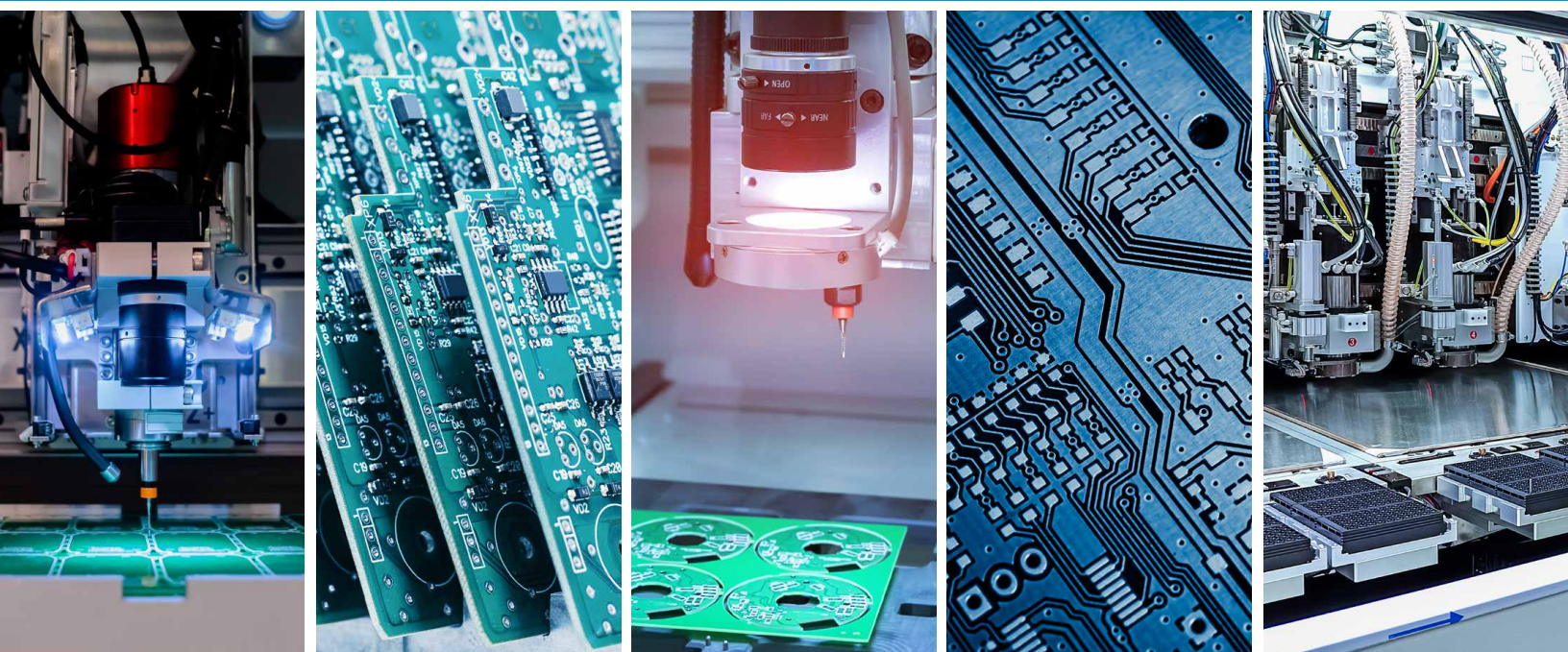




KYOCERA Precision Tools

PRINTED CIRCUIT BOARD

CUTTING TOOLS CATALOG



Contact



Customer Service

1 (888) 848-9266
001-714-428-3611 (Int)

Monday - Friday
5:00AM - 4:30PM (PST)
8:00AM - 7:30PM (EST)



Inquiries

pcb.cs@kyocerapcb.com



Visit us online

www.kyoceraprecisiontools.com/pcb

Table of Contents

Competitive Advantages	3
Tool Selection & Application Guide	4
Resharpener Services	6
Drills	7
End Mills	45
Routers	59
Scoring / Engraving / Countersinks	71
Diameter Conversion Chart	77
PCB Carbide Case Study	78
Recommended Cutting Conditions	79



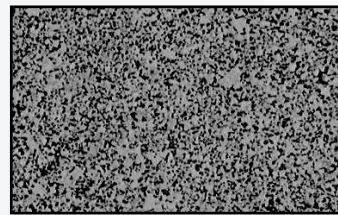
*Worldclass PCB and custom-tailored
micro tooling solutions for maximum productivity*

Key Competence in PCB and Micro Machining Applications

Kyocera's highest quality micro tooling portfolio delivers maximum productivity and lowest cost per part results. As a trusted and recognized manufacturer of PCB and special carbide cutting tools, Kyocera has earned a record of success among domestic and international leading brands. Our product strategy utilizes:

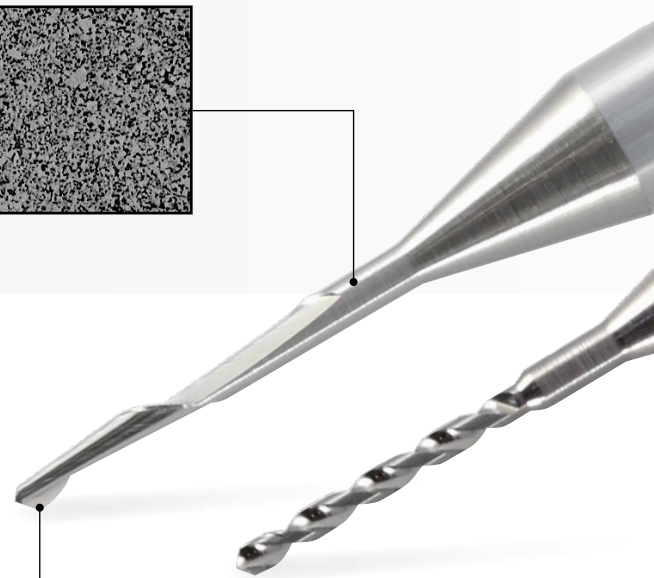
Optimized Carbide Grades

We only utilize premier carbide grades from qualified leading suppliers in grain size categories of fine ($1\mu\text{m} - 1.3\mu\text{m}$), submicron ($0.6\mu\text{m} - 0.9\mu\text{m}$), ultra fine ($0.3\mu\text{m} - 0.5\mu\text{m}$) and nano ($<0.3\mu\text{m}$).



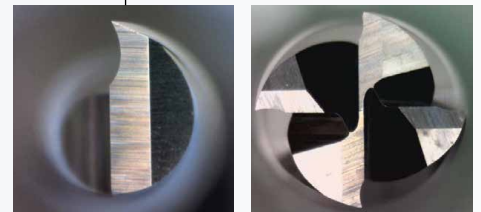
Highly Innovative Tool Geometries

Our custom-tailored solutions for milling, drilling and micro machining utilize worldclass engineering expertise, resulting in superior tooling with unique flute forms, optimized cutting angles, innovative flute offsets and other proprietary grinding features.



Superior Grinding Finish and Dimensional Accuracy

Applying state of the art tool production technology with innovative engineering, Kyocera aims to exceed the expectations of our valued customers and industry partners. Our tools feature superior flute and shank concentricity, highest accuracies in form and diameters.

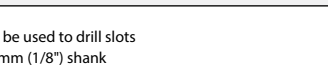


Advanced PVD and CVD Coating Technology

Our special micro tools utilize class leading thin-film PVD and true diamond CVD coatings.

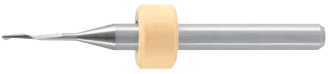


Tool Selection & Application Guide

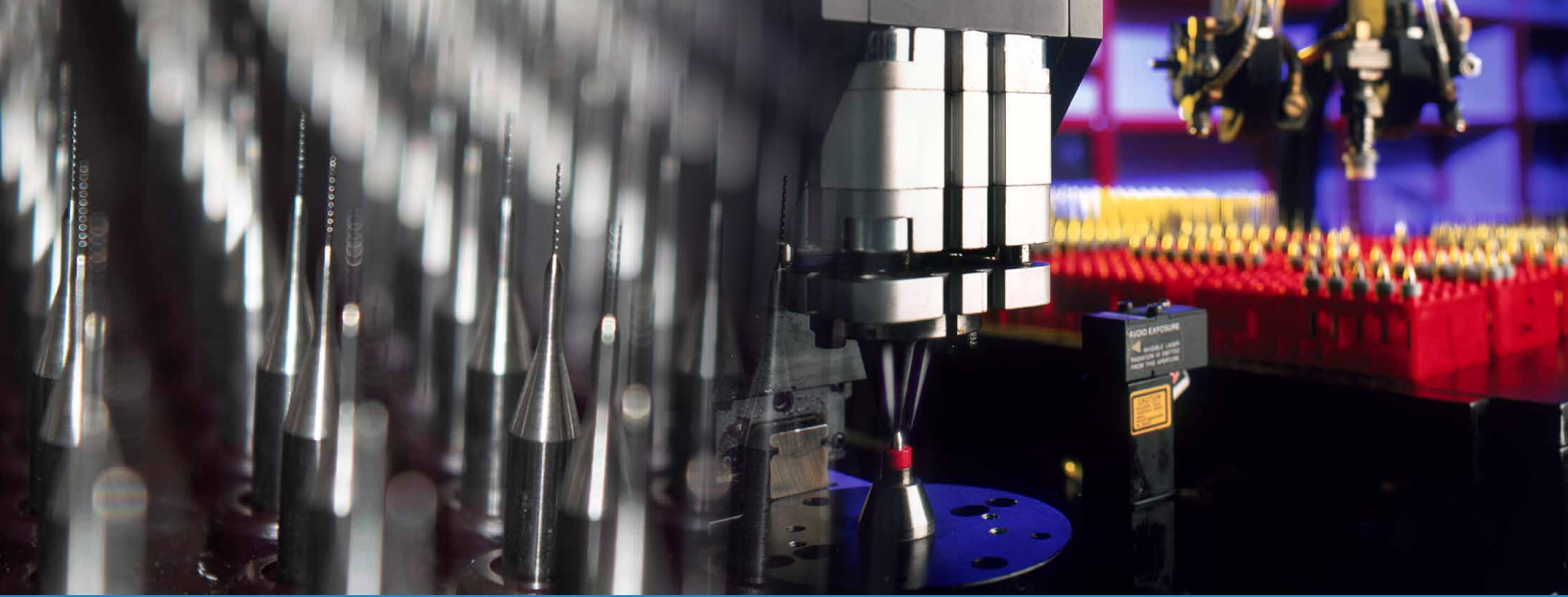
Tool Type	Series	Product Description	Shape (Not Actual Tool Size)	No. of Flutes	Diameter Range	Hole Location Accuracy	Hole Wall Quality	Stack Height	Repoint Layer	Layer Count	Slot Drilling	Back Panel Drilling	Ref. Page
DRILLS	Universal / General Application												
	100	Universal PCB Drills		2	0.0197"~0.1250" 0.50mm~3.15mm	Standard	Standard	Standard	Standard	Standard	Yes*	Yes	10
	150	Universal Inverse Diameter PCB Drills		2	0.1260"~0.2638" 3.20mm~6.70mm	All Applications							16
	560	High Helix Universal PCB Drills Standard Flute		2	0.0039"~0.0177" 0.10mm~0.45mm	Superior	Standard	Standard	Standard	Standard	-	-	21
	580	High Helix Universal PCB Drills Extended Flute		2	0.0039"~0.0180" 0.10mm~0.45mm	Standard	Standard	High	Standard	Standard	-	-	22
	700	Universal Slot Application PCB Drills Standard Flute		2	0.0160"~0.0520" 0.55mm~1.15mm	-	-	High (0.50mm-3.17mm)	Standard (0.50mm-3.17mm)	High (0.50mm-3.17mm)	Yes	Yes (0.50mm-3.17mm)	24
	750	Universal Slot Application PCB Drills Extended Flute		2	0.0374"~0.0787" 0.95mm~2.00mm	-	-	High (0.50mm-3.17mm)	Standard (0.50mm-3.17mm)	High (0.50mm-3.17mm)	Yes	Yes (0.50mm-3.17mm)	25
	High Performance / Special Application												
	405	High Performance Pilot Drills Short Flute		2	0.0039"~0.0453" 0.10mm~1.15mm	Superior	-	-	-	-	-	-	27
	422	MicroMax HP Drill		2	0.0039"~0.0256" 0.10mm~0.65mm	Superior	Superior	High	Extended	High	-	Yes	29
	430	High Performance Hybrid Drills		2	0.0039"~0.0394" 0.10mm~1.00mm	Superior	Superior	High	Extended	High	-	Yes	31
	460	Advanced Undercut Drills Standard Flute		2	0.0059"~0.0256" 0.15mm~0.65mm	Superior	Superior	Standard	Limited	High	-	-	34
	480	Advanced Undercut Drills Extended Flute		2	0.0059"~0.1240" 0.15mm~3.15mm	Standard	Superior	High	Limited	High	-	Yes	36
	102	Blind Via PCB Drills		2	0.0039"~0.0276" 0.10mm~0.70mm	Superior	High	-	-	-	-	-	40
	240	High Performance Flex Drills		2	0.0059"~0.0394" 0.15mm~1.00mm	Standard	Superior	Standard	Standard	High	-	-	42
	260	High Performance Back Drills		2	0.0145"~0.0420" 0.40mm~1.00mm	Standard	Superior	Standard	Standard	High	-	-	44

*Series 100 drills > 2.00mm in diameter can be used to drill slots
 All products are manufactured with a 3.17mm (1/8") shank
 See product page for high performance features.

Tool Selection & Application Guide

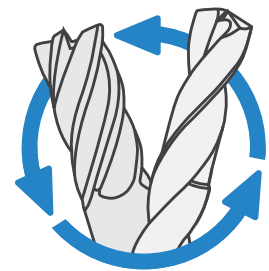
Tool Type	Series	Product Description	Shape (Not Actual Tool Size)	No. of Flutes	Diameter Range	Edge Finish	Material Application	Controlled Depth Mill	Gold Edges	Plated Slots (<2xD)	Flash Removal	Ref. Page
END MILLS	1500	High Speed Cutting (HSC) Standard Single Flute End Mill		1	0.0312"~0.1250" 1.27mm~2.00mm	Superior	Soft (PTFE, Flex, Metal)	-	-	-	-	47
	1560	High Speed Cutting (HSC) Single Flute End Mill for Flexible Materials and Adhesive Layers		1	0.0217"~0.0787" 0.55mm~2.00mm	Superior	Flex	-	-	-	-	48
	1600	Universal PCB End Mills Two Flutes for General Purpose Milling		2	0.0118"~0.1250" 0.30mm~3.00mm	Superior	Soft (PTFE, Flex, Metal)	Yes	Yes	Yes	-	50
	1603	Universal PCB End Mills Two Flutes for Plexiglass, Soft PCB Materials and Non-ferrous Metals		2	0.0472"~0.1250" 1.20mm	Superior	Soft (PTFE, Flex, Metal)	Yes	Yes	Yes	-	52
	1660	Universal PCB End Mills Two Flutes for Flexible Laminates		2	0.0315"~0.0630" 0.80mm~1.60mm	Superior	Flex	-	-	-	-	53
	1730	High Precision Cutting (HPC) Three Flute End Mills for Soft PCB Materials, Non-ferrous Metals & Gold Tab Connectors		3	0.0315"~0.0945" 0.80mm~2.40mm	Superior	Soft (PTFE, Flex, Metal)	-	Yes	-	-	55
	1735	High Precision Cutting (HPC) End Mills Three Flutes for Flex Products and PTFE Milling		3	0.0315"~0.1250" 0.80mm~2.40mm	Superior	All	Yes	Yes	Yes	-	57
	1800	Universal PCB End Mills Four Flutes		4	0.0625"~0.1250"	Superior	Soft (PTFE, Flex, Metal)	-	-	Yes	-	58
ROUTERS	Universal / General Application											
	2300	Universal PCB Router with Chipbreaker		2	0.0197"~0.1250" 0.80mm~3.00mm	Standard	Standard	-	-	-	-	61
	4100	High Efficiency Cross Cut Router		2	0.0197"~0.1250" 0.50mm~2.60mm	Standard	Standard	-	-	-	-	64
	High Performance / Special Application											
	2350	High Performance Fracture Reducing Routers		2	0.0315"~0.0945" 0.80mm~2.40mm	Superior	Brittle	-	-	-	-	67
SCORING / ENGRAVING / COUNTERSINKS	2390	High Performance Flash Routers		2	0.0938"~0.1250"	Standard	All	-	-	-	Yes	68
	1300	Gold Tab Premium Edge Routers		2	0.0630"~0.0945" 1.60mm~2.40mm	Superior	-	-	Yes	-	-	70
	2002	Universal PCB Scoring / Engraving Tools		2	0.0625"~0.1250" 3.00mm	Superior	Standard	Yes	Yes	-	-	73
	2000	Universal PCB Single Flute Countersinks		1	0.2500" 82°, 90°, 100°	Superior	All	-	-	-	-	75
	2400	Universal PCB Four Flute Countersinks		4	0.2500"~0.6250" 60°, 82°, 90°, 100°, 120°, 140°	Standard	All	-	-	-	-	76

*Series 1735 End Mill End Style allows surface milling and plunging.
All products are manufactured with a 3.17mm (1/8") shank
See product page for high performance features.



Resharpener Services

KYOCERA Precision Tools offers its valued customers a resharpener service available upon request. For diameters from 0.15mm to 1.20mm, our automated regrounding process delivers consistent, high-precision results to extend tool life. Contact customer service for more information.



Quality assurance within Kyocera's automated resharpener service includes:

- ✓ **Screening of Every Tool Before Resharpener**
to ensure proper geometry and confirm sufficient remaining flute length.
- ✓ **Inspection of Every Tool After Resharpener**
for 11 critical attributes prior to repackaging.
- ✓ **Stock Removal Measurement**
to ensure that the specified amount has been removed. Ensures quality of point while maximizing tool life.
- ✓ **Sharp Tools**
ensured by an automatic 2nd pass resharpen with variable stock removal in cases where the initial specified stock removal was insufficient to achieve the desired cutting edge sharpness.



Customer Service

1 (888) 848-9266
001-714-428-3611 (Int)



Inquiries

pcb.cs@kyocerapcb.com

Contents

Universal & General Application Drills

Series 100 - Universal PCB Drills	9
Series 150 - Universal Inverse Diameter PCB Drills	15
Series 560 / 580 - High Helix Universal PCB Drills - Standard / Long Flute	20
Series 700 / 750 - Universal Slot Application PCB Drills - Standard / Long Flute	23

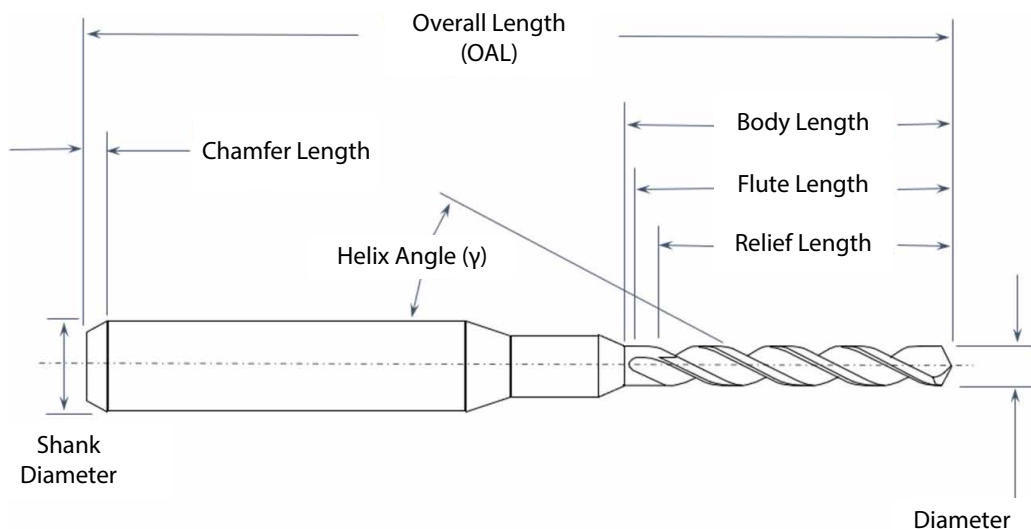
High Performance & Special Application Drills

Series 405 - High Performance Short Flute Pilot Drills	26
Series 422 - MicroMax High Performance Drills	28
Series 430 - High Performance Hybrid Drills	30
Series 460 / 480 - Advanced Undercut Drills - Standard / Long Flute	33
Series 102 - Blind Via Drills	39
Series 240 - High Performance Flex Drills	41
Series 260 - High Performance Back Drills	43

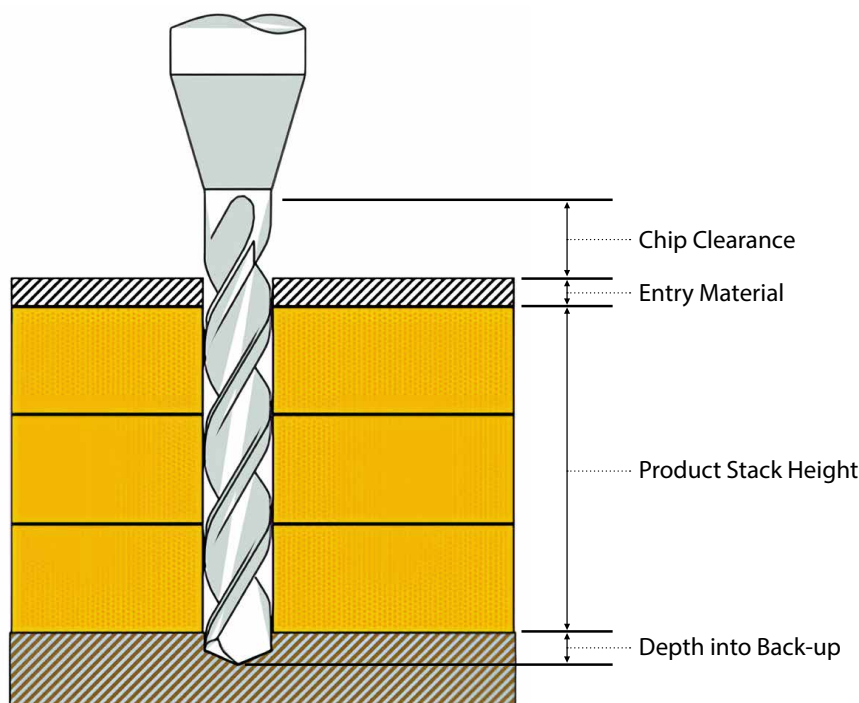
PCB Drills

Technical Overview

PCB Drill Characteristics and Geometry Details



Minimum Length of Cut Requirement



Minimum Chip Clearance
+
Entry Material Thickness
+
Product Stack Height
+
Depth into Back-up
+
Stock Removal (@ Last Use)

=

Minimum Flute Length

Series 100

Universal PCB Drills



Application and Competitive Advantages of Series 100 PCB Drills



- Ideal for general PCB board drilling in low-, medium- and high-stack panels.
- Wide application range as these drills accommodate successful machining of most common PCB materials.
- Accurate and precise PCB drill point geometry in wire-, fractional and metric sizes (0.020" to 0.125").
- No "bird nest" since these drills reduce debris build-up by offering multiple drill point angles (130° and 165°).
- Standard flute lengths provides enhanced chip evacuation and reduced heat build-up in deeper stacks.
- Precision ground for consistent hole diameter and tight tolerance control across high-volume runs.

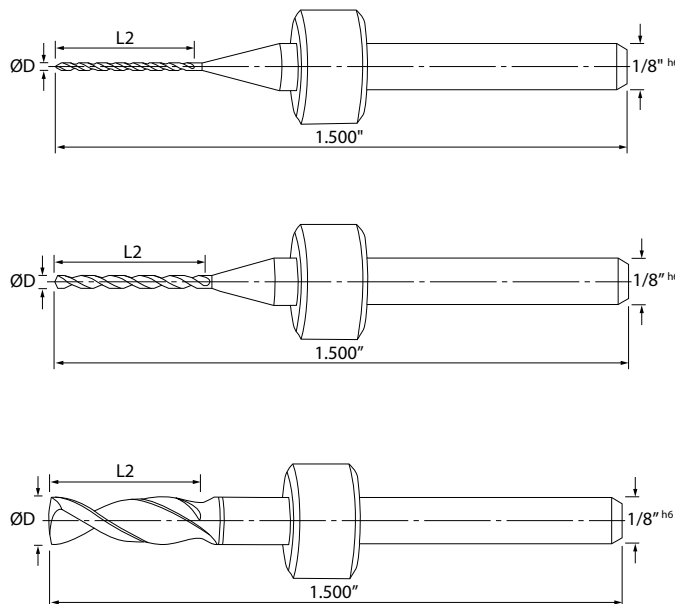
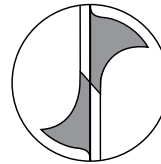
Series 100 Diameter Range

0.0197" ~ 0.1250"

0.50mm ~ 3.15mm

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.

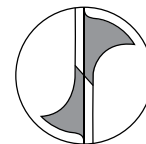
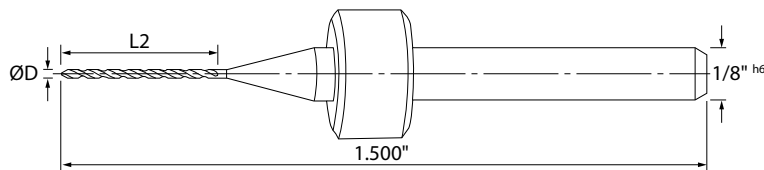


Series 100

Universal PCB Drills

Diameter Range

0.0197" ~ 0.0394" | 0.50mm ~ 1.00mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
100.0197.360	0.50mm	0.0197	0.360	9.14	130°	+0/-0.0003	+0/-0.008
100.0200.360	#76	0.0200	0.360	9.14	130°	+0/-0.0003	+0/-0.008
100.0210.360	#75	0.0210	0.360	9.14	130°	+0/-0.0003	+0/-0.008
100.0217.360	0.55mm	0.0217	0.360	9.14	130°	+0/-0.0003	+0/-0.008
100.0225.360	#74	0.0225	0.360	9.14	130°	+0/-0.0003	+0/-0.008
100.0236.360	0.60mm	0.0236	0.360	9.14	130°	+0/-0.0003	+0/-0.008
100.0240.400	#73	0.0240	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0250.400	#72	0.0250	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0256.400	0.65mm	0.0256	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0260.400	#71	0.0260	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0276.400	0.70mm	0.0276	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0280.400	#70	0.0280	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0292.400	#69	0.0292	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0295.400	0.75mm	0.0295	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0310.400	#68	0.0310	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0315.400	0.80mm	0.0315	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0320.400	#67	0.0320	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0330.400	#66	0.0330	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0335.400	0.85mm	0.0335	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0350.400	#65	0.0350	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0354.400	0.90mm	0.0354	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0360.400	#64	0.0360	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0370.400	#63	0.0370	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0374.400	0.95mm	0.0374	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0380.400	#62	0.0380	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0390.400	#61	0.0390	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0394.400	1.00mm	0.0394	0.400	10.16	130°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 100

Small and medium sized drills with optimized flute lengths capable of drilling medium and high stacks for improved utilization.

Suitable for:

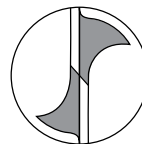
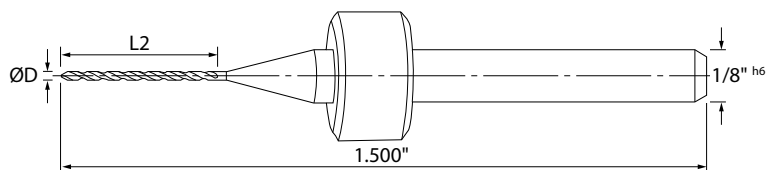
- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Ceramic filled laminates
- Flex Materials

Series 100

Universal PCB Drills

Diameter Range

0.0400" ~ 0.0689" | 1.05mm ~ 1.75mm



4 Facet Point Geometry



Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
100.0400.400	#60	0.0400	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0410.400	#59	0.0410	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0413.400	1.05mm	0.0413	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0420.400	#58	0.0420	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0430.400	#57	0.0430	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0433.400	1.10mm	0.0433	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0441.400	1.12mm	0.0441	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0453.400	1.15mm	0.0453	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0465.400	#56	0.0465	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0472.400	1.20mm	0.0472	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0492.400	1.25mm	0.0492	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0512.400	1.30mm	0.0512	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0520.400	#55	0.0520	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0531.400	1.35mm	0.0531	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0550.400	#54	0.0550	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0551.400	1.40mm	0.0551	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0571.400	1.45mm	0.0571	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0591.400	1.50mm	0.0591	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0595.400	#53	0.0595	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0610.400	1.55mm	0.0610	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0625.400	1/16"	0.0625	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0630.400	1.60mm	0.0630	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0635.400	#52	0.0635	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0650.400	1.65mm	0.0650	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0669.400	1.70mm	0.0669	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0670.400	#51	0.0670	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0689.400	1.75mm	0.0689	0.400	10.16	130°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 100

Small and medium sized drills with optimized flute lengths capable of drilling medium and high stacks for improved utilization.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Ceramic filled laminates
- Flex Materials

DRILLS

END MILLS

ROUTERS

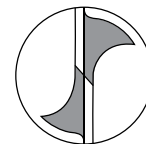
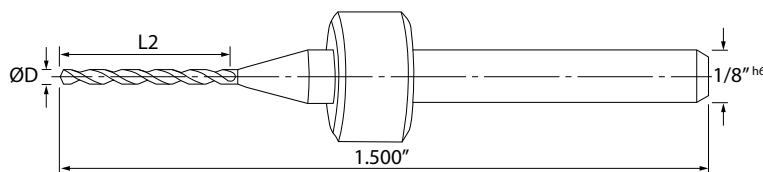
SCORING / ENGRAVING /
COUNTERSINKS

Series 100

Universal PCB Drills

Diameter Range

0.0700" ~ 0.0980" | 1.80mm ~ 2.45mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
100.0700.400	#50	0.0700	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0709.400	1.80mm	0.0709	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0728.400	1.85mm	0.0728	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0730.400	#49	0.0730	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0748.400	1.90mm	0.0748	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0760.400	#48	0.0760	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0768.400	1.95mm	0.0768	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0781.400	5/64"	0.0781	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0785.400	#47	0.0785	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0787.400	2.00mm	0.0787	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0807.400	2.05mm	0.0807	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0810.400	#46	0.0810	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0820.400	#45	0.0820	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0827.400	2.10mm	0.0827	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0846.400	2.15mm	0.0846	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0860.400	#44	0.0860	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0866.400	2.20mm	0.0866	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0886.400	2.25mm	0.0886	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0890.400	#43	0.0890	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0906.400	2.30mm	0.0906	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0925.400	2.35mm	0.0925	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0935.400	#42	0.0935	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0938.400	3/32"	0.0938	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0945.400	2.40mm	0.0945	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0960.400	#41	0.0960	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0965.400	2.45mm	0.0965	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0980.400	#40	0.0980	0.400	10.16	130°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



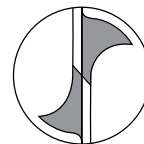
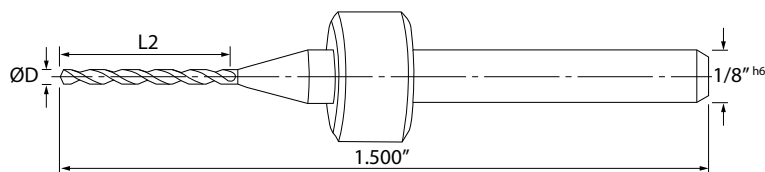
For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 100

Universal PCB Drills

Diameter Range

0.0984" ~ 0.1160" | 2.50mm ~ 2.95mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
100.0984.400	2.50mm	0.0984	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.0995.400	#39	0.0995	0.400	10.16	130°	+0/-0.0003	+0/-0.008
100.1004.394	2.55mm	0.1004	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1004.400	2.55mm	0.1004	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1015.400	#38	0.1015	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1024.394	2.60mm	0.1024	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1024.400	2.60mm	0.1024	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1040.400	#37	0.1040	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1043.394	2.65mm	0.1043	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1043.400	2.65mm	0.1043	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1063.394	2.70mm	0.1063	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1063.400	2.70mm	0.1063	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1065.400	#36	0.1065	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1083.394	2.75mm	0.1083	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1083.400	2.75mm	0.1083	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1094.400	7/64"	0.1094	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1100.400	#35	0.1100	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1102.394	2.80mm	0.1102	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1102.400	2.80mm	0.1102	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1110.400	#34	0.1110	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1122.394	2.85mm	0.1122	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1122.400	2.85mm	0.1122	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1130.400	#33	0.1130	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1142.394	2.90mm	0.1142	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1142.400	2.90mm	0.1142	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1160.400	#32	0.1160	0.400	10.16	165°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 100

Small and medium sized drills with optimized flute lengths capable of drilling medium and high stacks for improved utilization.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Ceramic filled laminates
- Flex Materials

DRILLS

END MILLS

ROUTERS

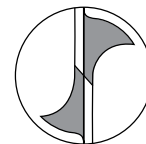
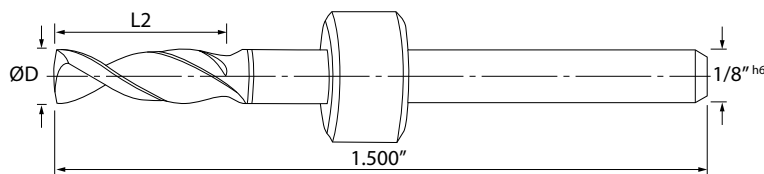
SCORING / ENGRAVING /
COUNTERSINKS

Series 100

Universal PCB Drills

Diameter Range

0.1161" ~ 0.1250" | 2.95mm ~ 3.15mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
100.1161.394	2.95mm	0.1161	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1161.400	2.95mm	0.1161	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1181.394	3.00mm	0.1181	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1181.400	3.00mm	0.1181	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1200.400	#31	0.1200	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1201.394	3.05mm	0.1201	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1201.400	3.05mm	0.1201	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1220.394	3.10mm	0.1220	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1220.400	3.10mm	0.1220	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1240.394	3.15mm	0.1240	0.394	10.00	130°	+0/-0.0003	+0/-0.008
100.1240.400	3.15mm	0.1240	0.400	10.16	165°	+0/-0.0003	+0/-0.008
100.1250.394	1/8"	0.1250	0.394	10.01	130°	+0/-0.0003	+0/-0.008
100.1250.400	1/8"	0.1250	0.400	10.16	165°	+0/-0.0003	+0/-0.008

Series 100

Small and medium sized drills with optimized flute lengths capable of drilling medium and high stacks for improved utilization.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Ceramic filled laminates
- Flex Materials



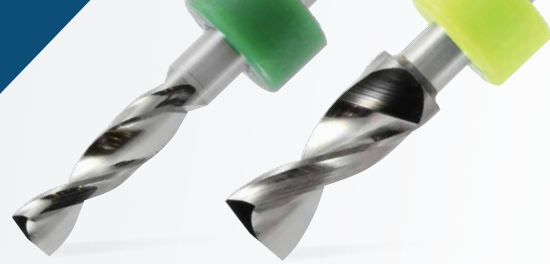
Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 150

Universal Inverse Diameter PCB Drills



Application and Competitive Advantages of Series 150 PCB Drills



- Engineered for general PCB board drilling when large cutting diameters are required in low-, medium- and high-stack panels.
- Size range from 0.1260" to 0.2638" (wire & fractional sizes) and 3.20mm to 6.70mm (metric sizes).
- Accurate and precise PCB drill point geometry with large drill point (165°) produces high quality hole finish.
- Strong and highly accurate brazing supports excellent flute concentricity for improved hole accuracy and longer tool life.
- Large size drills with a reverse shank configuration capable of drilling small to large stacks.
- Precision ground for consistent hole diameter and tight tolerance control across high-volume runs.

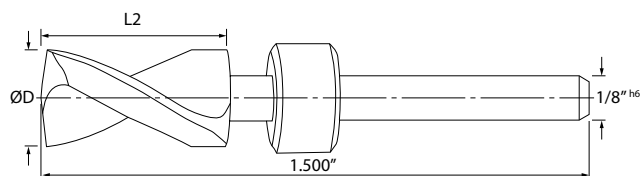
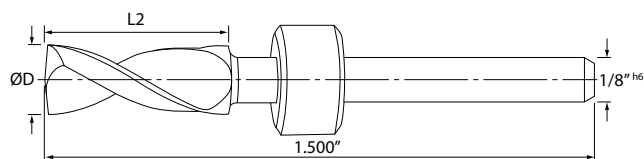
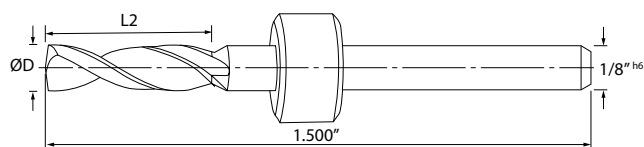
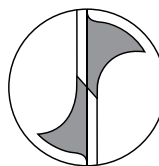
Series 150 Diameter Range

0.1260" ~ 0.2638"

3.20mm ~ 6.70mm

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.



DRILLS

END MILLS

ROUTERS

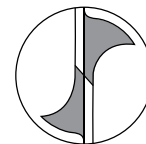
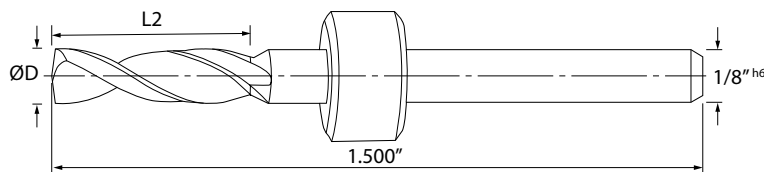
SCORING / ENGRAVING /
COUNTERSINKS

Series 150

Universal Inverse Diameter PCB Drills

Diameter Range

0.1260" ~ 0.1594" | 3.20mm ~ 4.05mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
150.1260.500	3.20mm	0.1260	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1270.500	3.23mm	0.1272	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1280.500	3.25mm	0.1280	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1285.500	#30	0.1285	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1299.500	3.30mm	0.1299	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1319.500	3.35mm	0.1319	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1339.500	3.40mm	0.1339	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1358.500	3.45mm	0.1358	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1360.500	#29	0.1360	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1378.500	3.50mm	0.1378	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1398.500	3.55mm	0.1398	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1405.500	#28	0.1405	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1417.500	3.60mm	0.1417	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1437.500	3.65mm	0.1437	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1440.500	#27	0.1440	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1457.500	3.70mm	0.1457	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1476.500	3.75mm	0.1476	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1496.500	3.80mm	0.1496	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1516.500	3.85mm	0.1516	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1520.500	#24	0.1520	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1535.500	3.90mm	0.1535	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1540.500	#23	0.1540	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1555.500	3.95mm	0.1555	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1562.500	5/32"	0.1562	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1570.500	#22	0.1570	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1575.500	4.00mm	0.1575	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1594.500	4.05mm	0.1594	0.500	12.70	165°	+0/-0.0004	+0/-0.010



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 150

Large sized drills with a reverse shank configuration capable of drilling small to large stacks.

Suitable for:

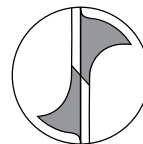
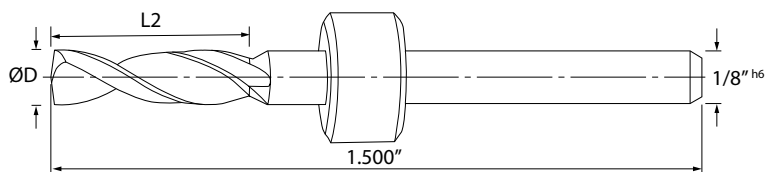
- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Flex Materials

Series 150

Universal Inverse Diameter PCB Drills

Diameter Range

0.1610" ~ 0.1990" | 4.10mm ~ 5.05mm



4 Facet Point Geometry



Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
150.1610.500	#20	0.1610	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1614.500	4.10mm	0.1614	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1634.500	4.15mm	0.1634	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1654.500	4.20mm	0.1654	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1673.500	4.25mm	0.1673	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1693.500	4.30mm	0.1693	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1713.500	4.35mm	0.1713	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1730.500	#17	0.1730	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1732.500	4.40mm	0.1732	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1752.500	4.45mm	0.1752	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1772.500	4.50mm	0.1772	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1791.500	4.55mm	0.1791	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1800.500	#15	0.1800	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1811.500	4.60mm	0.1811	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1820.500	#14	0.1820	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1831.500	4.65mm	0.1831	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1850.500	#13-4.70mm	0.1850	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1870.500	4.75mm	0.1870	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1875.500	3/16"	0.1875	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1890.500	#12-4.80mm	0.1890	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1909.500	4.85mm	0.1909	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1929.500	4.90mm	0.1929	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1935.500	#10	0.1935	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1949.500	4.95mm	0.1949	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1968.500	5.00mm	0.1969	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1988.500	5.05mm	0.1988	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.1990.500	#8	0.1990	0.500	12.70	165°	+0/-0.0004	+0/-0.010



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 150

Large sized drills with a reverse shank configuration capable of drilling small to large stacks.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Flex Materials

DRILLS

END MILLS

ROUTERS

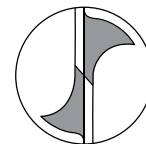
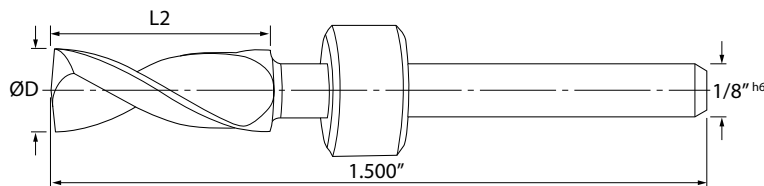
SCORING / ENGRAVING /
COUNTERSINKS

Series 150

Universal Inverse Diameter PCB Drills

Diameter Range

0.2008" ~ 0.2382" | 5.10mm ~ 6.05mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
150.2008.500	5.10mm	0.2008	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2010.500	#7	0.2010	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2028.500	5.15mm	0.2028	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2040.500	#6	0.2040	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2047.500	5.20mm	0.2047	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2055.500	#5	0.2055	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2067.500	5.25mm	0.2067	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2087.500	5.30mm	0.2087	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2090.500	#4	0.2090	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2106.500	5.35mm	0.2106	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2126.500	5.40mm	0.2126	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2146.500	5.45mm	0.2146	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2165.500	5.50mm	0.2165	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2185.500	5.55mm	0.2185	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2205.500	5.60mm	0.2205	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2224.500	5.65mm	0.2224	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2244.500	5.70mm	0.2244	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2264.500	5.75mm	0.2264	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2280.500	#1	0.2280	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2283.500	5.80mm	0.2283	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2302.500	5.85mm	0.2303	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2323.500	5.90mm	0.2323	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2340.500	A	0.2340	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2343.500	5.95mm	0.2343	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2362.500	6.00mm	0.2362	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2380.500	B	0.2380	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2382.500	6.05mm	0.2382	0.500	12.70	165°	+0/-0.0004	+0/-0.010



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 150

Large sized drills with a reverse shank configuration capable of drilling small to large stacks.

Suitable for:

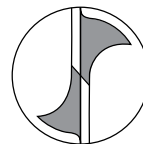
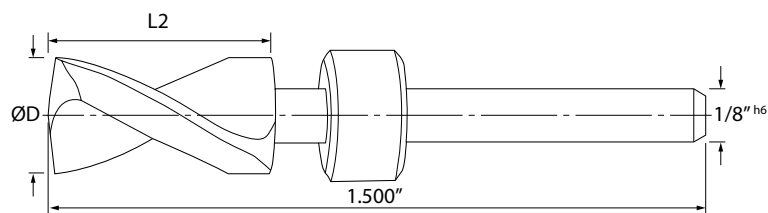
- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Flex Materials

Series 150

Universal Inverse Diameter PCB Drills

Diameter Range

0.2402" ~ 0.2638" | 6.10mm ~ 6.70mm



4 Facet Point Geometry



Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
150.2402.500	6.10mm	0.2402	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2421.500	6.15mm	0.2421	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2441.500	6.20mm	0.2441	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2461.500	6.25mm	0.2461	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2480.500	6.30mm	0.2480	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2500.500	1/4"-6.35mm	0.2500	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2520.500	6.40mm	0.2520	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2559.500	6.50mm	0.2559	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2570.500	F	0.2570	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2579.500	6.55mm	0.2579	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2598.500	6.60mm	0.2598	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2610.500	G	0.2610	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2618.500	6.65mm	0.2618	0.500	12.70	165°	+0/-0.0004	+0/-0.010
150.2638.500	6.70mm	0.2638	0.500	12.70	165°	+0/-0.0004	+0/-0.010



Series 150

Large sized drills with a reverse shank configuration capable of drilling small to large stacks.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Flex Materials



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 560 / 580

High Helix Universal PCB Drills - Standard & Long Flute



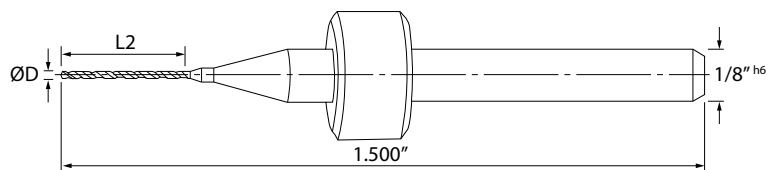
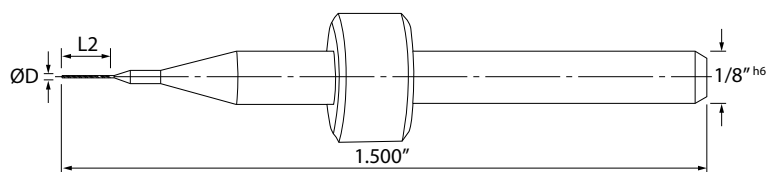
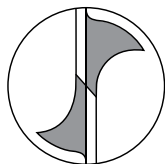
Application and Competitive Advantages of Series 560 / 580 PCB Drills



- Ideal drills for applications in "higher copper content" and "rigid-flex" panels.
- This "non-undercut" drill is perfect for low- to medium stack applications with high accuracy requirements in "rigid-flex" applications.
- Higher helix for maximum material removal (MMR) and debris evacuation.
- **Series 560 - Standard Flute:** inch sizes (0.0039" to 0.0177") and metric sizes (0.10mm to 0.45mm).
- **Series 580 - Extended Flute:** inch sizes (0.0039" to 0.0180") and metric sizes (0.10mm to 0.45mm).

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.



DRILLS

END MILLS

ROUTERS

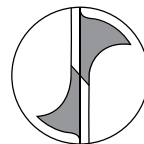
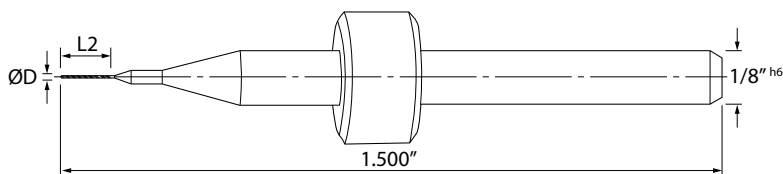
SCORING / ENGRAVING /
COUNTERSINKS

Series 560

High Helix Universal PCB Drills - Standard Flute

Diameter Range

0.0039" ~ 0.0177" | 0.10mm ~ 0.45mm



4 Facet Point Geometry



Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
560.0040.040	0.10mm	0.0039	0.040	1.02	130°	+0/-0.0003	+0/-0.008
560.0079.118	0.20mm	0.0079	0.118	3.00	130°	+0/-0.0003	+0/-0.008
560.0091.150	#89	0.0091	0.150	3.81	130°	+0/-0.0003	+0/-0.008
560.0098.150	0.25mm	0.0098	0.150	3.81	130°	+0/-0.0003	+0/-0.008
560.0118.220	0.30mm	0.0118	0.220	5.59	130°	+0/-0.0003	+0/-0.008
560.0125.220	#82	0.0125	0.220	5.59	130°	+0/-0.0003	+0/-0.008
560.0130.220	#81	0.0130	0.220	5.59	130°	+0/-0.0003	+0/-0.008
560.0145.220	#79	0.0145	0.220	5.59	130°	+0/-0.0003	+0/-0.008
560.0157.220	0.40mm	0.0157	0.220	5.59	130°	+0/-0.0003	+0/-0.008
560.0177.220	0.45mm	0.0177	0.220	5.59	130°	+0/-0.0003	+0/-0.008



Series 560

Micro and small sized drills with standard flutes capable of drilling small to medium stacks.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Flex Materials



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



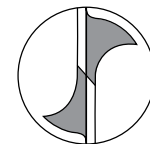
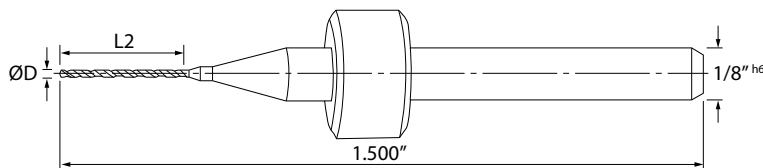
For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 580

High Helix Universal PCB Drills - Extended Flute

Diameter Range

0.0039" ~ 0.0180" | 0.10mm ~ 0.45mm



4 Facet Point Geometry

Extended Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
580.0040.079	0.10mm	0.0039	0.079	2.01	130°	+0/-0.0003	+0/-0.008
580.0050.087	0.13mm	0.0050	0.087	2.21	130°	+0/-0.0003	+0/-0.008
580.0059.118	0.15mm	0.0059	0.118	3.00	130°	+0/-0.0003	+0/-0.008
580.0071.150	#94	0.0071	0.150	3.81	130°	+0/-0.0003	+0/-0.008
580.0079.157	0.20mm	0.0079	0.157	4.00	130°	+0/-0.0003	+0/-0.008
580.0105.220	#86	0.0105	0.220	5.59	130°	+0/-0.0003	+0/-0.008
580.0135.280	#80	0.0135	0.280	7.11	130°	+0/-0.0003	+0/-0.008
580.0145.280	#79	0.0145	0.280	7.11	130°	+0/-0.0003	+0/-0.008
580.0157.295	0.40mm	0.0157	0.295	7.49	130°	+0/-0.0003	+0/-0.008
580.0160.295	#78	0.0160	0.295	7.49	130°	+0/-0.0003	+0/-0.008
580.0177.295	0.45mm	0.0177	0.295	7.49	130°	+0/-0.0003	+0/-0.008
580.0180.295	#77	0.0180	0.295	7.49	130°	+0/-0.0003	+0/-0.008

Series 580

Micro and small sized drills with extended flutes capable of drilling medium to high stacks.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Flex Materials



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 700 / 750

Universal Slot Application PCB Drills - Standard & Long Flute



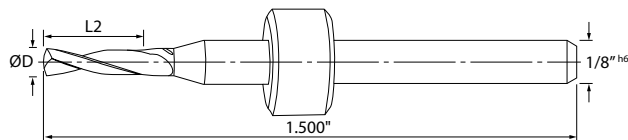
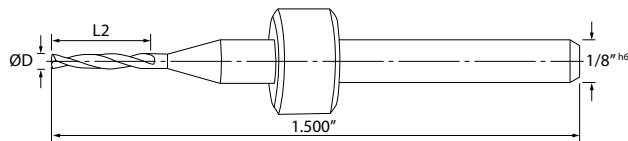
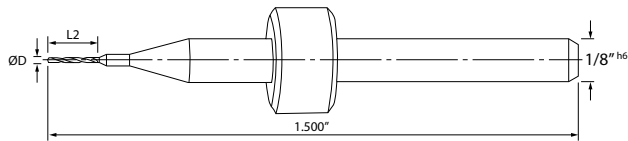
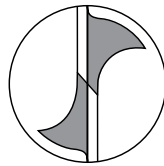
Application and Competitive Advantages of Series 700 / 750 PCB Drills



- Ideal drills for reduced deflection in slot drilling applications (low to medium stack).
- Drill point angle of 150° for highest rigidity and minimal deflection.
- Accurate, precise 4-facet drill point optimizes self-centering cutting action with efficient chip formation and reduced cutting forces.
- **Series 700 - Standard Flute:** inch sizes (0.0160" to 0.0520") and metric sizes (0.55mm to 1.15mm).
- **Series 750 - Extended Flute:** inch sizes (0.0374" to 0.0787") and metric sizes (0.95mm to 2.00mm).

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.



DRILLS

END MILLS

ROUTERS

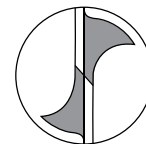
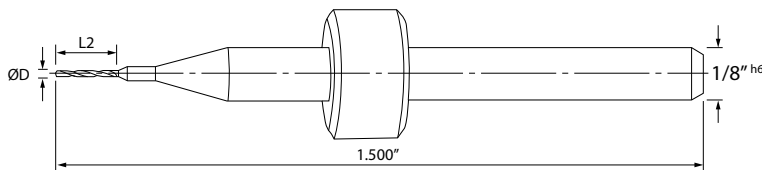
SCORING / ENGRAVING /
COUNTERSINKS

Series 700

Universal Slot Application PCB Drills - Standard Flute

Diameter Range

0.0160" ~ 0.0520" | 0.55mm ~ 1.15mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
700.0160.100	#78	0.0160	0.100	2.54	150°	+0/-0.0003	+0/-0.008
700.0180.100	#77	0.0180	0.100	2.54	150°	+0/-0.0003	+0/-0.008
700.0200.150	#76	0.0200	0.150	3.81	150°	+0/-0.0003	+0/-0.008
700.0217.280	0.55mm	0.0217	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0225.280	#74	0.0225	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0236.280	0.60mm	0.0236	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0240.280	#73	0.0240	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0250.280	#72	0.0250	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0256.280	0.65mm	0.0256	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0260.280	#71	0.0260	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0276.280	0.70mm	0.0276	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0280.280	#70	0.0280	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0295.280	0.75mm	0.0295	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0310.280	#68	0.0310	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0315.280	0.80mm	0.0315	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0320.280	#67	0.0320	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0330.280	#66	0.0330	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0335.280	0.85mm	0.0335	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0354.280	0.90mm	0.0354	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0360.280	#64	0.0360	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0370.280	#63	0.0370	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0430.280	#57	0.0430	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0433.280	1.10mm	0.0433	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0453.280	1.15mm	0.0453	0.280	7.11	150°	+0/-0.0003	+0/-0.008
700.0520.280	#55	0.0520	0.280	7.11	150°	+0/-0.0003	+0/-0.008

Series 700

Small and medium sized drills with standard flutes capable of slot drilling small to medium stacks.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Flex Materials



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



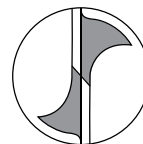
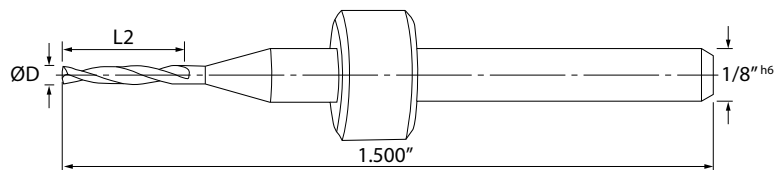
For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 750

Universal Slot Application PCB Drills - Extended Flute

Diameter Range

0.0374" ~ 0.0787" | 0.95mm ~ 2.00mm



4 Facet Point Geometry



Extended Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
750.0374.340	0.95mm	0.0374	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0394.340	1.00mm	0.0394	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0413.340	1.05mm	0.0413	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0420.340	#58	0.0420	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0433.340	1.10mm	0.0433	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0453.340	1.15mm	0.0453	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0465.340	#56	0.0465	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0472.340	1.20mm	0.0472	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0492.340	1.25mm	0.0492	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0512.340	1.30mm	0.0512	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0531.340	1.35mm	0.0531	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0551.340	1.40mm	0.0551	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0571.340	1.45mm	0.0571	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0591.340	1.50mm	0.0591	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0610.340	1.55mm	0.0610	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0630.340	1.60mm	0.0630	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0650.340	1.65mm	0.0650	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0669.340	1.70mm	0.0669	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0689.340	1.75mm	0.0689	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0709.340	1.80mm	0.0709	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0728.340	1.85mm	0.0728	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0748.340	1.90mm	0.0748	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0768.340	1.95mm	0.0768	0.340	8.64	150°	+0/-0.0003	+0/-0.008
750.0787.340	2.00mm	0.0787	0.340	8.64	150°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 750

Small and medium sized drills with extended flutes capable of slot drilling medium to high stacks.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates
- Flex Materials

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 405

High Performance Short Flute Pilot Drills



Application and Competitive Advantages of Series 405 PCB Drills



- Highly recommended for machining thick- or high-stack panels
- Ideal drills for center- and pilot drilling applications as a pre-stage operation for precise, high aspect ratio (15:1) PCB thru-holes.
- Excellent hole location and fast drilling action for highest productivity.
- Accurate, precise 4-facet drill point optimizes self-centering cutting action with efficient chip formation and reduced cutting forces.

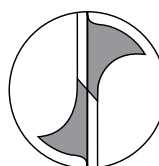
Series 405 Diameter Range

0.0039" ~ 0.0453"

0.10mm ~ 1.15mm

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.



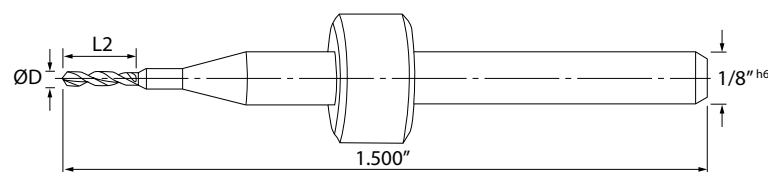
Higher Aspect Ratio

1. Recommend a Pilot Drill / Series 405

- Pilot depth of 1 to 1.5 times x cutting diameter.
- Peck as a last resort.
- Entry material makes a difference.

2. Recommend a Hybrid Drill / Series 430

- Superior drill performance for thick panels (high aspect ratios).
- 2 flutes merge to 1 flute volume and increased accuracy.



DRILLS

END MILLS

ROUTERS

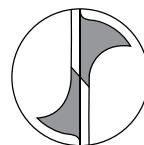
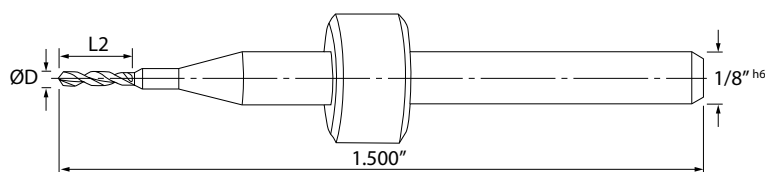
SCORING / ENGRAVING /
COUNTERSINKS

Series 405

High Performance Short Flute Pilot Drills

Diameter Range

0.0039" ~ 0.0453" | 0.10mm ~ 1.15mm



4 Facet Point Geometry



Short Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
405.0039.025	0.10mm	0.0039	0.025	0.64	130°	+0/-0.0003	+0/-0.008
405.0050.030	0.13mm	0.0050	0.030	0.76	130°	+0/-0.0003	+0/-0.008
405.0059.040	0.15mm	0.0059	0.040	1.02	130°	+0/-0.0003	+0/-0.008
405.0079.050	0.20mm	0.0079	0.050	1.27	130°	+0/-0.0003	+0/-0.008
405.0098.050	0.25mm	0.0098	0.050	1.27	130°	+0/-0.0003	+0/-0.008
405.0118.050	0.30mm	0.0118	0.050	1.27	130°	+0/-0.0003	+0/-0.008
405.0138.075	0.35mm	0.0138	0.075	1.91	130°	+0/-0.0003	+0/-0.008
405.0157.075	0.40mm	0.0157	0.075	1.91	130°	+0/-0.0003	+0/-0.008
405.0165.075	0.42mm	0.0165	0.075	1.91	130°	+0/-0.0003	+0/-0.008
405.0177.075	0.45mm	0.0177	0.075	1.91	130°	+0/-0.0003	+0/-0.008
405.0190.100	0.483mm	0.0190	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0197.100	0.50mm	0.0197	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0217.100	0.55mm	0.0217	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0225.100	#74	0.0225	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0236.100	0.60mm	0.0236	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0256.100	0.65mm	0.0256	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0260.100	#71	0.0260	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0276.100	0.70mm	0.0276	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0280.100	#70	0.0280	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0295.100	0.75mm	0.0295	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0315.100	0.80mm	0.0315	0.100	2.54	130°	+0/-0.0003	+0/-0.008
405.0330.125	#66	0.0330	0.125	3.18	130°	+0/-0.0003	+0/-0.008
405.0335.125	0.85mm	0.0335	0.125	3.18	130°	+0/-0.0003	+0/-0.008
405.0354.125	0.90mm	0.0354	0.125	3.18	130°	+0/-0.0003	+0/-0.008
405.0374.125	0.95mm	0.0374	0.125	3.18	130°	+0/-0.0003	+0/-0.008
405.0394.125	1.00mm	0.0394	0.125	3.18	130°	+0/-0.0003	+0/-0.008
405.0413.125	1.05mm	0.0413	0.125	3.18	130°	+0/-0.0003	+0/-0.008
405.0433.125	1.10mm	0.0433	0.125	3.18	130°	+0/-0.0003	+0/-0.008
405.0453.125	1.15mm	0.0453	0.125	3.18	130°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 405

Micro, small, and medium diameter drills used in piloting holes exceeding 15:1 aspect ratio, promoting hole location precision.

Excellent for:

- Pilot drilling in rigid laminates

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 422

MicroMax High Performance Drills



Application and Competitive Advantages of Series 422 PCB Drills



- Optimized for high-stack panels and deep hole applications with aspect ratios greater than 15:1.
- The unique drill point geometry combines the rigidity of a traditional single-flute design with the balanced cutting performance of a two-flute design.
- Delivers excellent hole positioning capability with high CpK performance and reliable hole location accuracy.
- Minimizes the need for pilot, peck, and flip drilling operations, significantly reducing machining time while improving overall hole quality.
- Supports high infeed rates and efficient throughput improves productivity.
- High rigidity, advanced geometry, and specialized carbide grade maximize tool life and stable machining performance.

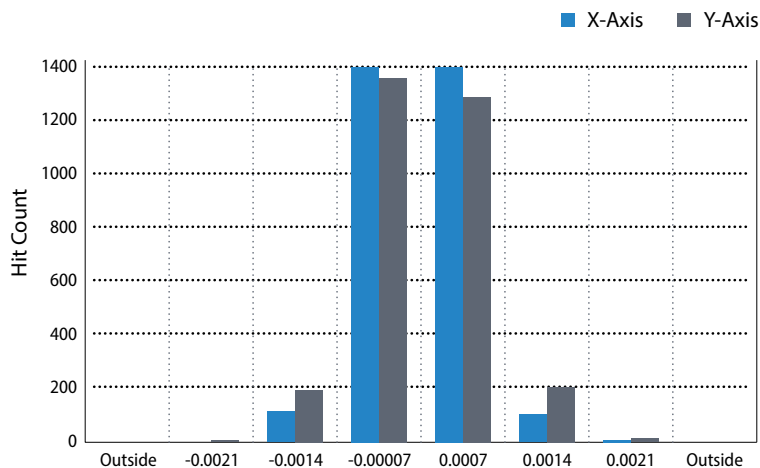
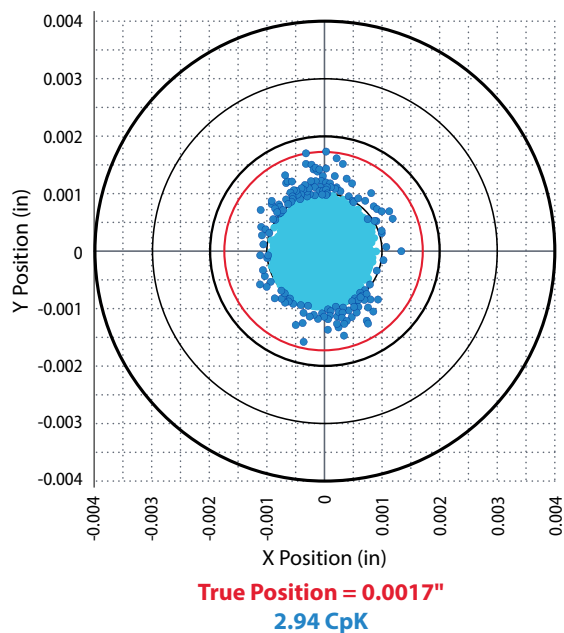
Series 422 Diameter Range

0.0039" ~ 0.0256"

0.10mm ~ 0.65mm



HOLE LOCATION ACCURACY (Internal Evaluation)



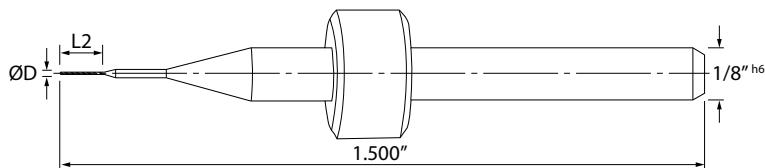
Within RTP of (0.003")			Sample Size 3000 Points	
0.001	0.002	0.003	Outside	Sample
93.2%	6.8%	0.0%	0.0%	3000

Series 422

MicroMax HP Drills

Diameter Range

0.0039" ~ 0.0256" | 0.10mm ~ 0.65mm



Standard & Extended Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
422.0039.079	0.10mm	0.0039	0.079	2.00	130°	+0/-0.0003	+0/-0.008
422.0039.098	0.10mm	0.0039	0.098	2.50	130°	+0/-0.0003	+0/-0.008
422.0051.098	0.13mm	0.0051	0.098	2.50	130°	+0/-0.0003	+0/-0.008
422.0051.118	0.13mm	0.0051	0.118	3.00	130°	+0/-0.0003	+0/-0.008
422.0059.118	0.15mm	0.0059	0.118	3.00	130°	+0/-0.0003	+0/-0.008
422.0059.138	0.15mm	0.0059	0.138	3.50	130°	+0/-0.0003	+0/-0.008
422.0079.118	0.20mm	0.0079	0.118	3.00	130°	+0/-0.0003	+0/-0.008
422.0079.158	0.20mm	0.0079	0.158	4.00	130°	+0/-0.0003	+0/-0.008
422.0098.197	0.25mm	0.0098	0.197	5.00	130°	+0/-0.0003	+0/-0.008
422.0098.217	0.25mm	0.0098	0.217	5.50	130°	+0/-0.0003	+0/-0.008
422.0118.217	0.30mm	0.0118	0.217	5.50	130°	+0/-0.0003	+0/-0.008
422.0118.276	0.30mm	0.0118	0.276	7.00	130°	+0/-0.0003	+0/-0.008
422.0138.197	0.35mm	0.0138	0.197	5.00	130°	+0/-0.0003	+0/-0.008
422.0138.276	0.35mm	0.0138	0.276	7.00	130°	+0/-0.0003	+0/-0.008
422.0157.236	0.40mm	0.0157	0.236	6.00	130°	+0/-0.0003	+0/-0.008
422.0157.295	0.40mm	0.0157	0.295	7.50	130°	+0/-0.0003	+0/-0.008
422.0177.236	0.45mm	0.0177	0.236	6.00	130°	+0/-0.0003	+0/-0.008
422.0177.315	0.45mm	0.0177	0.315	8.00	130°	+0/-0.0003	+0/-0.008
422.0197.276	0.50mm	0.0197	0.276	7.00	130°	+0/-0.0003	+0/-0.008
422.0197.354	0.50mm	0.0197	0.354	9.00	130°	+0/-0.0003	+0/-0.008
422.0217.276	0.55mm	0.0217	0.276	7.00	130°	+0/-0.0003	+0/-0.008
422.0217.354	0.55mm	0.0217	0.354	9.00	130°	+0/-0.0003	+0/-0.008
422.0236.276	0.60mm	0.0236	0.276	7.00	130°	+0/-0.0003	+0/-0.008
422.0236.354	0.60mm	0.0236	0.354	9.00	130°	+0/-0.0003	+0/-0.008
422.0256.394	0.65mm	0.0256	0.394	10.00	130°	+0/-0.0003	+0/-0.008



Series 422

Micro and small diameter drills designed with a unique hybrid flute advancing performance through superior strength, hole location precision, and tool life.

Excellent for:

- Polyimides
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 430

High Performance Hybrid Drills



Application and Competitive Advantages of Series 430 PCB Drills



- Innovative specialty undercut drills with a unique two- into one-flute geometry for maximum material removal rates (MRR) & minimal breakage.
- The unique tool geometry offers greater rigidity, precise hole location and increased cutting volume with accelerated chip-evacuation.
- Ideal for applications in high aspect ratio holes (15:1 or larger) especially in combination with the short flute pilot drills (Series 405).
- Unique 2 to 1 flute hybrid geometry advancing performance through superior strength, hole location precision, and tool life.

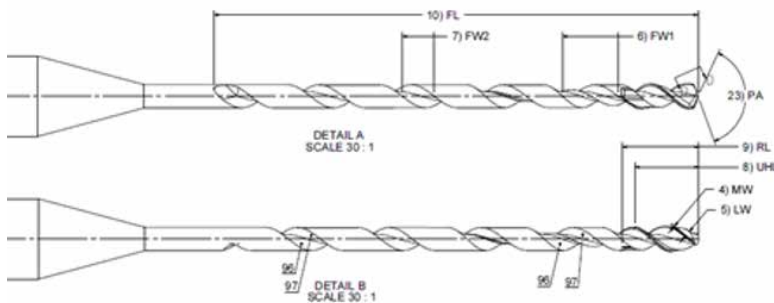
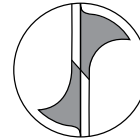
Series 430 Diameter Range

0.0039" ~ 0.0394"

0.10mm ~ 1.00mm

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.



DRILLS

END MILLS

ROUTERS

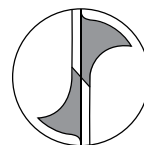
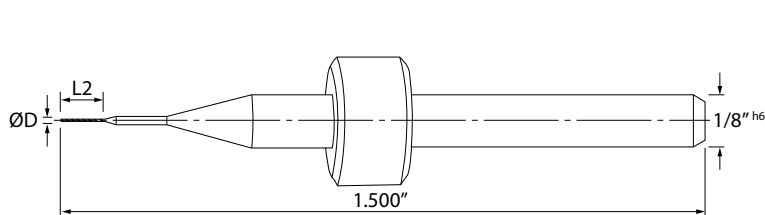
SCORING / ENGRAVING /
COUNTERSINKS

Series 430

High Performance Hybrid Drills

Diameter Range

0.0039" ~ 0.0197" | 0.10mm ~ 0.50mm



4 Facet Point Geometry

Standard & Extended Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
430.0039.079	0.10mm	0.0039	0.079	2.00	130°	+0/-0.0003	+0/-0.008
430.0039.098	0.10mm	0.0039	0.098	2.50	130°	+0/-0.0003	+0/-0.008
430.0051.098	0.13mm	0.0051	0.098	2.50	130°	+0/-0.0003	+0/-0.008
430.0051.118	0.13mm	0.0051	0.118	3.00	130°	+0/-0.0003	+0/-0.008
430.0059.118	0.15mm	0.0059	0.118	3.00	130°	+0/-0.0003	+0/-0.008
430.0059.138	0.15mm	0.0059	0.138	3.50	130°	+0/-0.0003	+0/-0.008
430.0071.138	#94	0.0071	0.138	3.50	130°	+0/-0.0003	+0/-0.008
430.0079.118	0.20mm	0.0079	0.118	3.00	130°	+0/-0.0003	+0/-0.008
430.0079.158	0.20mm	0.0079	0.158	4.00	130°	+0/-0.0003	+0/-0.008
430.0083.158	#91	0.0083	0.158	4.00	130°	+0/-0.0003	+0/-0.008
430.0091.197	#89	0.0091	0.197	5.00	130°	+0/-0.0003	+0/-0.008
430.0098.197	0.25mm	0.0098	0.197	5.00	130°	+0/-0.0003	+0/-0.008
430.0098.217	0.25mm	0.0098	0.217	5.50	130°	+0/-0.0003	+0/-0.008
430.0098.276	0.25mm	0.0098	0.276	7.00	130°	+0/-0.0003	+0/-0.008
430.0110.197	#85	0.0110	0.197	5.00	130°	+0/-0.0003	+0/-0.008
430.0118.217	0.30mm	0.0118	0.217	5.50	130°	+0/-0.0003	+0/-0.008
430.0118.276	0.30mm	0.0118	0.276	7.00	130°	+0/-0.0003	+0/-0.008
430.0125.236	#82	0.0125	0.236	6.00	130°	+0/-0.0003	+0/-0.008
430.0130.236	#81	0.0130	0.236	6.00	130°	+0/-0.0003	+0/-0.008
430.0138.197	0.35mm	0.0138	0.197	5.00	130°	+0/-0.0003	+0/-0.008
430.0138.276	0.35mm	0.0138	0.276	7.00	130°	+0/-0.0003	+0/-0.008
430.0145.236	#79	0.0145	0.236	6.00	130°	+0/-0.0003	+0/-0.008
430.0157.236	0.40mm	0.0157	0.236	6.00	130°	+0/-0.0003	+0/-0.008
430.0157.295	0.40mm	0.0157	0.295	7.50	130°	+0/-0.0003	+0/-0.008
430.0177.236	0.45mm	0.0177	0.236	6.00	130°	+0/-0.0003	+0/-0.008
430.0177.315	0.45mm	0.0177	0.315	8.00	130°	+0/-0.0003	+0/-0.008
430.0197.276	0.50mm	0.0197	0.276	7.00	130°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 430

Micro and small diameter drills designed with a unique hybrid flute advancing performance through superior strength, hole location precision, and tool life.

Excellent for:

- Polyimides
- High speed laminates

DRILLS

END MILLS

ROUTERS

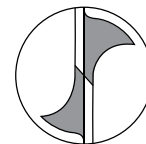
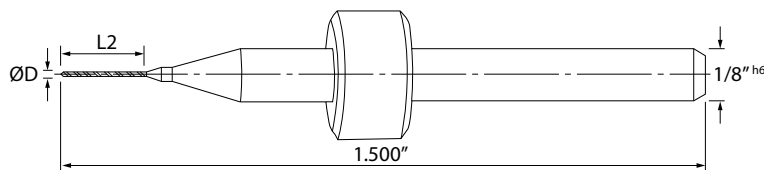
SCORING / ENGRAVING /
COUNTERSINKS

Series 430

High Performance Hybrid Drills

Diameter Range

0.0217" ~ 0.0394" | 0.55mm ~ 1.00mm



4 Facet Point Geometry

Standard & Extended Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
430.0197.354	0.50mm	0.0197	0.354	9.00	130°	+0/-0.0003	+0/-0.008
430.0217.276	0.55mm	0.0217	0.276	7.00	130°	+0/-0.0003	+0/-0.008
430.0217.354	0.55mm	0.0217	0.354	9.00	130°	+0/-0.0003	+0/-0.008
430.0236.276	0.60mm	0.0236	0.276	7.00	130°	+0/-0.0003	+0/-0.008
430.0236.354	0.60mm	0.0236	0.354	9.00	130°	+0/-0.0003	+0/-0.008
430.0256.394	0.65mm	0.0256	0.394	10.00	130°	+0/-0.0003	+0/-0.008
430.0276.394	0.70mm	0.0276	0.394	10.00	130°	+0/-0.0003	+0/-0.008
430.0295.394	0.75mm	0.0295	0.394	10.00	130°	+0/-0.0003	+0/-0.008
430.0315.394	0.80mm	0.0315	0.394	10.00	130°	+0/-0.0003	+0/-0.008
430.0335.394	0.85mm	0.0335	0.394	10.00	130°	+0/-0.0003	+0/-0.008
430.0354.394	0.90mm	0.0354	0.394	10.00	130°	+0/-0.0003	+0/-0.008
430.0374.394	0.95mm	0.0374	0.394	10.00	130°	+0/-0.0003	+0/-0.008
430.0394.394	1.00mm	0.0394	0.394	10.00	130°	+0/-0.0003	+0/-0.008

Series 430

Micro and small diameter drills designed with a unique hybrid flute advancing performance through superior strength, hole location precision, and tool life.

Excellent for:

- Polyimides
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "r" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 460

Advanced Undercut Drills - Standard Flute

Application and Competitive Advantages of Series 460 PCB Drills



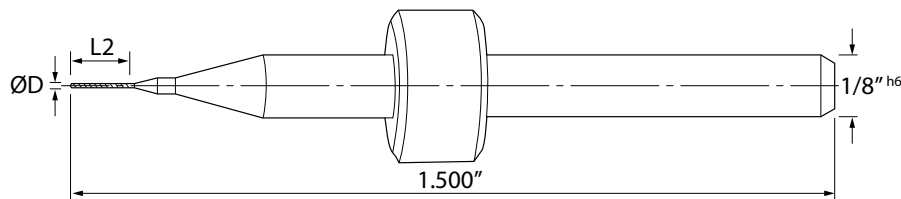
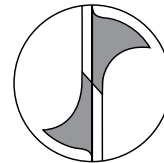
- Ideal high-performance drills for low aspect ratio holes (low-stack panel applications) with high accuracy requirements.
- Geometry advantages are:
 - Variable web taper for maximum rigidity.
 - Thicker web section for higher strength and prolonged tool life.
 - Optimized flute shape to combat chip packing.
 - High helix geometry for faster chip evacuation and improved debris flow.

Series 460 Diameter Range

0.0059" ~ 0.0256"
0.15mm ~ 0.65mm

4-Facet Point Geometry

promotes the self-centering action
of the drill, improving hole location.

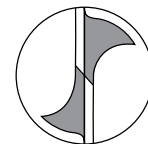
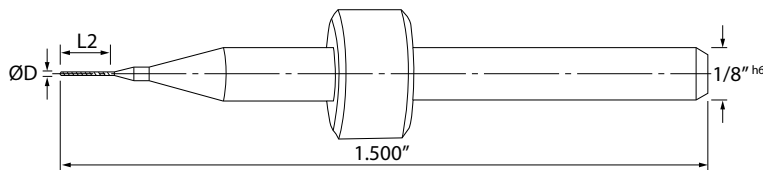


Series 460

Advanced Undercut Drills - Standard Flute

Diameter Range

0.0059" ~ 0.0256" | 0.15mm ~ 0.65mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
460.0059.079	0.15mm	0.0059	0.079	2.01	130°	+0/-0.0003	+0/-0.008
460.0079.118	0.20mm	0.0079	0.118	3.00	130°	+0/-0.0003	+0/-0.008
460.0091.158	#89	0.0091	0.158	4.01	130°	+0/-0.0003	+0/-0.008
460.0098.177	0.25mm	0.0098	0.177	4.50	130°	+0/-0.0003	+0/-0.008
460.0110.177	#85	0.0110	0.177	4.50	130°	+0/-0.0003	+0/-0.008
460.0118.217	0.30mm	0.0118	0.217	5.51	130°	+0/-0.0003	+0/-0.008
460.0118.236	0.30mm	0.0118	0.236	5.99	130°	+0/-0.0003	+0/-0.008
460.0130.217	#81	0.0130	0.217	5.51	130°	+0/-0.0003	+0/-0.008
460.0138.217	0.35mm	0.0138	0.217	5.51	130°	+0/-0.0003	+0/-0.008
460.0145.217	#79	0.0145	0.217	5.51	130°	+0/-0.0003	+0/-0.008
460.0157.217	0.40mm	0.0157	0.217	5.51	130°	+0/-0.0003	+0/-0.008
460.0177.220	0.45mm	0.0177	0.220	5.59	130°	+0/-0.0003	+0/-0.008
460.0197.220	0.50mm	0.0197	0.220	5.59	130°	+0/-0.0003	+0/-0.008
460.0217.250	0.55mm	0.0217	0.250	6.35	130°	+0/-0.0003	+0/-0.008
460.0256.250	0.65mm	0.0256	0.250	6.35	130°	+0/-0.0003	+0/-0.008

Series 460

Micro and small sized drills with standard flutes capable of drilling small to medium stacks.

Excellent for:

- Polyimides
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 480

Advanced Undercut Drills - Long Flute



Application and Competitive Advantages of Series 480 PCB Drills



- Similar in engineering concept to series 460 but with extended flute length.
- Ideal high-performance drills to accommodate medium- to high-stack panel applications or higher aspect ratio holes (15:1 or larger).
- Advantage: no "bird nest" since the drills reduce debris build-up by offering multiple drill points (130° and 165°).

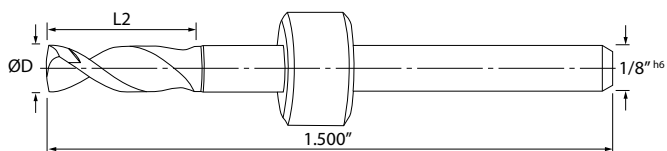
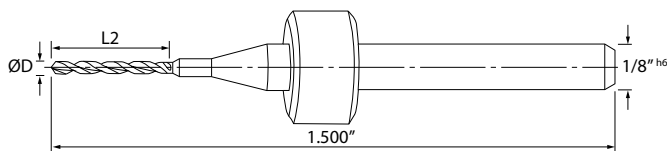
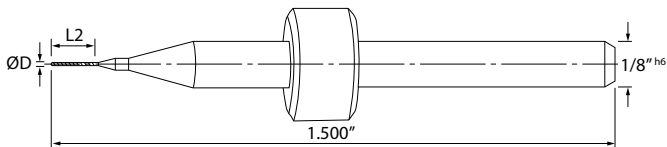
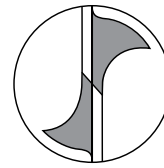
Series 480 Diameter Range

0.0059" ~ 0.1240"

0.15mm ~ 3.15mm

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.



DRILLS

END MILLS

ROUTERS

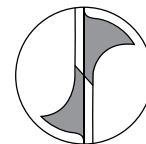
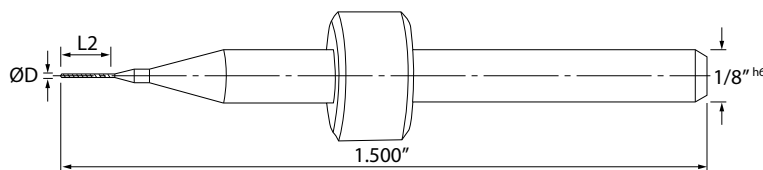
SCORING / ENGRAVING /
COUNTERSINKS

Series 480

Advanced Undercut Drills - Extended Flute

Diameter Range

0.0059" ~ 0.0354" | 0.15mm ~ 0.90mm



4 Facet Point Geometry

Extended Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
480.0059.118	0.15mm	0.0059	0.118	3.00	130°	+0/-0.0003	+0/-0.008
480.0079.158	0.20mm	0.0079	0.158	4.01	130°	+0/-0.0003	+0/-0.008
480.0098.217	0.25mm	0.0098	0.217	5.51	130°	+0/-0.0003	+0/-0.008
480.0110.217	#85	0.0110	0.217	5.51	130°	+0/-0.0003	+0/-0.008
480.0118.256	0.30mm	0.0118	0.256	6.50	130°	+0/-0.0003	+0/-0.008
480.0135.280	#80	0.0135	0.280	7.11	130°	+0/-0.0003	+0/-0.008
480.0138.277	0.35mm	0.0138	0.277	7.04	130°	+0/-0.0003	+0/-0.008
480.0145.280	#79	0.0145	0.280	7.11	130°	+0/-0.0003	+0/-0.008
480.0157.295B1	0.40mm	0.0157	0.295	7.49	130°	+0/-0.0003	+0/-0.008
480.0177.295	0.45mm	0.0177	0.295	7.49	130°	+0/-0.0003	+0/-0.008
480.0197.310	0.50mm	0.0197	0.310	7.87	130°	+0/-0.0003	+0/-0.008
480.0210.310	#75	0.0210	0.310	7.87	130°	+0/-0.0003	+0/-0.008
480.0217.340	0.55mm	0.0217	0.340	8.64	130°	+0/-0.0003	+0/-0.008
480.0225.360	#74	0.0225	0.360	9.14	130°	+0/-0.0003	+0/-0.008
480.0236.340	0.60mm	0.0236	0.340	8.64	130°	+0/-0.0003	+0/-0.008
480.0250.340	#72	0.0250	0.340	8.64	130°	+0/-0.0003	+0/-0.008
480.0256.340	0.65mm	0.0256	0.340	8.64	130°	+0/-0.0003	+0/-0.008
480.0260.400	#71	0.0260	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0276.360	0.70mm	0.0276	0.360	9.14	130°	+0/-0.0003	+0/-0.008
480.0280.400	#70	0.0280	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0295.360	0.75mm	0.0295	0.360	9.14	130°	+0/-0.0003	+0/-0.008
480.0310.394	#68	0.0310	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0315.400	0.80mm	0.0315	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0320.394	#67	0.0320	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0330.315	#66	0.0330	0.315	8.00	130°	+0/-0.0003	+0/-0.008
480.0335.400	0.85mm	0.0335	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0354.400	0.90mm	0.0354	0.400	10.16	130°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



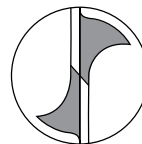
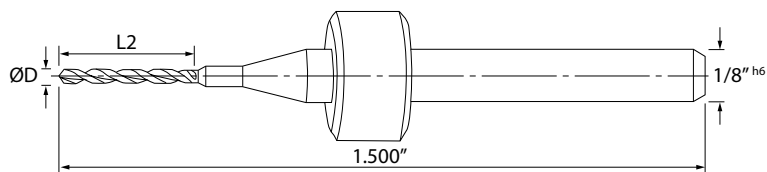
For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 480

Advanced Undercut Drills - Extended Flute

Diameter Range

0.0360" ~ 0.0728" | 0.95mm ~ 1.85mm



4 Facet Point Geometry



Extended Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
480.0360.400	#64	0.0360	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0370.394	#63	0.0370	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0374.400	0.95mm	0.0374	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0380.400	#62	0.0380	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0394.400	1.00mm	0.0394	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0400.400	#60	0.0400	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0413.400	1.05mm	0.0413	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0420.400	#58	0.0420	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0433.400	1.10mm	0.0433	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0441.400	1.12mm	0.0441	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0453.400	1.15mm	0.0453	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0465.400	#56	0.0465	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0472.400	1.20mm	0.0472	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0492.400	1.25mm	0.0492	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0512.394	1.30mm	0.0512	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0520.400	#55	0.0520	0.400	10.16	130°	+0/-0.0003	+0/-0.008
480.0531.394	1.35mm	0.0531	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0551.394	1.40mm	0.0551	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0571.394	1.45mm	0.0571	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0591.394	1.50mm	0.0591	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0610.394	1.55mm	0.0610	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0630.394	1.60mm	0.0630	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0650.394	1.65mm	0.0650	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0669.394	1.70mm	0.0669	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0689.394	1.75mm	0.0689	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0709.394	1.80mm	0.0709	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0728.394	1.85mm	0.0728	0.394	10.01	130°	+0/-0.0003	+0/-0.008



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 480

Micro, small, and medium sized undercut drills with extended flutes capable of drilling medium to high stacks.

Excellent for:

- Polyimides
- High speed laminates

DRILLS

END MILLS

ROUTERS

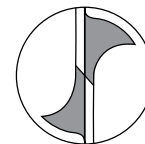
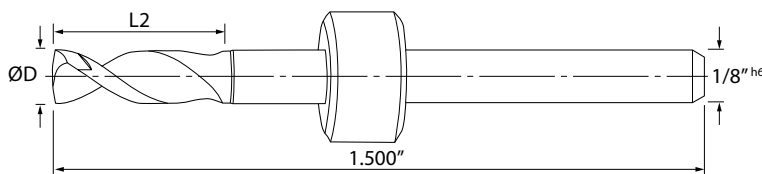
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COUNTERSINKS

Series 480

Advanced Undercut Drills - Extended Flute

Diameter Range

0.0748" ~ 0.1240" | 1.90mm ~ 3.15mm



4 Facet Point Geometry

Extended Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
480.0748.394	1.90mm	0.0748	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0768.394	1.95mm	0.0768	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0787.394	2.00mm	0.0787	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0807.394	2.05mm	0.0807	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0827.394	2.10mm	0.0827	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0846.394	2.15mm	0.0846	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0866.394	2.20mm	0.0866	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0886.394	2.25mm	0.0886	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0906.394	2.30mm	0.0906	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0925.394	2.35mm	0.0925	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0945.394	2.40mm	0.0945	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0965.394	2.45mm	0.0965	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.0984.394	2.50mm	0.0984	0.394	10.01	130°	+0/-0.0003	+0/-0.008
480.1004.394	2.55mm	0.1004	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1024.394	2.60mm	0.1024	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1043.394	2.65mm	0.1043	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1063.394	2.70mm	0.1063	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1083.394	2.75mm	0.1083	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1102.394	2.80mm	0.1102	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1122.394	2.85mm	0.1122	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1142.394	2.90mm	0.1142	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1161.394	2.95mm	0.1161	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1181.394	3.00mm	0.1181	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1201.394	3.05mm	0.1201	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1220.394	3.10mm	0.1220	0.394	10.01	165°	+0/-0.0003	+0/-0.008
480.1240.394	3.15mm	0.1240	0.394	10.01	165°	+0/-0.0003	+0/-0.008

Series 480

Micro, small, and medium sized undercut drills with extended flutes capable of drilling medium to high stacks.

Excellent for:

- Polyimides
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 102

Blind Via PCB Drills

Application and Competitive Advantages of Series 102 PCB Drills



- Ideal drills for blind via applications with fast and efficient cutting action.
- Improved hole wall and top surface quality with minimal debris.
- Accurate and precise tool geometry with side taper promoting superior plating capability.
- Precision ground for consistent hole diameter and tight tolerance control across high-volume runs.

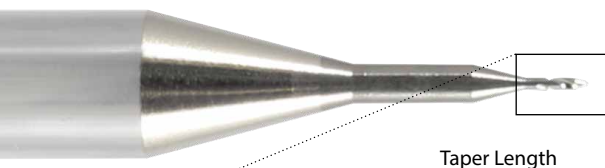
Series 102 Diameter Range

0.0039" ~ 0.0276"

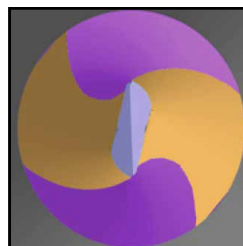
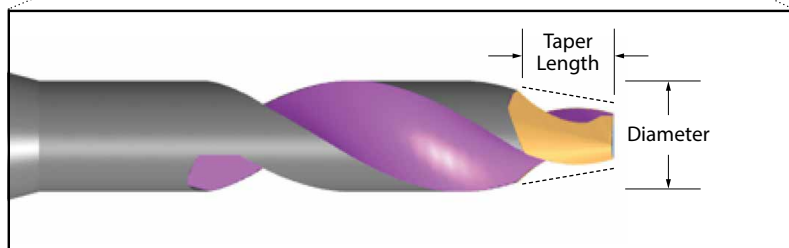
0.10mm ~ 0.70mm

Special V-Shaped Point

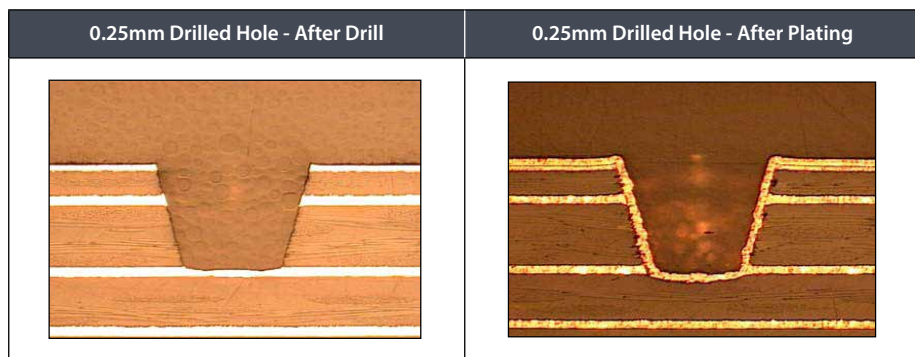
promotes blind via shape integrity and clean cuts



Taper Length



Series 102 Performance (Internal Evaluation)

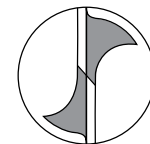
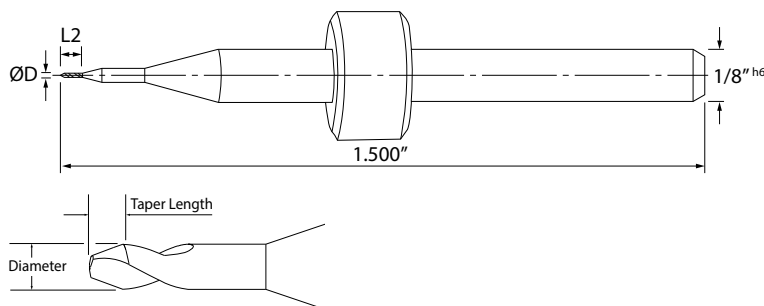


Series 102

Blind Via PCB Drills

Diameter Range

0.0039" ~ 0.0276" | 0.10mm ~ 0.70mm



4 Facet Point Geometry



Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions						
			Tip Diameter (mm)	Taper Length (mm)	Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
102.0039.030	0.10mm	0.0039	0.04	0.08	0.016	0.40	175°	+0/-0.0003	+0/-0.008
102.0050.030	0.13mm	0.0051	0.05	0.10	0.020	0.50	175°	+0/-0.0003	+0/-0.008
102.0059.030	0.15mm	0.0059	0.06	0.12	0.024	0.60	175°	+0/-0.0003	+0/-0.008
102.0079.050	0.20mm	0.0079	0.08	0.16	0.031	0.80	175°	+0/-0.0003	+0/-0.008
102.0098.050	0.25mm	0.0098	0.10	0.20	0.039	1.00	175°	+0/-0.0003	+0/-0.008
102.0118.075	0.30mm	0.0118	0.10	0.27	0.047	1.20	175°	+0/-0.0003	+0/-0.008
102.0138.075	0.35mm	0.0138	0.10	0.27	0.055	1.40	175°	+0/-0.0003	+0/-0.008
102.0157.075	0.40mm	0.0157	0.14	0.36	0.063	1.60	175°	+0/-0.0003	+0/-0.008
102.0177.100	0.45mm	0.0177	0.12	0.45	0.053	1.35	175°	+0/-0.0003	+0/-0.008
102.0197.100	0.50mm	0.0197	0.14	0.50	0.059	1.50	175°	+0/-0.0003	+0/-0.008
102.0217.100	0.55mm	0.0217	0.15	0.55	0.065	1.65	175°	+0/-0.0003	+0/-0.008
102.0236.100	0.60mm	0.0236	0.16	0.60	0.071	1.80	175°	+0/-0.0003	+0/-0.008
102.0256.100	0.65mm	0.0256	0.18	0.65	0.077	1.95	175°	+0/-0.0003	+0/-0.008
102.0276.125	0.70mm	0.0276	0.19	0.70	0.083	2.10	175°	+0/-0.0003	+0/-0.008

Series 102

Micro and small sized tapered body drills designed for blind via applications promoting superior plating capability.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 240

High Performance Flex Drills



Application and Competitive Advantages of Series 240 PCB Drills



- Ideal drills for machining pure flex panels (glass-free PCB layers) without high torque requirements.
- Improved hole wall quality (HWQ) with reduced risk of tearing and chattering in soft / flexible PCB materials.
- Accurate, precise and positive drill point geometry with web-thinning for improved chip formation and reduced cutting forces.
- Open flute design with small tool core allows maximum material removal and high cutting speeds with reduced torque and lower cutting forces.

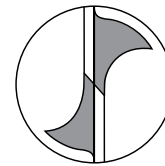
Series 240 Diameter Range

0.0059" ~ 0.0394"

0.15mm ~ 1.00mm

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.

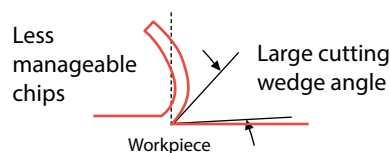
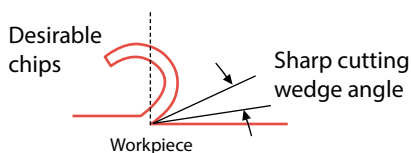


Geometry comparison "High Performance Flex" (Series 240) vs "Conventional PCB drill"

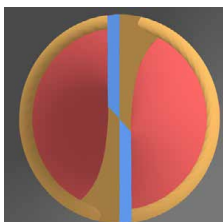
- Tool geometry is designed for excellent shearing action, chip formation and evacuation.
- Series 240 accomplishes faster cutting action with superior part finishes and highest productivity.
- Optimized rake angle for flex and rigid-flex materials results in minimal layer deformation.
- Sharp cutting wedge by rake and primary relief angle results in "no tearing".
- Higher helix supports fastest debris evacuation allowing drilling with greater feed and speed.



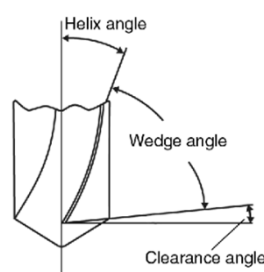
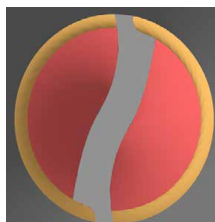
Chip Formation Process



Open Flute



Small Core

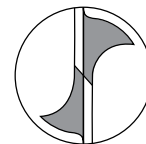
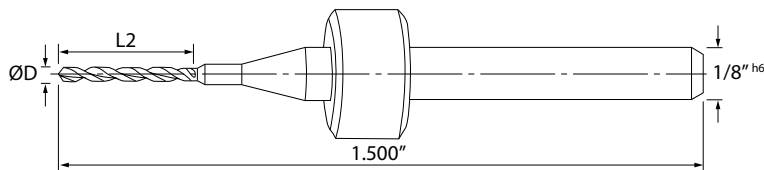


Series 240

High Performance Flex Drills

Diameter Range

0.0059" ~ 0.0394" | 0.15mm ~ 1.00mm



4 Facet Point Geometry

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
240.0059.098	0.15mm	0.0059	0.098	2.50	130°	+0/-0.0003	+0/-0.008
240.0079.138	0.20mm	0.0079	0.138	3.50	130°	+0/-0.0003	+0/-0.008
240.0098.138	0.25mm	0.0098	0.138	3.50	130°	+0/-0.0003	+0/-0.008
240.0118.138	0.30mm	0.0118	0.138	3.50	130°	+0/-0.0003	+0/-0.008
240.0138.138	0.35mm	0.0138	0.138	3.50	130°	+0/-0.0003	+0/-0.008
240.0157.158	0.40mm	0.0157	0.158	4.00	130°	+0/-0.0003	+0/-0.008
240.0177.158	0.45mm	0.0177	0.158	4.00	130°	+0/-0.0003	+0/-0.008
240.0197.177	0.50mm	0.0197	0.177	4.50	130°	+0/-0.0003	+0/-0.008
240.0217.177	0.55mm	0.0217	0.177	4.50	130°	+0/-0.0003	+0/-0.008
240.0236.197	0.60mm	0.0236	0.197	5.00	130°	+0/-0.0003	+0/-0.008
240.0256.197	0.65mm	0.0256	0.197	5.00	130°	+0/-0.0003	+0/-0.008
240.0276.197	0.70mm	0.0276	0.197	5.00	130°	+0/-0.0003	+0/-0.008
240.0295.197	0.75mm	0.0295	0.197	5.00	130°	+0/-0.0003	+0/-0.008
240.0315.197	0.80mm	0.0315	0.197	5.00	130°	+0/-0.0003	+0/-0.008
240.0335.197	0.85mm	0.0335	0.197	5.00	130°	+0/-0.0003	+0/-0.008
240.0354.197	0.90mm	0.0354	0.197	5.00	130°	+0/-0.0003	+0/-0.008
240.0374.236	0.95mm	0.0374	0.236	6.00	130°	+0/-0.0003	+0/-0.008
240.0380.197	#62	0.0380	0.197	5.00	130°	+0/-0.0003	+0/-0.008
240.0394.236	1.00mm	0.0394	0.236	6.00	130°	+0/-0.0003	+0/-0.008

Series 240

Small and medium diameter, low thrust, open flute drills designed for drilling flexible printed circuits. Flex drills improve HWQ and reduce tears and debris deposition in soft materials.

Excellent for:

- Flex Materials
- Teflon / PTFE



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 260

High Performance Back Drills



Application and Competitive Advantages of Series 260 PCB Drills



- These drills minimize the stub length in any back-drilled applications by featuring a short drill point at 170°.
- Precise plating removal generates superior and concentric hole quality with excellent wall surface finishes.
- Accurate, precise 4-facet drill point optimizes self-centering cutting action and chip formation with reduced cutting forces.

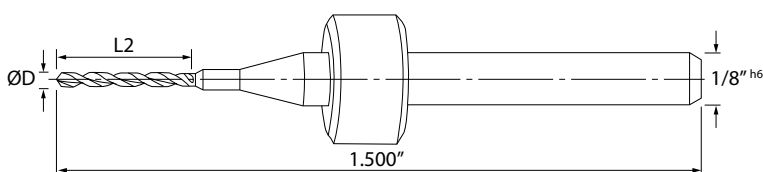
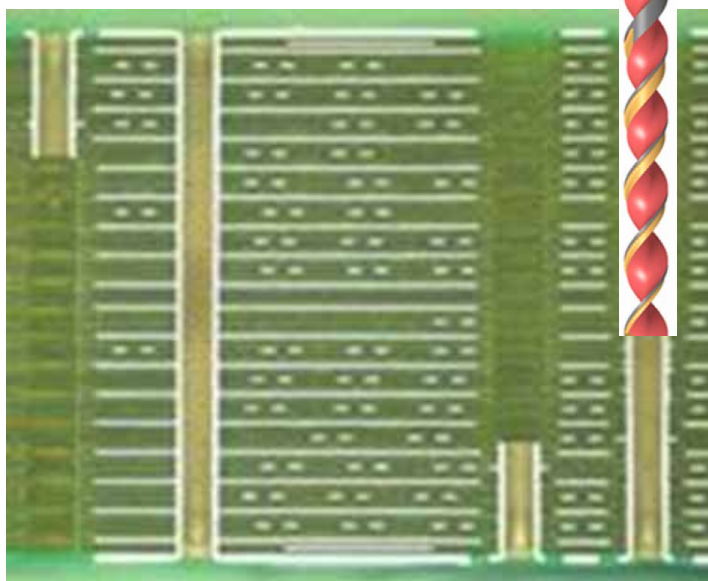
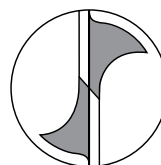
Series 260 Diameter Range

0.0145" ~ 0.0420"

0.40mm ~ 1.00mm

4-Facet Point Geometry

promotes the self-centering action of the drill, improving hole location.



DRILLS

END MILLS

ROUTERS

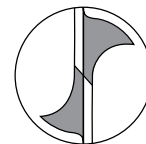
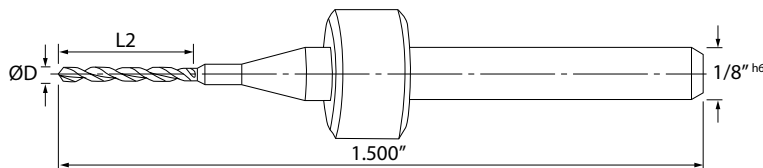
SCORING / ENGRAVING /
COUNTERSINKS

Series 260

High Performance Back Drills

Diameter Range

0.0145" ~ 0.0420" | 0.40mm ~ 1.00mm



4 Facet Point Geometry

Standard & Extended Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Flute Length (in) L2	Flute Length (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
260.0145.197	#79	0.0145	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0157.197	0.40mm	0.0157	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0177.197	0.45mm	0.0177	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0177.217	0.45mm	0.0177	0.217	5.50	170°	+0/-0.0003	+0/-0.008
260.0177.256	0.45mm	0.0177	0.256	6.50	170°	+0/-0.0003	+0/-0.008
260.0197.197	0.50mm	0.0197	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0197.217	0.50mm	0.0197	0.217	5.50	170°	+0/-0.0003	+0/-0.008
260Q0197.256	0.50mm	0.0197	0.256	6.50	170°	+0/-0.0003	+0/-0.008
260.0217.197	0.55mm	0.0217	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0236.197	0.60mm	0.0236	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0256.197	0.65mm	0.0256	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0276.197	0.70mm	0.0276	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0276.256	0.70mm	0.0276	0.256	6.50	170°	+0/-0.0003	+0/-0.008
260.0295.197	0.75mm	0.0295	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0315.197	0.80mm	0.0315	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0335.197	0.85mm	0.0335	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0354.197	0.90mm	0.0354	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0394.197	1.00mm	0.0394	0.197	5.00	170°	+0/-0.0003	+0/-0.008
260.0420.197	#58	0.0420	0.197	5.00	170°	+0/-0.0003	+0/-0.008

Series 260

Small and medium sized drills designed for reduced cutting forces with exceptional chip flow resulting in superior hole wall quality. Flat point allows for precise Back Drilling processing.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Contents

Series 1500 / 1560 - High Speed Cutting (HSC) End Mills - Single Flute 46

Series 1600 / 1603 / 1660 - Universal PCB End Mills - 2 Flutes 49

Series 1730 / 1735 - Soft Laminate & High Precision Cutting (HPC) End Mills - 3 Flutes 54

Series 1800 - Universal PCB End Mills - 4 Flutes 58

Series 1500 / 1560

High Speed Cutting (HSC) End Mills - Single Flute



Application and Competitive Advantages of Series 1500 / 1560 End Mills

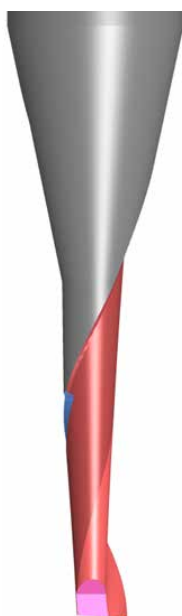


- Mill flexible laminates with greatest productivity and material removal rates.
- Excellent grinding finish for high-quality panel surface finish & clean edges.
- Unique flute geometry reduces chatter and heat.
- Sharp rake angle for perfect chip formation.
- Open flute form and optimized helix for best debris removal.
- **Series 1500:** Standard single flute end mill.
- **Series 1560:** Single flute end mill for flexible materials and adhesive layers.
- DLC coatings available upon request.

Series 1500

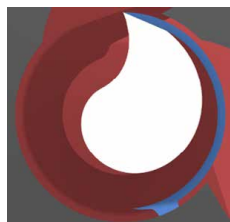
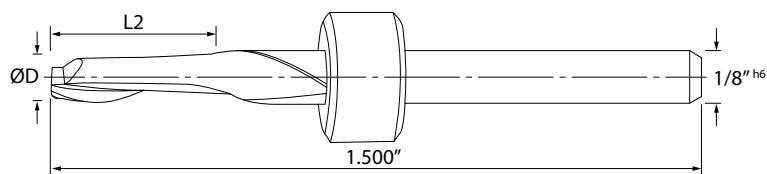
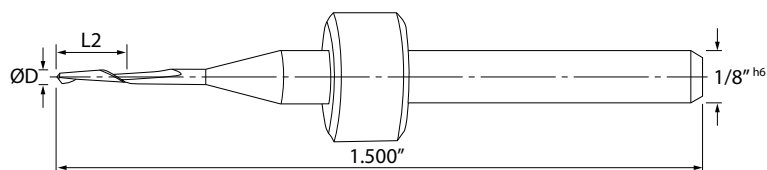


Series 1560



Series 1500

Series 1560



DRILLS

END MILLS

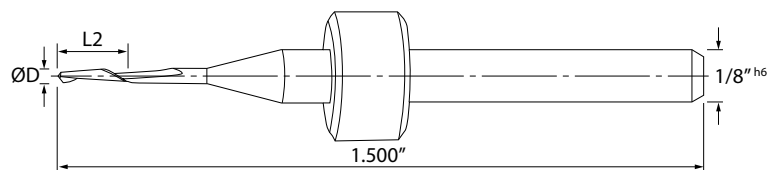
ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 1500

High Speed Cutting (HSC) End Mills - Single Flute

Diameter Range
0.0312" ~ 0.1250" | 1.27mm ~ 2.00mm



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions					
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
1500.0312.150D	1/32"	0.0312	0.150	3.81	30°	Drill Point	+0/-0.0010	+0/-0.025
1500.0500.197	1.27mm	0.0500	0.197	5.00	30°	Drill Point	+0/-0.0010	+0/-0.025
1500.0625.200D	1/16"	0.0625	0.200	5.08	30°	Drill Point	+0/-0.0010	+0/-0.025
1500.0625.200F1	1/16"	0.0625	0.200	5.08	26°	Square	+0/-0.0010	+0/-0.025
1500.0625.250	1/16"	0.0625	0.250	6.35	30°	Drill Point	+0/-0.0010	+0/-0.025
1500.0787.315	2.00mm	0.0787	0.315	8.00	28°	Square	+0/-0.0010	+0/-0.025
1500.0938.375	3/32"	0.0938	0.375	9.53	33°	Square	+0/-0.0010	+0/-0.025
1500.1250.400	1/8"	0.1250	0.400	10.16	30°	Drill Point	+0/-0.0020	+0/-0.050

Standard Flute Length | DLC Coated



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions					
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	End Style	Tolerance ØD (in) Before Coating	Tolerance ØD (mm) Before Coating
1500.0312BC150D	1/32"	0.0312	0.150	3.81	30°	Drill Point	+0/-0.0010	+0/-0.025
1500.0500BC197	1.27mm	0.0500	0.197	5.00	30°	Drill Point	+0/-0.0010	+0/-0.025
1500.0625BC200D	1/16"	0.0625	0.200	5.08	30°	Drill Point	+0/-0.0010	+0/-0.025
1500.0625BC200F1	1/16"	0.0625	0.200	5.08	26°	Square	+0/-0.0010	+0/-0.025
1500.0625BC250	1/16"	0.0625	0.250	6.35	30°	Drill Point	+0/-0.0010	+0/-0.025
1500.0787BC315	2.00mm	0.0787	0.315	8.00	28°	Square	+0/-0.0010	+0/-0.025
1500.0938BC375	3/32"	0.0938	0.375	9.53	33°	Square	+0/-0.0010	+0/-0.025
1500.1250BC400	1/8"	0.1250	0.400	10.16	30°	Drill Point	+0/-0.0020	+0/-0.050

DLC coated tools are available upon request. Specific price and delivery information will be quoted upon inquiry.
 A coating thickness of up to 0.003 mm per side applies to all cutting diameters.



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
 Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
 Review starting recommendations on **Page 79**



Series 1500

Single flute end mill designed for routing or milling printed circuit boards, plexiglass, soft materials, or soft metals.

Excellent for:

- Teflon / PTFE
- Flex Materials

DRILLS

END MILLS

ROUTERS

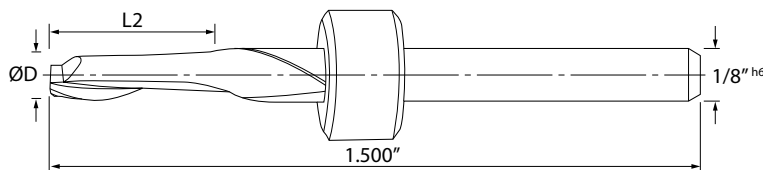
SCORING / ENGRAVING /
COUNTERSINKS

Series 1560

High Speed Cutting (HSC) End Mills - Single Flute
for flexible materials and adhesive layers

Diameter Range

0.0217" ~ 0.0787" | 0.55mm ~ 2.00mm



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in)	Tolerance ØD (mm)
1560.0217.138	0.55mm	0.0217	0.138	3.50	30°	+0/-0.0010	+0/-0.025
1560.0315.094	0.80mm	0.0315	0.094	2.39	30°	+0/-0.0010	+0/-0.025
1560.0394.118	1.00mm	0.0394	0.118	3.00	30°	+0/-0.0010	+0/-0.025
1560.0453.157	1.15mm	0.0453	0.157	4.00	30°	+0/-0.0010	+0/-0.025
1560.0472.142	1.20mm	0.0472	0.142	3.61	30°	+0/-0.0010	+0/-0.025
1560.0630.189	1.60mm	0.0630	0.189	4.80	30°	+0/-0.0010	+0/-0.025
1560.0787.236	2.00mm	0.0787	0.236	6.00	30°	+0/-0.0010	+0/-0.025

Series 1560

Single flute end mill designed for routing or milling flexible printed circuit boards, plexiglass, or soft materials.

Excellent for:

- Teflon / PTFE
- Flex Materials
- Thick Aluminum laminates

Standard Flute Length | DLC Coated



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in) Before Coating	Tolerance ØD (mm) Before Coating
1560.0217BC138	0.55mm	0.0217	0.138	3.50	30°	+0/-0.0010	+0/-0.025
1560.0315BC094	0.80mm	0.0315	0.094	2.39	30°	+0/-0.0010	+0/-0.025
1560.0394BC118	1.00mm	0.0394	0.118	3.00	30°	+0/-0.0010	+0/-0.025
1560.0453BC157	1.15mm	0.0453	0.157	4.00	30°	+0/-0.0010	+0/-0.025
1560.0472BC142	1.20mm	0.0472	0.142	3.61	30°	+0/-0.0010	+0/-0.025
1560.0630BC189	1.60mm	0.0630	0.189	4.80	30°	+0/-0.0010	+0/-0.025
1560.0787BC236	2.00mm	0.0787	0.236	6.00	30°	+0/-0.0010	+0/-0.025

DLC coated tools are available upon request. Specific price and delivery information will be quoted upon inquiry.

A coating thickness of up to 0.003 mm per side applies to all cutting diameters.



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 1600 / 1603 / 1660

Universal PCB End Mills - 2 Flutes

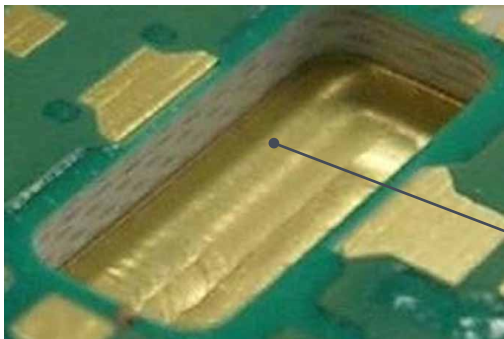


Application and Competitive Advantages of Series 1600 / 1603 / 1660 End Mills



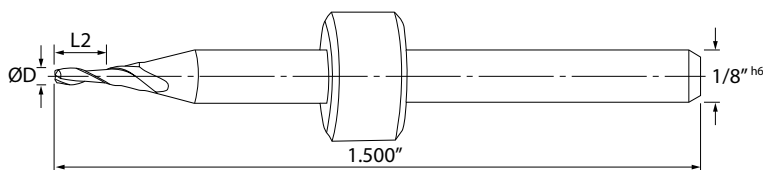
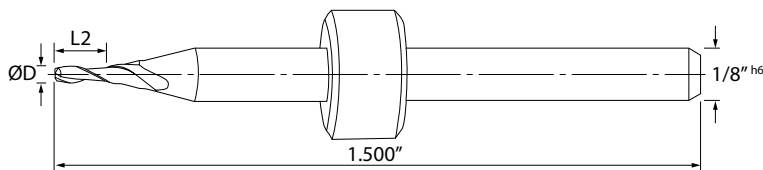
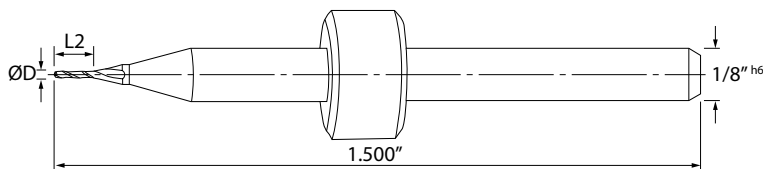
- General PCB board milling in low-, medium- and high-stack panels. End mills feature a cylindrical flute form (square end).
- Wide application range – suitable for milling most common PCB materials.
- Accurate and precise tool geometry – excellent flute finish.
- **Series 1600:** general purpose milling. DLC coatings available on request.
- **Series 1603:** ideal for plexiglas, soft PCB materials and non-ferrous metals.
- **Series 1660:** ideal for flexible laminates with a positive rake of 16°.

Clean Pocket Milling with Excellent Bottom Surface



Flat point angle with zero dish

Burnished ready for plating



Series 1600

Series 1603

Series 1660

DRILLS

END MILLS

ROUTERS

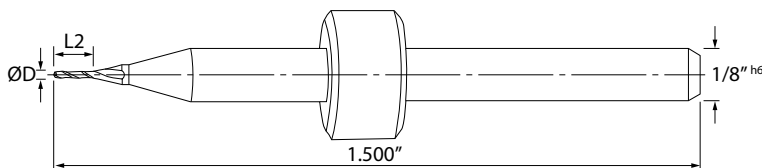
SCORING / ENGRAVING /
COUNTERSINKS

Series 1600

Universal PCB End Mills - 2 Flutes
for General Purpose Milling

Diameter Range

0.0118" ~ 0.1250" | 0.30mm ~ 3.00mm



Standard & Extended Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in)	Tolerance ØD (mm)
1600.0118.045	0.30mm	0.0118	0.045	1.14	30°	+0/-0.0010	+0/-0.025
1600.0150.050	0.38mm	0.0150	0.050	1.27	30°	+0/-0.0010	+0/-0.025
1600.0157.079	0.40mm	0.0157	0.079	2.00	30°	+0/-0.0010	+0/-0.025
1600.0177.079	0.45mm	0.0177	0.079	2.00	30°	+0/-0.0010	+0/-0.025
1600.0197.079	0.50mm	0.0197	0.079	2.00	30°	+0/-0.0010	+0/-0.025
1600.0197.118	0.50mm	0.0197	0.118	3.00	30°	+0/-0.0010	+0/-0.025
1600.0217.065	0.55mm	0.0217	0.065	1.65	30°	+0/-0.0010	+0/-0.025
1600.0236.079	0.60mm	0.0236	0.079	2.00	30°	+0/-0.0010	+0/-0.025
1600.0276.120	0.70mm	0.0276	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0312.120	1/32"	0.0312	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0315.120	0.80mm	0.0315	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0315.157	0.80mm	0.0315	0.157	4.00	30°	+0/-0.0010	+0/-0.025
1600.0354.120	0.90mm	0.0354	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0394.120	1.00mm	0.0394	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0394.200	1.00mm	0.0394	0.200	5.08	30°	+0/-0.0010	+0/-0.025
1600.0472.138	1.20mm	0.0472	0.138	3.50	30°	+0/-0.0010	+0/-0.025
1600.0472.210	1.20mm	0.0472	0.210	5.33	30°	+0/-0.0010	+0/-0.025
1600.0500.200	0.0500"	0.0500	0.200	5.08	30°	+0/-0.0010	+0/-0.025
1600.0551.195	1.40mm	0.0551	0.195	4.95	30°	+0/-0.0010	+0/-0.025
1600.0591.250	1.50mm	0.0591	0.250	6.35	30°	+0/-0.0010	+0/-0.025
1600.0625.250	1/16"	0.0625	0.250	6.35	30°	+0/-0.0010	+0/-0.025
1600.0630.188	1.60mm	0.0630	0.188	4.78	30°	+0/-0.0010	+0/-0.025
1600.0630.250	1.60mm	0.0630	0.250	6.35	30°	+0/-0.0010	+0/-0.025
1600.0630.315	1.60mm	0.0630	0.315	8.00	30°	+0/-0.0010	+0/-0.025
1600.0787.340	2.00mm	0.0787	0.340	8.64	30°	+0/-0.0010	+0/-0.025
1600.0938.390	3/32"	0.0938	0.390	9.91	30°	+0/-0.0010	+0/-0.025
1600.0945.390	2.40mm	0.0945	0.390	9.91	30°	+0/-0.0010	+0/-0.025
1600.1181.500	3.00mm	0.1181	0.500	12.70	30°	+0/-0.0010	+0/-0.025
1600.1250.500	1/8"	0.1250	0.500	12.70	30°	+0/-0.0020	+0/-0.050

Series 1600

Two flute end mill designed for routing or milling printed circuit boards, plexiglass, soft materials, or soft metals.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



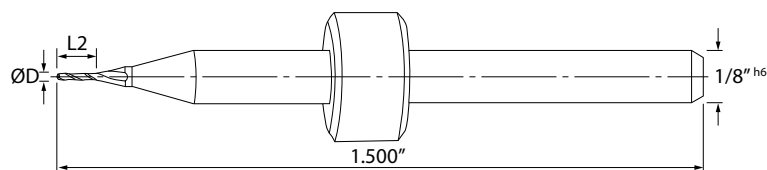
For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 1600

Universal PCB End Mills - 2 Flutes
for General Purpose Milling

Diameter Range

0.0118" ~ 0.1250" | 0.30mm ~ 3.00mm



Standard & Extended Flute Length | DLC Coated



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in) Before Coating	Tolerance ØD (mm) Before Coating
1600.0118BC045	0.30mm	0.0118	0.045	1.14	30°	+0/-0.0010	+0/-0.025
1600.0150BC050	0.38mm	0.0150	0.050	1.27	30°	+0/-0.0010	+0/-0.025
1600.0157BC079	0.40mm	0.0157	0.079	2.00	30°	+0/-0.0010	+0/-0.025
1600.0177BC079	0.45mm	0.0177	0.079	2.00	30°	+0/-0.0010	+0/-0.025
1600.0197BC079	0.50mm	0.0197	0.079	2.00	30°	+0/-0.0010	+0/-0.025
1600.0197BC118	0.50mm	0.0197	0.118	3.00	30°	+0/-0.0010	+0/-0.025
1600.0217BC065	0.55mm	0.0217	0.065	1.65	30°	+0/-0.0010	+0/-0.025
1600.0236BC079	0.60mm	0.0236	0.079	2.00	30°	+0/-0.0010	+0/-0.025
1600.0276BC120	0.70mm	0.0276	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0312BC120	1/32"	0.0312	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0315BC120	0.80mm	0.0315	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0315BC157	0.80mm	0.0315	0.157	4.00	30°	+0/-0.0010	+0/-0.025
1600.0354BC120	0.90mm	0.0354	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0394BC120	1.00mm	0.0394	0.120	3.05	30°	+0/-0.0010	+0/-0.025
1600.0394BC200	1.00mm	0.0394	0.200	5.08	30°	+0/-0.0010	+0/-0.025
1600.0472BC138	1.20mm	0.0472	0.138	3.50	30°	+0/-0.0010	+0/-0.025
1600.0472BC210	1.20mm	0.0472	0.210	5.33	30°	+0/-0.0010	+0/-0.025
1600.0500BC200	0.0500"	0.0500	0.200	5.08	30°	+0/-0.0010	+0/-0.025
1600.0551BC195	1.40mm	0.0551	0.195	4.95	30°	+0/-0.0010	+0/-0.025
1600.0591BC250	1.50mm	0.0591	0.250	6.35	30°	+0/-0.0010	+0/-0.025
1600.0625BC250	1/16"	0.0625	0.250	6.35	30°	+0/-0.0010	+0/-0.025
1600.0630BC188	1.60mm	0.0630	0.188	4.78	30°	+0/-0.0010	+0/-0.025
1600.0630BC250	1.60mm	0.0630	0.250	6.35	30°	+0/-0.0010	+0/-0.025
1600.0630BC315	1.60mm	0.0630	0.315	8.00	30°	+0/-0.0010	+0/-0.025
1600.0787BC340	2.00mm	0.0787	0.340	8.64	30°	+0/-0.0010	+0/-0.025
1600.0938BC390	3/32"	0.0938	0.390	9.91	30°	+0/-0.0010	+0/-0.025
1600.0945BC390	2.40mm	0.0945	0.390	9.91	30°	+0/-0.0010	+0/-0.025
1600.1181BC500	3.00mm	0.1181	0.500	12.70	30°	+0/-0.0010	+0/-0.025
1600.1250BC500	1/8"	0.1250	0.500	12.70	30°	+0/-0.0020	+0/-0.050

DLC coated tools are available upon request. Specific price and delivery information will be quoted upon inquiry.
A coating thickness of up to 0.003 mm per side applies to all cutting diameters.



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 1600

Two flute end mill designed for routing or milling printed circuit boards, plexiglass, soft materials, or soft metals.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 1603

Universal PCB End Mills - 2 Flutes

for plexiglass, soft PCB materials and non-ferrous metals

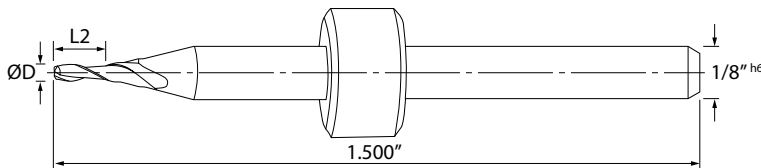
Diameter Range

0.0472" ~ 0.1250" | 1.20mm

DRILLS

END MILLS

ROUTERS



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions					Ring Color
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in)	Tolerance ØD (mm)	
1603Q0472.210	1.20mm	0.0472	0.210	5.34	30°	+0/-0.0010	+0/-0.025	Black
1603Q0625.250	1/16"	0.0625	0.250	6.35	30°	+0/-0.0010	+0/-0.025	Red
1603Q0938.390	3/32"	0.0938	0.390	9.91	30°	+0/-0.0010	+0/-0.025	Black
1603Q1250.500	1/8"	0.1250	0.500	12.70	30°	+0/-0.0020	+0/-0.050	Black

Series 1603

Two flute flat point end mill designed for routing or milling printed circuit boards, plexiglass, soft materials, or soft metals.

Excellent for:

- Rigid laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.

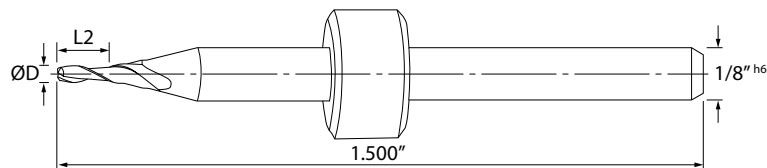


For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 1660

Universal PCB End Mills - 2 Flutes
for flexible laminates with a positive rake of 16°

Diameter Range
0.0315" ~ 0.0630" | 0.80mm ~ 1.60mm



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in)	Tolerance ØD (mm)
1660.0315.093	0.80mm	0.0315	0.093	2.36	30°	+0/-0.0010	+0/-0.025
1660.0630.295	1.60mm	0.0630	0.295	7.50	16°	+0/-0.0010	+0/-0.025



Series 1660

Two flute end mill designed for routing or milling flexible printed circuit boards, plexiglass, or soft materials.

Excellent for:

- Flexible laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 1730 / 1735

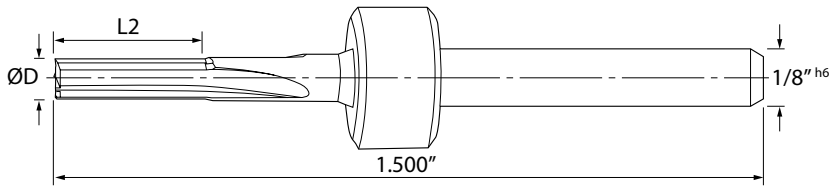
High Precision Cutting (HPC) End Mills - 3 Flutes



Application and Competitive Advantages of Series 1730 / 1735 End Mills



- High performance end mills with zero helix (straight flute) for high-precision milling and routing applications.
- Both series are designed for side- and plunge milling.
- **Series 1730:** most suitable for milling soft PCB materials, non-ferrous metals and gold tab connectors. Side milling only (no end cut).
- **Series 1735:** ideal for flex products and PTFE milling (radially & axially).
- The tool geometries of both series enable excellent surface finishes, high dimensional accuracy and sharp, accurate and clean panel edges.



DRILLS

END MILLS

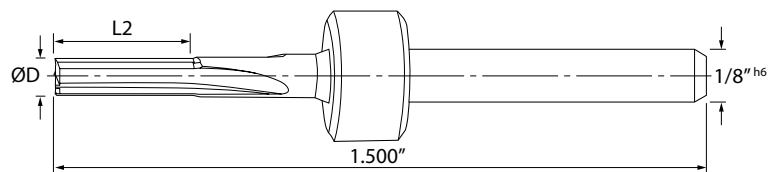
ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 1730

High Precision Cutting (HPC) End Mills - 3 Flutes for milling soft PCB materials, non-ferrous metals and gold tab connectors

Diameter Range
0.0315" ~ 0.0945" | 0.80mm ~ 2.40mm



Side milling only
(no end cut)

Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in)	Tolerance ØD (mm)
1730.0315.120	0.80mm	0.0315	0.120	3.05	0°	+0/-0.0010	+0/-0.025
1730.0630.315	1.60mm	0.0630	0.315	8.00	0°	+0/-0.0010	+0/-0.025
1730.0787.320	2.00mm	0.0787	0.320	8.13	0°	+0/-0.0010	+0/-0.025
1730.0945.394	2.40mm	0.0945	0.394	10.00	0°	+0/-0.0010	+0/-0.025



Series 1730

Three flute zero helix cutter designed for side routing printed circuit boards, gold tab connectors, soft materials, or soft metals.

Excellent for:

- Gold
- Aluminum
- Copper
- Teflon / PTFE



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
 Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
 Review starting recommendations on **Page 79**

Series 1735

High Precision Cutting (HPC) End Mills - 3 Flutes
for flex products and PTFE milling (radially & axially)

Series 1735 End Mills designed to provide an ultra-fine edge finish on soft PCB laminate materials and metals that require flawless edges. End Style allows surface milling and plunging.

Flex products, Aramid reinforced materials, PTFE, most soft materials, and gold fingers are prime examples of the challenges posed to PCB Fabrication Departments worldwide. In some cases, parameters can be adjusted with standard tools to address the rough edges, raised burrs, and/or fibers. There are, however, cases that require special tools and methods. Specific to these cases, Kyocera Precision Tools introduces an upgrade to the 1730 design with surface milling and plunging capabilities.

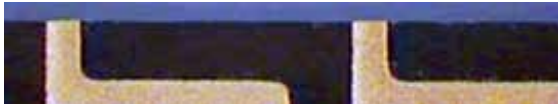
In addition, these tools generally eliminate the requirement of entry material that is sometimes needed on this type of work when using conventional cutters.

** This product requires specific processes and operating parameters.
For optimal results, please contact a Kyocera Precision Tools field engineer.*

Material: PTFE

Series 1735 Smooth edges and cleanly cut PTFE fibers	Conventional Cutters Rough edges and poorly cut fibers
	

Material: Gold Tabs/Connectors

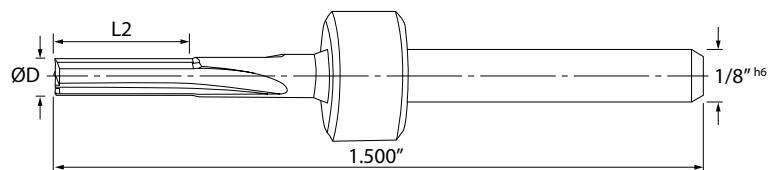
Series 1735 Clean edges and no gold lifting or deformation


- Smooth edges
- No gold lifting
- No deformation
- Clean cut PTFE fibers

Series 1735

High Precision Cutting (HPC) End Mills - 3 Flutes
for flex products and PTFE milling (radially & axially)

Diameter Range
0.0315" ~ 0.1250" | 0.80mm ~ 2.40mm



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in)	Tolerance ØD (mm)
1735.0315.138	0.80mm	0.0315	0.138	3.50	0°	+0/-0.0010	+0/-0.025
1735.0630.315	1.60mm	0.0630	0.315	8.00	0°	+0/-0.0010	+0/-0.025
1735.0945.315	2.40mm	0.0945	0.315	8.00	0°	+0/-0.0010	+0/-0.025
1735.1250.500	1/8"	0.1250	0.500	12.70	0°	+0/-0.0020	+0/-0.050



Series 1735

Three flute zero helix cutter designed for side routing printed circuit boards, gold tab connectors, soft materials, or soft metals.

Excellent for:

- Gold
- Aluminum
- Copper
- Teflon / PTFE



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 1800

Universal PCB End Mills - 4 Flutes



Application and Competitive Advantages of Series 1800 End Mills

- Engineered for general PCB milling in low-, medium- and high-stack panels. End mills feature a cylindrical flute form (square end).
- Wide application range as these end mills accommodate successful machining of most common PCB materials.
- Tool geometry is engineered for achieving excellent surface finishes with high feed rates.

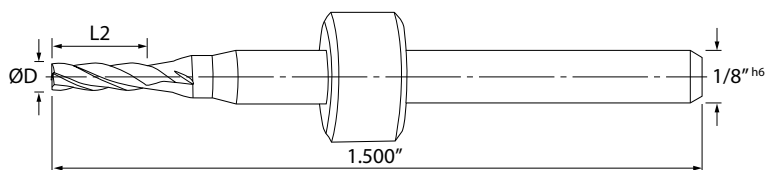
Diameter Range

0.0625" ~ 0.1250"

DRILLS

END MILLS

ROUTERS



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Helix Angle	Tolerance ØD (in)	Tolerance ØD (mm)
1800.0625.200	1/16"	0.0625	0.200	5.08	30°	+0/-0.0010	+0/-0.025
1800.0938.438	3/32"	0.0938	0.438	11.13	30°	+0/-0.0010	+0/-0.025
1800.1250.500	1/8"	0.1250	0.500	12.70	30°	+0/-0.0020	+0/-0.050

Series 1800

Four flute end mill designed for routing or milling printed circuit boards.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit:
www.kyoceraprecisiontools.com/pcb/speeds-feeds

Contents

Universal & General Application Routers

Series 2300 - Universal PCB Router with Chipbreaker - Up-cut, right hand spiral 60

Series 4100 - High Efficiency Cross Cut Router - Up-cut, right hand spiral 63

High Performance & Special Application Routers

Series 2350 / 2390 - High Performance Fracture Reducing and Flash Routers - Up-cut, right hand spiral 66

Series 1300 - Gold Tab Premium Edge Routers - Up-cut, right hand spiral 69

Down-cut and Left-Hand-Spiral Routers can be quoted upon request.

Series 2300

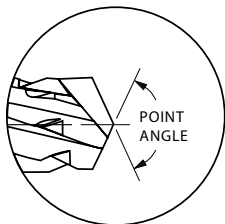
Universal PCB Router with Chipbreaker



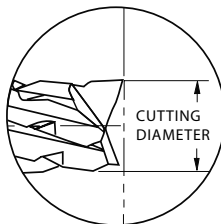
Application and Competitive Advantages of Series 2300 PCB Routers

- Ideal routers for general routing applications with external and internal cuts.
- Precision ground and made from premium carbide for longest tool life.
- High strength geometry is designed for increased wear resistance under high heat - achieving maximum productivity.
- Chipbreaker design enables a superior panel edge and surface finish.
- Router geometry is up-cut, right hand spiral.

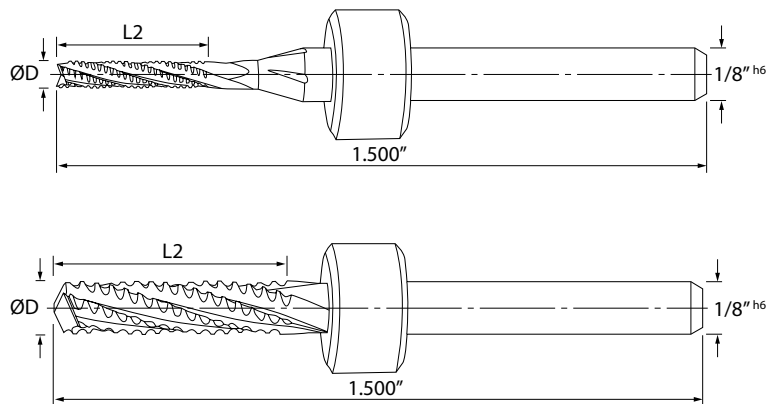
End Style



Drill Point



Fish Tail



DRILLS

END MILLS

ROUTERS

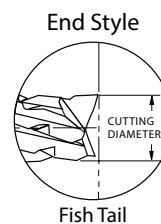
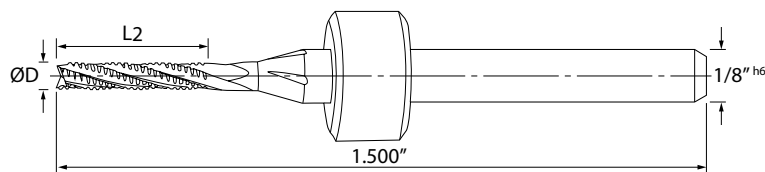
SCORING / ENGRAVING /
COUNTERSINKS

Series 2300

Universal PCB Router with Chipbreaker - Fish Tail
Up-cut, right hand spiral

Diameter Range

0.0315" ~ 0.1250" | 0.80mm ~ 3.00mm



Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
2300.0315.197	0.80mm	0.0315	0.197	5.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0354.197	0.90mm	0.0354	0.197	5.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0394.256	1.00mm	0.0394	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
2300.0472.256	1.20mm	0.0472	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
2300.0500.256	0.0500"	0.0500	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
2300.0512.256	1.30mm	0.0512	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
2300.0551.256	1.40mm	0.0551	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
2300.0591.315	1.50mm	0.0591	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0630.315	1.60mm	0.0630	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0669.315	1.70mm	0.0669	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0709.315	1.80mm	0.0709	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0748.315	1.90mm	0.0748	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0787.315	2.00mm	0.0787	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0787.394	2.00mm	0.0787	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0827.394	2.10mm	0.0827	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0945.394	2.40mm	0.0945	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.0984.394	2.50mm	0.0984	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.1004.394	2.55mm	0.1004	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.1181.394	3.00mm	0.1181	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
2300.1250.472	1/8"	0.1250	0.472	12.00	Fish Tail	+0/-0.0010	+0/-0.025



Series 2300

Chipbreaker style updraft router designed for superior edge finish on external and internal cuts.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



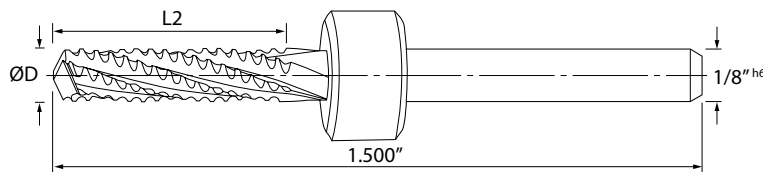
For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 2300

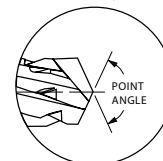
Universal PCB Router with Chipbreaker - Drill Point
Up-cut, right hand spiral

Diameter Range

0.0197" ~ 0.1250" | 0.50mm ~ 2.40mm



End Style



Drill Point

Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
2300.0197.118D	0.50mm	0.0197	0.118	3.00	Drill Point	+0/-0.0010	+0/-0.025
2300.0315.197D	0.80mm	0.0315	0.197	5.00	Drill Point	+0/-0.0010	+0/-0.025
2300.0354.256D	0.90mm	0.0354	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
2300.0394.256D	1.00mm	0.0394	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
2300.0472.256D	1.20mm	0.0472	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
2300.0500.256D	0.0500"	0.0500	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
2300.0512.256D	1.30mm	0.0512	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
2300.0551.256D	1.40mm	0.0551	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
2300.0630.256D	1.60mm	0.0630	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
2300.0630.315D	1.60mm	0.0630	0.315	8.00	Drill Point	+0/-0.0010	+0/-0.025
2300.0787.394D	2.00mm	0.0787	0.394	10.00	Drill Point	+0/-0.0010	+0/-0.025
2300.0945.394D	2.40mm	0.0945	0.394	10.00	Drill Point	+0/-0.0010	+0/-0.025
2300.1250.472D	1/8"	0.1250	0.472	12.00	Drill Point	+0/-0.0010	+0/-0.025

Series 2300

Chipbreaker style updraft router designed for superior edge finish on external and internal cuts.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 4100

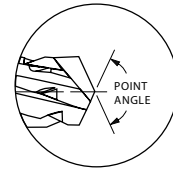
High Efficiency Cross Cut Router



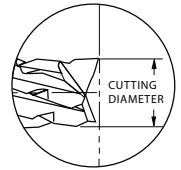
Application and Competitive Advantages of Series 4100 PCB Routers

- Unique geometry combines the advantages of a chipbreaker design with a diamond-cut flute geometry.
- Geometry features a high-strength design for maximum tool life and efficient cutting action with superior panel edge quality.
- Router geometry is up-cut, right hand spiral.

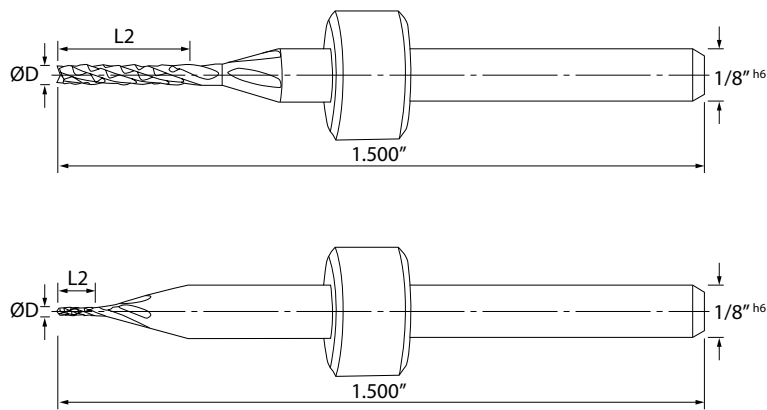
End Style



Drill Point



Fish Tail



Testing Parameters	
Material :	High Tg
Thickness :	0.177"
Diameter :	0.0630"

Distance to Debris			Distance to Breakage		
Design	Distance (inches)		Design	Distance (inches)	
	Mean	StdDev		Mean	StdDev
Standard	560	80	Standard	2,119	1,554
Series 4100	2,453	184	Series 4100	3,757	342
p-value:	0.000		p-value:	0.030	

Age of Tool at 25% Debris (Inches)	
4100	~2400
Standard	~500

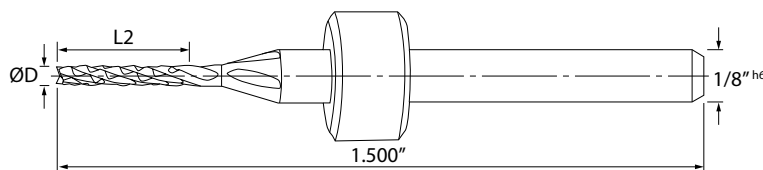
Age of Tool at Breakage (Inches)	
4100	~3800
Standard	~3200

Series 4100

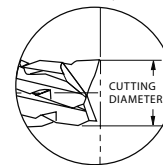
High Efficiency Cross Cut Router - Fish Tail
Up-cut, right hand spiral

Diameter Range

0.0197" ~ 0.1250" | 0.50mm ~ 2.60mm



End Style



Fish Tail

Standard & Extended Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
4100.0197.079	0.50mm	0.0197	0.079	2.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0236.118	0.60mm	0.0236	0.118	3.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0236.157	0.60mm	0.0236	0.157	4.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0276.177	0.70mm	0.0276	0.177	4.50	Fish Tail	+0/-0.0010	+0/-0.025
4100.0315.197	0.80mm	0.0315	0.197	5.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0315.256	0.80mm	0.0315	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
4100.0354.197	0.90mm	0.0354	0.197	5.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0354.256	0.90mm	0.0354	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
4100.0394.197	1.00mm	0.0394	0.197	5.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0394.256	1.00mm	0.0394	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
4100.0394.276	1.00mm	0.0394	0.276	7.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0433.256	1.10mm	0.0433	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
4100.0472.276	1.20mm	0.0472	0.276	7.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0500.276	1.27mm	0.0500	0.276	7.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0512.276	1.30mm	0.0512	0.276	7.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0551.256	1.40mm	0.0551	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
4100.0591.315	1.50mm	0.0591	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0630.256	1.60mm	0.0630	0.256	6.50	Fish Tail	+0/-0.0010	+0/-0.025
4100.0630.315	1.60mm	0.0630	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0669.315	1.70mm	0.0669	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0709.315	1.80mm	0.0709	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0748.315	1.90mm	0.0748	0.315	8.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0787.394	2.00mm	0.0787	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0945.394	2.40mm	0.0945	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.0984.394	2.50mm	0.0984	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.1004.394	2.55mm	0.1004	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.1024.394	2.60mm	0.1024	0.394	10.00	Fish Tail	+0/-0.0010	+0/-0.025
4100.1250.472	1/8"	0.1250	0.472	12.00	Fish Tail	+0/-0.0010	+0/-0.025

Series 4100

Diamond cut style updraft router designed for high productivity routing.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series " " with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

DRILLS

END MILLS

ROUTERS

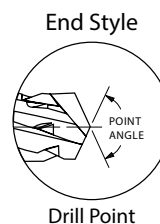
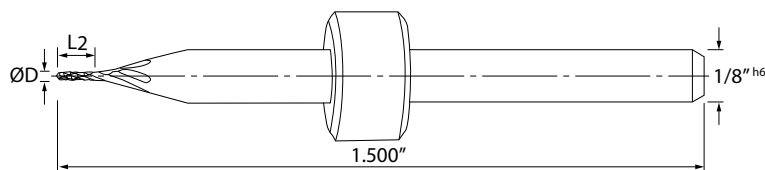
SCORING / ENGRAVING /
COUNTERSINKS

Series 4100

High Efficiency Cross Cut Router - Drill Point
Up-cut, right hand spiral

Diameter Range

0.0315" ~ 0.1250" | 0.80mm ~ 2.55mm



Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
4100.0315.197D	0.80mm	0.0315	0.197	5.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0354.197D	0.90mm	0.0354	0.197	5.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0394.256D	1.00mm	0.0394	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
4100.0472.276D	1.20mm	0.0472	0.276	7.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0500.276D	1.27mm	0.0500	0.276	7.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0625.315D	1/16"	0.0625	0.315	8.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0709.315D	1.80mm	0.0709	0.315	8.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0748.315D	1.90mm	0.0748	0.315	8.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0787.315D	2.00mm	0.0787	0.315	8.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0906.394D	2.30mm	0.0906	0.394	10.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0938.394D	3/32"	0.0938	0.394	10.00	Drill Point	+0/-0.0010	+0/-0.025
4100.0984.394D	2.50mm	0.0984	0.394	10.00	Drill Point	+0/-0.0010	+0/-0.025
4100.1004.394D	2.55mm	0.1004	0.394	10.00	Drill Point	+0/-0.0010	+0/-0.025
4100.1250.472D	1/8"	0.1250	0.472	12.00	Drill Point	+0/-0.0010	+0/-0.025

Series 4100

Diamond cut style updraft router designed for high productivity routing.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 2350 / 2390

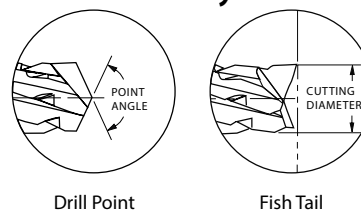
High Performance Fracture Reducing and Flash Routers



Application and Competitive Advantages of Series 2350 & 2390 PCB Routers

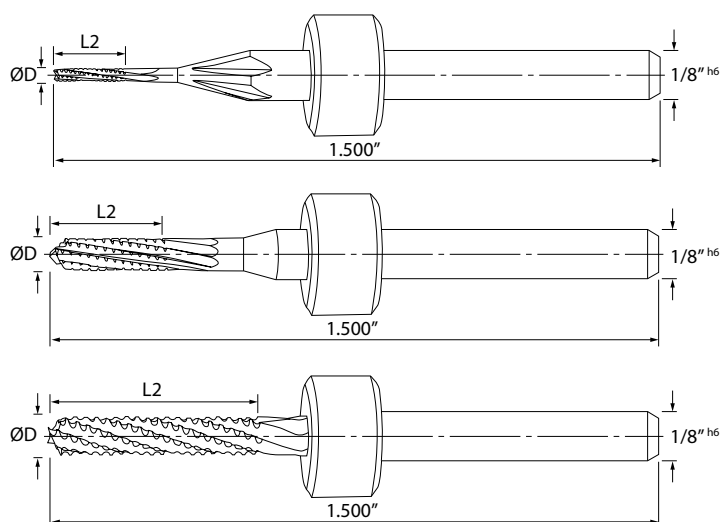
- Reduces edge fracturing by 70% to 94% in comparison to conventional routers by reducing cutting forces and chatter.
- Eliminates entry material. Minimizes panel scrap-rate and improves surface finish with superior edge quality.
- High precision updraft routing geometry featuring a fish-tail and drill-point end style.
- **Series 2350:** Low- to medium-stack panels.
- **Series 2390:** High-stack panels.
- Router geometry is up-cut, right hand spiral.

End Style



Drill Point

Fish Tail



Testing Parameters

Material :	Polyimide
Board Thickness :	0.063"
Diameter :	1.60mm

2350 Series

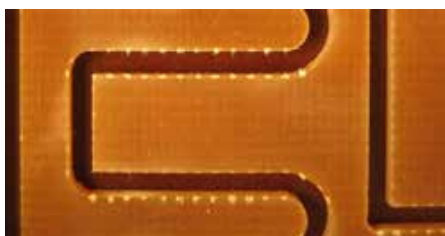
Minimal to no fracturing

Standard Chipbreaker

Notable fracturing

Standard Diamond Cut

Elevated fracturing



DRILLS

END MILLS

ROUTERS

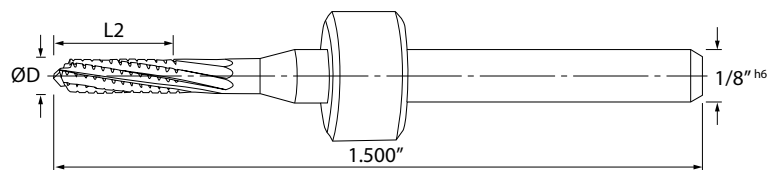
SCORING / ENGRAVING /
COUNTERSINKS

Series 2350

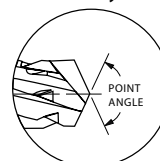
High Performance Fracture Reducing Routers
Up-cut, right hand spiral

Diameter Range

0.0315" ~ 0.0945" | 0.80mm ~ 2.40mm



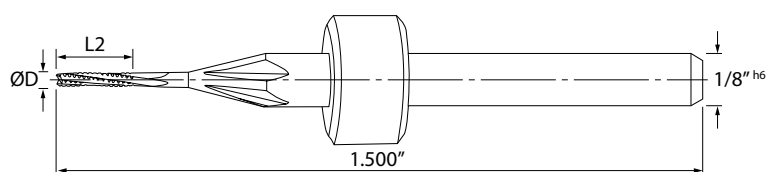
End Style



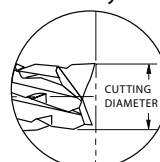
Drill Point

Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
2350.0315.177D	0.80mm	0.0315	0.177	4.50	Drill Point	+0/-0.0010	+0/-0.025
2350.0394.177D	1.00mm	0.0394	0.177	4.50	Drill Point	+0/-0.0010	+0/-0.025
2350.0492.197D	1.25mm	0.0492	0.197	5.00	Drill Point	+0/-0.0010	+0/-0.025
2350.0630.256D	1.60mm	0.0630	0.256	6.50	Drill Point	+0/-0.0010	+0/-0.025
2350.0787.276D	2.00mm	0.0787	0.276	7.00	Drill Point	+0/-0.0010	+0/-0.025
2350.0945.315D	2.40mm	0.0945	0.315	8.00	Drill Point	+0/-0.0010	+0/-0.025



End Style



Fish Tail

Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
2350.0472.276	1.20mm	0.0472	0.276	7.00	Fish Tail	+0/-0.0010	+0/-0.025



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 2350

Chipbreaker style updraft router designed with a cutting force reduction geometry leading to minimal routed edge fracturing and superior edge finish.

Excellent for:

- Polyimides
- High speed laminates

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 2390

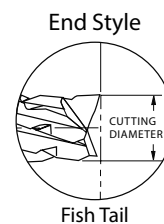
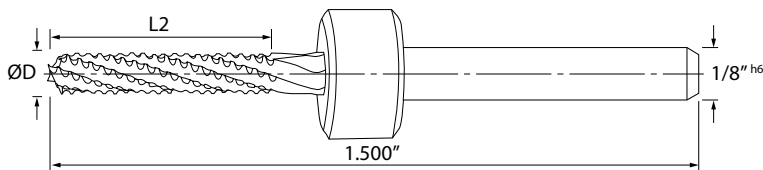
High Performance Flash Routers
Up-cut, right hand spiral

Diameter Range
0.0938" ~ 0.1250"

DRILLS

END MILLS

ROUTERS



Standard & Extended Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
2390.0938.500	3/32"	0.0938	0.495	12.57	Fish Tail	+0/-0.0010	+0/-0.025
2390.1250.590	1/8"	0.1250	0.585	14.86	Fish Tail	+0/-0.0010	+0/-0.025

Series 2390

Chipbreaker style updraft router designed for high stack routing with superior edge finish on external cuts.

Excellent for:

- Flash routing post lamination



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "r" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

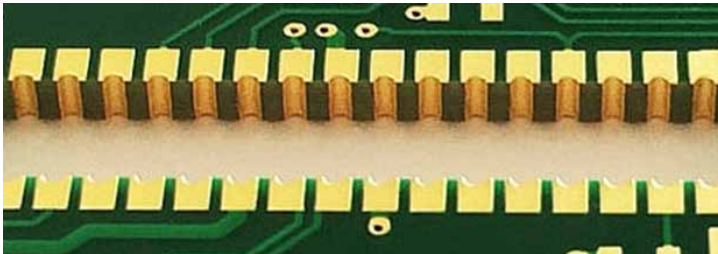
Series 1300

Gold Tab Premium Edge Routers

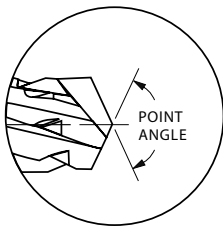


Application and Competitive Advantages of Series 1300 PCB Routers

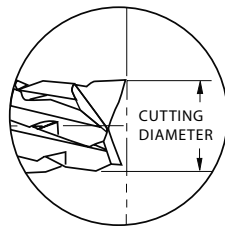
- Ideal routers for machining gold tab connectors and plated solder features.
- Precision ground and made from premium carbide for longest tool life.
- The special multi flute geometry enables routing with clean tab edges.
- Router geometry is up-cut, right hand spiral.



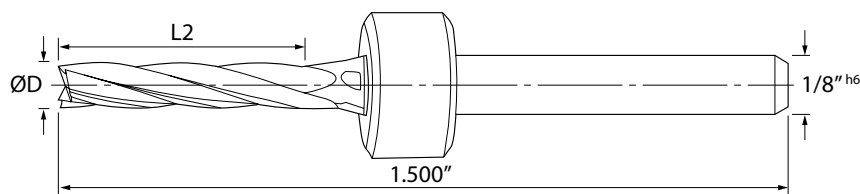
End Style



Drill Point



Fish Tail



DRILLS

END MILLS

ROUTERS

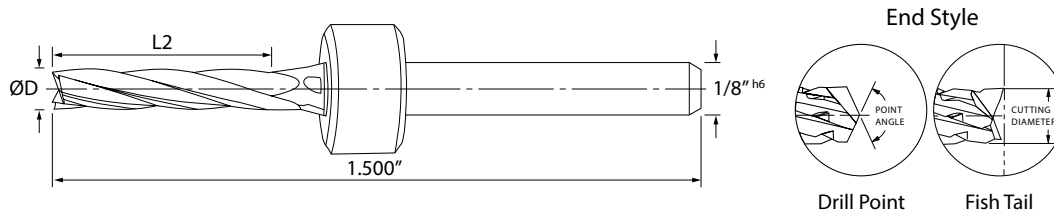
SCORING / ENGRAVING /
COUNTERSINKS

Series 1300

Gold Tab Premium Edge Routers
Up-cut, right hand spiral

Diameter Range

0.0630" ~ 0.0945" | 1.60mm ~ 2.40mm



Standard Flute Length

Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	End Style	Tolerance ØD (in)	Tolerance ØD (mm)
1300.0630.310	1.60mm	0.0630	0.310	7.87	Drill Point	+0/-0.0010	+0/-0.025
1300.0945.395	2.40mm	0.0945	0.395	10.03	Fish Tail	+0/-0.0010	+0/-0.025

Series 1300

Multiple flute cutter designed for routing printed circuit board gold tab connectors and plated solder features.

Excellent for:

- Gold
- Aluminum



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "r" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

SCORING / ENGRAVING / COUNTERSINKS

Contents

Series 2002 - Universal PCB Scoring / Engraving Tools 72

Series 2000 / 2400 - Universal PCB Countersinks 74

Series 2002

Universal PCB Scoring / Engraving Tools



Application and Competitive Advantages of Series 2002 PCB Scoring / Engraving Tools

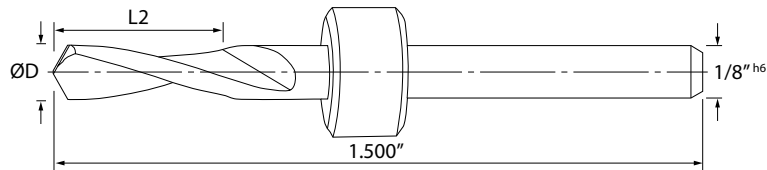
- Suitable for general PCB board scoring / engraving applications.
- Precision ground with an excellent cutting-edge quality.
- Wide application range with multi point end cuts (30°, 45°, 60°, 90°, 120°).

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

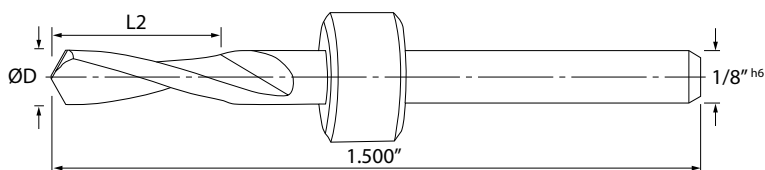


Series 2002

Universal PCB Scoring / Engraving Tools

Diameter Range

0.0625" ~ 0.1250" | 3.00mm



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions				
			Length of Cut (in) L2	Length of Cut (mm) L2	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
2002.0625.030	1/16"	0.0625	0.551	14.00	30°	+0/-0.0003	+0/-0.008
2002.1181.030	3.00mm	0.1181	0.492	12.50	30°	+0/-0.0003	+0/-0.008
2002.1250.030	1/8"	0.1250	0.551	14.00	30°	+0/-0.0003	+0/-0.008
2002.1250.045	1/8"	0.1250	0.551	14.00	45°	+0/-0.0003	+0/-0.008
2002.1250.060	1/8"	0.1250	0.551	14.00	60°	+0/-0.0003	+0/-0.008
2002.1250.090	1/8"	0.1250	0.551	14.00	90°	+0/-0.0003	+0/-0.008
2002.1250.120	1/8"	0.1250	0.551	14.00	120°	+0/-0.0003	+0/-0.008



Series 2002

Two flute scoring tool available with specified scoring angle.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



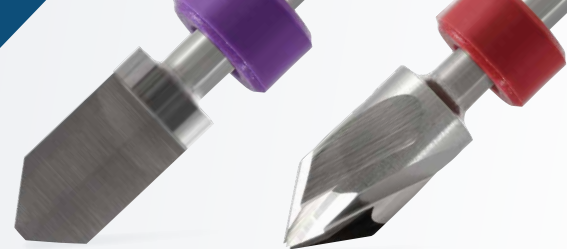
Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

Series 2000 / 2400

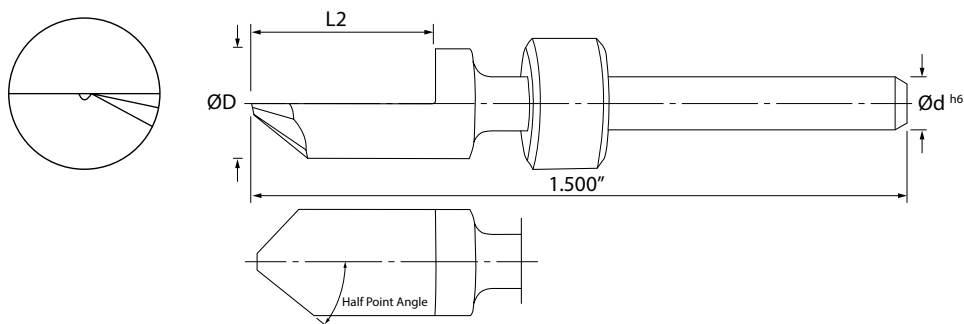
Universal PCB Countersinks



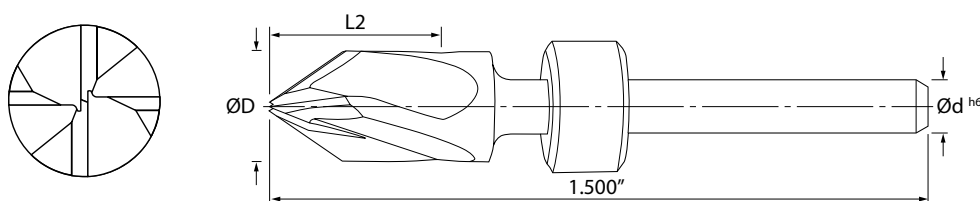
Application and Competitive Advantages of Series 2000 / 2400 PCB Countersinks

- Suitable for a wide range of PCB countersinking applications.
- Strong and highly accurate brazing supports a perfect center line and high application accuracy.
- **Series 2000:** Single Flute Countersinks – perfect for maximum debris removal. Available in multi point end cuts (82°, 90°, 100°).
- **Series 2400:** Four Flute Countersinks – perfect for universal finishing. Available in multi point end cuts (60°, 82°, 90°, 100°, 120°, 140°).

Series 2000



Series 2400



DRILLS

END MILLS

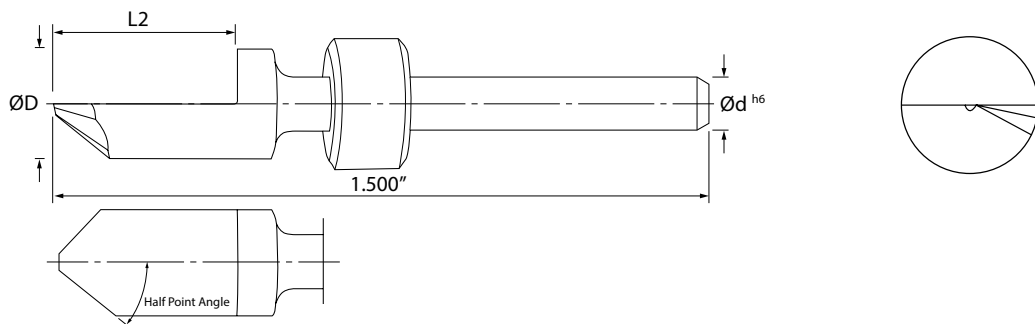
ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Series 2000

Universal PCB Countersinks - 1 Flute

End Cut Angles
82°, 90°, 100°



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions					
			Length of Cut (in) L2	Length of Cut (mm) L2	Shank Diameter Ød	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
2000.2500.082A1	1/4"	0.2500	0.500	12.70	1/8"	82°	+0.0005/-0.0005	+0.013/-0.013
2000.2500.090A1	1/4"	0.2500	0.500	12.70	1/8"	90°	+0.0005/-0.0005	+0.013/-0.013
2000.2500.100A1	1/4"	0.2500	0.500	12.70	1/8"	100°	+0.0005/-0.0005	+0.013/-0.013



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**



Series 2000

Single flute countersink tool with specified countersink angle.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates

DRILLS

END MILLS

ROUTERS

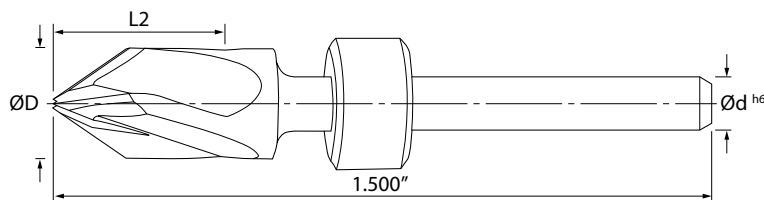
SCORING / ENGRAVING /
COUNTERSINKS

Series 2400

Universal PCB Countersinks - 4 Flute

End Cut Angles

60°, 82°, 90°, 100°, 120°, 140°



Standard Flute Length



Part Number	Cutting Diameter ØD	Decimal Inch ØD	Dimensions					
			Length of Cut (in) L2	Length of Cut (mm) L2	Shank Diameter Ød	Point Angle	Tolerance ØD (in)	Tolerance ØD (mm)
2400.2500.060G1	1/4"	0.2500	0.500	12.70	1/8"	60°	+0.0005/-0.0005	+0.013/-0.013
2400.2500.082	1/4"	0.2500	0.500	12.70	1/8"	82°	+0.0005/-0.0005	+0.013/-0.013
2400.2500.090	1/4"	0.2500	0.500	12.70	1/8"	90°	+0.0005/-0.0005	+0.013/-0.013
2400.2500.100	1/4"	0.2500	0.500	12.70	1/8"	100°	+0.0005/-0.0005	+0.013/-0.013
2400.2500.120	1/4"	0.2500	0.500	12.70	1/8"	120°	+0.0005/-0.0005	+0.013/-0.013
2400.2500.140	1/4"	0.2500	0.500	12.70	1/8"	140°	+0.0005/-0.0005	+0.013/-0.013
2400-6250.090A1	5/8"	0.6250	0.630	16.00	1/4"	90°	+0.0005/-0.0005	+0.013/-0.013

*Part Number 2400-6250.090A1 is a Ringless Part Number due to 1/4" Shank Diameter

Series 2400

Four flute countersink tool with specified countersink angle.

Suitable for:

- FR-4
- Polyimides
- Teflon / PTFE
- High copper content laminates
- High speed laminates



Part Numbers above include rings set at 0.800" - For Ringless Part Number, replace series "R" with "-" (XXX-XXXX.XXXX)
Additional diameters and special ring colors available upon request.



For recommended cutting conditions please visit: www.kyoceraprecisiontools.com/pcb/speeds-feeds or
Review starting recommendations on **Page 79**

DRILLS

END MILLS

ROUTERS

SCORING / ENGRAVING /
COUNTERSINKS

Diameter Conversion Chart

Drill Size	Decimal Inch	Drill Size	Decimal Inch	Drill Size	Decimal Inch	Drill Size	Decimal Inch
0.05mm	0.0020"	58	0.0420"	34	0.1110"	4.75mm	0.1870"
0.10mm	0.0039"	57	0.0430"	2.85mm	0.1122"	3/16"	0.1875"
0.13mm	0.0051"	1.10mm	0.0433"	33	0.1130"	4.80mm	0.1890"
0.15mm	0.0059"	1.15mm	0.0453"	2.90mm	0.1142"	12	0.1890"
97	0.0059"	56	0.0465"	32	0.1160"	4.85mm	0.1909"
96	0.0063"	3/64"	0.0469"	2.95mm	0.1161"	11	0.1910"
95	0.0067"	1.20mm	0.0472"	3.00mm	0.1181"	4.90mm	0.1929"
94	0.0071"	1.25mm	0.0492"	31	0.1200"	10	0.1935"
93	0.0075"	1.30mm	0.0512"	3.05mm	0.1201"	4.95mm	0.1949"
92	0.0079"	55	0.0520"	3.10mm	0.1220"	9	0.1960"
0.20mm	0.0079"	1.35mm	0.0531"	3.15mm	0.1240"	5.00mm	0.1968"
91	0.0083"	54	0.0550"	1/8"	0.1250"	5.05mm	0.1988"
90	0.0087"	1.40mm	0.0551"	3.20mm	0.1260"	8	0.1990"
89	0.0091"	1.45mm	0.0571"	3.25mm	0.1280"	5.10mm	0.2008"
88	0.0095"	1.50mm	0.0591"	30	0.1285"	7	0.2010"
0.25mm	0.0098"	53	0.0595"	3.30mm	0.1299"	5.15mm	0.2028"
87	0.0100"	1.55mm	0.0610"	3.35mm	0.1319"	13/64"	0.2031"
86	0.0105"	1/16"	0.0625"	3.40mm	0.1339"	6	0.2040"
85	0.0110"	1.60mm	0.0630"	3.45mm	0.1358"	5.20mm	0.2047"
84	0.0115"	52	0.0635"	29	0.1360"	5	0.2055"
0.30mm	0.0118"	1.65mm	0.0650"	3.50mm	0.1378"	5.25mm	0.2067"
83	0.0120"	1.70mm	0.0669"	3.55mm	0.1398"	5.30mm	0.2087"
82	0.0125"	51	0.0670"	28	0.1405"	4	0.2090"
81	0.0130"	1.75mm	0.0689"	9/64"	0.1406"	5.35mm	0.2106"
80	0.0135"	50	0.0700"	3.60mm	0.1417"	5.40mm	0.2126"
0.35mm	0.0138"	1.80mm	0.0709"	3.65mm	0.1437"	3	0.2130"
79	0.0145"	1.85mm	0.0728"	27	0.1440"	5.45mm	0.2146"
1/64"	0.0156"	49	0.0730"	3.70mm	0.1457"	5.50mm	0.2165"
0.40mm	0.0157"	1.90mm	0.0748"	26	0.1470"	5.55mm	0.2185"
78	0.0160"	48	0.0760"	3.75mm	0.1476"	7/32"	0.2188"
0.42mm	0.0165"	1.95mm	0.0768"	25	0.1495"	5.60mm	0.2205"
0.45mm	0.0177"	5/64"	0.0781"	3.80mm	0.1496"	2	0.2210"
77	0.0180"	47	0.0785"	3.85mm	0.1516"	5.65mm	0.2224"
0.50mm	0.0197"	2.00mm	0.0787"	24	0.1520"	5.70mm	0.2244"
76	0.0200"	2.05mm	0.0807"	3.90mm	0.1535"	5.75mm	0.2264"
75	0.0210"	46	0.0810"	23	0.1540"	1	0.2280"
0.55mm	0.0217"	45	0.0820"	3.95mm	0.1555"	5.80mm	0.2283"
74	0.0225"	2.10mm	0.0827"	5/32"	0.1562"	5.85mm	0.2302"
0.60mm	0.0236"	2.15mm	0.0846"	22	0.1570"	5.90mm	0.2323"
73	0.0240"	44	0.0860"	4.00mm	0.1575"	A	0.2340"
72	0.0250"	2.20mm	0.0866"	21	0.1590"	5.95mm	0.2343"
0.65mm	0.0256"	2.25mm	0.0886"	4.05mm	0.1594"	15/64"	0.2344"
71	0.0260"	43	0.0890"	20	0.1610"	6.00mm	0.2362"
0.70mm	0.0276"	2.30mm	0.0906"	4.10mm	0.1614"	B	0.2380"
70	0.0280"	2.35mm	0.0925"	4.15mm	0.1634"	6.05mm	0.2382"
69	0.0292"	42	0.0935"	4.20mm	0.1654"	6.10mm	0.2402"
0.75mm	0.0295"	3/32"	0.0938"	19	0.1660"	C	0.2420"
68	0.0310"	2.40mm	0.0945"	4.25mm	0.1673"	6.15mm	0.2421"
1/32"	0.0312"	41	0.0960"	4.30mm	0.1693"	6.20mm	0.2441"
0.80mm	0.0315"	2.45mm	0.0965"	18	0.1695"	D	0.2460"
67	0.0320"	40	0.0980"	4.35mm	0.1713"	6.25mm	0.2461"
66	0.0330"	2.50mm	0.0984"	11/64"	0.1719"	6.30mm	0.2480"
0.85mm	0.0335"	39	0.0995"	17	0.1730"	6.35mm	0.2500"
65	0.0350"	2.55mm	0.1004"	4.40mm	0.1732"	E	0.2500"
0.90mm	0.0354"	38	0.1015"	4.45mm	0.1752"	1/4"	0.2500"
64	0.0360"	2.60mm	0.1024"	16	0.1770"	6.40mm	0.2520"
63	0.0370"	37	0.1040"	4.50mm	0.1772"	6.50mm	0.2559"
0.95mm	0.0374"	2.65mm	0.1043"	4.55mm	0.1791"	F	0.2570"
62	0.0380"	2.70mm	0.1063"	15	0.1800"	6.60mm	0.2598"
61	0.0390"	36	0.1065"	4.60mm	0.1811"	G	0.2610"
1.00mm	0.0394"	2.75mm	0.1083"	14	0.1820"	6.70mm	0.2638"
60	0.0400"	7/64"	0.1094"	4.65mm	0.1831"		
59	0.0410"	35	0.1100"	13	0.1850"		
1.05mm	0.0413"	2.80mm	0.1102"	4.70mm	0.1850"		

* Colors indicate standard ring (collar) colors

KYOCERA Carbide Study – PCB Drills

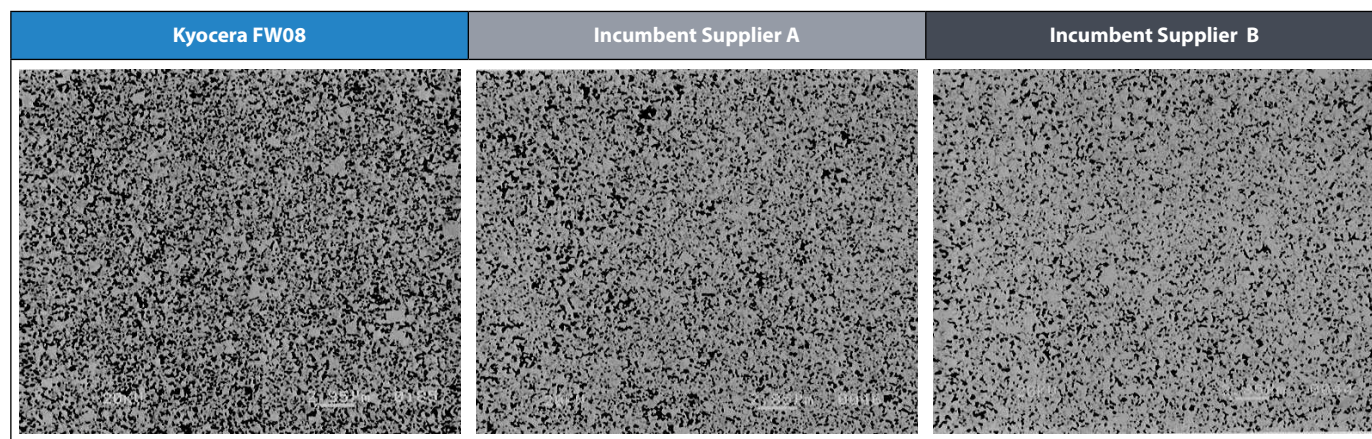
KYOCERA Corporation, one of the world's leading suppliers of carbide blanks, developed a carbide grade specifically engineered for PCB applications. Following multiple iterations of 8% and 6% formulations, the material emerged as the preferred choice for KYOCERA Precision Tools PCB drills.

During supplier evaluations, KYOCERA Precision Tools maintains strict qualification standards, requiring all candidates to demonstrate measurable performance improvements over incumbent suppliers, particularly for critical micro-drill applications.

KYOCERA Corporation carbide serves as the primary raw material for KYOCERA Precision Tools drill diameters ranging from 0.0079" to 0.0453". Qualification testing included multiple carbide grades and extensive performance trials; the results below represent the highest-volume micro-drill lengths.

Carbide Performance Comparison

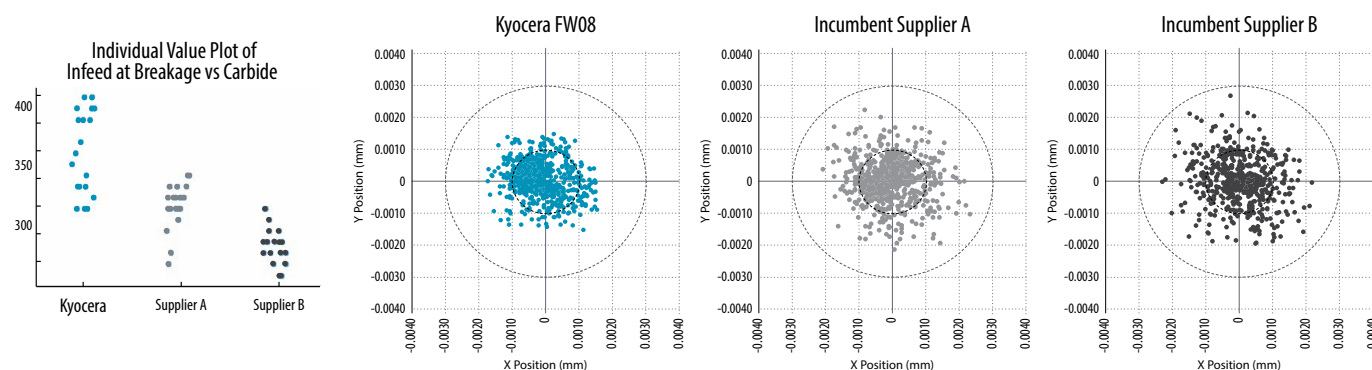
Grain Structure and Homogeneity



Performance Testing

Robustness and Positional Accuracy were the two primary performance metrics in the study.

Kyocera FW08 met or exceeded the incumbent suppliers' performance in both cases.



One-way ANOVA: Infeed at Breakage versus Carbide					
Source	DF	SS	MS	F	P
Carbide	2	301720	150860	52.06	0.000
Error	57	165180	2898		
Total	59	466900			

True Position Deviation			
	Mean	Std Dev	Median
Kyocera	0.0009807	0.0005157	0.0009493
Supplier A	0.0010761	0.0005583	0.0009820
Supplier B	0.0011299	0.0005847	0.0010445

S = 53.83 R-Sq = 64.62% R-Sq(adj) = 63.38%

Level	N	Mean	StDev
Kyocera	20	306.00	75.70
Supplier A	20	206.00	41.09
Supplier B	20	133.00	35.70

Recommended Cutting Conditions

Cutting Speed / Surface Feed Per Minute (SFM) & Chip Load (Feed Rate Per Tooth)

Material	Hole Aspect Ratio < 10:1 Depth / Dia.	Hole Aspect Ratio > 10:1 + < 12:1	Hole Aspect Ratio > 12:1	Chip Load
Ceramic Filled (Rogers 3003 / 3010 / TC350 / TC600) (Arlon AD600 / AD1000 / 25N / 25FR / 33N) (Taconic)	200	200	200	0.0020"
Teflon / PTFE / Soft Materials (Rogers 5870 / 5880 / 6006 / 6010 / 6202) (Arlon 522 / 527 / 822 / 880) (DuPont Pyralux / Taconic)	250	250	250	0.0030"
Flex Materials (Kapton)	300	300	300	0.0025"
Polyimide / Brittle Materials (Polymers with synthetic structure) (Arlon 35N / 45NT / 85N / 85NT / 49N) (Isola P95 / P96) (Ventec VT901 / Panasonic 1766 / Grace)	350	325	300	0.0020"
Filled Hi Speed / Hal Free Materials (Isola I-Speed / 408HR / IS415 / IS640 / IS680 / Astra / Iterra / Tachyon) (Nelco NP4000 / 5000 / 7000 / 13) (Arlon 55NT / Rogers 438 / DuPont Iterra HK04 / ITEQ180)	390	375	350	0.0025"
ROGERS 4000 Series (Rogers 4000 / 4350 / 4835)	400	400	400	0.0030"
FR-4 Multilayer / HiTg Materials (Isola 185 HR / 370 / 410 / 620)	420	400	380	0.0025"
FR-4 / FR-5 Standard / Double Sided Materials (Nelco 6 / 7 / 11 / Isola 406 / Arlon 47N)	550	525	500	0.0030"

This information shall be considered as a general recommendation, suitable to conduct initial PCB machining.
Actual conditions and the machining environment determine final cutting speed and chip load.
Final data may vary and deviate from these general recommendations.



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