SCAN TO SEE THE DIAMOND
BURNISHING TOOL **TECH MANUAL**

Diamond Burnishing Tool

TOOL OPERATION PROCEDURE & ROLL PATH

PART PREPARATION:	SPEED:	COOLANT PREPARATION:	FEED RATE:	MIN. HOLE DIAMETER:	MAXIMUM TOOL REACH:
60 - 100 Ra uin	250 to 500 surface ft. per min (750 max)	Cutting Oil or Water Soluble Coolant (6% - 10% Concentration)	0.003"/0.004"	0.500"	2.861"



Carbide Roll vs. Diamond Stem

MATERIAL HARDNESS, VOLUME AND PART PROFILE

Burnishing is a fast and easy method to improve the surface finish of a part. When it comes to finishing an outside diameter or profiled surface, there are two primary options, carbide roll burnishing and diamond burnishing. While both options will produce a similar end finish, they may not work in all applications. Understanding the benefits and limitations of each method will ensure that you select the right tool for the job.

There are 3 main factors that will influence how a burnishing tool is selected: Material hardness, volume, and the part profile.

01 MATERIAL HARDNESS

Material hardness is one of the most important considerations for burnishing applications, as it helps determine what tool is necessary and the end finish that can be achieved. For harder materials, 45 HRC and above, a diamond burnishing tool will perform the best.

In contrast, a diamond burnishing tool does not handle softer materials like Aluminum, Copper, or Brass very well. Since the material is softer, the diamond tip can deform the material too much and cause build-up on the tip, creating imperfections or dig marks on the surface. In these cases, a carbide roll burnishing tool would be the best option, since it can produce smooth finishes on soft materials.

02 VOLUME

While the volume of production won't have a direct impact on the surface finish achieved, it will impact the number of spare parts required for the job. For high volume production, 3,000 parts or more, a carbide roll tool is recommended. This is because the tool is extremely durable and more versatile than a diamond tool. The carbide roll itself has a much longer life and less inconsistencies than the diamond stems, which will result in less downtime due to roll changes. Additionally, the carbide roll tool can work on a wider variety of parts, so it can be easily moved to another production line if the job changes.

03 PART PROFILE

The last factor impacting tool selection is the profile of the part itself. Due to the design of the diamond tool, it has to remain perpendicular to the part being burnished. This means that it will only work on straight, linear surfaces. In contrast, a carbide roll tool can burnish curved and concaved surfaces, allowing for more flexibility in the parts it's used on.

Overall, both diamond and carbide roll burnishing tools are great options for creating smooth finishes on the exterior of a part. However, when choosing between the two, diamond style tools are the best equipped for harder materials and linear surfaces, while carbide roll tools are great for high volume production and curved surfaces.

Angle Burnishing Tool

APPLICATION:

ID or OD Angles

FINISH RANGE:

4 – 24 μ in. (0.10 – 0.60 μ mm)

Smooth Finishes For Complex Angles

Angle Burnishing tools create smooth, localized finishes in ID or OD angle applications. Best suited for complex part geometries, these tools create a smooth, repeatable finish in hard to reach areas.

Eliminating costly secondary processes such as grinding and honing, the Angle Burnishing tool uses compressive forces to cold work the metal, resulting in a smooth surface finish.

FEATURES AND BENEFITS:

One Step Operation

Produce a 4 – 8 Ra surface finish in one pass.

Lower Production Costs

Eliminate costly secondary operations such as grinding, honing, and polishing.

Increase Part Life

Increased surface hardness from cold working the material makes it less susceptible to wear and tear, prolonging the life of the part.

Better Part Performance

A smooth finish reduces the amount of friction generated while in use, preventing premature failure or excess wear on the part.

Great For High Volume

Quickly achieve a single digit finish in a specific area every time.

SPARES:

- Rolls



APPLICATION:

Face Profiles

FINISH RANGE:

4 – 24 μ in. (0.10 – 0.60 μ mm)

Superior Face Finishes, Every Time

Face Burnishing tools create smooth, localized finishes in face or profile applications. Best suited for sealing and mating surfaces, these tools create a smooth, repeatable finish.

Eliminating costly secondary processes such as grinding and honing, the Face Burnishing tool uses compressive forces to cold work the metal, resulting in a smooth surface finish.

FEATURES AND BENEFITS:**One Step Operation**

Produce a 4 – 8 Ra surface finish in one pass.

Lower Production Costs

Eliminate costly secondary operations such as grinding, honing, and polishing.

Increase Part Life

Increased surface hardness from cold working the material makes it less susceptible to wear and tear, prolonging the life of the part.

Better Part Performance

A smooth finish reduces the amount of friction generated while in use, preventing premature failure or excess wear on the part.

Great For High Volume

Quickly achieve a single digit finish in a specific area every time.

SPARES:

- Rolls



Burnishing For Precision

WHEN TO USE ANGLE OR FACE ROLLER BURNISHING TOOLS

As part complexity increases, specialized burnishing tools can offer a cost-effective solution for achieving precise finishes. Angle and face burnishing tools are designed to better accommodate specific part geometries, enhancing efficiency, and reducing processing time. Understanding the benefits and limitations of these tools can allow you to choose the best tool for your application.

The Challenge of Finishing Complex Part Geometries

Fittings and other mating surface parts require a fine surface finish in the sealing area. The better the finish, the less friction the part will be subject to, increasing durability and part life. Today, many manufacturers will utilize honing or grinding operations to create the desired surface finish on these parts, however, it can be costly and time consuming. Additionally, in smaller spaces or more complicated geometries, honing and grinding may not be applicable, which means more specialized finishing is required.

One of the most efficient methods for finishing these types of applications is with face or angle burnishing. Angle burnishing tools are designed for finishing ID or OD angles in a part, while face burnishing tools are designed to burnish a specific face profile. Both the angle and face burnishing tools are a good solution for high volume production, because they can quickly achieve a single digit finish in a localized area repeatedly. Additionally, these are a good option when working in smaller parts, because it can burnish the area more effectively than other methods.

LIMITATIONS TO CONSIDER

One limitation with these tools is that they lack versatility. Due to their custom nature, they cannot be easily adapted to other lines or parts like other standard burnishing tools can. In low volume applications, a custom tool may not make sense depending on the cost of the tool.

Overall, specialized angle and face burnishing tools offer a valuable solution for manufacturers seeking to achieve precise finishes on complex parts. By understanding the benefits and limitations of angle and face burnishing, businesses can make informed decisions to optimize their finishing processes.



MODEL
ELC110220

VOLTAGE
110V - 240V

LANGUAGES
ENG & ESP

TUBE SIZE
0.25" - 3.0"

ELC110220 ELECTRIC TORQUE CONTROLLER

SET UP JOBS 2-3 TIMES FASTER

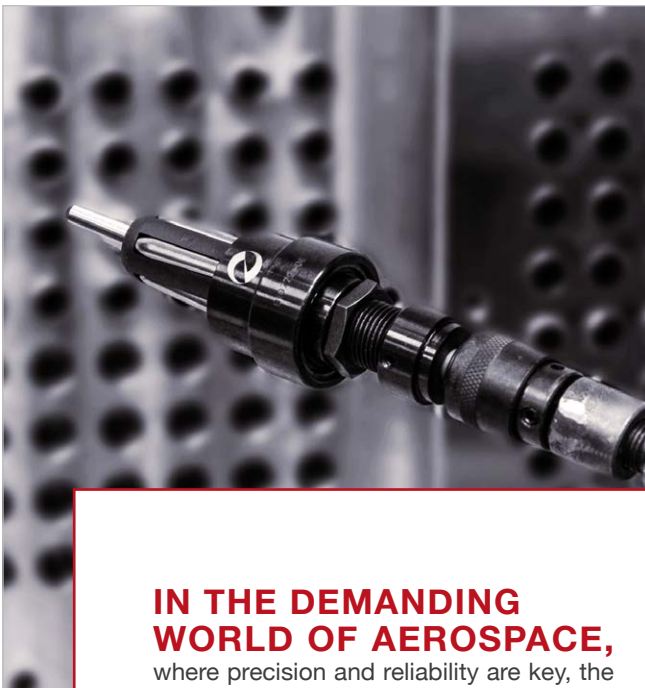
NEW PRODUCT UPDATES COMING SOON!

- Compatible with 110V, 220V, automatic, and manual reverse rolling motors
- Lightweight and easy setup
- Single controller lowers investment in separate tools
- 3 setup modes to suit your application needs



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The Heat-Free Advantage in Aerospace



IN THE DEMANDING WORLD OF AEROSPACE,

where precision and reliability are key, the method of mechanical joining stands out as an essential technique. Unlike traditional heat-based joining processes such as welding or brazing, mechanical joining in aircraft systems involves the plastic deformation—specifically, the expansion—of a tube end into a fitting or sleeve. This innovative approach creates a robust, leak-proof joint without the need for elevated temperatures, offering a multitude of benefits crucial to the stringent requirements of aircraft design and operation.

What is Mechanical Joining?

In manufacturing there are numerous applications where tubes need to be joined to flanges or fittings to create a leak proof seal. One common example is joining flexible couplings and hose assemblies for use in aerospace and hydraulic assemblies in heavy industry. While there are a few different ways to achieve the required seal, mechanical joining is one of the most consistent and low-cost methods available. In this article, we will discuss what mechanical joining is, how it compares to other methods, and some common industry applications.

THE PROCESS

Mechanical joining is a process of joining a tubular element to another component by compressing the outer diameter of the tube against a fixed container, generally a flange or fitting. Virtually any metal can be mechanically joined, including steel, stainless, aluminum, titanium, copper, Inconel, etc. Consisting of a mandrel, roll set, and cage, the mechanical joining tool works by advancing the mandrel forward until the rolls expand and make contact with the inner wall of the tube. This process forces the material out, compressing it into the serrations on the flange ID, creating a tight seal and locking the tube in place.

There are two methods for mechanically joining two components: rolling to torque and rolling to diameter. Depending on the part specifications, the amount of expansion is going to vary. Rolling to a torque is going to be the most accurate in terms of guaranteeing consistent joints, as it accounts for any variations in tube size, thickness, and component ID. On the other hand, rolling to a diameter will ensure that a consistent finished ID size is achieved.

BENEFITS OF MECHANICAL JOINING

Mechanical joining is best suited for applications that are subject to high vibration, changes in temperature or altitude, and high-pressure applications. This is because mechanical joints can withstand up to 20,000 pounds of hydro-static pressure without leaking or pulling apart. Additionally, the process of mechanical joining is generally lower cost and easier to perform when compared to welding, brazing, or crimping.

In addition to creating a leak-free joint, mechanical joining is also easy to operate and can be used with a variety of installation sources. From handheld motors to assisted rolling systems to CNC machines, there are many power options available.



Why Heat-Free Joining Matters for Aircraft Components

One of the primary advantages of mechanical joining lies in its ability to circumvent the detrimental effects of heat. Many materials commonly used in aircraft, such as aluminum and titanium, are susceptible to heat distortion or changes in their mechanical properties when exposed to high temperatures. Thin-walled tubes, in particular, are highly vulnerable to such damage. Mechanical joining eliminates this risk entirely, preserving the material's original integrity and strength, which is vital for components operating under extreme conditions.

Furthermore, the process is uniquely suited for applications demanding permanent, leak-tight connections. By plastically deforming the tube into the fitting, a secure fit is achieved. In addition to leak protection, mechanical joints can also withstand up to 20,000 pounds of hydro-static pressure without pulling apart, making them ideal for applications subject to vibration, changes in temperature or altitude, and high-pressure.

Aircraft Systems That Rely on Mechanical Joining

FUEL SYSTEMS

The suitability of mechanical joining extends to diverse aircraft systems. In fuel systems, where small-diameter aluminum or titanium tubes are frequently used for fuel manifolds and lines, the expansion process into ferrules or sleeves creates robust connections without the risk of heat distortion common with welding. This is particularly prevalent in rigid fuel lines and engine fuel delivery systems.

HIGH-PRESSURE HYDRAULIC SYSTEMS

High-pressure hydraulic systems also greatly benefit. Here, stainless steel or titanium tubes are commonly expanded into fittings, mitigating the risk of cracking that welds or braze joints might experience under constant vibration. The tight seal created by the expansion ensures system integrity even under extreme dynamic loads.

ENVIRONMENTAL CONTROL SYSTEMS

Similarly, environmental control systems, responsible for cooling and bleed air lines, leverage mechanical joining for its ability to create lightweight, vibration-resistant joints. Thin-walled aluminum tubes are often expanded into couplings or header fittings, contributing to the overall weight reduction that is a continuous goal in aerospace engineering.

OXYGEN AND PNEUMATIC SYSTEMS

Finally, in oxygen and pneumatic systems, where maintaining material integrity is of the utmost importance, mechanical joining of thin-walled aluminum or stainless lines avoids the heat-related issues associated with welding, ensuring the long-term reliability of these life-critical systems.

The Case for Mechanical Joining in Aerospace

In essence, mechanical joining offers a compelling combination of material preservation, leak prevention, vibration resistance, and weight efficiency. Its ability to create strong, durable, and heat-free connections makes it an indispensable process, contributing significantly to the safety, performance, and longevity of modern aircraft.

Mechanical Joining Tool

APPLICATION:

Tubes & Fittings

MATERIALS:

Ductile Metals

OPERATION:

Electric or Pneumatic Motors, Assisted Expansion Machines, CNC Machines

Superior Method For Secure, Leak-Proof Joints

The Mechanical Joining Tool is designed to create secure, leak-proof joints between ductile tubular products and fittings, which eliminates the need for welding.

This tool consists of a mandrel and rolls housed inside of a cage, so as the mandrel moves forward, the rolls expand and make contact with the inner wall of the tube, forcing the material to expand into a flange.

FEATURES AND BENEFITS:

Withstand Extreme Pressure

Mechanical joints can withstand over 20,000 pounds of hydrostatic pressure.

Superior Mechanical Joint

Mechanically joined joints will not leak, pull apart, or come loose due to pressure, vibrations or temperature change.

Cost Effective Solution

Tools are easy to use in a single operation, making them more cost effective compared to welding or brazing.

Consistent Expansion

Rolling to torque ensures consistent results regardless of tolerance and variations in tube size.

Roll To Size

Rolling to a set diameter guarantees a consistent tube ID, making it easier to "iron out" or increase the ID of the tube.

Easy To Use

Easy to use and maintain, requiring minimal operator training.

SPARES:

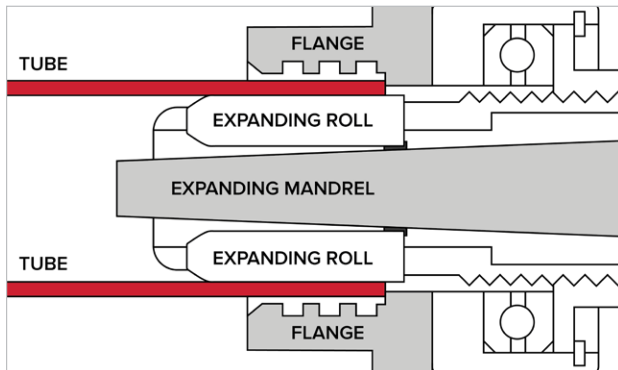
- Rolls
- Cage
- Mandrel



Mechanical Joining Tool

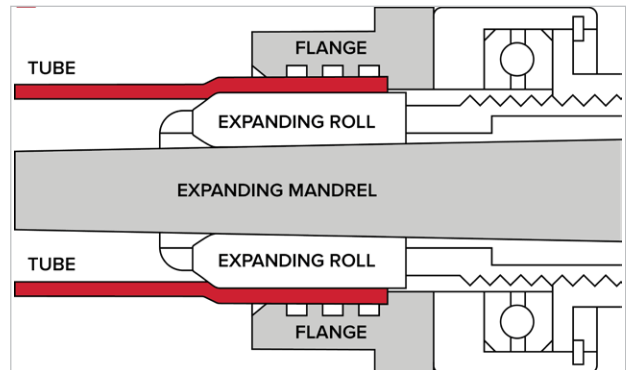
TOOL OPERATION PROCEDURE

Mechanical Joining Tools can be used on manual electric rolling motors, pneumatic motors, special machines, and in rare cases, on CNC machines.



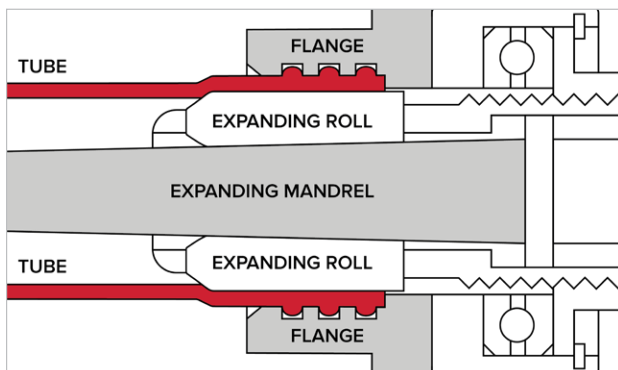
01 0% EXPANSION

The tube is inserted into the flange and the mechanical joining tool is inserted into the tube.



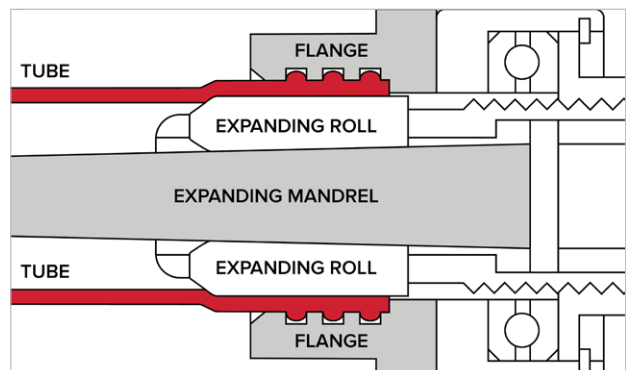
02 25% EXPANSION

When the tube has been rolled to roughly 25% of the total expansion required, the tube will make metal-to-metal contact with the flange.



03 50% EXPANSION

At this point the tube metal has begun to flow into the grooved serrations of the flange.



04 100% EXPANSION

Grooved serrations are now filled, and the tube metal has flowed to the point of at least resistance beyond the flange resulting in a mechanically formed joint that will not leak, vibrate loose, or pull apart.



SCAN TO SEE THE MECHANICAL
JOINING TOOL **TECH MANUAL**

When To Roll To Torque Vs. Size In Mechanical Joining



Rolling to Size

Historically, rolling to a predetermined size was the more prevalent method. This technique involves an operator expanding the tube to a pre-calculated diameter, often achieved by visual cues or a set mandrel stop that halts the forward travel of the mandrel. Rolling to size depends heavily on tight manufacturing tolerances. Variations in tube thickness, fitting bore, or tool dimensions can all affect seal effectiveness.

Most operators reserve rolling to size for less critical systems and joints where precise groove fill — the extent to which the tube material fills the grooves in the fitting — is less important. This is because it's challenging to determine the exact groove fill for every part.

Rolling to Torque

For parts used in hydraulic or high-pressure applications, rolling to torque is recommended. Rather than rolling to a predetermined finished size, this method monitors the amount of force applied during expansion until a set value is reached. Electronic torque control works by monitoring the amperage draw of a motor and determines the power needed to reach the desired torque value. Once the motor reaches the power requirement, the control cuts power to the motor.

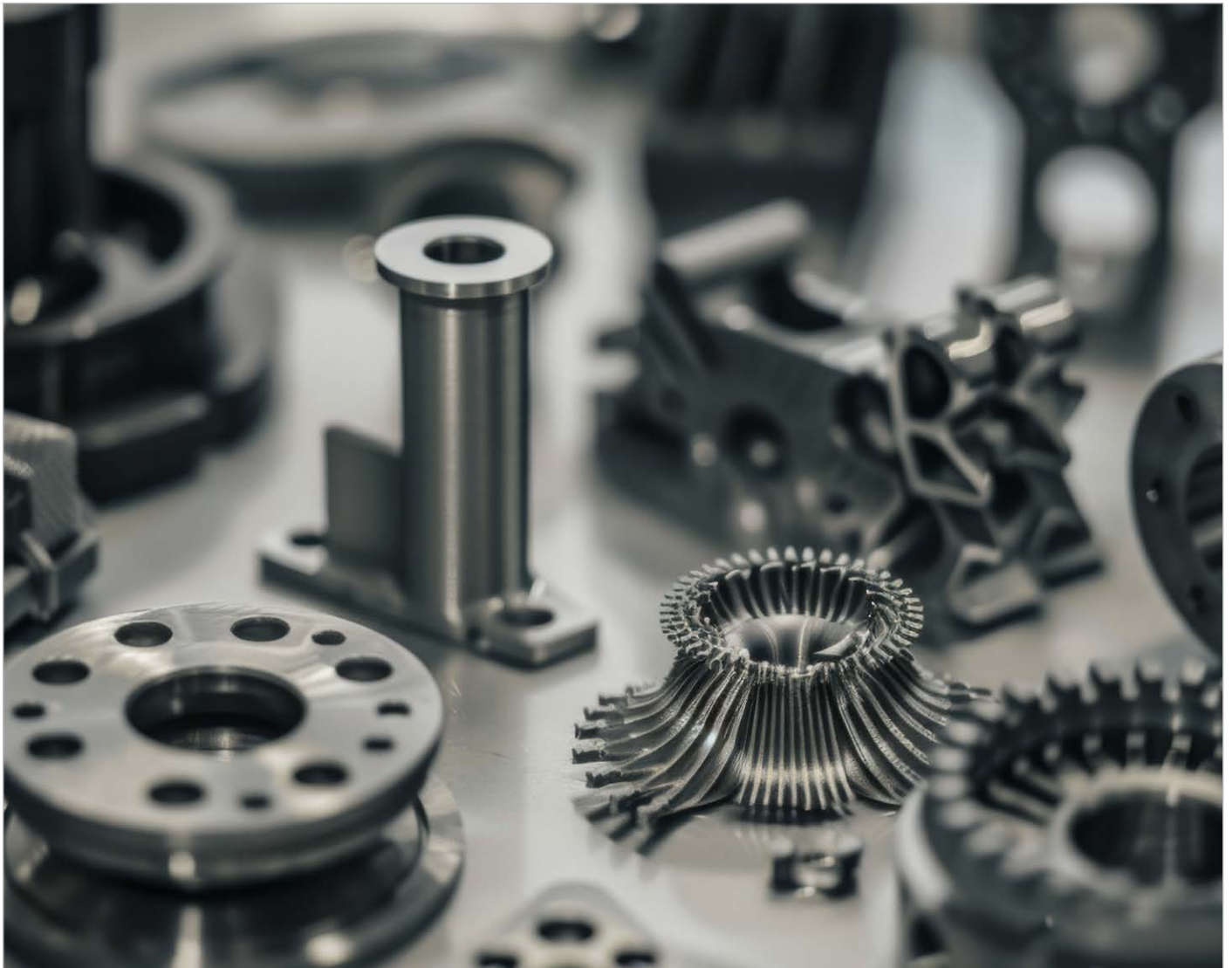
Torque wrenches are another popular and often more accessible option for mechanical joining. These tools, whether utilizing an internal mechanism or an electronic sensor, precisely measure the force being applied. Upon reaching the desired value, the wrench provides a clear digital or audible signal to the operator, indicating expansion is complete.

Regardless of the driving force, rolling to torque compensates for variance in tube sizes, die blocks, fittings, and other manufacturing tolerances. This allows for repeatable and consistent expansions regardless of inconsistencies. The required torque range varies based on material properties, application, part setup, and manufacturing specifications. In critical applications, extensive testing may be necessary to precisely determine the

torque value needed to achieve the desired groove fill for an assembly. diameter will ensure that a consistent finished ID size is achieved.

Which Method is Right for Your Application?

Overall, while rolling to size offers simplicity for less demanding scenarios, rolling to torque provides the precision and consistency vital for high performance and safety critical applications, ensuring a robust and reliable mechanical joint.



ALSO FROM ELLIOTT

ROLLING MOTORS

Elliott's rolling motors are engineered to pair directly with tube rolling and metal finishing applications — delivering consistent torque, speed, and control across a full range of tube sizes and materials. Available in pneumatic, electric, torque controlled, and stall type configurations.



ET850 Series

Torque Controlled Pneumatic

TUBE SIZE	POWER	TORQUE RANGE
0.750" – 1.250"	Pneumatic	22-115 lbs

Next evolution of push-pull motors — same USA quality with improved operator experience.



ET720 Series

Torque Controlled Pneumatic

TUBE SIZE	POWER	TORQUE RANGE
0.250" – 0.500"	Pneumatic	2-75 lbs

Ideal for small tubes in oil coolers and small heat exchangers. Proven long tool life.



Midi/Maxi Series

Torque Controlled Pneumatic

TUBE SIZE	POWER	TORQUE RANGE
0.750" – 2.000"	Pneumatic	12-150 lbs

Quality materials throughout for motor robustness and durability across years of use.



Stall Torque

Stall Torque Pneumatic

TUBE SIZE	POWER	TORQUE RANGE
0.750" – 6.000"	Pneumatic	56-950 ft lbs

Most powerful motors available. Recommended for heavy wall, thick drum applications.



99 Series

Electric Rolling Motor

TUBE SIZE	POWER	TORQUE RANGE
0.250" – 3.000"	Electric	15-30 ft lbs

Better consistency and faster RPMs than pneumatic offerings, with comparable torque.



445 Series

Right Angle Pneumatic

TUBE SIZE	POWER	TORQUE RANGE
1.500" – 4.000"	Pneumatic	70-305 ft lbs

Right angle head for tight spaces. Ideal for boiler tube applications with limited access.



GO TO **ELLIOTT-TOOL.COM/TUBE-TOOLS/ROLLING-MOTORS/** TO LEARN MORE.

ID Sizing & Finishing Tool

APPLICATION:

Thin Wall Finished ID

ID SIZE RANGE:

0.125" +

FINISH RANGE:

2 – 32 μ in. Ra (0.05 – 0.08 μ mm Ra)

Precise ID Sizing & Finishing Solution

Sizing and Finishing Tools are designed to operate in a manner similar to the ID Multi-Roller Burnishing Tools. The difference is that the compression on the Sizing and Finishing Tools occurs across the entire length of the roll, as opposed to a single point like with the Multi-Roller Burnishing Tools.

This “parallel rolling” disperses wear, making Sizing and Finishing Tools last longer than other types of burnishing tools. Parallel rolling also allows for faster cycle times compared to traditional burnishing.

All sizing tools are customized to the specific application, ensuring precision and efficiency. Some common applications are bushing seats, lamination stack alignment, reforming the ends of a tube, as well as finishing attachment points.

FEATURES AND BENEFITS:

One-Step Operation

Produce a smooth finish and uniform ID in one pass.

Uniform Size

Expand a bore or tube end to a uniform size, holding to a consistent tolerance each time.

Customize To Suit Your Application

Designed to specification, the sizing tool is available in various reaches, roll lengths, diameters, and expansion ranges to suit the application.

Easy To Use

Easy to use and maintain, requiring minimal operator training.

SPARES:

- Rolls
- Mandrel
- Cage



Sizing Tools vs Roller Burnishing

WHICH METHOD IS BEST FOR YOUR APPLICATION?

When choosing a burnishing tool, there are many different styles to choose from. One tool that offers some added versatility is a sizing tool. Although sizing and roller burnishing tools are employed to achieve smooth internal bores and part features, they operate differently. Understanding the advantages of a sizing tool, will help you select the right tool for the job. innovative solutions to overcome these hurdles.

Roller Burnishing

Roller burnishing involves passing a hardened roll or set of rolls over the workpiece's internal surface. This compressive force induces plastic deformation, resulting in a smoother, harder, and more wear-resistant surface.

KEY CHARACTERISTICS OF ROLLER BURNISHING

- **Focus on Surface Improvement:** Primarily aimed at enhancing surface finish, hardness, and wear resistance.
- **Limited Dimensional Adjustment:** Primarily improves surface quality rather than significantly altering part dimensions.
- **Great For Low Clearance Applications:** Design allows for use in holes with less clearance, allowing the tool to get closer to the bottom of a bore without damaging the tool or scratching the bottom of the hole.

Sizing Tools

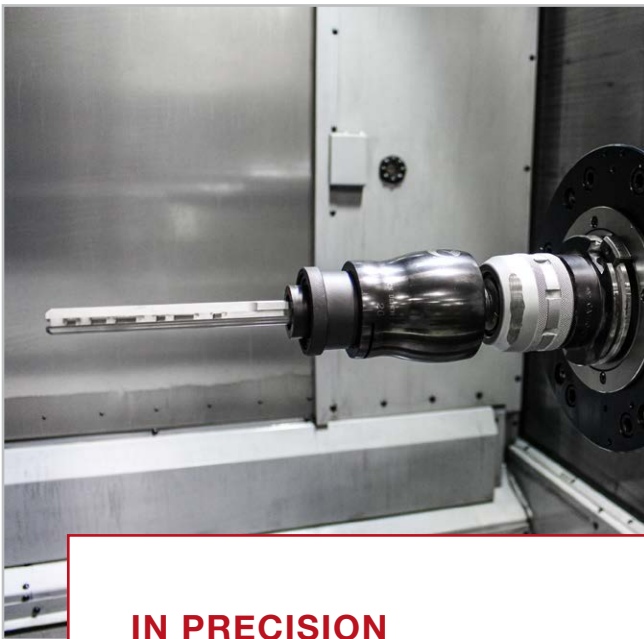
Sizing tools, while like burnishing, employ a precisely engineered expanding mandrel to achieve the desired internal dimensions. The tool is inserted into the bore and expanded when the mandrel is pushed forward. This process does require an actuation surface on a fixture or workpiece for the tool to work correctly.

KEY CHARACTERISTICS OF SIZING TOOLS

- **Precisely Control Dimensions:** Provides high accuracy in achieving target internal diameters.
- **Minimal Deformation:** Due to the distributed contact pressure, sizing tools minimize the risk of deforming thin-walled parts.
- **Accommodate Irregularities:** Can effectively address irregularities such as voids or cross-holes, finishing the entire ID in one operation.
- **Expand to Larger Diameters:** Can be used to finish larger diameters from smaller entry points.
- **Suitable for Joining Applications:** Can be used to seat components like bushings or expand interference fits.



Elliott's IRU Solutions for Deep Hole Manufacturing Challenges



IN PRECISION MANUFACTURING, the creation of recesses in deep holes – those where the depth-to-diameter ratio typically exceeds 10:1 – presents a unique set of challenges. Maintaining accuracy, achieving desired surface finishes, and ensuring efficient chip evacuation become significantly more complex as the bore deepens. Traditional machining methods often struggle in these scenarios, leading to increased cycle times, higher scrap rates, and compromised part quality. However, specialized tooling like Elliott's Internal Recessing Unit (IRU) offers innovative solutions to overcome these hurdles.

Chip Evacuation and Tool Breakage

One of the primary obstacles in deep hole manufacturing is chip evacuation and the associated risk of tool breakage. As the cutting tool goes deeper into the workpiece, removing debris becomes increasingly difficult. Trapped chips can lead to clogging, causing excessive friction, tool deflection, and ultimately, catastrophic tool failure. A broken tool deep within a part often results in irreparable damage and costly scrap. Elliott's IRU is specifically engineered with through-tool coolant delivery, a critical feature for efficient chip management. This design ensures a constant flow of coolant directly to the cutting edge, effectively flushing chips away from the cutting zone. By keeping the blade clean and cool, the risk of chip buildup, tool deflection, and breakage is significantly reduced, leading to more reliable and consistent processes.

Bore Straightness and Tool Drift

Another significant challenge is maintaining bore straightness and minimizing drift. The longer the bore, the greater the susceptibility to tool deflection, resulting in misaligned features and out-of-tolerance grooves. Elliott's IRU addresses this issue through its precision piloting and rigid tool guidance. This design provides enhanced stability and support to the cutting blade, effectively eliminating tool drift and ensuring consistent alignment throughout the machining operation, even at significant depths.

Groove Tolerances in Deep Bores

Achieving tight groove tolerances in deep bores presents its own set of difficulties. Maintaining consistent land diameters and precise groove locations becomes harder to control as the distance from the spindle increases. While IRUs are generally used to create reliefs in existing grooves in deep hole applications, cutting a full groove from solid material in a deep bore requires careful consideration. The increased chip load in such scenarios makes it challenging to achieve the final groove dimensions in a single pass. Elliott's IRU can be employed effectively in these situations by utilizing multiple cutting steps to gradually achieve the desired groove profile, ensuring accuracy and managing chip load effectively.

HEAT BUILDUP AND THERMAL EXPANSION

Heat buildup and thermal expansion are also critical concerns in deep hole manufacturing. The reduced coolant access in deep bores can lead to significant temperature increases at the cutting edge. This heat can cause the tool to expand, negatively impacting accuracy and accelerating tool wear. Elliott's IRU incorporates a high-efficiency coolant system designed to directly target the cutting zone. This effective cooling action mitigates heat buildup, maintaining dimensional stability of both the tool and the workpiece, ultimately improving accuracy and extending tool life.



Tool Deflection and Wear With Extended Reach

The inherent nature of deep hole manufacturing often necessitates longer tool reaches, which introduces the challenge of tool bending and excessive wear. The increased unsupported length makes the tool more prone to deflection under cutting forces, leading to inaccuracies and premature wear. Elliott's IRU is designed to guide the cutting edge using a precision ground pilot, providing enhanced support and minimizing deflection even with extended reaches. This design consideration helps maintain accuracy over prolonged use and contributes to improved tool longevity.

Vibration and Chatter

Finally, vibration and chatter can be significant obstacles, particularly when machining long parts or challenging materials. These unwanted vibrations can lead to poor hole quality and surface finish. Elliott's IRU is engineered to minimize vibration during operation, contributing to a more stable cutting process and reducing the occurrence of chatter. This, coupled with proper workpiece holding techniques to minimize excess movement, ensures a higher quality finished bore.

SUMMARY

In conclusion, deep hole manufacturing presents a complex array of challenges that demand specialized solutions. Elliott's Internal Recessing Unit offers a comprehensive approach to overcoming these hurdles through its innovative design features, including efficient chip evacuation, precision guidance, effective coolant delivery, and vibration dampening capabilities. By leveraging the power of the IRU, manufacturers can confidently tackle deep hole applications, achieving improved accuracy, reduced cycle times, and higher quality finished parts.

Internal Recessing Unit (IRU)

APPLICATION:

Hydraulic Control Valves

SIZES:

Designed To Customer Specifications

Precision Internal Machining, Redefined

The Internal Recessing Unit (IRU) is engineered to machine multiple grooves and lands simultaneously.

The IRU eliminates deflection, creates precisely machined features, and provides perfect concentricity. It also eliminates the slow and unreliable processes of circular interpolation or circular milling of internal features such as grooves, chamfers, lands, and faces.

FEATURES AND BENEFITS:

Repeatable & Accurate

Get repeatable and accurate cuts with diametrical tolerance of $\pm .004$ ", axial tolerance of $\pm .001$ "

Machine In One Operation

Most efficient method for machining grooves in a single operation, with cycle time of 15 seconds or less.

Eliminate Deflection

Designed to support the cutter along its entire length, the IRU eliminates deflection and creates precisely machined features.

Consistent Results Every Time

Strategic location of the cams support the cutting teeth, allowing for rigidity and accuracy every time.

Easy To Use

With only two settings required for operation, the IRU is easy to for operators to set-up and maintain.

Lower Consumable Cost

Carbide cutters can be resharpened 2 – 5 times, reducing replacement costs.

SPARES:

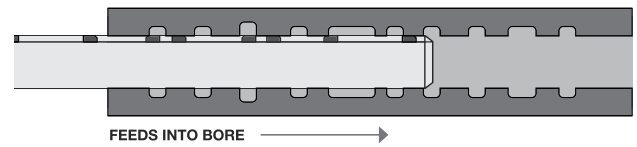
- Carrier Arms
- Cutters
- Nose Pieces
- Pilots



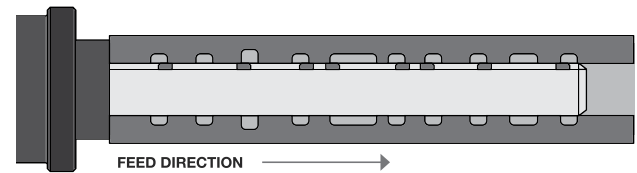
Internal Recessing Unit (IRU)

TOOL OPERATION PROCEDURE

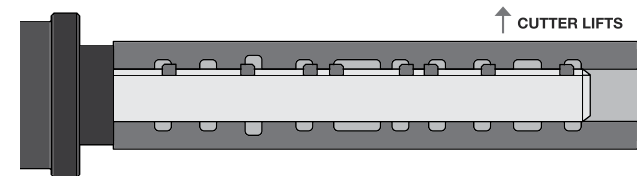
- 01** The IRU is fed into the work-piece at a fast feed rate with the pilot locating within the bore until the nose piece is approximately 0.020" (0.5mm) away from the face of the work-piece.



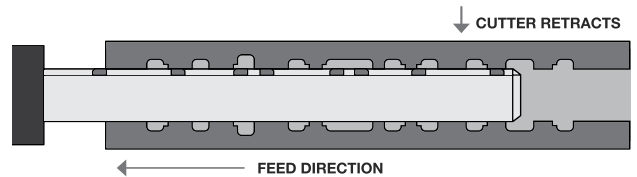
- 02** Feed into the work-piece at a cutting feed rate and make contact with the face of work-piece. At this point, the operating head and nose piece are engaged and will stop rotating.



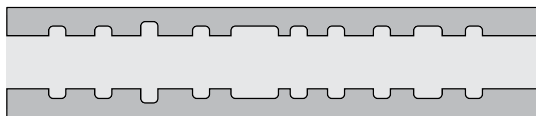
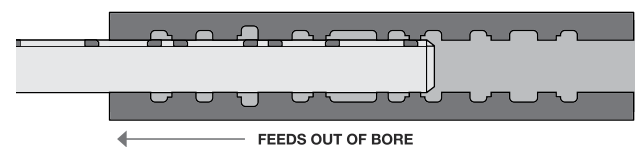
- 03** Continue feeding forward – causing the system to actuate – lifting the cutter perpendicular to the axis of rotation, machining the internal features in the bore.



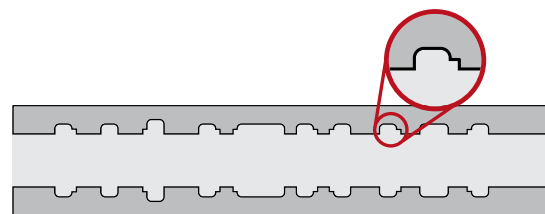
- 04** Retract the IRU three (3) times faster than the cutting feed rate.



- 05** Once the nose piece is off of the face of the work piece, the cutter has fully retracted back into the pilot and from this point, the IRU can be rapid fed out of the work-piece.



BEFORE IRU OPERATION



AFTER IRU OPERATION



SCAN TO SEE THE INTERNAL
RECESSING UNIT **TECH MANUAL**

Internal Recessing Unit (IRU)

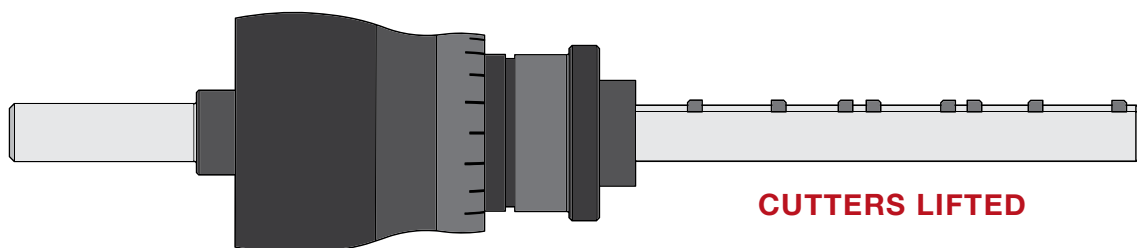
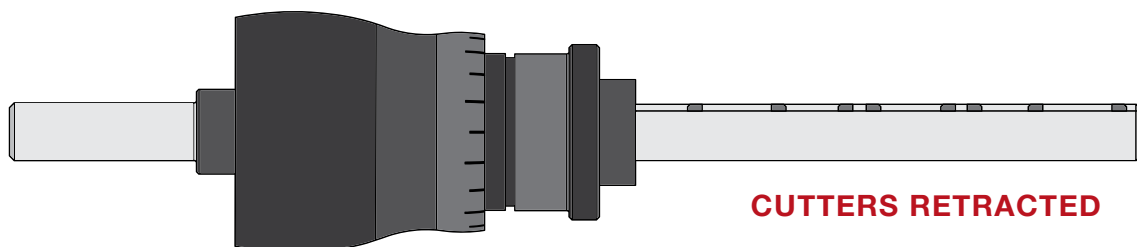
FEEDS & SPEEDS

FEEDS & SPEEDS

Feed rates of 0.002 to 0.005 IPR are typical starting points for most applications. For smaller bore diameters (less than 0.500"), decrease the feed rate below 0.002 IPR.

Surface feet per minute are equal to those recommended for multi-fluted reamers (the speeds below can be increased up to 3x).

Material Machined	Surface ft. per Minute
Cast Iron - Gray	100 - 110
Cast Iron - Nodular	30 - 70
Steel/Forgings	35 - 70
Aluminum and Brass	150 - 160



**MACHINE MULTIPLE
GROOVES AND LANDS
SIMULTANEOUSLY, QUICKLY,
AND ACCURATELY.**

METAL FINISHING TOOLS AVAILABLE FOR RENT

BOOST YOUR FINISH **WITHOUT** BREAKING THE BUDGET

Rent Elliott's precision burnishing tools and experience proven performance, without the upfront investment.

WHY RENT FROM ELLIOTT?

Whether you need a tool for a single project, want to evaluate performance before purchasing, or simply can't justify the upfront cost for limited use — Elliott's rental program gives you access to the same precision tools our customers rely on every day.

READY TO PURCHASE?

When you're ready to buy, receive **50% credit*** of your current rental charges toward a new or used tool of the same model.



**CONTACT US TODAY TO LEARN
MORE ABOUT OUR RENTALS**



*maximum credit may not exceed 25% of the Retail List Price of the new tool.

THE ELLIOTT DIFFERENCE

WHY CHOOSE ELLIOTT?

83%

ON-TIME SHIPPING

85%

ITEM AVAILABILITY

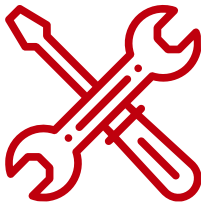
130+

YEARS OF EXPERIENCE



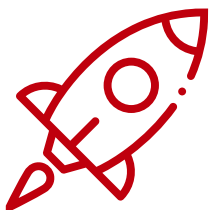
Exceptional Customer Service

Elliott is committed to being your partner throughout the process — not just at the point of sale. With 24-hour support and a team that knows your application, we work to keep your operations running without interruption.



High Quality Tools

Every Elliott tool is built to outperform the job it's designed for. Through continuous improvement, Six Sigma, and 5-S practices, we produce tools you can rely on every time.



Continuous Innovation

With over 130 years of engineering experience, Elliott is always looking for better ways to solve industry challenges — from refining existing designs to developing entirely new solutions.

FROM OUR CUSTOMERS

WHAT THEY'RE SAYING



“

Elliott Tool has been a joy to work with due to the professionalism and high standards they uphold themselves. Elliott sets the bar high as an example to other vendors.

CHARLIE SHIN

Purchasing and Production Planner,
Hydraflow Inc

“

I could only wish the majority of my supplier base could improve to Elliott's level of customer satisfaction we have become accustomed to. I would be honored to be called upon to recommend Elliott as a source of supply.

PAUL IRWIN

Procurement Manager,
Parker Hannifin - Aerospace

“

Elliott's ID Multi-Roller Burnishing Tool has been performing very well for us, and we are extremely pleased with the results and the surface finishes we're achieving.

ANDERS GRIMBARK

Custom Solutions, FORTIVA

“

We have nothing but respect for Kyle and the Elliott team. He answered every question we had with precision and in a timely manner. The tool [IRU] performed exactly as intended, and we have successfully produced thousands of parts using the original recommended parameters.

DAN KARBON

Continuous Improvement Engineer,
Stecker Machine Co.



ELLIOTT'S ID MULTI-ROLL BURNISHING TOOL

FINE FINISHES FOR EVERY BORE

Elliott's ID Multi-Roll Burnishing Tool delivers superior results for sizing, finishing, and hardening internal holes and bores. The ID Multi-Roll Burnishing Tool uses compressive forces to cold work the metal, resulting in a smooth surface finish.

READ MORE ON PAGE 8



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