



PRECISION METAL FINISHING

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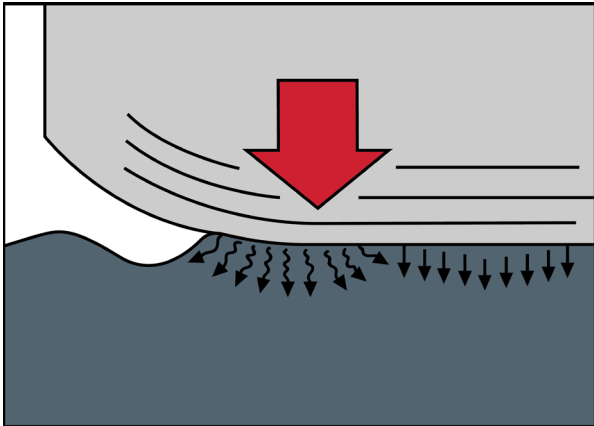


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BURNISHING INTRODUCTION

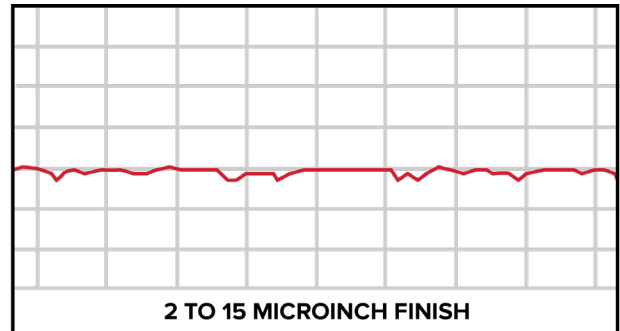
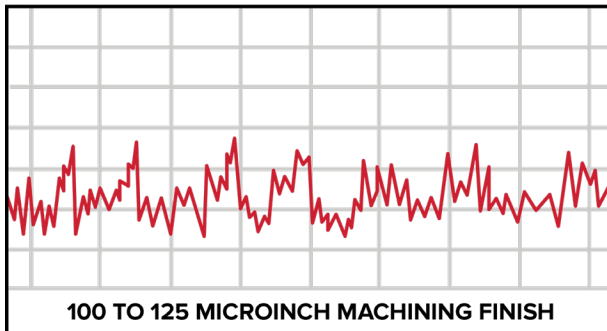
Burnishing is a chip-less machining method in which cold temperature alters a metal surface without cutting or abrading it. This process removes no metal by compressing the peaks of a metal surface into the valleys, which generates a dense and uniform surface.



Compressive Forces

The cold working condenses the grain structure of metal, producing an increase in surface hardness from 50% to 100%, within a penetration of 0.010" to 0.030" on the part's surface.

In burnishing, the material is elastically deformed to a given depth below the surface. This happens as a burnishing tool exerts a pressure that surpasses the yield point of the workpiece. This cold work interaction removes minor surface irregularities, including tool marks, and increases the material's resistance to fatigue failure.



Benefits of Burnishing

Burnishing imparts three major characteristics: accurate sizing, a low microinch finish and hardening of the surface.

Burnishing will obtain a high quality finish and eliminate the need for secondary operations such as grinding, honing and lapping.

The low microinch finish, combined with a hardened and denser surface, substantially 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 corrosion resistance, noise level reduction, stress and friction resistance, heat reduction, fatigue reduction, visual defect elimination, and surface porosity reduction.

BURNISHING ADVANTAGES



LOW MICRON FINISH

- Produces a 4 to 8 Ra surface finish in one pass
- Improves surface irregularities and tool marks
- Reaches final finish in one pass from rough finish (80-120 Ra)



WORK HARDENING

- Burnishing increases the surface hardness through the cold working process and compressive forces
- Produces a dense and uniform surface
- Increases metal's resistance to fatigue and failure at stress points



PROCESS IMPROVEMENTS

- Burnishing is repeatable and consistent
- Fast cycle times (measured in seconds)



EASY-TO-USE

- Burnishing tools require limited training to operate
- Easy to maintain and repair



ACCURATE SIZING

- Multi-roller burnishing tools produce accurate sizing in 0.0001" inch (0.0025mm) increments
- Roller burnishing results in 25% size improvement in steel and up to a 50% improvement in high ductility materials



PROVEN QUALITY

- The burnishing process has been refined and improved for over 100 years and has a proven record of success
- Elliott continues the long tradition by providing the industry's highest quality burnishing tools



COST SAVINGS

- Eliminates secondary machines and set ups
- Eliminates secondary processes such as grinding, honing and polishing
- Burnishing tools feature long lasting and replaceable wear parts reducing total cost over the life of the tool



PROVEN QUALITY

- Burnishing is effective for many different part configurations
- Suitable process for a variety of metals – all ductile metals can be burnished
- Multi-roller burnishing tools are adjustable to cover a wide size range
- Engineered products with interchangeable parts

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 (in)	Internal Surfaces			External Surfaces		
		Stock Allowance (in)	Machined μ Ra	Roller Burnished μ Ra	Stock Allowance	Machined μ Ra	Roller Burnished μ Ra
High Ductility	0.125 - 0.484"	0.0004	80	8	0.0004	80	8
		0.0007	125	8	0.0005	100	8
	0.500 - 1.000"	0.0007	60	8	0.0005	60	8
		0.0015	125	8	0.001	180	8
	1.031 - 2.000"	0.001	60	8	0.0007	100	8
		0.002	125	8	0.001	180	8
	2.031 - 6.500"	0.0015	60	8	0.001	125	8
		0.002	125	8	0.0015	300	8
		0.003	200	8	0.002	500	8
Low Ductility	0.125 - 0.484"	0.0004	80	18	0.0003	60	18
		0.0007	100	18	0.0005	90	18
	0.500 - 1.000"	0.0007	90	18	0.0005	100	18
		0.001	125	18	0.0007	140	20
	1.031 - 2.000"	0.001	125	18	0.0005	100	18
		0.0015	180	20	0.001	180	20
	2.031 - 6.500"	0.0015	120	18	0.001	125	18
		0.0015	160	18	0.0015	140	18
		0.002	200	24	0.0015	200	20

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 microinch finish can be expected.

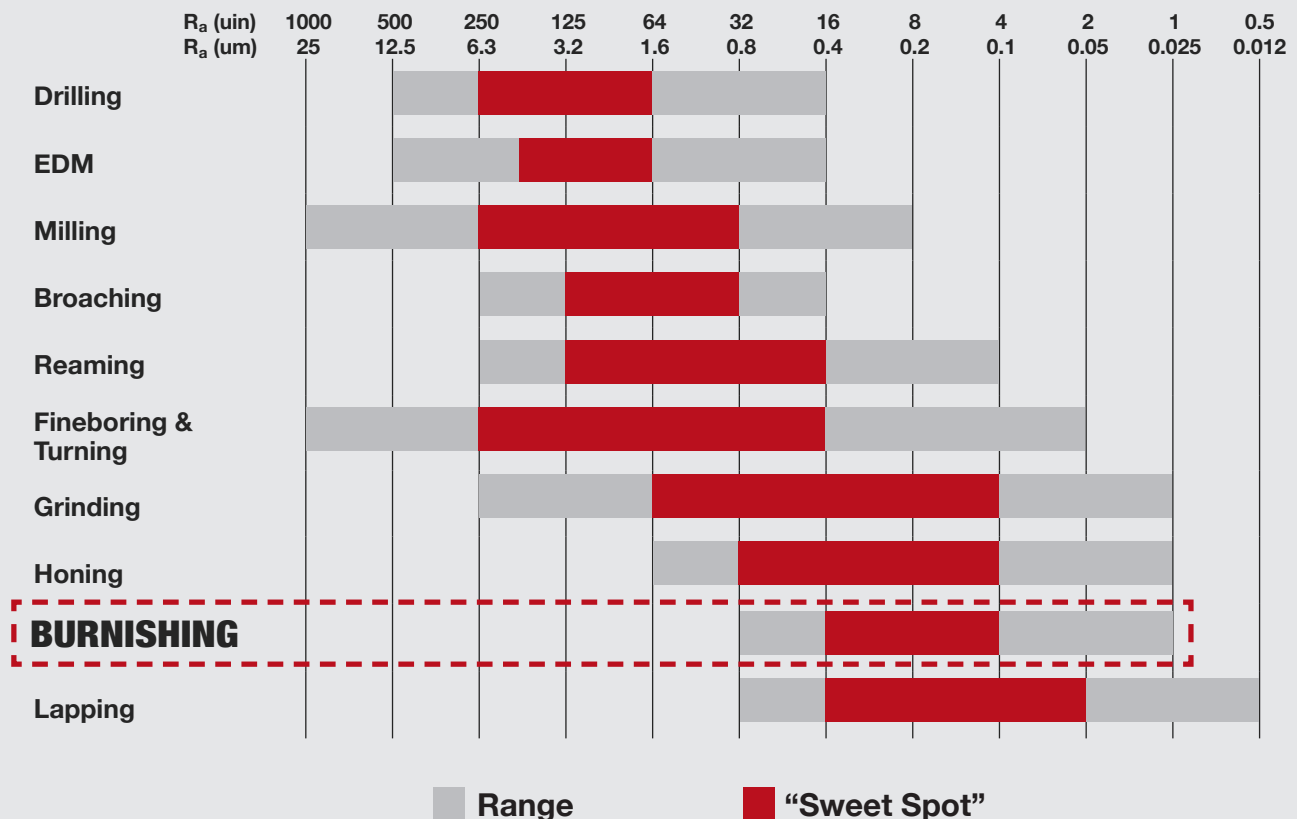
Varying surface finishes are obtained in the machining of mating parts. Machined surfaces result in a loose fit on mating parts. Surfaces which have been roller burnished have a higher bearing capacity and abrasion resistance. Roller burnishing improves this fit by providing a larger contact area between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

PROCESS COMPARISON



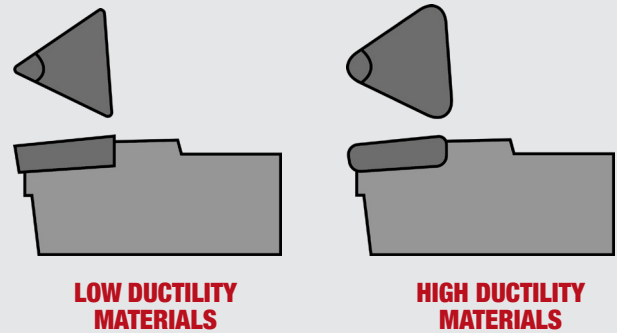
BURNISHING PREPARATION

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

Tool Geometry

Ductile material with single point tools (a 0.032" nose radius with a minimum 5 degree back taper) is recommended.

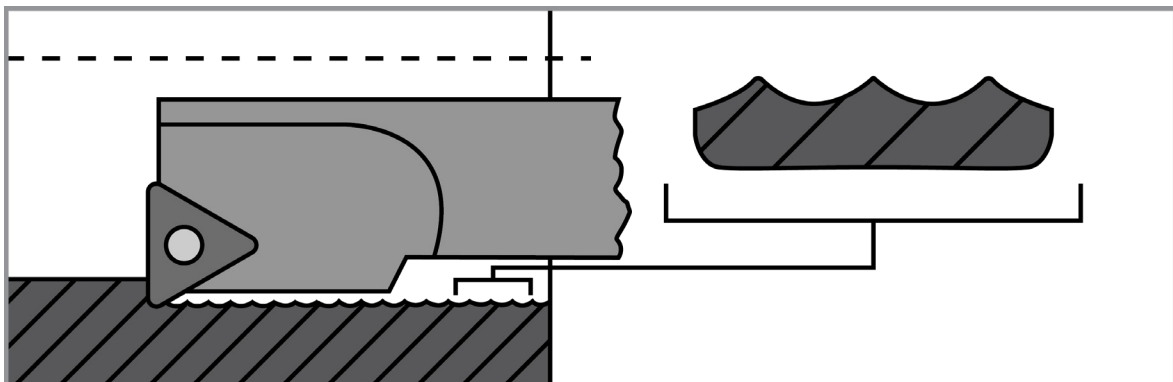
For best results, feed the cutting tool at a feed rate sufficient to produce a surface in the 80 to 120 microinch range with a consistent peak and valley pattern. For less ductile materials, use a feed rate of about 50% less than that of more ductile materials. The result should be a 60 to 100 microinch surface finish.



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.



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-ROLLER BURNISHING

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.

The cold working action will improve minor surface irregularities and tool marks resulting in a low microinch surface finish.



Great for accurate sizing, precision finishing, and surface hardening of bores.





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	0.157 - 0.501	3.912 - 12.725
5419	0.500 - 0.625	12.700 - 15.875
5433	0.656 - 0.937	16.662 - 23.800
5444	0.968 - 1.187	24.587 - 30.150
5405	1.218 - 1.375	30.937 - 34.925
5406	1.406 - 1.812	35.712 - 46.025
5407	1.843 - 2.187	46.812 - 55.550
5408	2.218 - 2.687	56.337 - 68.250
5409	2.718 - 3.312	69.037 - 84.125
5610	3.343 - 4.062	84.912 - 103.175
5611	4.093 - 5.000	103.962 - 127.000
5612	5.031 - 5.875	127.787 - 139.700
5613	5.530 - 6.500	140.462 - 165.100



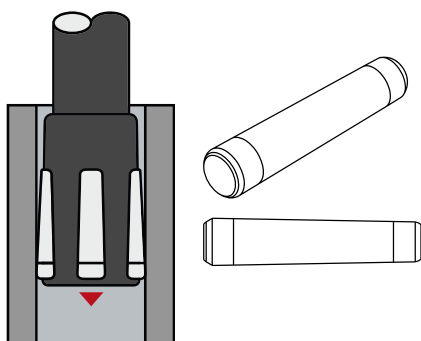
TOOL STYLES & CLEARANCE

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

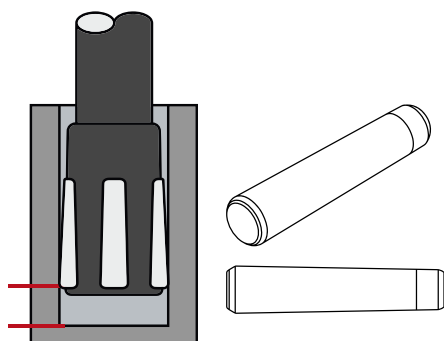
Rolls with greater radius relief are used for through holes. These tools are self-feeding and a release clearance is required. These rolls are interchangeable between blind and through cages.



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

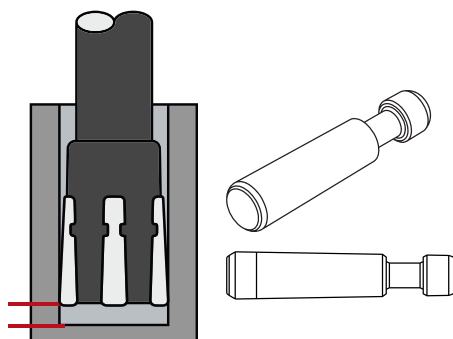
Blind rolls burnish closer to the bottom of a hole than through rolls. These rolls are interchangeable between blind and through cages.



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

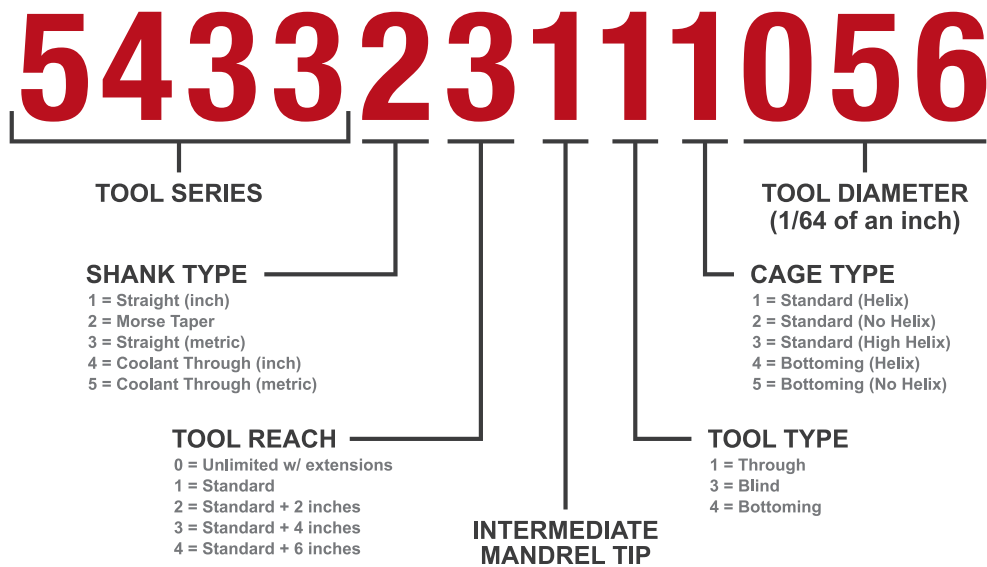
BOTTOMING STYLE

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

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



INTERMEDIATE MANDRELS

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
					(-0.003) 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
	(-0.004) 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 0.028 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

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:

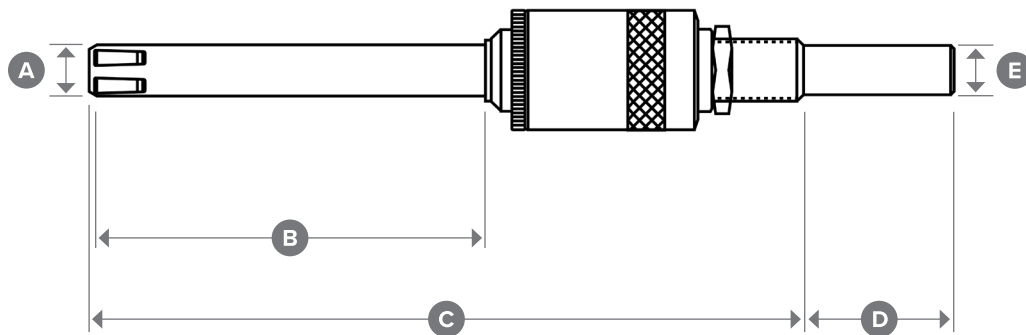
1.266 (Size of Bore)
 1.250 (Nominal Tool Diameter)
0.016 (Diameter Difference)

Could Use Intermediate Sizes:

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

5418 Series - Tool Selector

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	-

remaining sizes and styles located on next page

5418 Series - Tool Selector

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

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

5418 Series - Rolls

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

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# 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)

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)	5418-033-10012	-	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, please reference the Intermediate Mandrel table on 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)	5418-033-20012	-	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, please reference the Intermediate Mandrel table on page 11

5418 Series - Mandrels & Cages

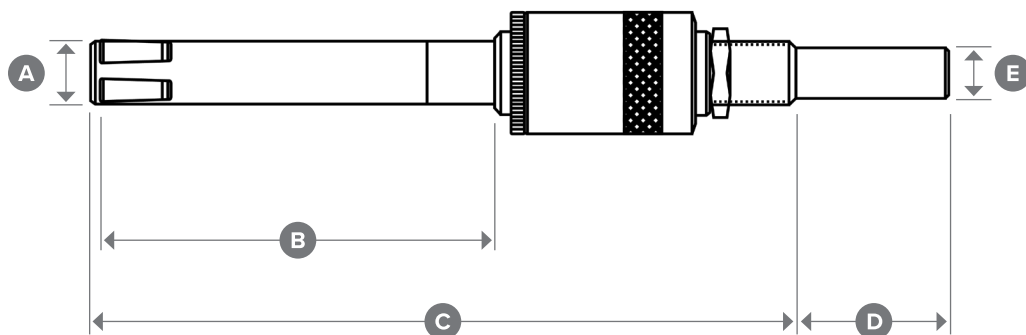
0.154" - 0.501" (3.912mm - 12.725mm)

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)	5418-033-30012	-	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, please reference the Intermediate Mandrel table on page 11

5419 Series - Tool Selector

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

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

5419 Series - Rolls, Cages, & Mandrels

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

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# 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

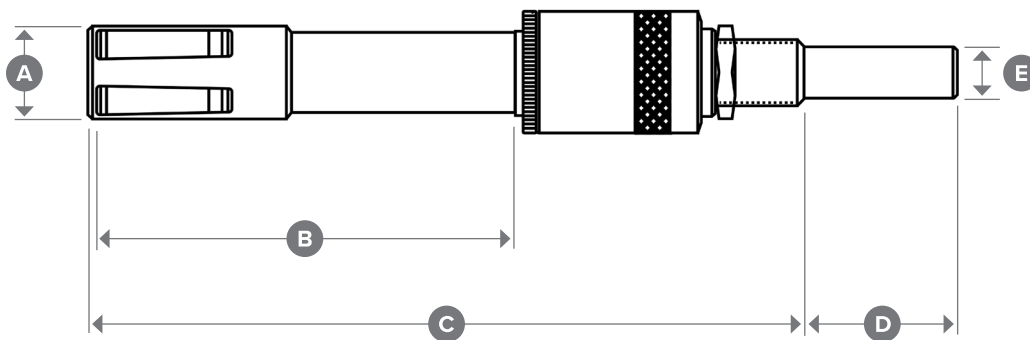
Tool Nominal Diameter	Max Burnishing Reach: 1.875" (47.625mm)				Max Burnishing Reach: 3.875" (98.425mm)			
	Mandrel Tip Part #		Cage Part #		Mandrel Tip Part #		Cage Part #	
	Blind	Bottoming	Blind	Bottoming	Blind	Bottoming	Blind	Bottoming
0.500" (12.700mm)	5319-031-10032	5319-032-10032	-	-	5319-031-20032	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

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, please reference the Intermediate Mandrel table on page 11

5433 Series - Tool Selector

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" (18.138 - 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

5433 Series - Rolls, Mandrels, & Cages

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

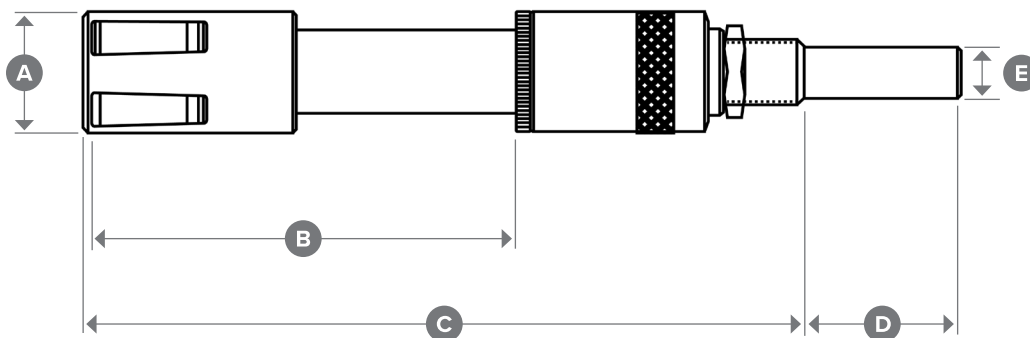
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
0.656" (16.662mm)	5	5100-701-00187	5	5100-704-00187	5	5100-708-00187
0.687" (17.450mm)	5	5100-701-00187	5	5100-704-00187	5	5100-708-00187
0.718" (18.237mm)	5	5100-701-00218	5	5100-704-00218	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	Max Burnishing Reach: 1.625" (41.275mm)			
	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, please reference the Intermediate Mandrel table on page 11

5444 Series - Tool Selector

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

5444 Series - Rolls, Mandrels, & Cages

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

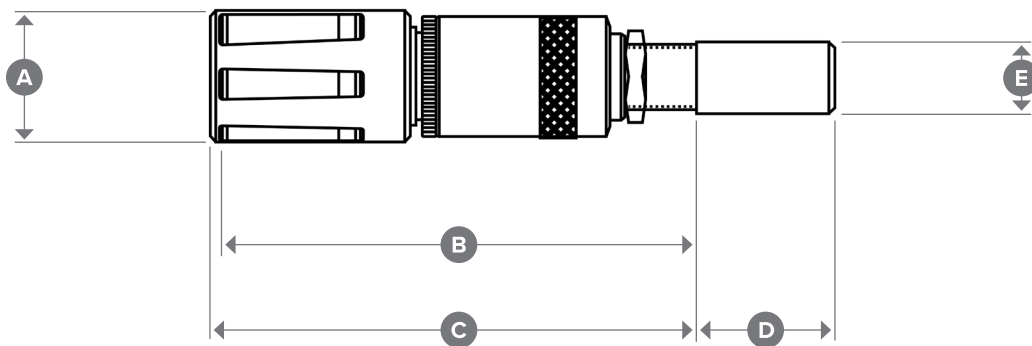
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
0.968" (24.587mm)	5	5100-701-00265	5	5100-704-00265	5	5100-708-00265
1.000" (25.400mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.031" (26.187mm)	7	5100-701-00265	7	5100-704-00265	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	Max Burnishing Reach: 1.875" (47.625mm)			
	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, please reference the Intermediate Mandrel table on page 11

5405 Series - Tool Selector

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

5405 Series - Rolls, Mandrels, & Cages

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

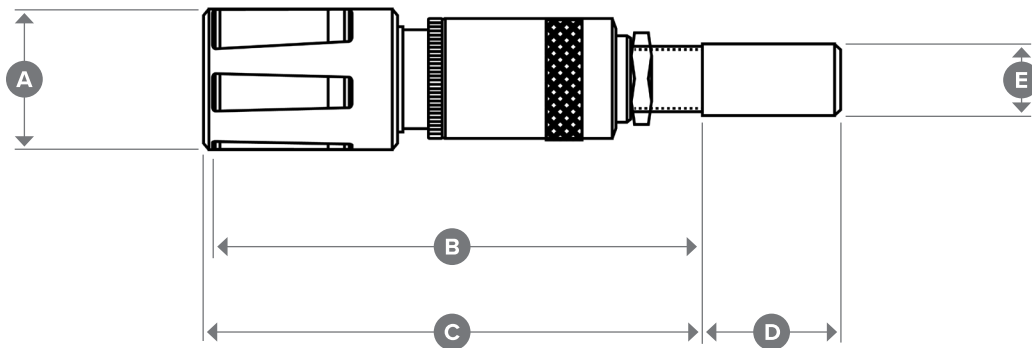
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
1.218" (30.937mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.250" (31.750mm)	7	5100-701-00265	7	5100-704-00265	5	5100-708-00265
1.281" (32.537mm)	7	5100-701-00265	7	5100-704-00265	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, please reference the Intermediate Mandrel table on page 11

5406 Series - Tool Selector

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

5406 Series - Rolls, Mandrels, & Cages

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

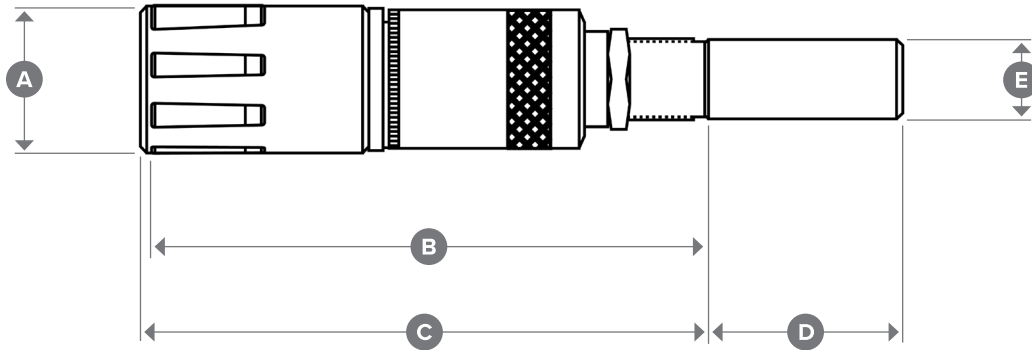
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
1.406" (35.712mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.437" (36.500mm)	7	5100-701-00312	7	5100-704-00312	5	5100-708-00312
1.468" (37.287mm)	7	5100-701-00312	7	5100-704-00312	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)	5306-031-00090	5306-032-00090	5406-011-00090	5406-015-00090
1.437" (36.500mm)	5306-031-00092	5306-032-00092	5406-011-00092	5406-015-00092
1.468" (37.287mm)	5306-031-00094	5306-032-00094	5406-011-00094	5406-015-00094
1.500" (38.100mm)	5306-031-00096	5306-032-00096	5406-011-00096	5406-015-00096
1.531" (38.887mm)	5306-031-00080	5306-032-00080	5406-011-00098	5406-015-00098
1.562" (39.675mm)	5306-031-00082	5306-032-00082	5406-011-00100	5406-015-00100
1.593" (40.462mm)	5306-031-00090	5306-032-00090	5406-011-00102	5406-015-00102
1.625" (41.275mm)	5306-031-00092	5306-032-00092	5406-011-00104	5406-015-00104
1.656" (42.062mm)	5306-031-00094	5306-032-00094	5406-011-00106	5406-015-00106
1.687" (42.850mm)	5306-031-00082	5306-032-00082	5406-011-00108	5406-015-00108
1.718" (43.637mm)	5306-031-00090	5306-032-00090	5406-011-00110	5406-015-00110
1.750" (44.450mm)	5306-031-00092	5306-032-00092	5406-011-00112	5406-015-00112
1.781" (45.237mm)	5306-031-00094	5306-032-00094	5406-011-00114	5406-015-00114
1.812" (46.025mm)	5306-031-00096	5306-032-00096	5406-011-00116	5406-015-00116

If an Intermediate Mandrel is required, please reference the Intermediate Mandrel table on page 11

5407 Series - Tool Selector

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

5407 Series - Rolls, Mandrels, & Cages

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

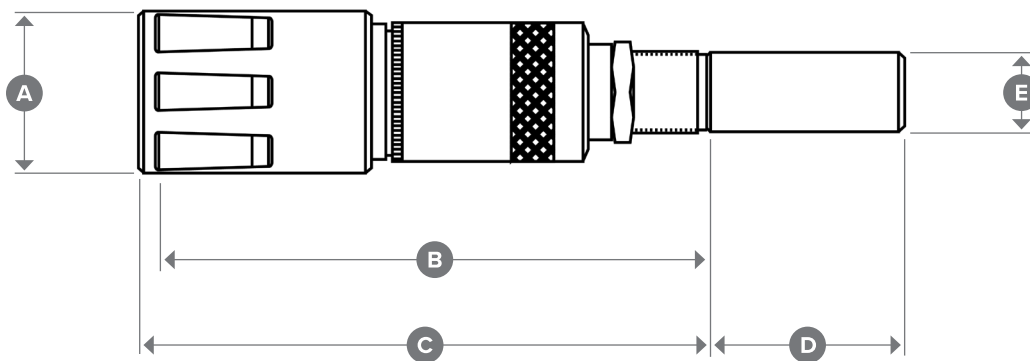
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
1.843" (46.812mm)	9	5100-701-00312	9	5100-704-00312	7	5100-708-00312
1.875" (47.625mm)	9	5100-701-00312	9	5100-704-00312	7	5100-708-00312
1.906" (48.412mm)	9	5100-701-00312	9	5100-704-00312	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, please reference the Intermediate Mandrel table on page 11

5408 Series - Tool Selector

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" (63.3988 - 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

5408 Series - Rolls, Mandrels, & Cages

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

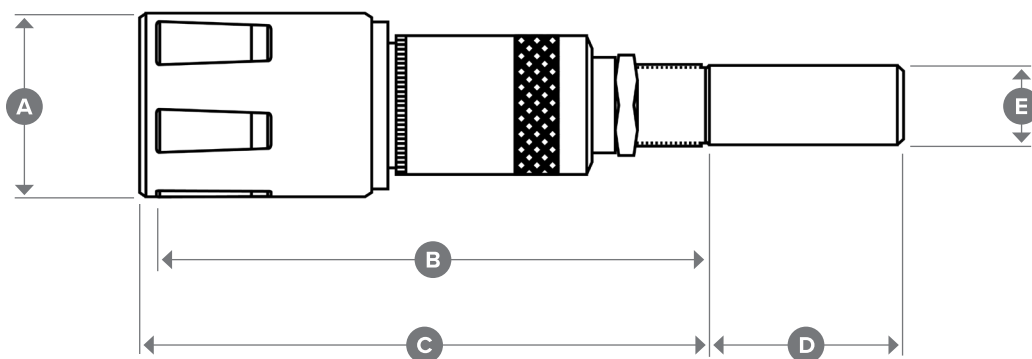
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
2.218" (56.337mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.250" (57.150mm)	9	5100-701-00406	9	5100-704-00406	7	5100-708-00406
2.281" (57.937mm)	9	5100-701-00406	9	5100-704-00406	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

If an Intermediate Mandrel is required, please reference the Intermediate Mandrel table on page 11

5409 Series - Tool Selector

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

remaining sizes and styles located on next page

5409 Series - Tool Selector

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

5409 Series - Rolls

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

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# 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

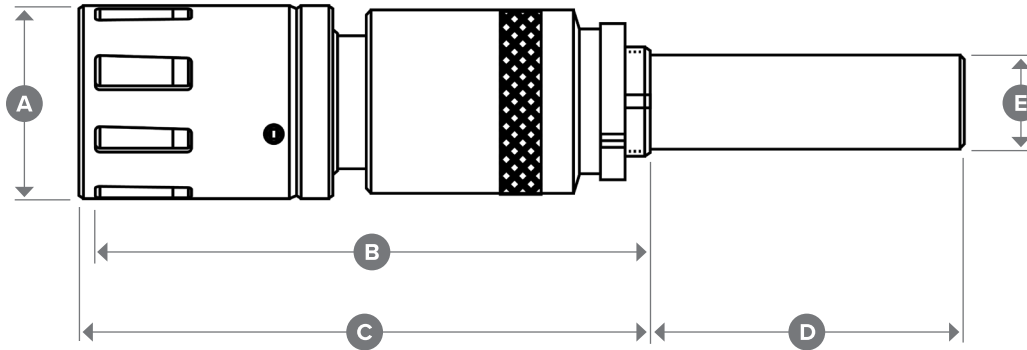
2.714" - 3.349" (68.936mm - 85.065mm)

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

5610 Series - Tool Selector

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

remaining sizes and styles located on next page

5610 Series - Tool Selector

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

5610 Series - Rolls

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

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
3.343" (84.912mm)	11	5100-701-00468	9	5100-704-00468	9	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

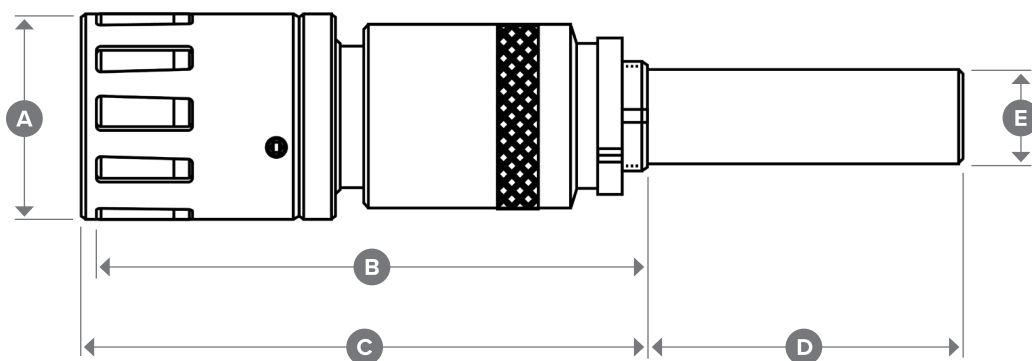
3.339" - 4.099" (84.811mm - 104.115mm)

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, please reference the Intermediate Mandrel table on page 11

5611 Series - Tool Selector

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

5611 Series - Tool Selector

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

5611 Series - Rolls

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

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# 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

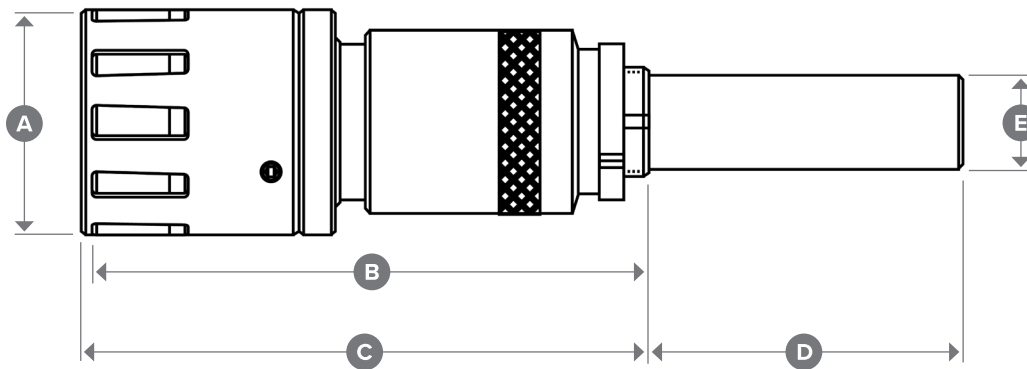
4.089" - 5.037" (103.861mm - 127.940mm)

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, please reference the Intermediate Mandrel table on page 11

5612 Series - Tool Selector

5.027" - 5.495" (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) Gauge Length: 9.125" (231.78mm)		
		Through	Blind	Bottoming
5.027" - 5.068" (127.686 - 128.727mm)	5.031" (127.787mm)	5612-*01-11142	5612-*01-31142	5612-*02-45142
5.058" - 5.099" (128.473 - 129.515mm)	5.062" (128.575mm)	5612-*01-11144	5612-*01-31144	5612-*02-45144
5.089" - 5.130" (129.261 - 130.302mm)	5.093" (129.362mm)	5612-*01-11146	5612-*01-31146	5612-*02-45146
5.121" - 5.162" (130.073 - 131.115mm)	5.125" (130.175mm)	5612-*01-11148	5612-*01-31148	5612-*02-45148
5.152" - 5.193" (130.861 - 131.902mm)	5.156" (130.962mm)	5612-*01-11150	5612-*01-31150	5612-*02-45150
5.183" - 5.224" (131.648 - 132.690mm)	5.187" (131.750mm)	5612-*01-11152	5612-*01-31152	5612-*02-45152
5.214" - 5.255" (132.436 - 133.477mm)	5.218" (132.537mm)	5612-*01-11154	5612-*01-31154	5612-*02-45154
5.246" - 5.287" (133.248 - 134.290mm)	5.250" (133.350mm)	5612-*01-11156	5612-*01-31156	5612-*02-45156
5.277" - 5.318" (134.036 - 135.077mm)	5.281" (134.137mm)	5612-*01-11158	5612-*01-31158	5612-*02-45158
5.308" - 5.349" (134.823 - 135.865mm)	5.312" (134.925mm)	5612-*01-11160	5612-*01-31160	5612-*02-45160
5.339" - 5.380" (135.611 - 136.652mm)	5.343" (135.712mm)	5612-*01-11162	5612-*01-31162	5612-*02-45162
5.371" - 5.412" (136.423 - 137.465mm)	5.375" (136.525mm)	5612-*01-11164	5612-*01-31164	5612-*02-45164
5.402" - 5.443" (137.211 - 138.252mm)	5.406" (137.312mm)	5612-*01-11166	5612-*01-31166	5612-*02-45166
5.433" - 5.474" (137.998 - 139.040mm)	5.437" (138.100mm)	5612-*01-11168	5612-*01-31168	5612-*02-45168
5.464" - 5.505" (138.786 - 139.827mm)	5.468" (138.887mm)	5612-*01-11170	5612-*01-31170	5612-*02-45170
5.496" - 5.537" (139.598 - 140.640mm)	5.500" (139.700mm)	5612-*01-11172	5612-*01-31172	5612-*02-45172

5612 Series - Rolls, Mandrels, & Cages

5.027" - 5.495" (127.686mm - 140.640mm)

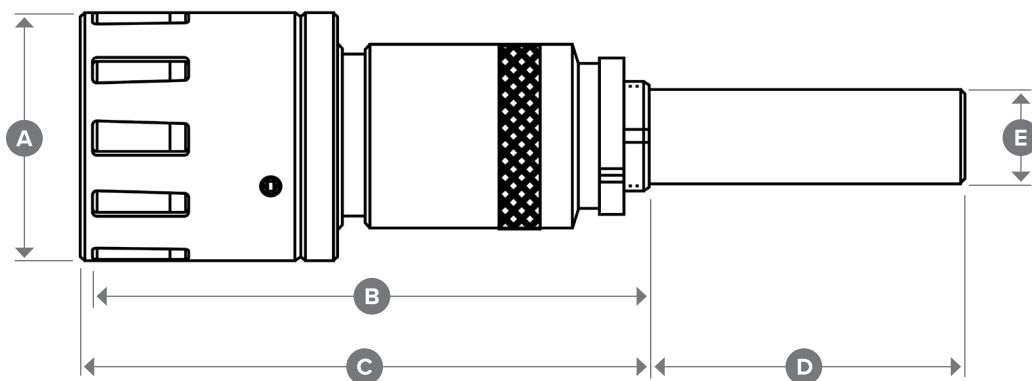
Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# of Rolls	Part #	# of Rolls	Part #	# of Rolls	Part #
5.031" (127.787mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.062" (128.575mm)	13	5100-701-00531	13	5100-704-00531	13	5100-708-00531
5.093" (129.362mm)	13	5100-701-00531	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	3	5100-704-00531	13	5100-708-00531
5.500" (139.700mm)	15	5100-701-00531	13	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, please reference the Intermediate Mandrel table on page 11

5613 Series - Tool Selector

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

remaining sizes and styles located on next page

5613 Series - Tool Selector

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

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)	5611-*01-11378	5611-*01-31378	5611-*02-45378
5.934" - 5.975" (150.724 - 151.765mm)	5.938" (150.825mm)	5611-*01-11380	5611-*01-31380	5611-*02-45380
5.965" - 6.006" (151.511 - 152.552mm)	5.969" (151.613mm)	5611-*01-11382	5611-*01-31382	5611-*02-45382
5.996" - 6.037" (152.298 - 153.340mm)	6.000" (152.400mm)	5611-*01-11384	5611-*01-31384	5611-*02-45384
6.027" - 6.068" (153.086 - 154.127mm)	6.031" (153.187mm)	5611-*01-11386	5611-*01-31386	5611-*02-45386
6.059" - 6.100" (153.899 - 154.940mm)	6.063" (154.000mm)	5611-*01-11388	5611-*01-31388	5611-*02-45388
6.090" - 6.131" (154.686 - 155.727mm)	6.094" (154.788mm)	5611-*01-11390	5611-*01-31390	5611-*02-45390
6.121" - 6.162" (155.473 - 156.515mm)	6.125" (155.575mm)	5611-*01-11392	5611-*01-31392	5611-*02-45392
6.152" - 6.193" (156.261 - 157.302mm)	6.156" (156.362mm)	5611-*01-11394	5611-*01-31394	5611-*02-45394
6.184" - 6.225" (157.074 - 158.115mm)	6.188" (157.175mm)	5611-*01-11396	5611-*01-31396	5611-*02-45396
6.215" - 6.256" (157.861 - 158.902mm)	6.219" (157.963mm)	5611-*01-11398	5611-*01-31398	5611-*02-45398
6.246" - 6.287" (158.648 - 159.690mm)	6.250" (158.750mm)	5611-*01-11400	5611-*01-31400	5611-*02-45400
6.277" - 6.318" (159.436 - 160.477mm)	6.281" (159.537mm)	5611-*01-11402	5611-*01-31402	5611-*02-45402
6.309" - 6.350" (160.249 - 161.290mm)	6.313" (160.350mm)	5611-*01-11404	5611-*01-31404	5611-*02-45404
6.340" - 6.381" (161.036 - 161.077mm)	6.344" (161.138mm)	5611-*01-11406	5611-*01-31406	5611-*02-45406
6.371" - 6.412" (161.823 - 162.865mm)	6.375" (161.925mm)	5611-*01-11408	5611-*01-31408	5611-*02-45408
6.402" - 6.443" (161.619 - 163.652mm)	6.406" (162.712mm)	5611-*01-11410	5611-*01-31410	5611-*02-45410
6.434" - 6.475" (163.424 - 164.465mm)	6.438" (163.525mm)	5611-*01-11412	5611-*01-31412	5611-*02-45412
6.465" - 6.506" (164.211 - 165.252mm)	6.469" (164.313mm)	5611-*01-11414	5611-*01-31414	5611-*02-45414
6.496" - 6.537" (164.998 - 166.040mm)	6.500" (165.100mm)	5611-*01-11416	5611-*01-31416	5611-*02-45416

5613 Series - Rolls

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

Tool Nominal Diameter	Through Rolls		Blind Rolls		Bottoming Roll	
	# 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)

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, please reference the Intermediate Mandrel table on page 11

COMPACT BURNISHING

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

Compact Burnishing Tools are great for accurate sizing, precision finishing, and surface hardening of bores.

Available in ID Multi-Roll style and stick style.

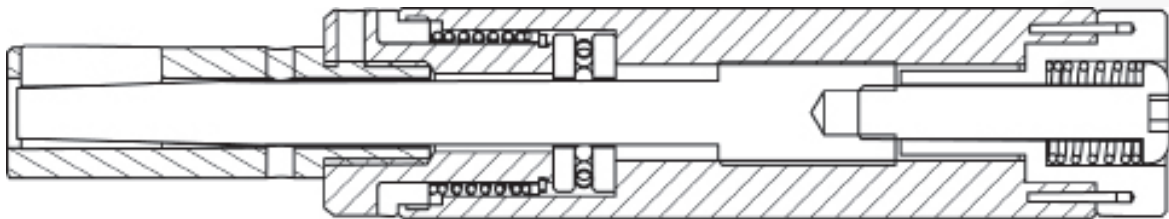




STANDARD TOOL STYLES

ID bores can go down to 4mm in the standard designs.

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



OD CARBIDE ROLL BURNISHING

The Outside Diameter (OD) Carbide Roll Burnishing Tool is designed for use on turning machines to create extremely fine finishes on most ferrous and non-ferrous materials.

The versatility of these tools allows the burnishing of external diameters, tapers, radii, and face as well as large internal bores.



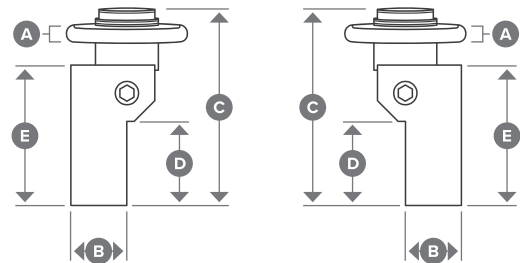
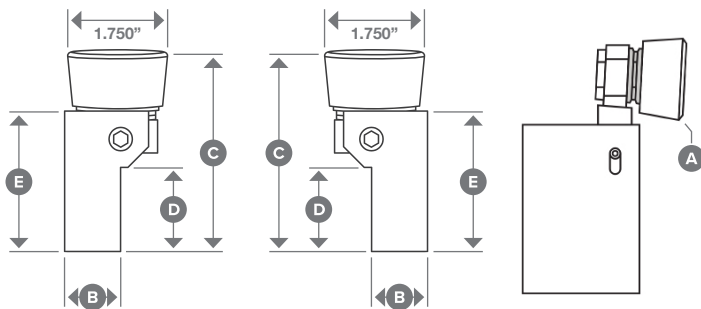
The OD carbide roll burnishing tool can be used to burnish ODs, flat face surfaces, and shallow ID parts (up to 1.000" deep).

Available in right and left hand styles.





CARBIDE ROLL TOOL STYLES



STANDARD STYLE

Tool Number	Left or Right Hand	A Roll Radius	B Shank Size	C Overall Height	D Clamping Height	E Block Height
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"
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

TOP HAT STYLE

Tool Number	Left or Right Hand	A Roll Radius	B Shank Size	C Overall Height	D Clamping Height	E Block Height
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"
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

OPERATING PROCEDURE

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:**

100/120 RMS

FEED RATE:

0.004"/0.008"

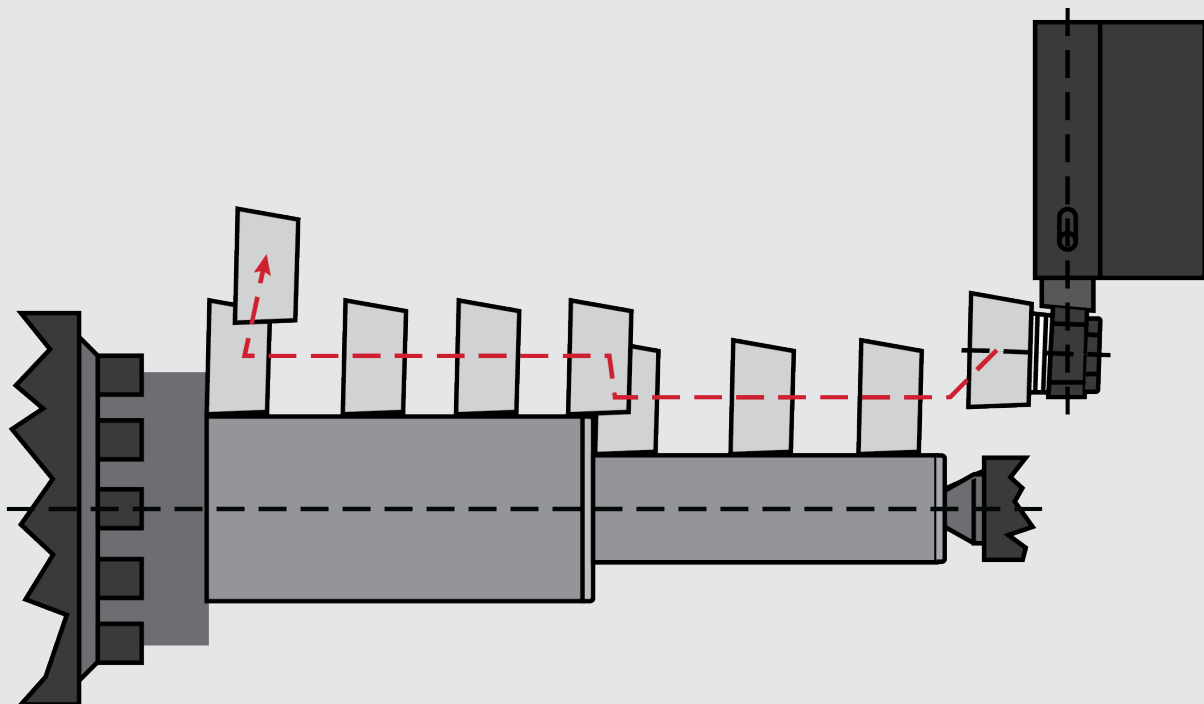
SPEED:

400 to 800
surface ft
per min
(1200 max)

**COOLANT
PREPARATION:**

Water
soluble or oil

Ensure
bearings are
sufficiently
greased at
all times



APPLICATION

Eliminate secondary processes such as grinding, honing, and polishing.

Part Material:
4140 Steel

Diameter:
2.000"

Length:
2.500"

Stock Allowance:
0.0005" - 0.0010"

**Pre Burnish Surface
Finish:**
80 μ Ra

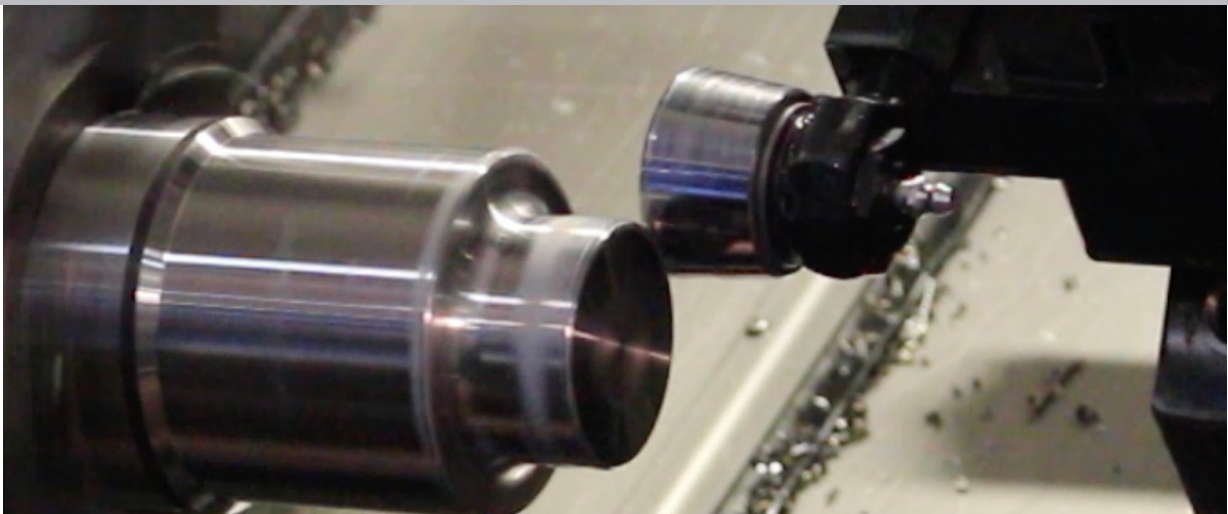
Tool Used:
S2075-00

Speed:
750 SFM

Feed:
0.004 IPR
(Slower on radii)

**Post Burnish
Surface Finish:**
7 μ Ra

Cycle Time:
26.18 seconds



ID/OD CARBIDE ROLL BURNISHING

The Boring Bar Style Internal Diameter and Outer Diameter (ID/OD) Tool is used on turning machines to burnish internal and external surfaces, creating extremely fine finishes on most ferrous and non-ferrous materials.

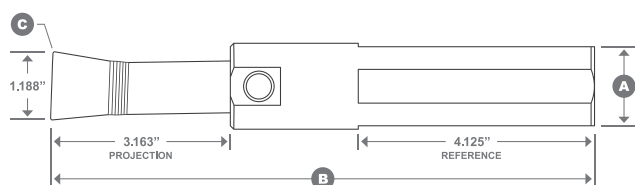
Available in standard lengths of 12" and 18".



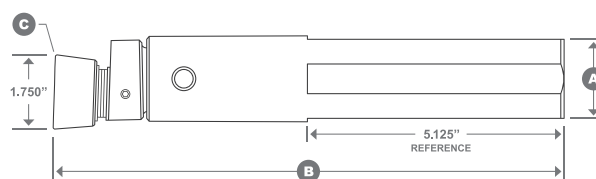


STANDARD TOOL STYLES

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".



-	A	B	-	C
Tool Number	Shank Size	Overall Length	Effective Reach	Roll Radius
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)

OPERATING PROCEDURE

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:

100/120 RMS

FEED RATE:

0.004"/0.008"

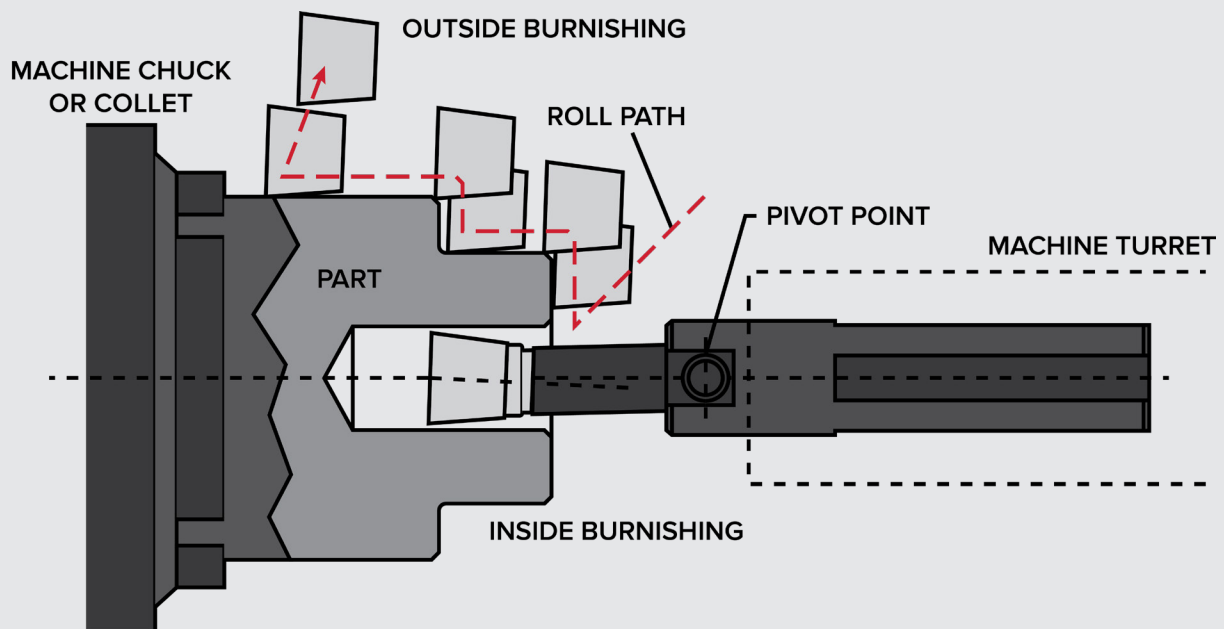
SPEED:

400 to 800
surface ft
per min
(1200 max)

COOLANT PREPARATION:

Water
soluble or oil

Ensure
bearings are
sufficiently
greased at
all times



APPLICATION

Transform your turning center into a fine finishing machine.

Part Material:
Stainless Steel

Diameter:
2.500"

Length:
1.500"

Stock Allowance:
0.0005" - 0.0010"

**Pre Burnish Surface
Finish:**
90 μ Ra

Tool Used:
S2320-00

Speed:
400 SFM (611 RPM)

Feed:
0.004 IPR

**Post Burnish
Surface Finish:**
6 μ Ra

Cycle Time:
24.54 seconds



DIAMOND BURNISHING

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.



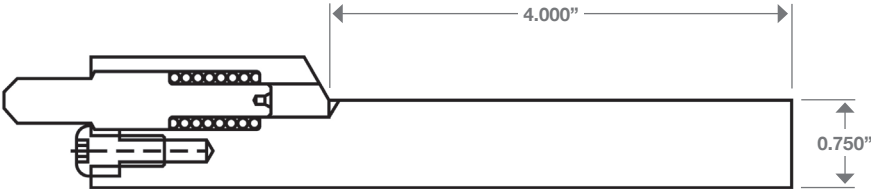
Available in inch and metric slim-line, square, offset, on-center, and boring bar styles.

All diamond burnishing tools are also available as kits which contain: a complete tool, spare diamond stem, spring and Allen key.



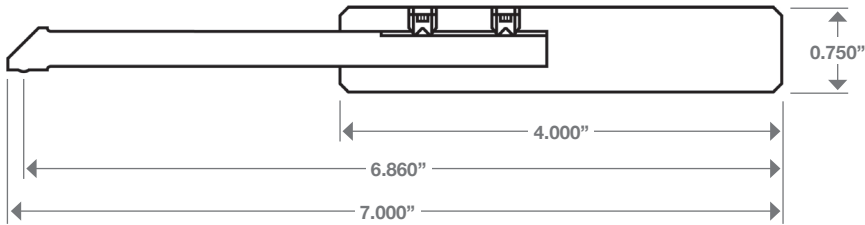


STANDARD TOOL STYLES



STICK TOOL 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 TOOL 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.

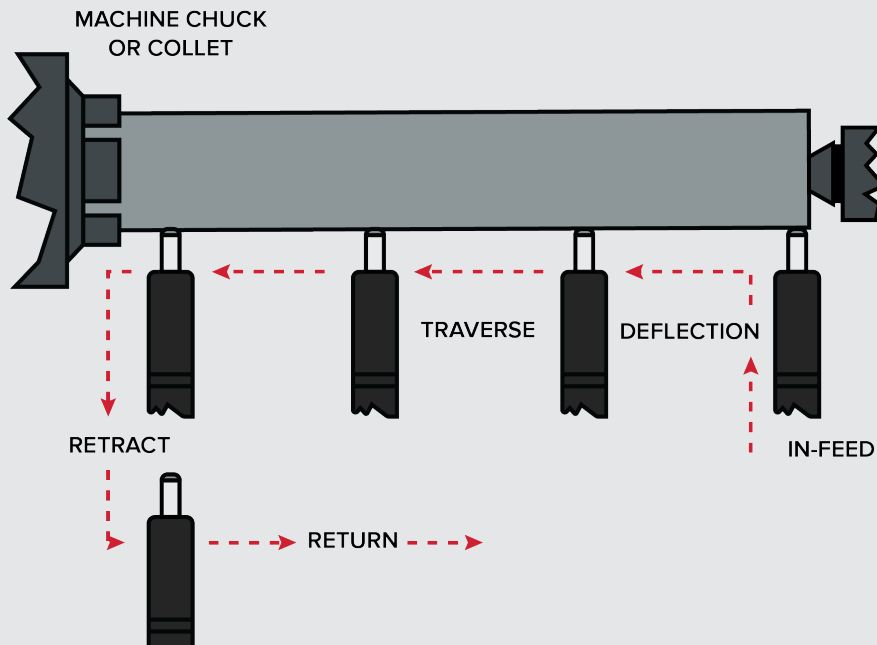
STANDARD DIAMOND BURNISHING TOOLS

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	0.750" square shank with boring bar arm on center

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

OPERATING PROCEDURE

**PART PREPARATION:**

100/120 RMS

FEED RATE:

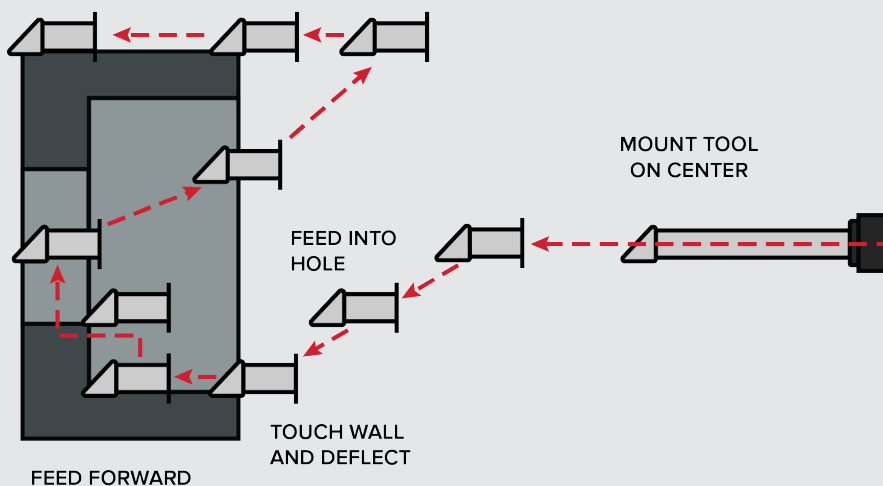
0.003"/0.004"

SPEED:

250 to 500 surface
ft. per min (750 max)

COOLANT REQUIRED:

Water soluble or oil

**PART PREPARATION:**

100/120 RMS

FEED RATE:

0.003"/0.004"

SPEED:

250 to 500 surface
ft. per min (750 max)

COOLANT REQUIRED:

Water soluble or oil

MINIMUM HOLE DIAMETER:

0.500"

MAXIMUM TOOL REACH:

2.861"

APPLICATION

An economical and user-friendly tool for producing a mirror-like surface finish.

Part Material:
4140

Diameter:
2.500"

Length:
1.250"

Stock Allowance:
0.0002" - 0.0005"

**Pre Burnish Surface
Finish:**
80 μ Ra

Tool Used:
S2300-00

Speed:
400 SFM

Feed:
0.004 IPR

**Post Burnish
Surface Finish:**
2 μ Ra

Cycle Time:
30.68 seconds



SIZING AND FINISHING

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.



Sizing and Finishing tools are ideal for use with automatic screw machines, drill presses, lathes, and most CNC machines.





OPERATING PROCEDURE

Sizing and Finishing Tools enter the workpiece with rolls retracted, once in position, the rolls are expanded radially to create size.

Actuation can be either mechanical off a qualified part surface or actuation plate, hydraulic, pneumatic, or coolant fed.



MECHANICAL JOINING

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.

Mechanical joints can withstand over 20,000 pounds of hydro-static pressure and will not leak, pull apart, or come loose due to vibrations or temperature change.

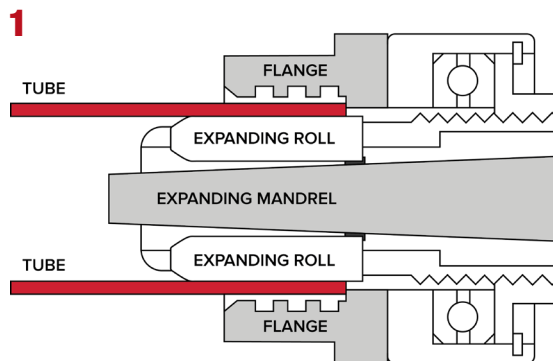


Mechanical Joining Tools are easy to operate and can be used on manual electric rolling motors, pneumatic motors, special machines, and in rare cases, on CNC machines.



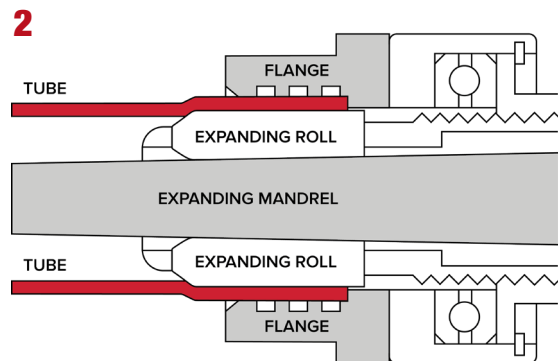


OPERATING PROCEDURE



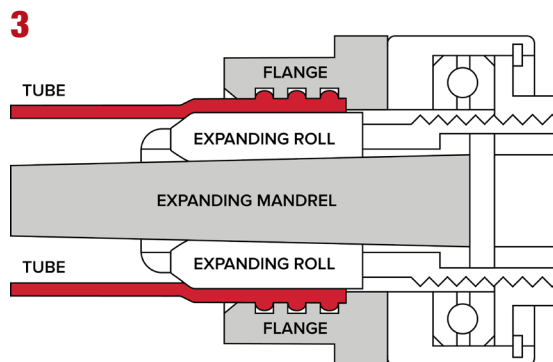
0% EXPANSION

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



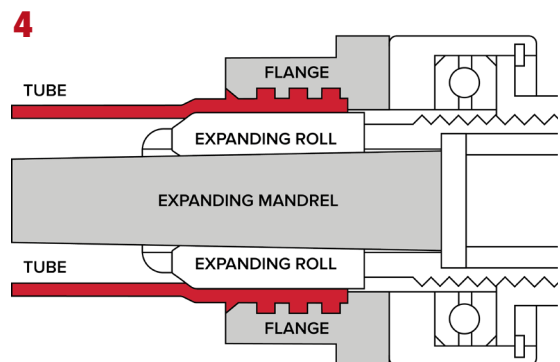
25% EXPANSION

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.



50% EXPANSION

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



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.

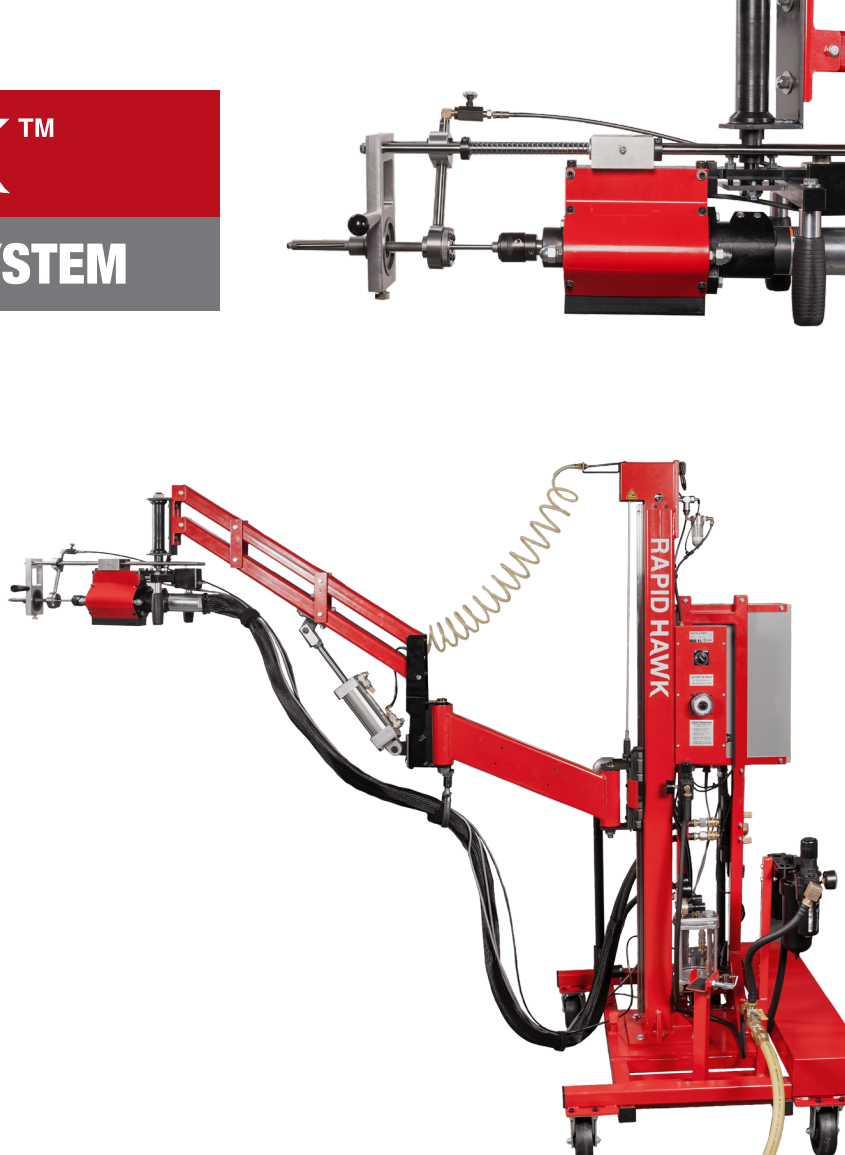
RAPID HAWK™

ELECTRIC TUBE ROLLING SYSTEM

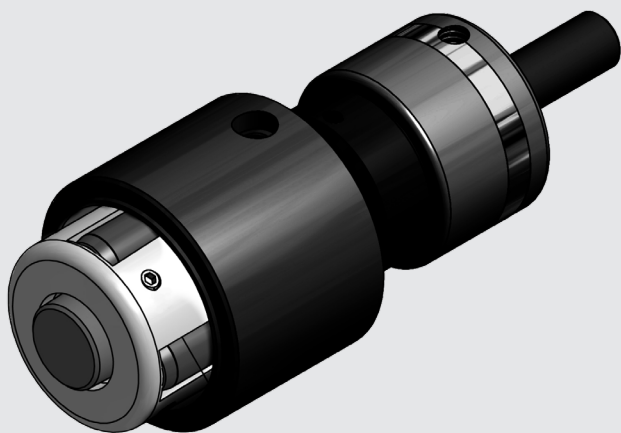
Rapid Hawk offers the speed and productivity of a pneumatic motor with the precision and control of an electronically controlled system. It maximizes productivity by providing best in class cycle times and eliminating costly rework from less precise methods.

Combining a pneumatically driven power head with Elliott's patent pending Direct Torque™ technology, operators simply set a target torque and start rolling. The system monitors torque and provides consistently precise wall reductions for every expansion.

The Hybrid Series takes ergonomics and productivity to a new level with trigger-less operation and auto-cycling. Simply turn the system on and it will start, stop and reverse without any operator intervention.



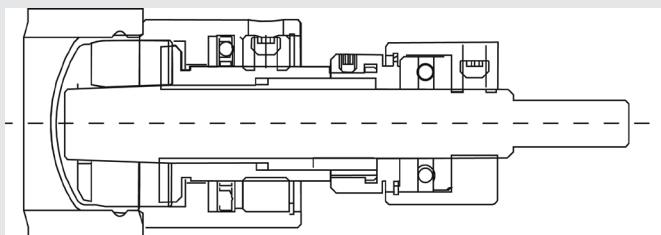
CUP PLUG EXPANDERS



Used to install cups in motor blocks, heads and other similar assemblies.

The cup plug expander offers substantial savings over the pipe or weld plug.

It can be used to expand rings or sleeves inside any bore diameters.



APPLICATION

The superior method for joining tubing to flanges and fittings.

Part Material:
Stainless Steel tube
to cast manifold

Tube ID:
0.992"

Tube Wall Thickness:
0.125"

Stock Allowance:
45 ft. lbs. using Elliott
hydraulic motor

**Pre Burnish Surface
Finish:**
80 μ Ra

Tool Used:
B10779-00

Entry Diameter Minimum:
0.975"

Max Expansion Diameter:
1.062"

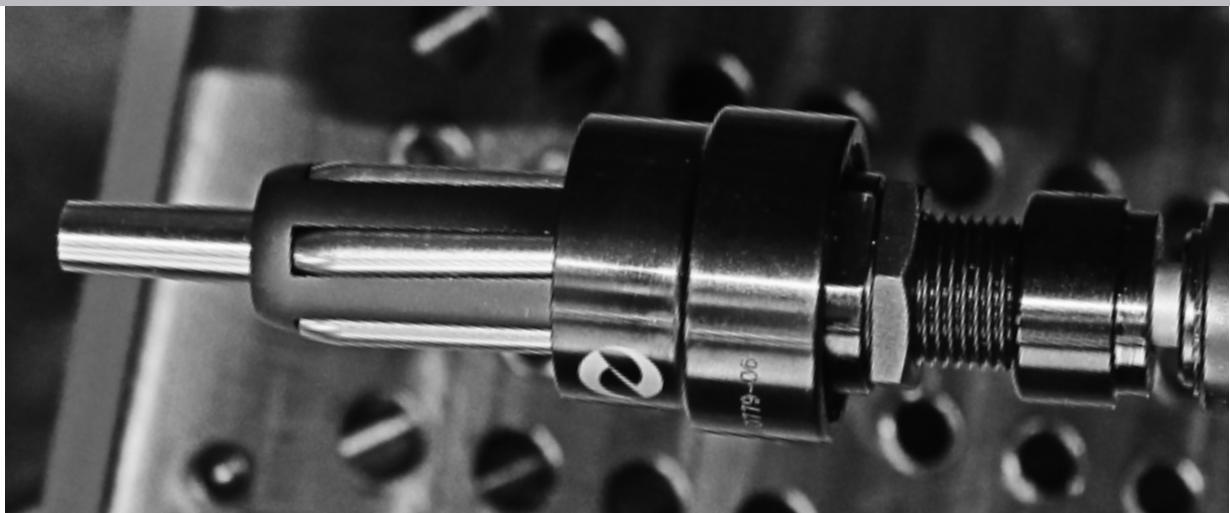
Depth:
1.250"

Max Depth:
1.750"

Speed:
80 RPM

Mechanically joined
a stainless steel
tube to a cast fitting
for a brake line
connection.

Cycle Time:
13 seconds



INTERNAL RECESSING UNIT

The Internal Recessing Unit (IRU), an Elliott Tool Technologies exclusive, is the most advanced and innovative cutting tool.

What makes the IRU so unique is its ability to machine multiple grooves and lands simultaneously, quickly, and accurately.

The IRU is designed to support the cutter along its entire length as the tool pilots into the bore. The strategic location of the cams to support the cutting teeth ensures accuracy and rigidity.

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.

The IRU is the preferred tool for machining metering lands by OEMs and Tier 1 suppliers of hydraulic control valves throughout the world.

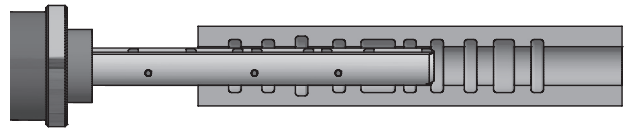




OPERATING PROCEDURE

1

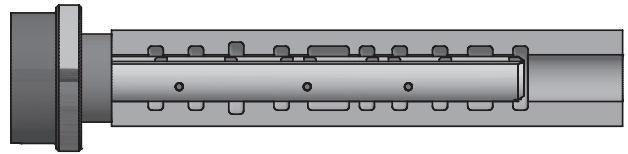
The IRU is fed into the work-piece at a fast feed rate with the pilot locating within the bore until the nose piece is approximately 0.020" (0.5mm) from the face of the work-piece.



FEED DIRECTION →

2

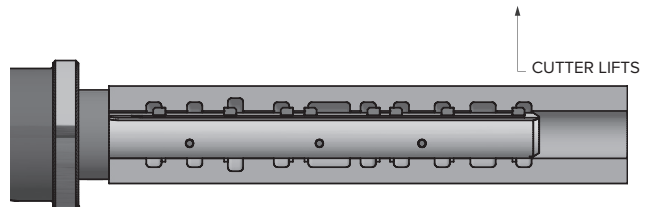
Feed into the work-piece at a cutting feed rate and make contact with the face of work-piece. At this point, the operating head and nose piece are engaged and will stop rotating.



FEED DIRECTION →

3

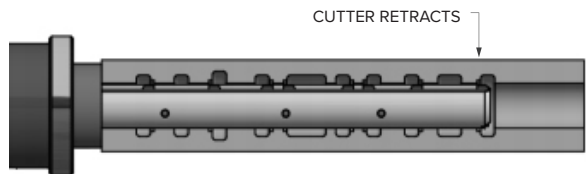
Continue feeding forward - causing the system to actuate - lifting the cutter perpendicular to the axis of rotation, machining the internal features in the bore.



FEED DIRECTION →

4

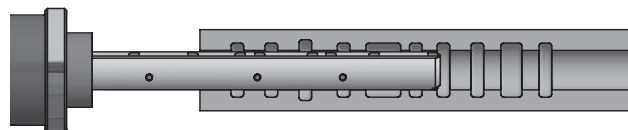
Retract the IRU three (3) times faster than the cutting feed rate.



FEED DIRECTION ←

5

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.



FEED DIRECTION ←

APPLICATION

Machine internal grooves in one operation.

Part Material:
Gray Iron

Diameter:
0.625" bore

Job Parameters:
Machine 2
internal grooves
simultaneously
(0.125" wide by
0.060" deep, per
side)

Tool Used:
IRU-0444

Speed:
1000 SFM

Cut Feed:
0.003 IPR

Retract Feed:
0.009 IPR

No deflection,
good surface finish
in grooves

Groove positions to
print and achieved
groove diameter of
0.745"

Cycle Time:
6.10 seconds





gull
TOOL TECHNIK
Since 1978
52075