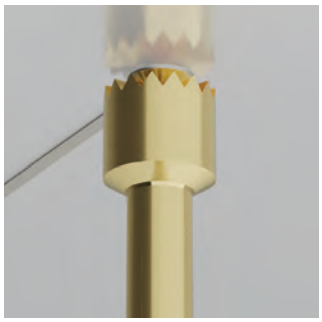
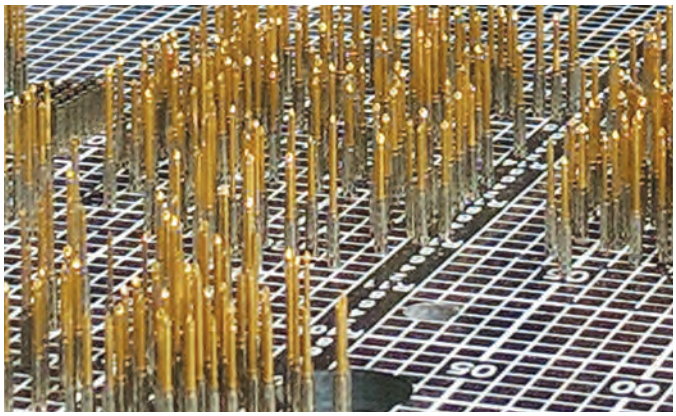
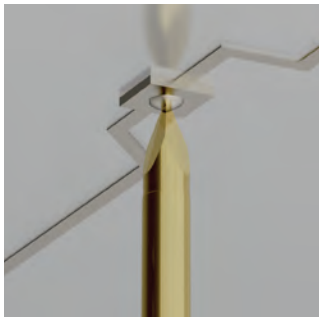
The World's Most Trusted

Test Probes and Interconnect Products







2023 CATALOG

QA® Technology Company, Inc.

Customer Service and Shipping and Delivery

Customer Service

The QA support team, equipped with extensive customer, industry and product experience, provides highly personalized advice and guidance in all aspects of product support including design, quality, applications and orders. We pride ourselves in responding to customer questions with information and solutions in a timely and professional manner.

For technical support, call us at (603) 926-1193
For direct sales assistance, call (603) 926-0348

Steve Kayal
General Manager

Jeff Smith
Director of Global Sales

Gabriel Gonzalez
Regional Sales Manager

Deb Bragdon
Customer Service Lead

Kara Mathews
Customer Service Coordinator

Wendy Bongers
Marketing Specialist

Paul Gurrisi
Engineering Manager

Matt Parker
Product Engineer

Leah Hudson
Product Design Engineer

John Roell
Controller

Mike Cestone
Quality Manager

Jeff Brown
Product Engineer, integraMate

Shipping and Delivery

QA recognizes speed of delivery as a critical factor in our customer's success. Our bar code and order verification system enables us to ship our products quickly and accurately. Most orders are shipped the same day and can be delivered within 24 hours.

Our shipping department is designed to expedite the delivery of customer orders by utilizing virtually any carrier. Our volumes guarantee competitive discount rates both domestically and internationally.

QA's capabilities include "in-house" tracking of FedEx®, UPS®, DHL® or any other carrier you choose.

Our products are double packaged for safe delivery. We are also capable of meeting certain customer packaging specifications.

Call customer service at (603) 926-0348 for more information.

Typical Shipping Weights for Cost Comparison

PROBES	WEIGHT
1,000 pcs.	less than 1.0 lb. [0.45 kg]
3,000 pcs.	less than 2.0 lb. [0.91 kg]
5,000 pcs.	less than 5.0 lb. [2.27 kg]
10,000 pcs.	less than 10 lb. [4.54 kg]

SOCKETS	WEIGHT
3,000 pcs.	less than 2.0 lb. [0.91 kg]
10,000 pcs.	less than 10 lb. [4.52 kg]

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- 0.160 [4.06] Stroke – 039-16 Series 5
- 0.250 [6.35] Stroke – 039-25 Series 6
- 0.400 [10.16] Stroke – 039-40 Series 8

0.050 [1.27] Centers
- 0.050 [1.27] Stroke – 050-05 Series 10
- 0.160 [4.06] Stroke – 050-16 Series 12
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integraMate® Hyperboloid Contacts

QA Technology's integraMate® hyperboloid contacts are designed to meet the demanding requirements of connector manufacturers, cable assemblers and OEMs in today's military and aerospace, medical equipment, scientific instrument, telecommunications and other industries – where the reliability of signal and power connections is non-negotiable.

More Compact

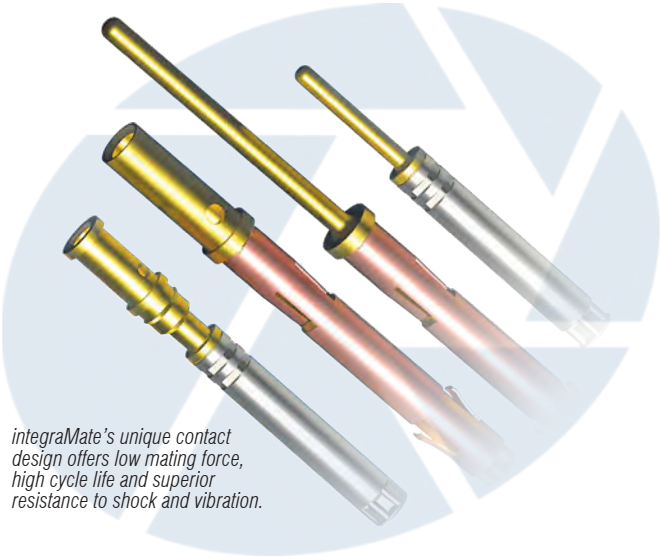
integraMate's reduced diameter allows them to fit into today's smaller connector platforms. Discrete contacts are available for connectors in mating pin sizes from 0.4mm diameter up to 1.5mm diameter (1.0A to 12.0A), for mounting spacing as small as 1.0mm from center to center. Contacts are also available in a family of latching circular connectors with 3, 7, 9 and 14 positions.

More Dependable

integraMate® contacts are extraordinarily resistant to shock and vibration. A single wall, deep drawn tube with an integral "return" delivers better protection of the hyperbolic wire cage. Lower, more uniform insertion and extraction forces mean high pin count connectors can be mated by hand. integraMate contacts also have low electrical resistance, a longer cycle life, and high resistance to fretting corrosion.

More Choice

QA Technology's automated assembly system enables a wide range of insulator design, termination needs and preferences for contact retention and loading. ICS contacts can be configured to be fixed, removable, loaded from the mating face or rear loaded. Terminations can include solder cup, crimp, straight and right-angle PCB, square post, etc.



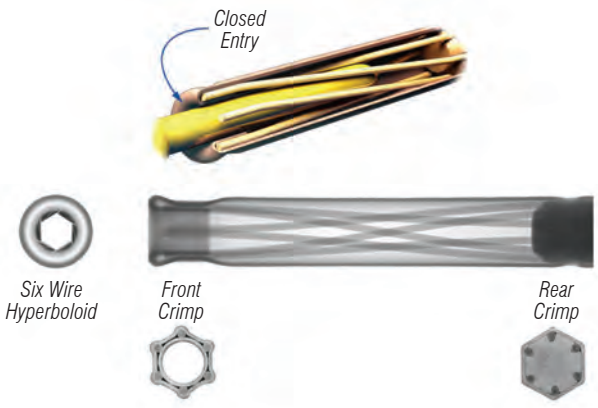
integraMate's unique contact design offers low mating force, high cycle life and superior resistance to shock and vibration.

APPLICATIONS

- Medical and Dental Equipment
- Scientific Instruments
- Industrial Equipment
- Transportation Equipment
- ATE Interfaces
- Military and Aerospace
- Telecommunications and Data Communications

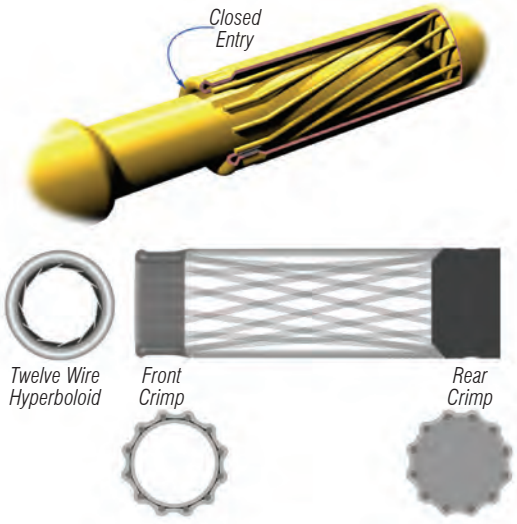
SIGNAL CONTACTS

integraMate ICS series signal contacts are shorter and smaller in diameter than earlier hyperboloid contacts. The simplified, less expensive design allows ICS sockets to be used in high density board-level connectors (as well as in circular and rectangular I/O Connectors).



POWER CONTACTS

integraMate® ICO Series Power contacts use a 12-wire cage to provide higher current carrying and very low insertion/extraction force.



Termination and Mounting Flexibility

Custom terminations to suit specific applications can be readily available due to QA's "state of the art" automation equipment.

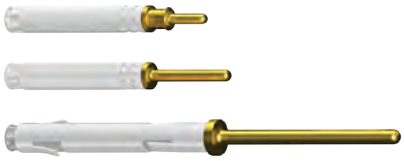
Contacts are available for front and rear loaded connector designs and in removable versions. Please contact QA Technology integraMate® Applications Engineering for assistance with your next high performance connector design.

You will be pleasantly surprised to see how easy it is to use the best pin and socket design for your new connector.

MATCHING MATING PINS

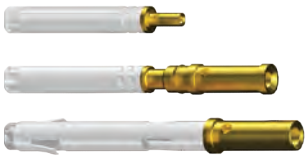
Matching screw machined pins with custom terminations are also available for your connector design. QA's in-house CNC Swiss turning capability means design flexibility and fast turnaround times.

PCB



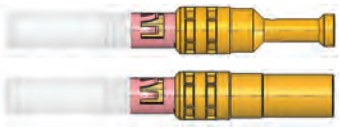
SOLDER CUP

CRIMP

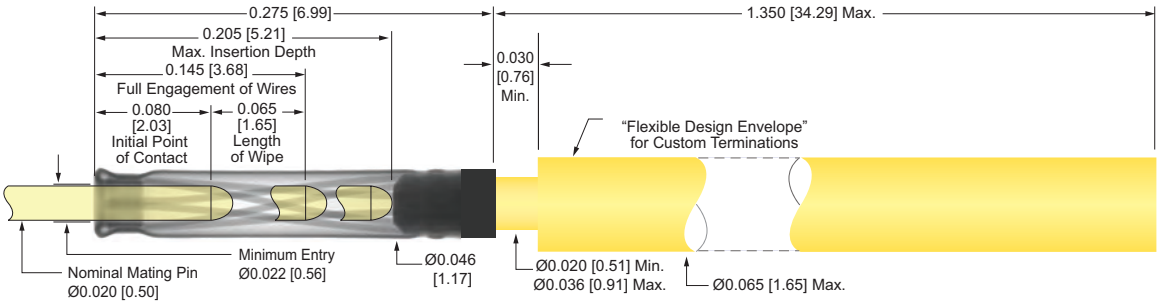


RIGHT ANGLE

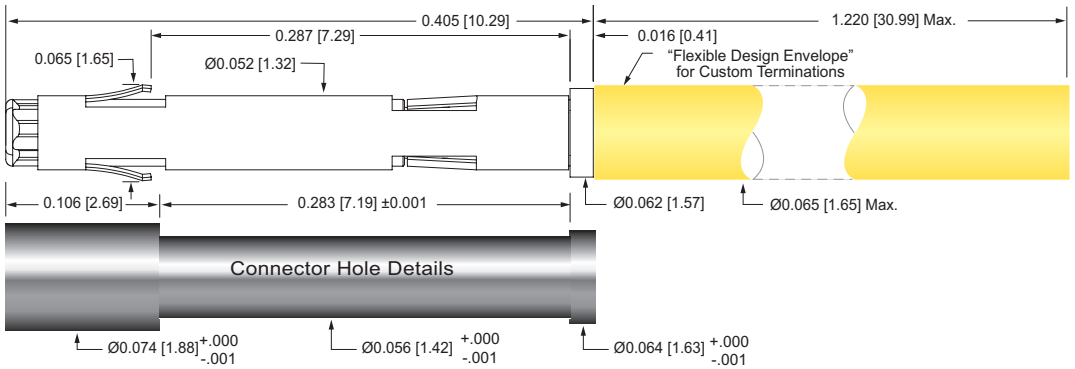
REMOVEABLE CRIMP

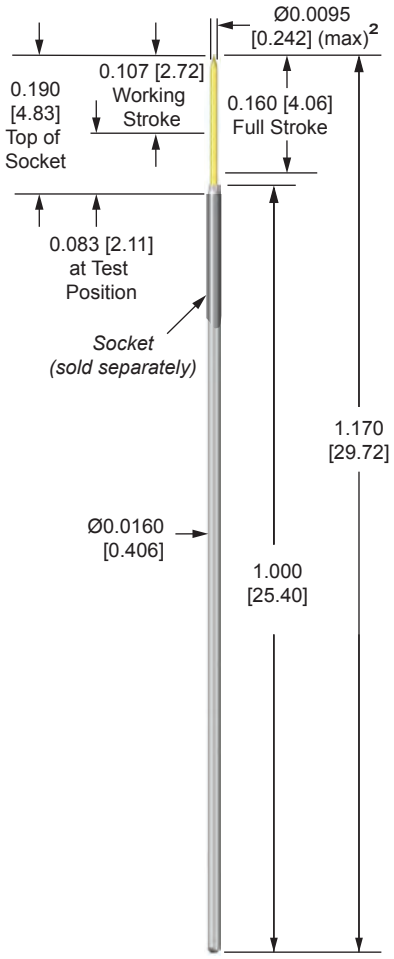


PRESS-FIT SOCKET – FLEXIBLE DESIGN ENVELOPE FOR CUSTOM TERMINATIONS (TYPICAL)

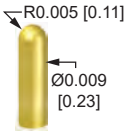


REMOVABLE SOCKET, REAR LOADED – FLEXIBLE DESIGN ENVELOPE FOR CUSTOM TERMINATIONS (TYPICAL)





ROUND



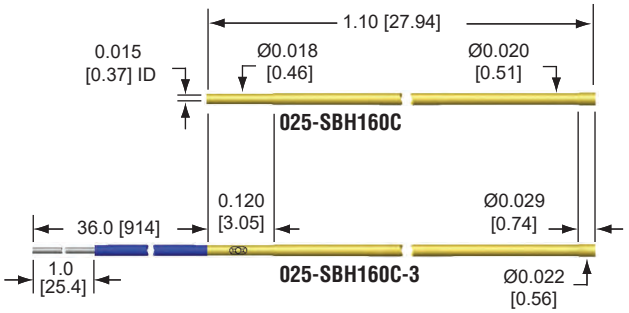
40 Round

SPEAR

41 Spear

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0205 / 0.0215 [0.521 / 0.546]; Drill Size #75 or 0.55mm



SOCKET P/N 025-SBH160C-■ example: 025-SBH160C-3

	Letter	Material/Finish
Tube	H	Phos Bronze/ID & OD precious metal clad
Term.	Letter	Material/Finish
	C	Crimp
Option	Digit	Spring Force
	3	30 AWG Blue Kynar insulated solid wire 36 [914] length pre-attached with 1.0 [25.4] stripped end.
	(Blank)	No option required

US Patent No. 4,885,533

PROBE P/N 025-PRP16■■S-■ example: 025-PRP1641S

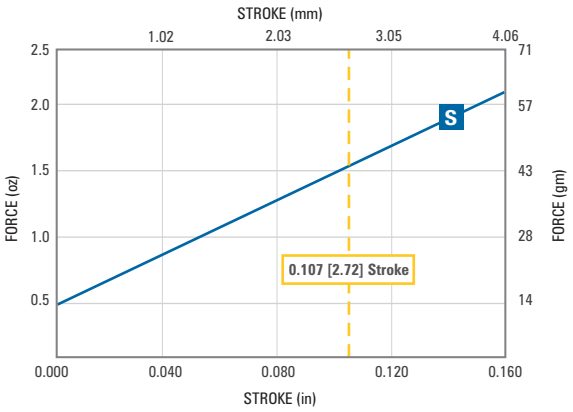
	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 100 mOhms	2.7 (3.7)[3]
Tip Style	Digits	Material/Finish		
	See Tips	Heat treated BeCu/plated gold over nickel		

	Letter	Spring Force	Preload	@ 0.107 [2.72] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke
Spring	S	Standard	0.5 [14g/0.14N]	1.6 [45g/0.44N]	MW	1,000,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

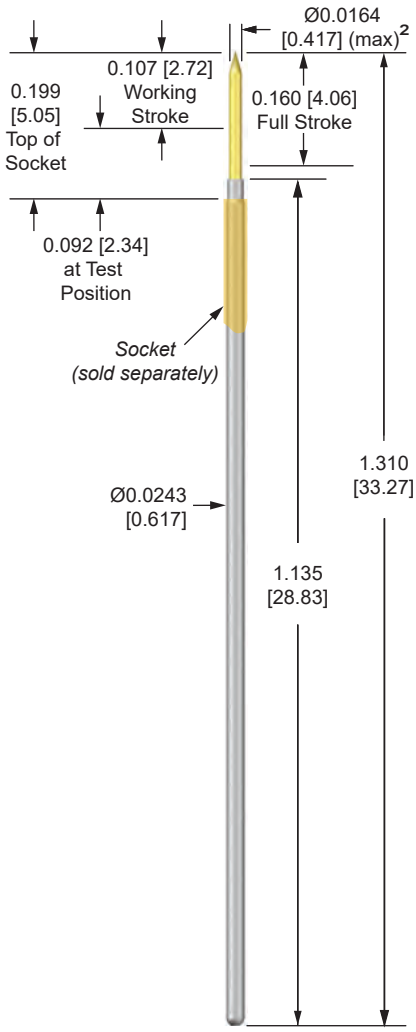
[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -5°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

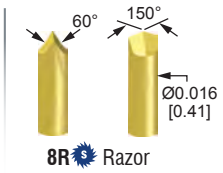


TOOLS & ACCESSORIES

See pages 75-79 for order information.



RAZOR

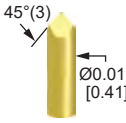


8R$ Razor

SPEAR

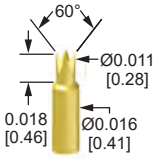
41$ Spear

CHISEL

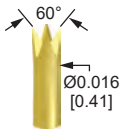


43$ Chisel

CROWN



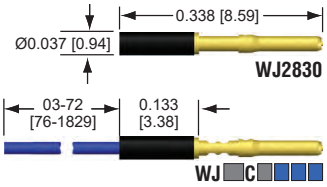
14$ Crown



44$ Crown

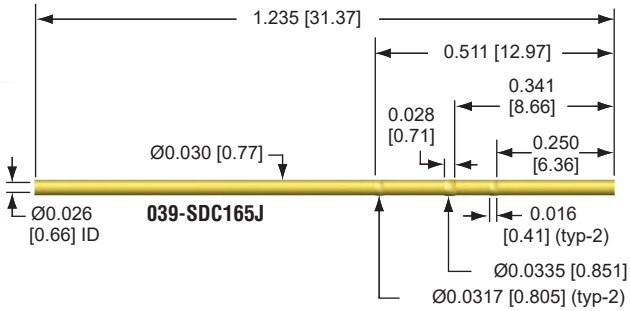
WIRE JACK

For use with J termination pins.



SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0307 / 0.0317 [0.780 / 0.805]; Drill Size #67 or 0.80mm



SOCKET P/N 039-SDC165J

	Letter	Material/Finish
Tube	C	Heat treated BeCu/gold plated over nickel

	Letter	Description
Term.	J	Wire Jack termination. Accepts wire jacks

US Patent No. 4,885,533

P/N: WJ■■■■■■■-■ example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.

Wire — Colors Available for 28C & 30C Termination

0	Black	2	Red	4	Yellow	6	Blue	8	Gray
1	Brown	3	Orange	5	Green	7	Violet	9	White

Wire Length Available for 28C & 30C Termination

Specify Length in inches: 03 – 72 [76-1829]

	Letter	Description
Option	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

PROBE P/N 039-PRP16■■■-■ example: 039-PRP1643X-S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 165 mOhms	3.1 (4.2)[3]

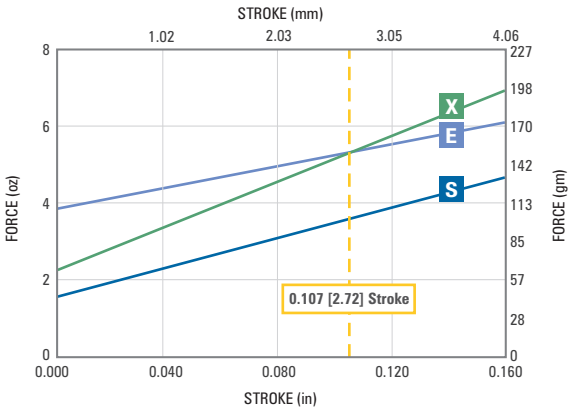
	Digits	Material/Finish
Tip Style	See Tips	Heat treated steel/plated gold over nickel

	Letter	Spring Force	Preload	@ 0.107 [2.72] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke
Springs	S	Standard	1.5 [43g/0.42N]	3.6 [102g/1.00N]	MW	1,000,000
	X	Extra	2.2 [62g/0.61N]	5.4 [153g/1.50N]	MW	75,000
	E	High Preload	3.8 [108g/1.06N]	5.4 [153g/1.50N]	MW	100,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

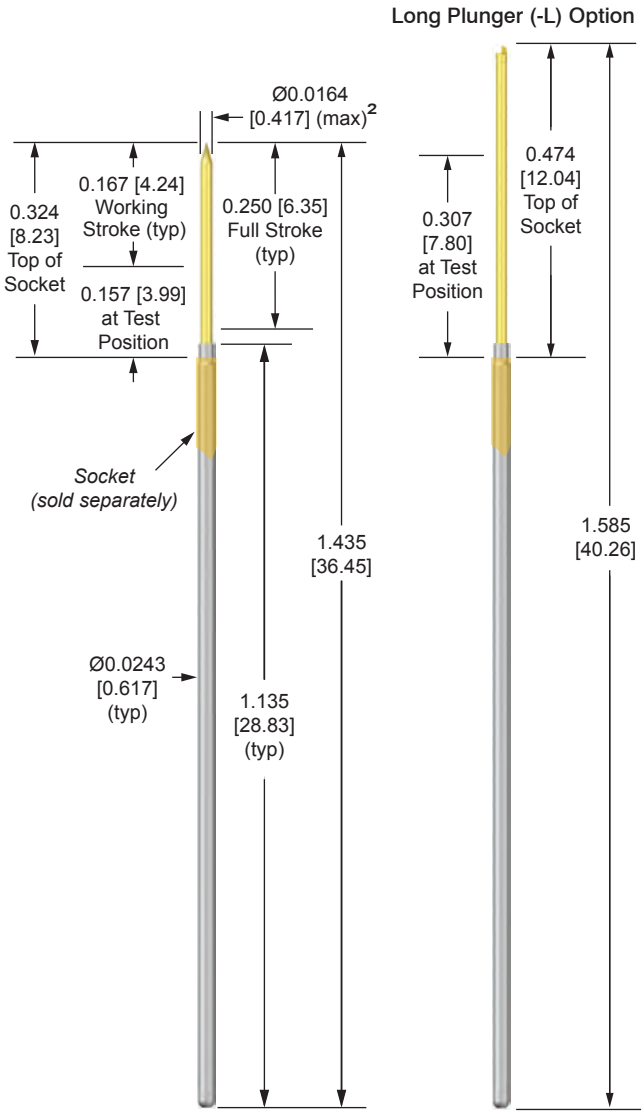


TOOLS & ACCESSORIES

See pages 75-79 for order information.

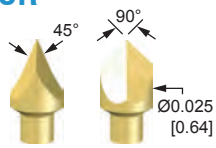
039-25 Series

0.039 [1.00] Centers | 0.250 [6.35] Full Stroke

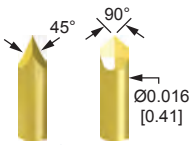


Long Plunger (-L) Option

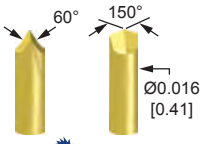
RAZOR



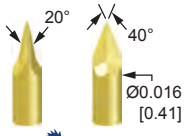
5R $ Razor



6R $ Razor



8R $ Razor

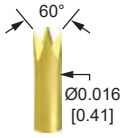


9R $ Razor

TORCH

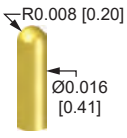
47 $ Torch

CROWN



44 $ Crown

ROUND



40 Round

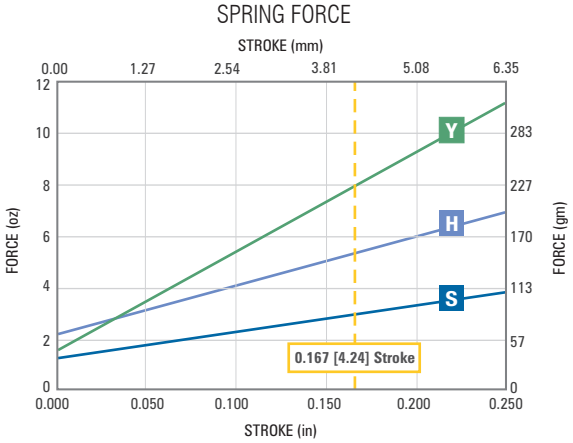
PROBE P/N 039-PRP25___-__ example: 039-PRP2543H-S

	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad			< 65 mOhms	3.1 (4.3)[3]
Tip Style	Digits	Material/Finish				
	See Tips	Standard material is heat treated BeCu/plated gold over nickel. (see S option for steel plungers)				
Springs	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24]Stroke
	S	Standard	1.5 [43g/0.42N]	3.6 [102g/1.00N]	MW	1,000,000
	H	High	2.2 [62g/0.62N]	5.4 [153g/1.50N]	SS	50,000
	Y	Elevated	1.5 [43g/0.42N]	8.0 [227g/2.22N]	SS	25,000
Option	Letter	Description				
	L	Long plunger. Must select from 039-40 tip styles				
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]				
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)				
	(Blank)	No option required				

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

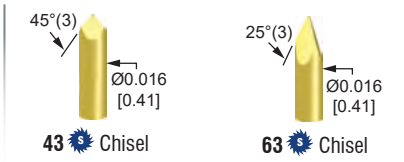
[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.



TOOLS & ACCESSORIES

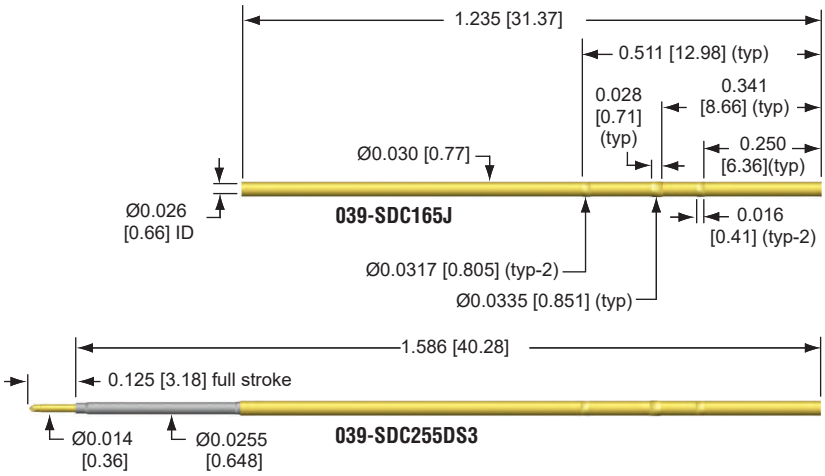
See pages 75-79 for order information.

CHISEL

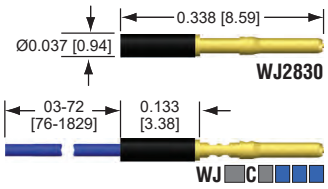


SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0307 / 0.0317 [0.780 / 0.805]; Drill Size #67 or 0.80mm



WIRE JACK For use with J termination pins.



P/N: WJ- example: WJ28C8230

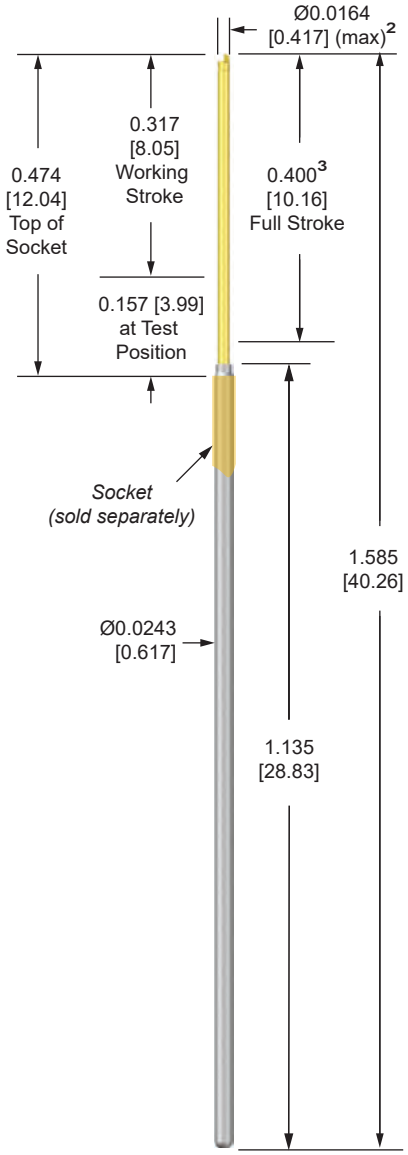
	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.
Wire	Colors Available for 28C & 30C Termination	
	0 Black, 1 Brown, 2 Red, 3 Orange, 4 Yellow, 5 Green, 6 Blue, 7 Violet, 8 Gray, 9 White	
	Wire Length Available for 28C & 30C Termination	
		Specify Length in inches: 03 – 72 [76-1829]
Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

SOCKET P/N

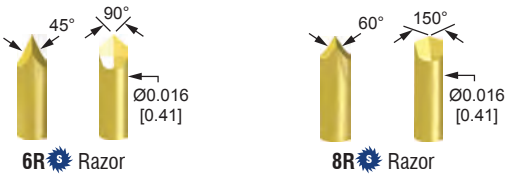
039-SDC165 example: 039-SDC165J

	Letter	Material/Finish
Tube	C	Heat treated BeCu/gold plated over nickel
	Letter	Description
Term.	DS3	Double-ended for wireless testing. See page 42 for ordering details.
	J	Wire Jack termination. Accepts wire jacks

US Patent No. 4,885,533



RAZOR



6R$ Razor

8R$ Razor

TORCH

47$ Torch

PROBE P/N 039-PRP40■■■-■ example: 039-PRP406RS-S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
Tube	P	Nickel silver/ID precious metal clad	< 75 mOhms	2.6 (3.6)[4]

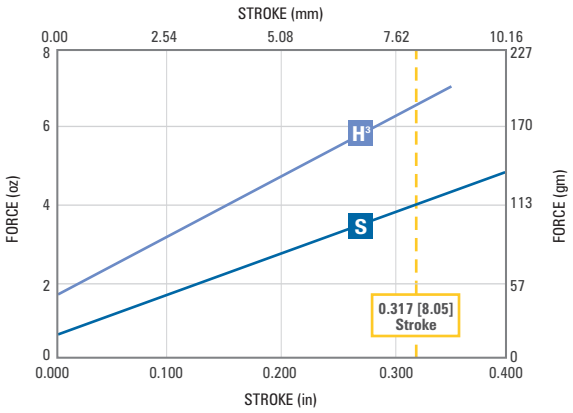
	Digits	Material/Finish
Tip Style	See Tips	Heat treated steel/plated gold over nickel

	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05]Stroke
Springs	S	Standard	0.7 [20g/0.19N]	4.0 [113g/1.11N]	SS	50,000
	H[3]	High	1.8 [51g/0.50N]	6.0 [170g/1.67N]	SS	50,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, range, see Testing in Extreme Working Temperatures application note for more details.[4]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] 0.350 [8.89] max stroke for H spring.
[4] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

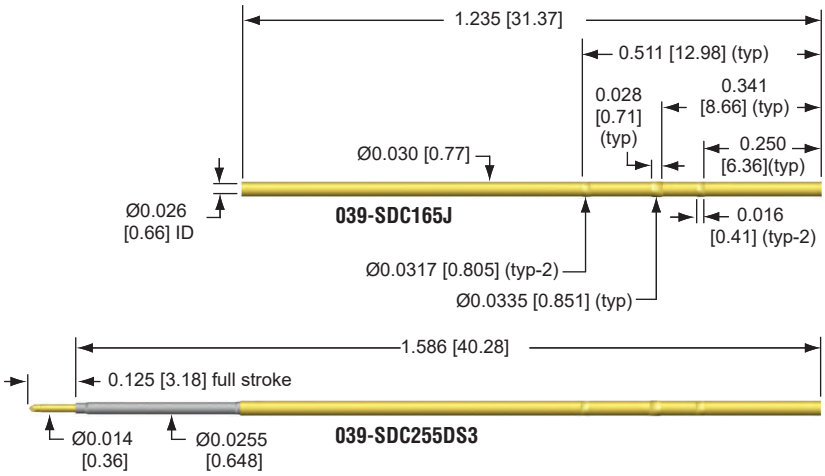


TOOLS & ACCESSORIES

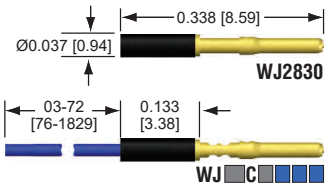
See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0307 / 0.0317 [0.780 / 0.805]; Drill Size #67 or 0.80mm



WIRE JACK For use with J termination pins.



P/N: WJ□□□□□□□-□ example: WJ28C8230

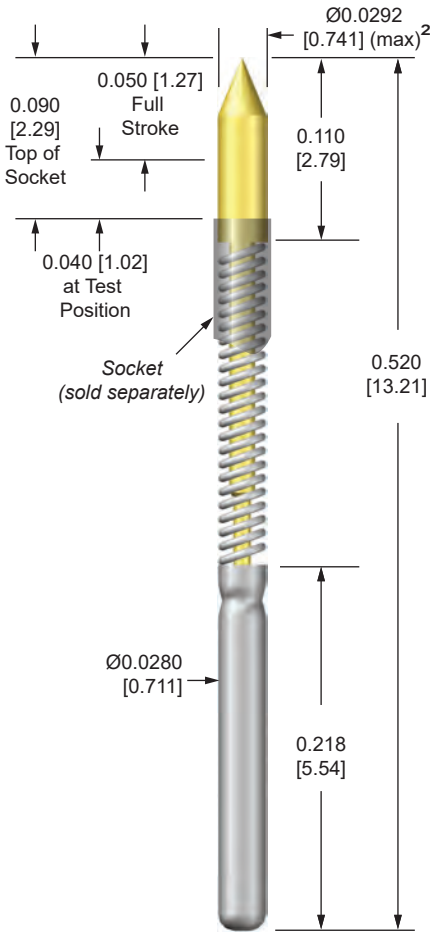
	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.
Wire	Colors Available for 28C & 30C Termination	
	0 Black, 2 Red, 4 Yellow, 6 Blue, 8 Gray	
	1 Brown, 3 Orange, 5 Green, 7 Violet, 9 White	
	Wire Length Available for 28C & 30C Termination	
	Specify Length in inches: 03 – 72 [76-1829]	
Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

SOCKET P/N

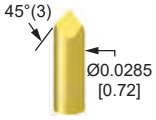
039-SDC165□ example: 039-SDC165J

	Letter	Material/Finish
Tube	C	Heat treated BeCu/gold plated over nickel
	Letter	Description
Term.	DS3	Double-ended for wireless testing. See page 42 for ordering details.
	J	Wire Jack termination. Accepts wire jacks

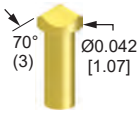
US Patent No. 4,885,533



CHISEL

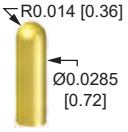


43 Chisel



13 Chisel

ROUND



40 Round

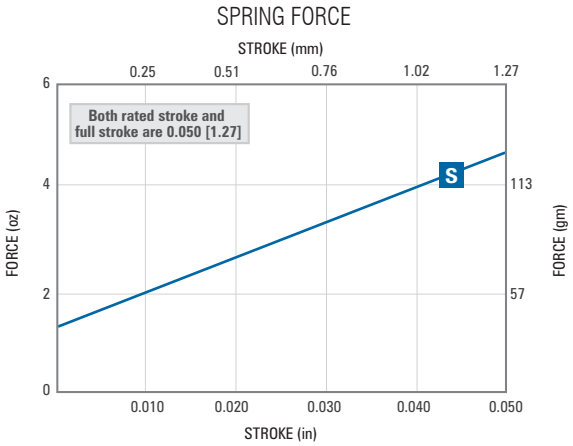
SPEAR

41 Spear

PROBE P/N 050-PLP05□□S-□ example: 050-PLP0513S

	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad			< 25 mOhms	3.7 (5.2)[3]
	Digits	Material/Finish				
Tip Style	See Tips	Heat treated BeCu/plated gold over nickel				
	Letter	Spring Force	Preload	@ 0.050 [1.27] Stroke	Material	Cycle Life @ 0.050 [1.27] Stroke
Spring	S	Standard	1.3 [37g/0.36N]	4.6 [130g/1.28N]	MW	1,000,000
	Letter	Description				
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]				
	(Blank)	No option required				

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -5°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

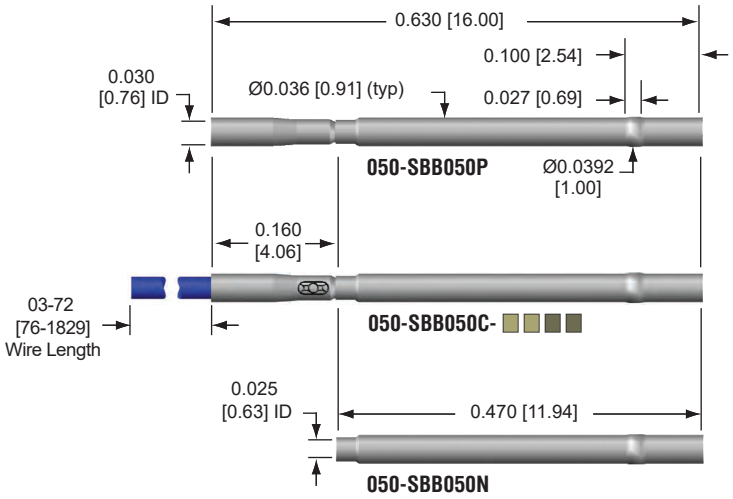


TOOLS & ACCESSORIES

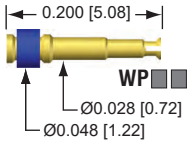
See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0368 / 0.0378 [0.935 / 0.960]; Drill Size .95mm or #62



WIRE PLUG For use with P termination sockets.



P/N: WP■■ example: WP30

	Digits	Description
Plug Size	28	Brass/plated gold over nickel with red insulating sleeve.To accept 28 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]
	30	Brass/plated gold over nickel with blue insulating sleeve. To accept 30 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]

SOCKET P/N

050-SBB050■■■■■ example: 050-SBB050C3630

	Letter	Material/Finish
Tube	B	Heat treated BeCu/Nickel clad ID/OD

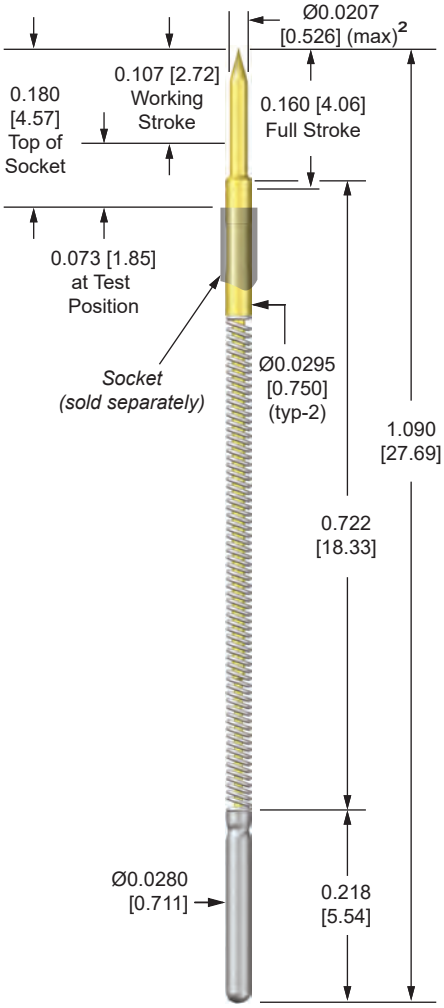
	Letter	Description
Termination	C	Crimp (specify wire size, color and length option)
	N	No termination
	P	Plug/Solder; Stainless Steel/ID precious metal clad. Accepts wire plugs or soldered wire connection

	Digits	Wire Size Available for C Termination
Options	3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length
	(Blank)	No option required

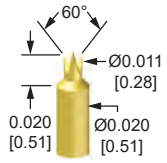
Wire Color Available for C Termination									
0	Black	2	Red	4	Yellow	6	Blue	8	Grey
1	Brown	3	Orange	5	Green	7	Violet	9	White

Wire Length Available for C Termination
Specify Length in inches: 03 – 72 [76-1829]

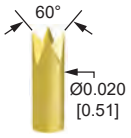
US Patent No. 4,659,987 & 4,597,622



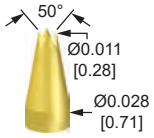
CROWN



14 or 14$ Crown

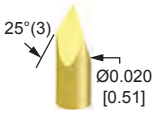


44 or 44$ Crown

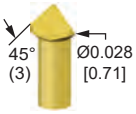


54 Crown

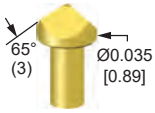
CHISEL



63 Chisel



03 Chisel



13 Chisel

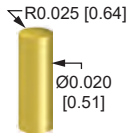
SERRATED

09 Serrated

SPEAR

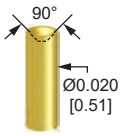
41 or 41$ Spear

ROUND



40 Round

CUP



42 Cup

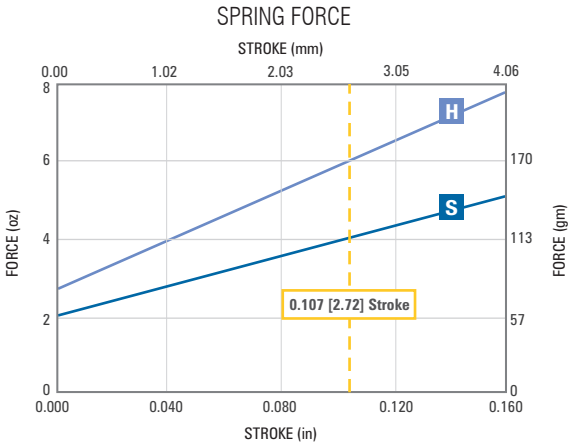
PROBE P/N 050-PLP16[ ][ ][ ]-[ ] example: 050-PLP1603H

	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad			< 20 mOhms	4.9 (7.4)[3]
	Digits	Material/Finish				
Tip Style	See Tips	Standard material is heat treated BeCu/plated gold over nickel (see S option for steel plungers)				
	Letter	Spring Force	Preload	@ 0.107 [2.72] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke
Spring	S	Standard	2.0 [57g/0.56N]	4.0 [113g/1.11N]	MW	1,000,000
	H	High	2.7 [77g/0.75N]	6.1 [173g/1.70N]	MW	1,000,000
	Letter	Description				
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]				
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)				
	(Blank)	No option required				

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -5°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

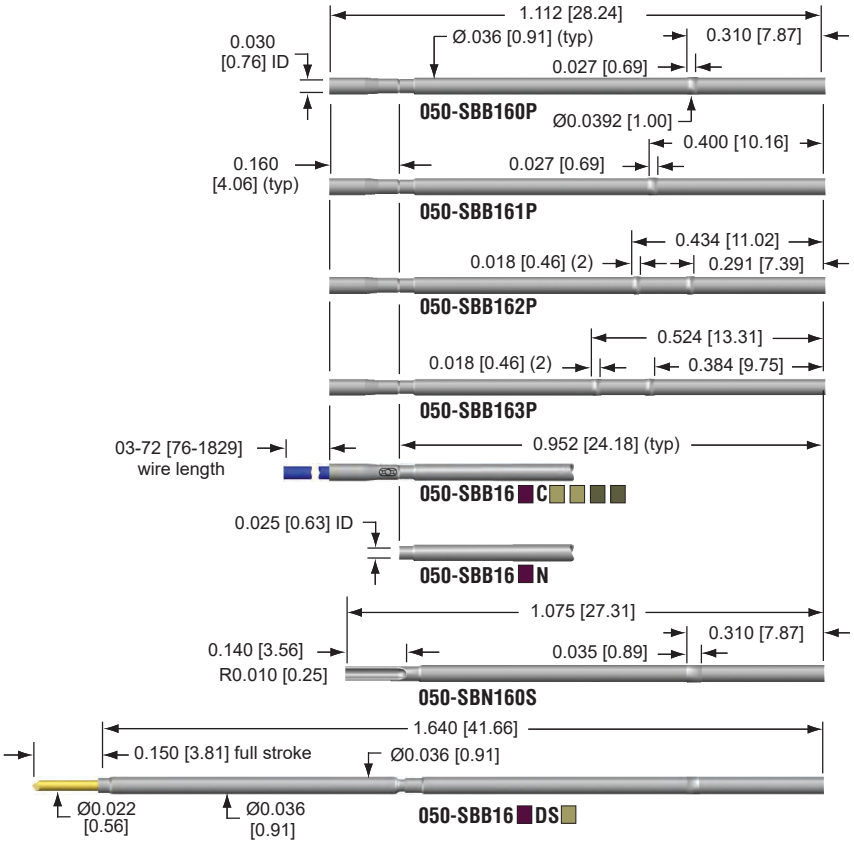


TOOLS & ACCESSORIES

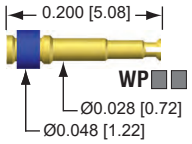
See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0368 / 0.0378 [0.935 / 0.960]; Drill Size .95mm or #62



WIRE PLUG For use with P termination sockets.



P/N: WP■■ example: WP30

	Digits	Description
Plug Size	28	Brass/plated gold over nickel with red insulating sleeve.To accept 28 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]
	30	Brass/plated gold over nickel with blue insulating sleeve. To accept 30 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]

SOCKET P/N

050-SB■16■■■■■ example: 050-SBB160P

	Letter	Material/Finish
Tube	B	Heat treated BeCu/Nickel clad ID/OD
	N	Nickel silver/no finish ②

	Digit	Description
Press Ring	0	Single press ring located at 0.310 [7.87]
	1	Single press ring located at 0.400 [10.16]
	2	Double press ring located at 0.434 [11.02]
	3	Double press ring located at 0.524 [13.31]

	Letter	Description
Termination	C	Crimp (specify wire size, color and length option)
	DS	Double-ended for wireless testing. See page 34 for ordering details.
	N	No termination
	P	Plug; Stainless Steel/ID precious metal clad. Accepts wire plugs
	S	Solder cup ①

	Digits	Wire Size Available for C Termination
Options	3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length
	(Blank)	No option required

Wire Color Available for C Termination									
0	Black	2	Red	4	Yellow	6	Blue	8	Grey
1	Brown	3	Orange	5	Green	7	Violet	9	White

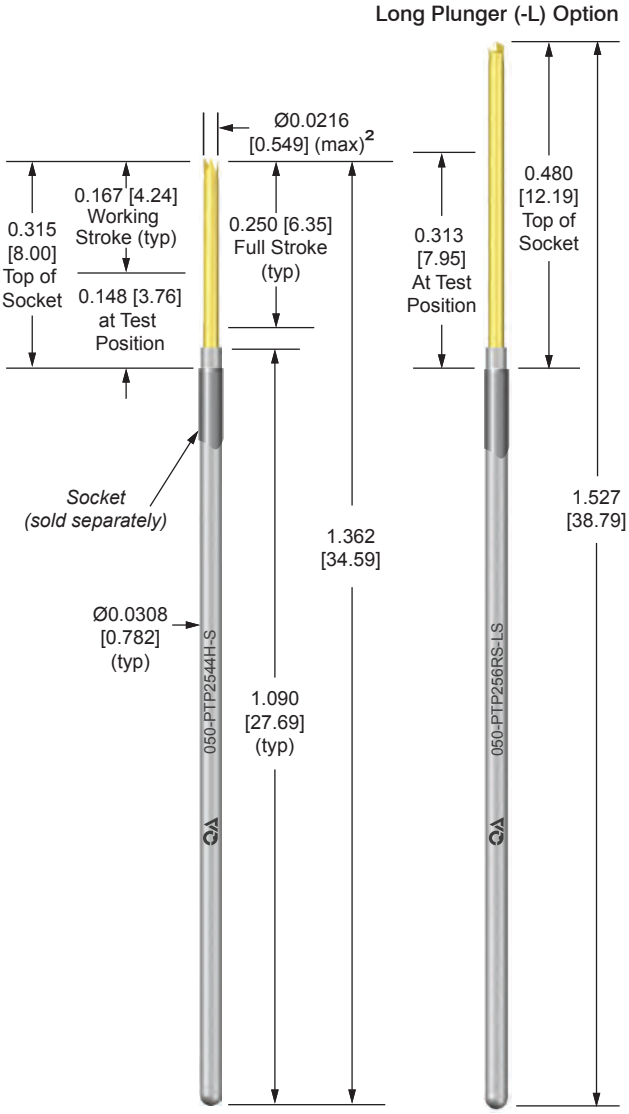
Wire Length Available for C Termination
Specify Length in inches: 03 – 72 [76-1829]

NOTES: ① Available only in N Tube Material ② Available only with S Termination

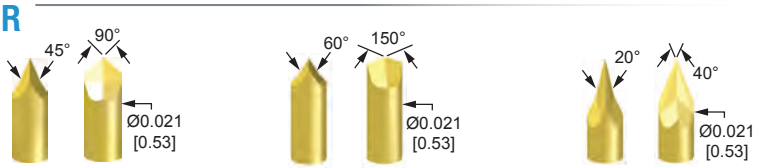
US Patent No. 4,659,987 & 4,597,622

050-T25 Series

0.050 [1.27] Centers | 0.250 [6.35] Full Stroke

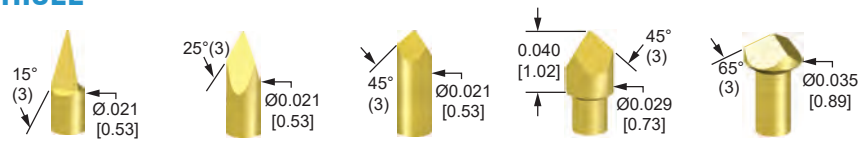


RAZOR



6R $ Razor | **8R** $ Razor | **9R** $ Razor

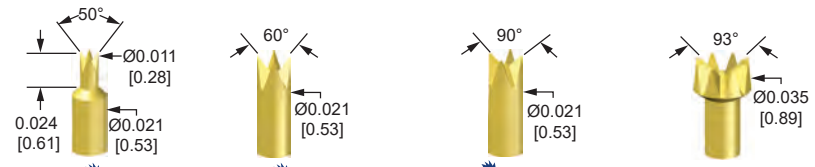
CHISEL



53 or 53 $ Chisel | **63 or 63** $ Chisel | **43 or 43** $ Chisel | **13** $ Chisel | **03 or 03** $ Chisel

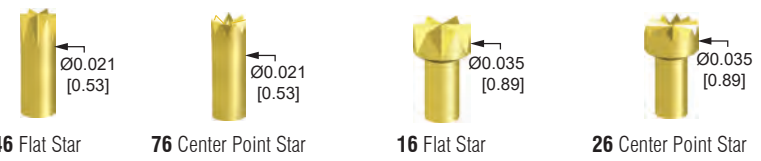
0.232 [5.89] Full Stroke

CROWN



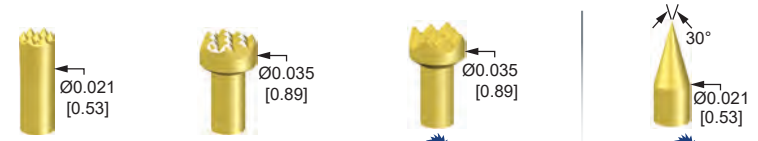
14 or 14 $ Crown | **44 or 44** $ Crown | **G4** Crown | **58** Crown

STAR



46 Flat Star | **76** Center Point Star | **16** Flat Star | **26** Center Point Star

SERRATED



79 Micro Serrated | **59** Micro Serrated | **09 or 09** $ Serrated

SPEAR

41 or 41 $ Spear

PROBE P/N 050-PTP25[ ][ ][ ]-[ ] example: 050-PTP2503L-S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 30 mOhms	4.5 (6.2)[3]

	Digits	Material/Finish
Tip Style	See Tips	Standard material is heat treated BeCu/plated gold over nickel. (see S option for steel plungers)

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	L	Low	1.2 [34g/0.33N]	3.0 [85g/0.83N]	MW	1,000,000
	S	Standard	1.1 [31g/0.31N]	4.3 [122g/1.20N]	MW	1,000,000
	H	High	2.4 [68g/0.67N]	5.6 [159g/1.56N]	MW	1,000,000
	Y	Elevated	3.2 [91g/0.89N]	8.0 [227g/2.22N]	SS	25,000
		High Preload Spring – Only available with headless $ steel tip styles.				
	E	High Preload	4.2 [119g/1.17N]	8.0 [227g/2.22N]	SS	10,000

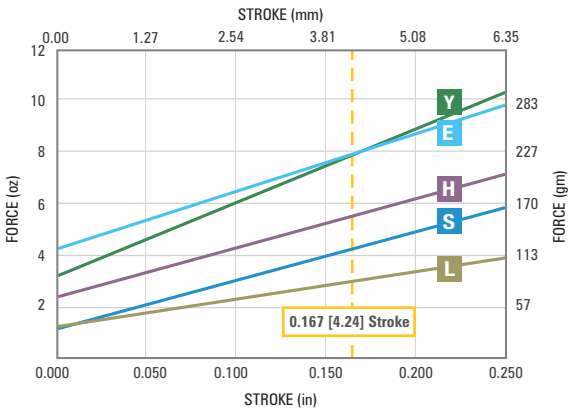
	Letter	Description
Option	L	Long plunger. Must select from 050-T40 tip styles
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

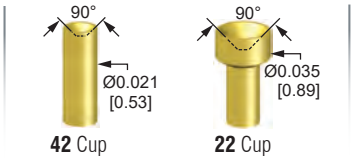
SPRING FORCE



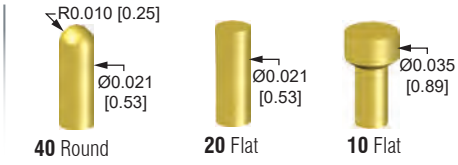
TOOLS & ACCESSORIES

See pages 75-79 for order information.

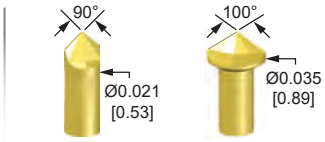
CUP



ROUND & FLAT



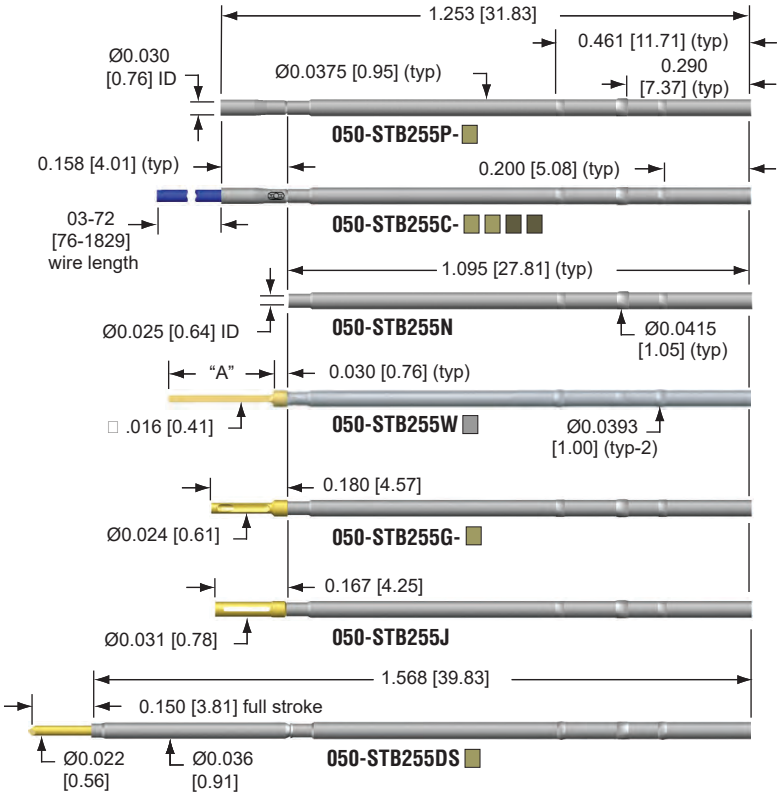
BLADE



TORCH

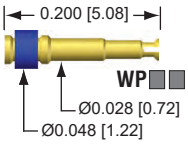
SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0380 / 0.0390 [0.965 / 0.991]; Drill Size 1.0mm



050-T25 Series

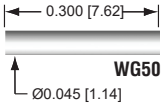
WIRE PLUG For use with P termination sockets.



P/N: WP example: WP30

	Digits	Description
Plug Size	28	Brass/plated gold over nickel with red insulating sleeve.To accept 28 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]
	30	Brass/plated gold over nickel with blue insulating sleeve. To accept 30 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]

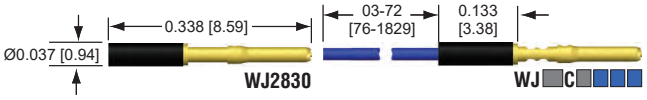
WIRE GRIP SLEEVE For use with G termination sockets.



P/N: WG50

Description
To accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05]. Nylon sleeve, white

WIRE JACK For use with J termination pins.



P/N: WJ- example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.

Wire	Colors Available for 28C & 30C Termination									
	0	Black	2	Red	4	Yellow	6	Blue	8	Gray
	1	Brown	3	Orange	5	Green	7	Violet	9	White

Wire	Wire Length Available for 28C & 30C Termination
	Specify Length in inches: 03 – 72 [76-1829]

Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

SOCKET P/N

050-STB255 example: 050-STB255C3630

Tube	Letter	Material/Finish
	B	Heat treated BeCu/Nickel plated

Termination	Letter	Description	A in (mm)
	C	Crimp (specify wire size, color and length option)	
	DS	Double-ended for wireless testing. See page 42 for ordering details.	
	G	Wire grip; BeCu/gold plated over nickel. Accepts wire grip sleeve.	
	J	Wire jack; BeCu/gold plated over nickel. Accepts wire jacks.	
	N	No termination	
	P	Plug/Solder; Stainless Steel/ID precious metal clad. Accepts wire plugs or soldered wire connection	
	W	Square wire wrap pin; BeCu/gold plated over nickel	0.250 [6.35]
	W1	Square wire wrap pin; BeCu/gold plated over nickel	0.400 [10.16]

Options	Digits	Description
		Available with P Termination Only
	0	050-STB255P with WP30 wire plug
	8	050-STB255P with WP28 wire plug
		Available with G Termination Only
	3	050-STB255G with WG50 wire grip sleeve
	Digits	Wire Size Available for C Termination
	3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length
	(Blank)	No option required

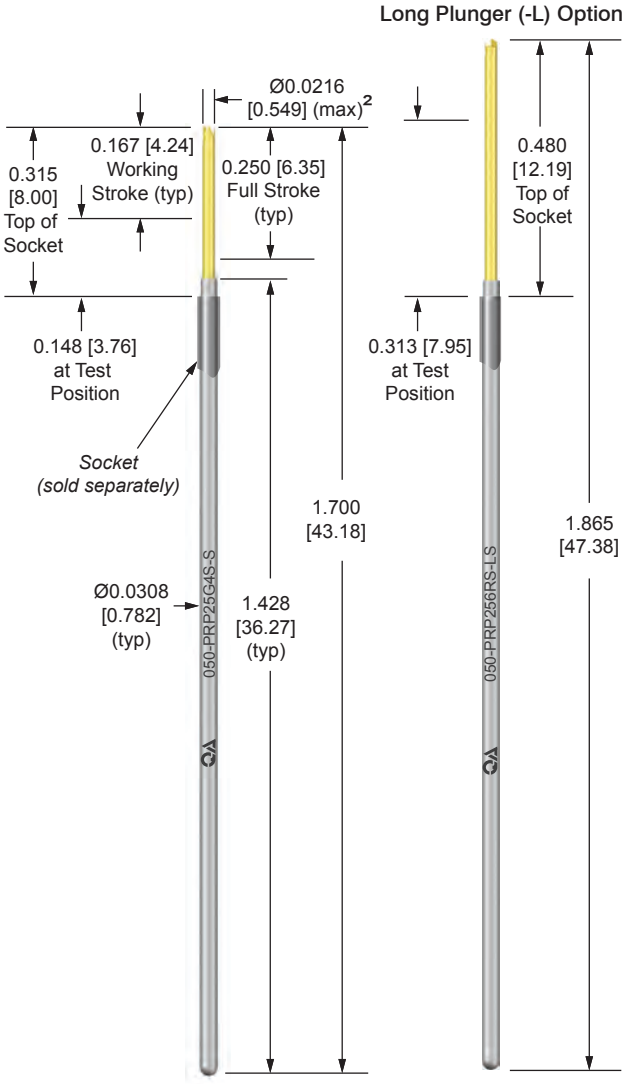
Wire Color Available for C Termination										
0	Black	2	Red	4	Yellow	6	Blue	8	Grey	
1	Brown	3	Orange	5	Green	7	Violet	9	White	

Wire Length Available for C Termination
Specify Length in inches: 03 – 72 [76-1829]

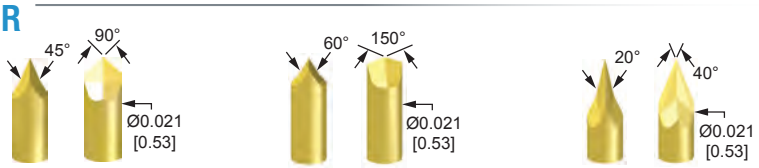
US Patent No. 4,885,533 & 4,597,622

050-R25 Series

0.050 [1.27] Centers | 0.250 [6.35] Full Stroke

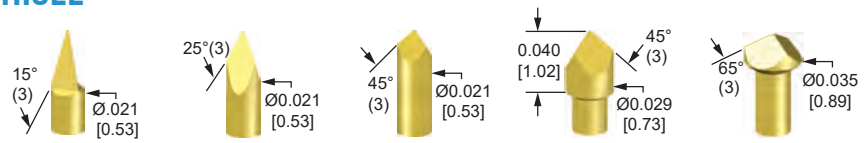


RAZOR



6R Razor | **8R** Razor | **9R** Razor

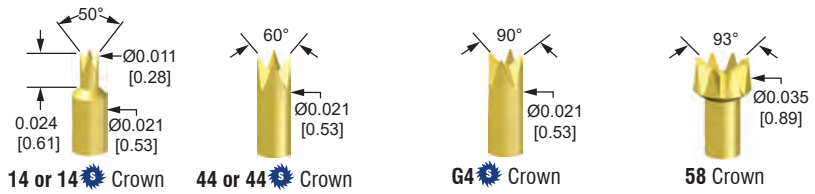
CHISEL



53 or 53 Chisel | **63 or 63** Chisel | **43 or 43** Chisel | **13** Chisel | **03 or 03** Chisel

0.232 [5.89] Full Stroke

CROWN



14 or 14 Crown | **44 or 44** Crown | **G4** Crown | **58** Crown

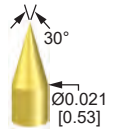
STAR

46 Flat Star | **76** Center Point Star | **16** Flat Star | **26** Center Point Star

SERRATED

79 Micro Serrated | **59** Micro Serrated | **09 or 09** Serrated

SPEAR



41 or 41 Spear

PROBE P/N 050-PRP25□□□-□ example: 050-PRP2503L-S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 35 mOhms	3.9 (5.4)[3]

	Digits	Material/Finish
Tip Style	See Tips	Standard material is heat treated BeCu/plated gold over nickel. (see S option for steel plungers)

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	L	Low	1.5 [43g/0.42N]	3.6 [102g/1.00N]	MW	1,000,000
	S	Standard	1.9 [54g/0.53N]	5.5 [156g/1.53N]	MW	1,000,000
	H	High	2.4 [68g/0.67N]	7.0 [198g/1.95N]	MW	1,000,000
	Y	Elevated	3.0 [85g/0.83N]	8.0 [227g/2.22N]	MW	500,000
	X	Extra	3.0 [85g/0.83N]	10.1 [286g/2.81N]	MW	50,000
		High Preload Spring – *Only available with headless* (S) *steel tip styles.*				
	E	High Preload	5.5 [156g/1.53N]	8.0 [227g/2.22N]	SS	50,000

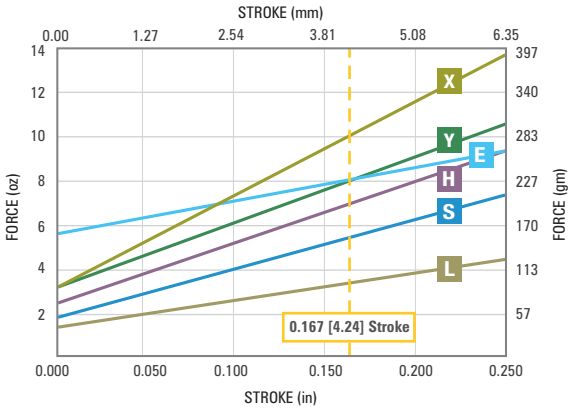
	Letter	Description
Option	L	Long plunger. Must select from 050-R40 tip styles
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	S	(S) Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -55°C to 120°C ith lubrication. SS springs can be used up to 204°C without lubrication.

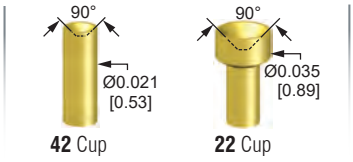
SPRING FORCE



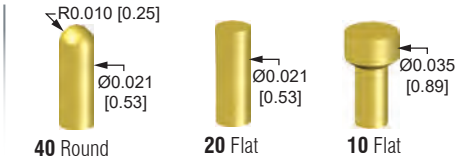
TOOLS & ACCESSORIES

See pages 75-79 for order information.

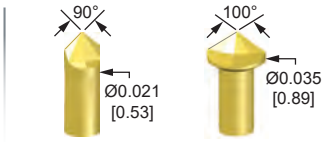
CUP



ROUND & FLAT



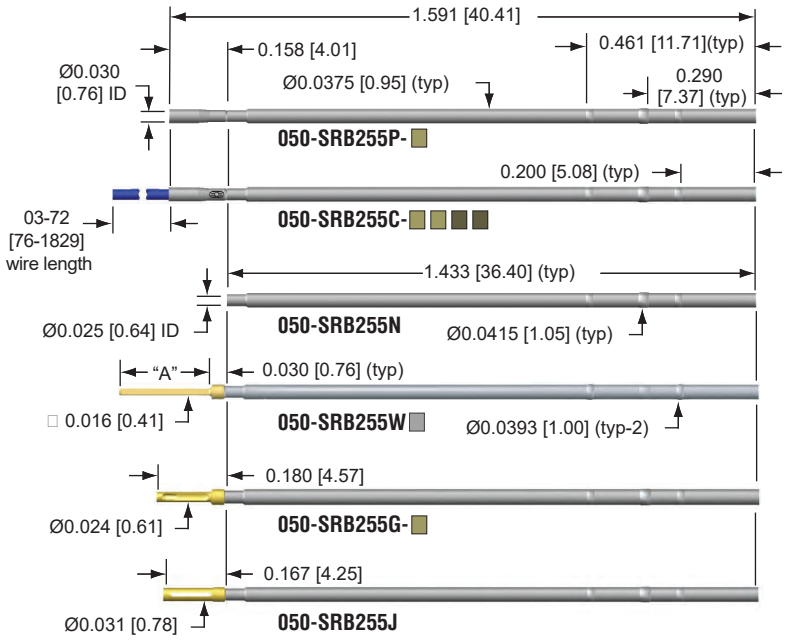
BLADE



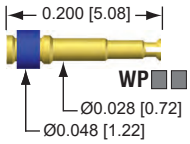
TORCH

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0380 / 0.0390 [0.965 / 0.991]; Drill Size 1.0mm



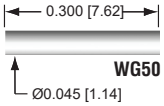
WIRE PLUG For use with P termination sockets.



P/N: WP example: WP30

	Digits	Description
Plug Size	28	Brass/plated gold over nickel with red insulating sleeve.To accept 28 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]
	30	Brass/plated gold over nickel with blue insulating sleeve. To accept 30 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]

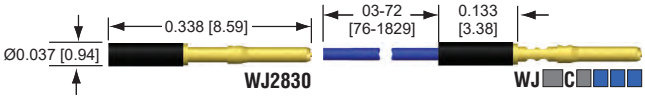
WIRE GRIP SLEEVE For use with G termination sockets.



P/N: WG50

Description
To accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05]. Nylon sleeve, white

WIRE JACK For use with J termination pins.



P/N: WJ- example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.

Wire	Colors Available for 28C & 30C Termination									
	0	Black	2	Red	4	Yellow	6	Blue	8	Gray
	1	Brown	3	Orange	5	Green	7	Violet	9	White

Wire	Wire Length Available for 28C & 30C Termination
	Specify Length in inches: 03 – 72 [76-1829]

Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

SOCKET P/N

050-SRB255 example: 050-SRB255C3630

Tube	Letter	Material/Finish
	B	Heat treated BeCu/Nickel plated

Termination	Letter	Description	A in (mm)
	C	Crimp (specify wire size, color and length option)	
	G	Wire grip; BeCu/gold plated over nickel. Accepts wire grip sleeve	
	J	Wire jack; BeCu/gold plated over nickel. Accepts wire jacks.	
	N	No termination	
	P	Plug/Solder; Stainless Steel/ID precious metal clad. Accepts wire plugs or soldered wire connection	
	W	Square wire wrap pin; BeCu/gold plated over nickel	0.250 [6.35]
	W1	Square wire wrap pin; BeCu/gold plated over nickel	0.400 [10.16]

Options	Digits	Description
		Available with P Termination Only
	0	050-SRB255P with WP30 wire plug
	8	050-SRB255P with WP28 wire plug
		Available with G Termination Only
	3	050-SRB255G with WG50 wire grip sleeve
	Digits	Wire Size Available for C Termination
	3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length
	(Blank)	No option required

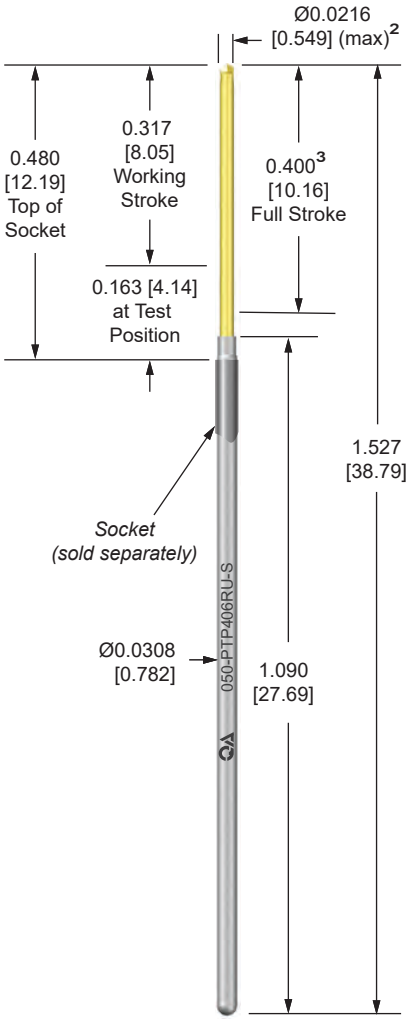
Wire Color Available for C Termination										
0	Black	2	Red	4	Yellow	6	Blue	8	Grey	
1	Brown	3	Orange	5	Green	7	Violet	9	White	

Wire Length Available for C Termination
Specify Length in inches: 03 – 72 [76-1829]

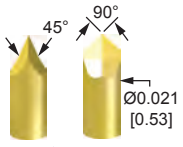
US Patent No. 4,885,533 & 4,597,622

050-T40 Series

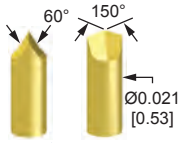
0.050 [1.27] Centers | 0.400 [10.16] Full Stroke



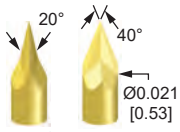
RAZOR



6R Razor

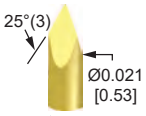


8R Razor

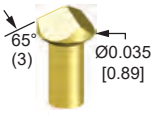


9R Razor

CHISEL

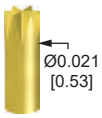


63 Chisel



03 Chisel

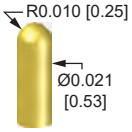
STAR



46 Flat Star

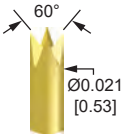
76 Center Point Star

ROUND

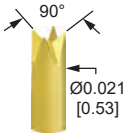


40 Round

CROWN



44 Crown



G4 Crown

PROBE P/N 050-PTP40[ ][ ][ ]-[ ] example: 050-PTP406RS-S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
Tube	P	Nickel silver/ID precious metal clad	< 35 mOhms	4.3 (5.9)[4]

	Digits	Material/Finish
Tip Style	See Tips	Standard material is heat treated BeCu/plated gold over nickel (see S option for steel plungers)

	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
Springs	S	Standard	1.2 [34g/0.33N]	4.8 [136g/1.33N]	SS	100,000
	U[3]	Ultra	1.3 [37g/0.36N]	7.5 [213g/2.09N]	SS	10,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[4]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

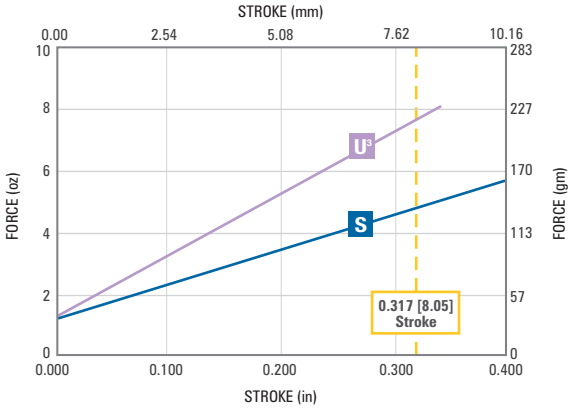
[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] 0.350 [8.89] max stroke for U spring.

[4] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

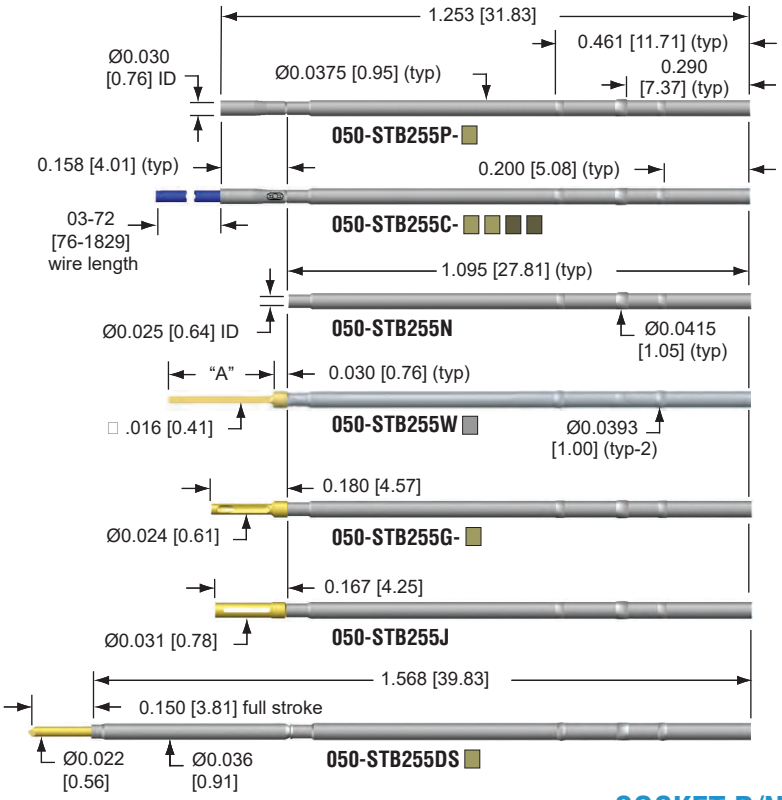


TOOLS & ACCESSORIES

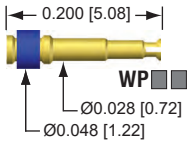
See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0380 / 0.0390 [0.965 / 0.991]; Drill Size 1.0mm



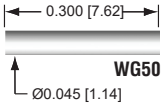
WIRE PLUG For use with P termination sockets.



P/N: WP■■ example: WP30

	Digits	Description
Plug Size	28	Brass/plated gold over nickel with red insulating sleeve.To accept 28 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]
	30	Brass/plated gold over nickel with blue insulating sleeve. To accept 30 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]

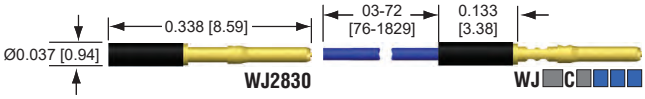
WIRE GRIP SLEEVE For use with G termination sockets.



P/N: WG50

Description
To accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05]. Nylon sleeve, white

WIRE JACK For use with J termination pins.



P/N: WJ■■■■■■■■-■ example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.

Wire	Colors Available for 28C & 30C Termination									
	0	Black	2	Red	4	Yellow	6	Blue	8	Gray
	1	Brown	3	Orange	5	Green	7	Violet	9	White
	Wire Length Available for 28C & 30C Termination									
	■■	Specify Length in inches: 03 – 72 [76-1829]								

Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

SOCKET P/N

050-STB255■■■■■ example: 050-STB255C3630

Tube	Letter	Material/Finish
	B	Heat treated BeCu/Nickel plated

Termination	Letter	Description	A in (mm)
	C	Crimp (specify wire size, color and length option)	
	DS	Double-ended for wireless testing. See page 42 for ordering details.	
	G	Wire grip; BeCu/gold plated over nickel. Accepts wire grip sleeve	
	J	Wire jack; BeCu/gold plated over nickel. Accepts wire jacks.	
	N	No termination	
	P	Plug/Solder; Stainless Steel/ID precious metal clad. Accepts wire plugs or soldered wire connection	
	W	Square wire wrap pin; BeCu/gold plated over nickel	0.250 [6.35]
	W1	Square wire wrap pin; BeCu/gold plated over nickel	0.400 [10.16]

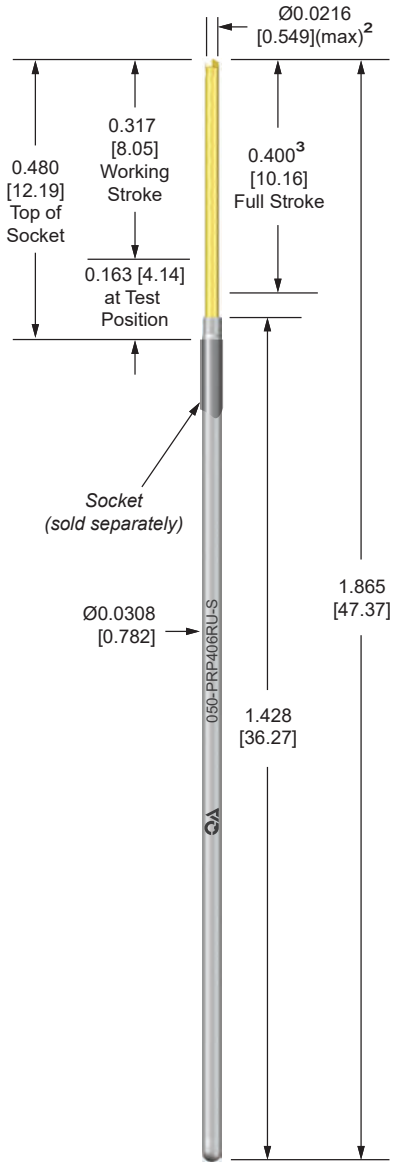
Options	Digits	Description
	Available with P Termination Only	
	0	050-STB255P with WP30 wire plug
	8	050-STB255P with WP28 wire plug
	Available with G Termination Only	
	3	050-STB255G with WG50 wire grip sleeve
	Digits	Wire Size Available for C Termination
	3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length
	(Blank)	No option required

Wire Color Available for C Termination										
0	Black	2	Red	4	Yellow	6	Blue	8	Grey	
1	Brown	3	Orange	5	Green	7	Violet	9	White	
Wire Length Available for C Termination										
■■	Specify Length in inches: 03 – 72 [76-1829]									

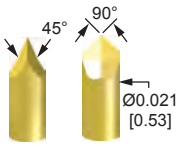
US Patent No. 4,885,533 & 4,597,622

050-R40 Series

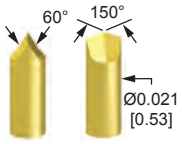
0.050 [1.27] Centers | 0.400 [10.16] Full Stroke



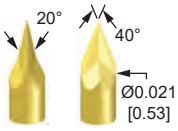
RAZOR



6R Razor

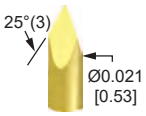


8R Razor

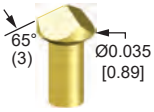


9R Razor

CHISEL

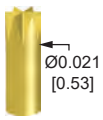


63 Chisel



03 Chisel

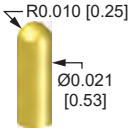
STAR



46 Flat Star

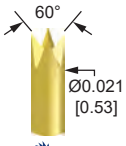
76 Center Point Star

ROUND

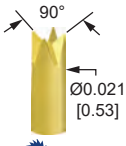


40 Round

CROWN



44 Crown



G4 Crown

PROBE P/N 050-PRP40[ ][ ][ ]-[ ] example: 050-PRP406RS-S

	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
Tube	P	Nickel silver/ID precious metal clad			< 35 mOhms	3.7 (5.0)[4]
Tip Style	Digits	Material/Finish				
	See Tips	Standard material is heat treated BeCu/plated gold over nickel (see S option for steel plungers)				
Springs	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
	S	Standard	1.5 [43g/0.42N]	6.0 [170g/1.67N]	SS	250,000
	H[3]	High	1.7 [48g/0.47N]	7.0 [198g/1.95N]	SS	300,000
	U[3]	Ultra	2.3 [65g/0.64N]	9.0 [255g/2.50N]	SS	100,000
Option	Letter	Description				
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[4]				
	S	S Heat treated steel/plated gold over nickel (see tip style for availability)				
	(Blank)	No option required				

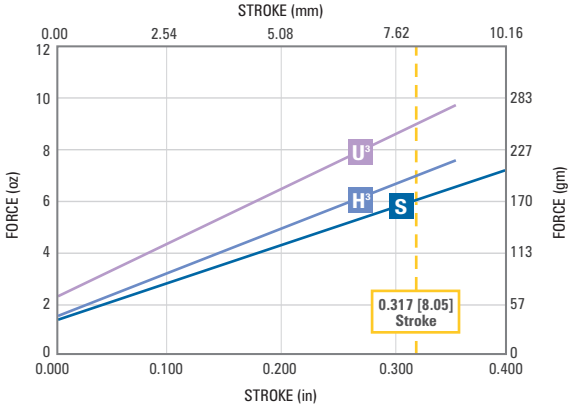
[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] 0.350 [8.89] max stroke for H & U spring.

[4] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

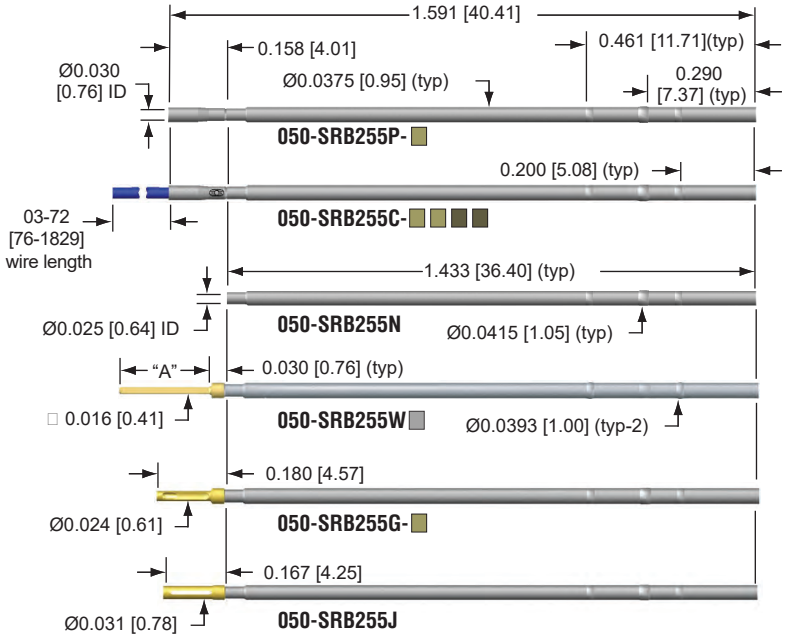


TOOLS & ACCESSORIES

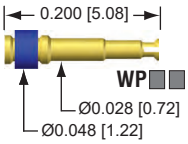
See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0380 / 0.0390 [0.965 / 0.991]; Drill Size 1.0mm



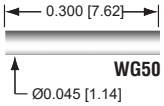
WIRE PLUG For use with P termination sockets.



P/N: WP example: WP30

	Digits	Description
Plug Size	28	Brass/plated gold over nickel with red insulating sleeve.To accept 28 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]
	30	Brass/plated gold over nickel with blue insulating sleeve. To accept 30 AWG Kynar insulated solid wire (not included), stripped at 0.120 [3.05]

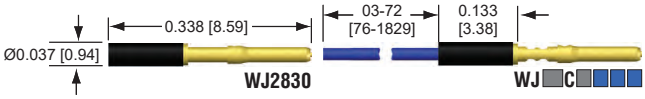
WIRE GRIP SLEEVE For use with G termination sockets.



P/N: WG50

Description
To accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05]. Nylon sleeve, white

WIRE JACK For use with J termination pins.



P/N: WJ- example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.

Wire	Colors Available for 28C & 30C Termination									
	0	Black	2	Red	4	Yellow	6	Blue	8	Gray
	1	Brown	3	Orange	5	Green	7	Violet	9	White

Wire	Wire Length Available for 28C & 30C Termination
	Specify Length in inches: 03 – 72 [76-1829]

Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

SOCKET P/N

050-SRB255 example: 050-SRB255C3630

Tube	Letter	Material/Finish
	B	Heat treated BeCu/Nickel plated

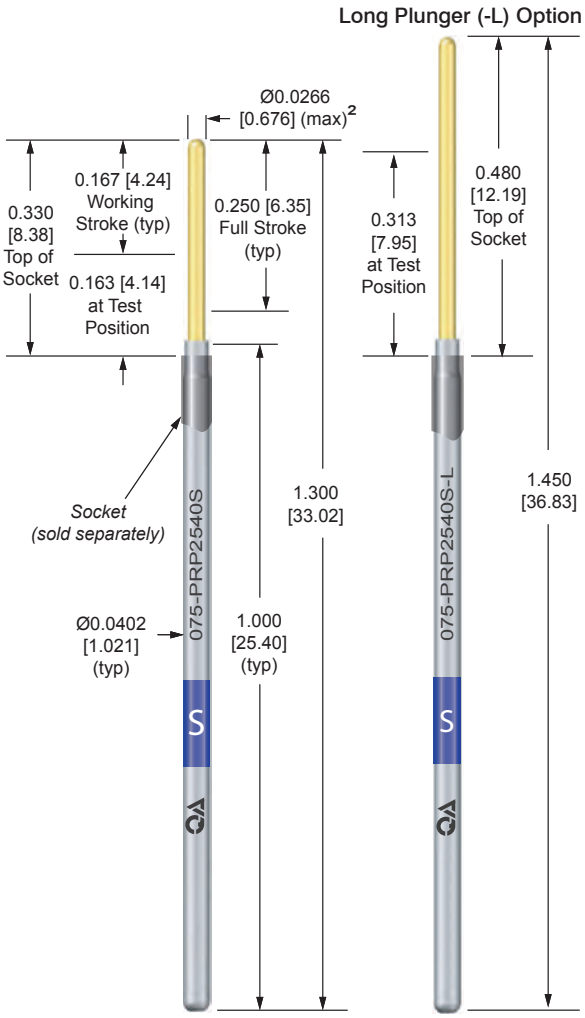
Termination	Letter	Description	A in (mm)
	C	Crimp (specify wire size, color and length option)	
	G	Wire grip; BeCu/gold plated over nickel. Accepts wire grip sleeve	
	J	Wire jack; BeCu/gold plated over nickel. Accepts wire jacks.	
	N	No termination	
	P	Plug/Solder; Stainless Steel/ID precious metal clad. Accepts wire plugs or soldered wire connection	
	W	Square wire wrap pin; BeCu/gold plated over nickel	0.250 [6.35]
	W1	Square wire wrap pin; BeCu/gold plated over nickel	0.400 [10.16]

Options	Digits	Description
		Available with P Termination Only
	0	050-SRB255P with WP30 wire plug
	8	050-SRB255P with WP28 wire plug
		Available with G Termination Only
	3	050-SRB255G with WG50 wire grip sleeve
	Digits	Wire Size Available for C Termination
	3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length
	(Blank)	No option required

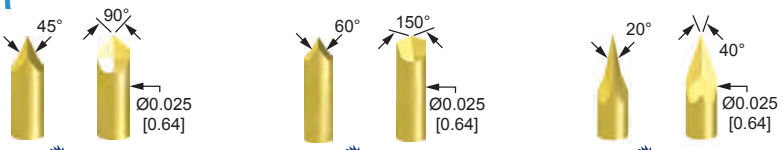
Wire Color Available for C Termination										
0	Black	2	Red	4	Yellow	6	Blue	8	Grey	
1	Brown	3	Orange	5	Green	7	Violet	9	White	

Wire Length Available for C Termination
Specify Length in inches: 03 – 72 [76-1829]

US Patent No. 4,885,533 & 4,597,622

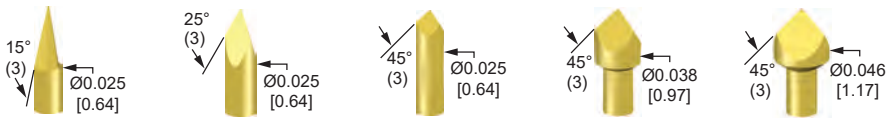


RAZOR



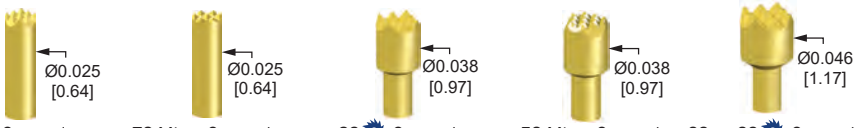
6R$ Razor | **8R**$ Razor | **9R**$ Razor

CHISEL



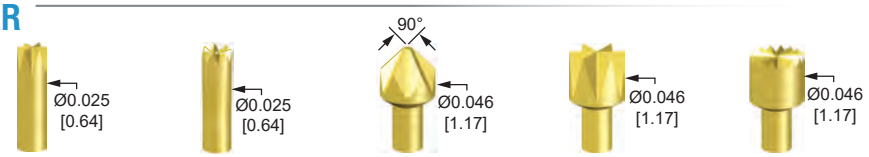
53 or 53$ Chisel | **63 or 63**$ Chisel | **43 or 43**$ Chisel | **13**$ Chisel | **03 or 03**$ Chisel

SERRATED



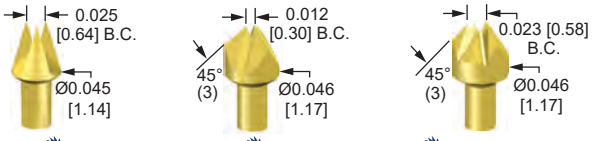
49 Serrated | **79** Micro Serrated | **39**$ Serrated | **59** Micro Serrated | **09 or 09**$ Serrated

STAR



46 Flat Star | **76** Center Point Star | **06** Star | **16** Flat Star | **26** Center Point Star

TRIAD



08 or 08$ Triad | **18 or 18**$ Chisel Triad | **38**$ Chisel Triad

BLADE

61$ Blade | **71**$ Blade | **51**$ Blade

PROBE P/N 075-PR■25■■■-■ example: 075-PRP2503H-S

Tube

Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
P	Nickel silver/ID precious metal clad	< 20 mOhms	7.7 (10.4)[3]
G	Nickel silver/OD gold plated	< 20 mOhms	7.7 (11.1)[3]
N	Nickel silver/no finish	< 155 mOhms	6.1 (8.5)[3]

Tip Style

Digits	Material/Finish
See Tips	Standard material is heat treated BeCu/plated gold over nickel. (see S option for steel plungers)

Spring

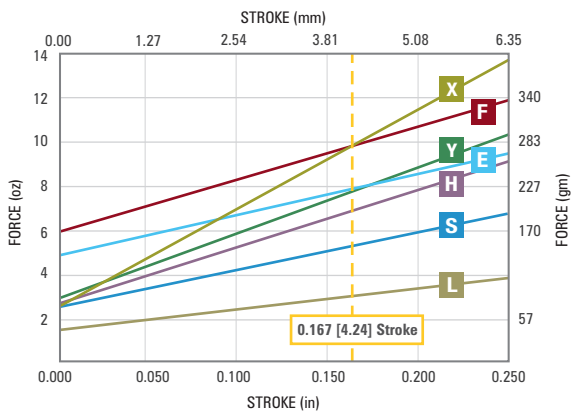
Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
L	Low	1.5 [43g/0.42N]	3.1 [88g/0.86N]	MW	1,000,000
S	Standard	2.7 [77g/0.75N]	5.5 [156g/1.53N]	MW	1,000,000
H	High	2.7 [77g/0.75N]	7.0 [198g/1.95N]	SS	1,000,000
Y	Elevated	3.1 [88g/0.86N]	8.0 [227g/2.22N]	MW	250,000
X	Extra	2.7 [77g/0.75N]	10.1 [286g/2.81N]	MW	100,000
	High Preload Spring – Only available with headless $ steel tip styles and P tube material.				
E	High Preload	5.0 [142g/1.39N]	8.0 [227g/2.22N]	SS	300,000
F	High Preload	6.0 [170g/1.67N]	10.0 [283g/2.78N]	SS	300,000

Option

Letter	Description
B	Curved tube (pylon replacement)
L	Long plunger. Must select from 075-40 tip styles
N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

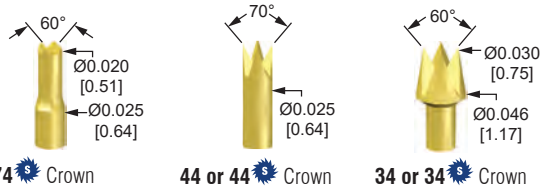


CROSS REFERENCE

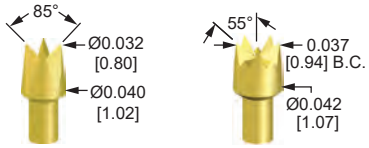
075-25 Series

CROWN

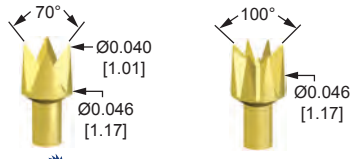
54 Crown — **84** ③ Crown — **G4** ③ Crown



74 ③ Crown — **44 or 44** ③ Crown — **34 or 34** ③ Crown

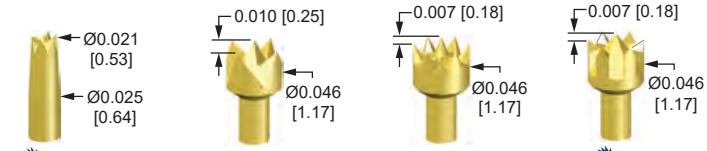


N4 ③ Crown — **55 or 55** ③ Crown



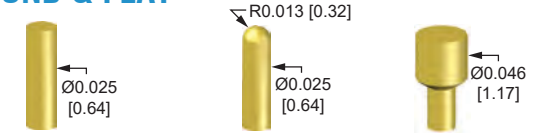
24 or 24 ③ Crown — **58** Crown

TORCH



47 ③ Torch — **05** Torch — **07** Torch — **17** ③ Torch

ROUND & FLAT

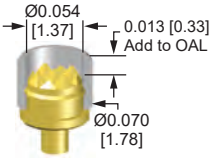


20 Flat — **40** Round — **10** Flat

SPEAR

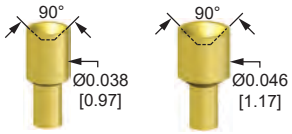
31 ③ Spear — **41 or 41** ③ Spear — **01** Spear

INSULATOR



99 Insulator

CUP



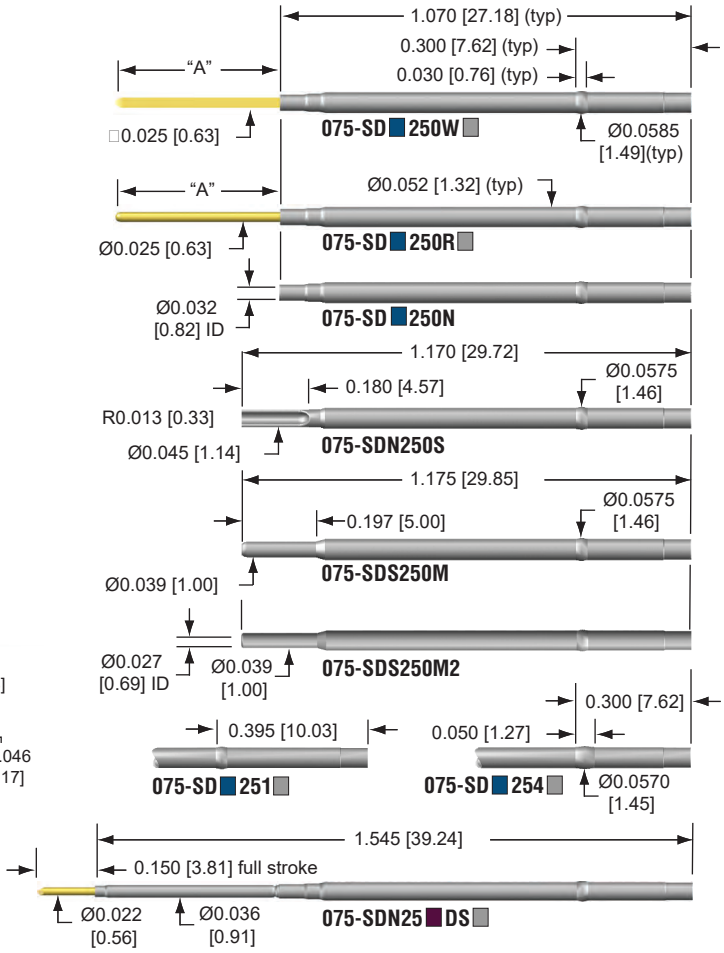
32 Cup — **22** Cup

TOOLS & ACCESSORIES

See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0530 / 0.0550 [1.346 / 1.397]; Drill Size #54 or 1.4mm



SOCKET P/N 075-SD■25■■ example: 075-SDG250W

	Letter	Material/Finish
Tube	G	Nickel silver/OD gold plated ④
	N	Nickel silver/no finish
	S	Stainless steel/no finish ①⑥

Press Ring	Digit	Description
	0	Single press ring located at 0.300 [7.62]
	1	Single press ring located at 0.395 [10.03] ④
	4	Single extra long press ring located at 0.300 [7.62] ④

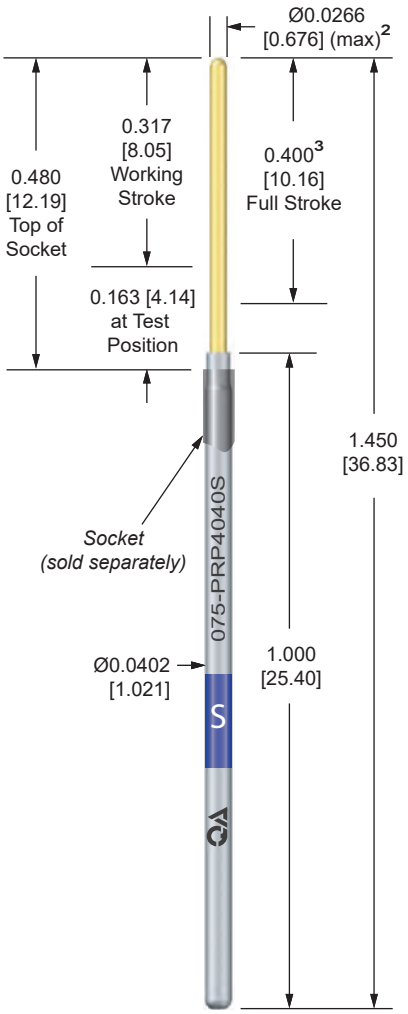
Termination	Letter	Description	A in (mm)
	DS	Double-ended for wireless testing. See page 43 for ordering details.	
	M	Male round tube ①⑤	
	M2	Male round tube ①⑤	
	N	No termination	
	S	Solder cup ①②③	
	R*	Round pin ③	0.410 [10.41]
	R1*	Round pin ③	0.547 [13.89]
	R3*	Round pin ③	0.216 [5.49]
	R5*	Round pin ③	0.947 [24.05]
	W*	Square wire wrap pin ③	0.429 [10.90]
	W1*	Square wire wrap pin ③	0.694 [17.63]
	W2*	Square wire wrap pin ③	1.044 [26.52]
	W5*	Square wire wrap pin ③	0.500 [12.70]

NOTES:
① Not available in 1 or 4 press ring
② Not available in G tube material
③ Not available in S tube material
④ Not available in M or S termination
⑤ Available only in S tube material and 0 press ring
⑥ Available only in M termination
* Pin material: Phosphor bronze/ gold plated over nickel

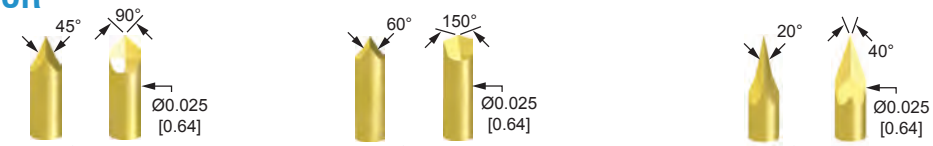
US Patent No. 4,885,533

075-40 Series

0.075 [1.91] Centers | 0.400 [10.16] Full Stroke

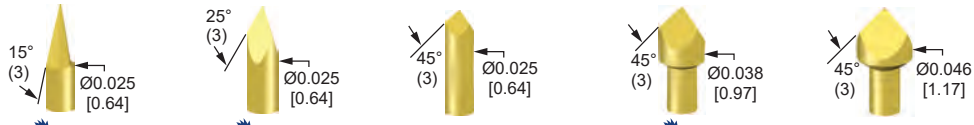


RAZOR



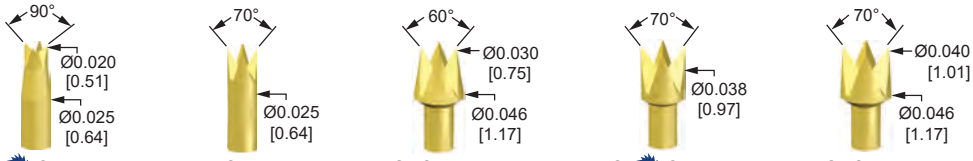
6R $ Razor | **8R** $ Razor | **9R** $ Razor

CHISEL



53 $ Chisel | **63** $ Chisel | **43** Chisel | **13** $ Chisel | **03** Chisel

CROWN



G4 $ Crown | **44** Crown | **34** Crown | **94** $ Crown | **24** Crown

STAR

46 Flat Star | **76** Center Point Star | **06** Star

SPEAR

41 Spear

PROBE P/N 075-PR■40■■■-■ example: 075-PRP4003S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
Tube	P	Nickel silver/ID precious metal clad	< 20 mOhms	7.3 (10.0)[4]
	G	Nickel silver/OD gold plated	< 25 mOhms	7.2 (9.0)[4]
	N	Nickel silver/no finish	< 210 mOhms	6.1 (9.1)[4]

	Digits	Material/Finish
Tip Style	See Tips	Standard material is heat treated BeCu/plated gold over nickel. (see S option for steel plungers)

	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
Spring	S	Standard	1.2 [34g/0.33N]	4.3 [122g/1.20N]	SS	500,000
	H[3]	High	1.7 [48g/0.47N]	7.0 [198g/1.95N]	SS	300,000
	U[3]	Ultra	1.3 [37g/0.36N]	9.3 [264g/2.59N]	MW	10,000

	Letter	Description
Option	B	Curved tube (pylon replacement)
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[4]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

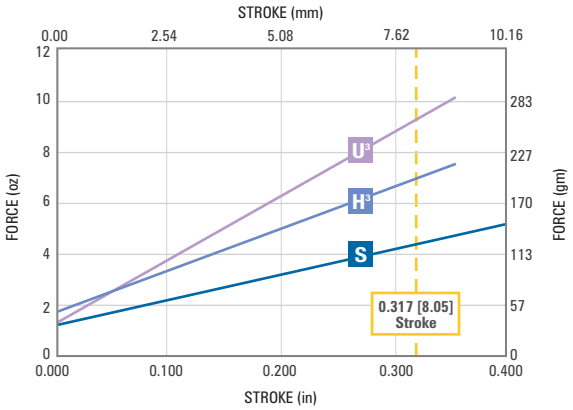
[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] 0.350 [8.89] max stroke for H & U spring.

[4] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE



TOOLS & ACCESSORIES

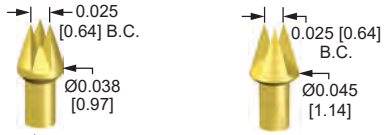
See pages 75-79 for order information.

SERRATED

79 Micro Serrated

09 Serrated

TRIAD



28 Triad

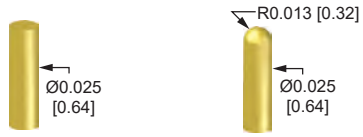
08 Triad

BLADE

61 Blade

71 Blade

FLAT & ROUND

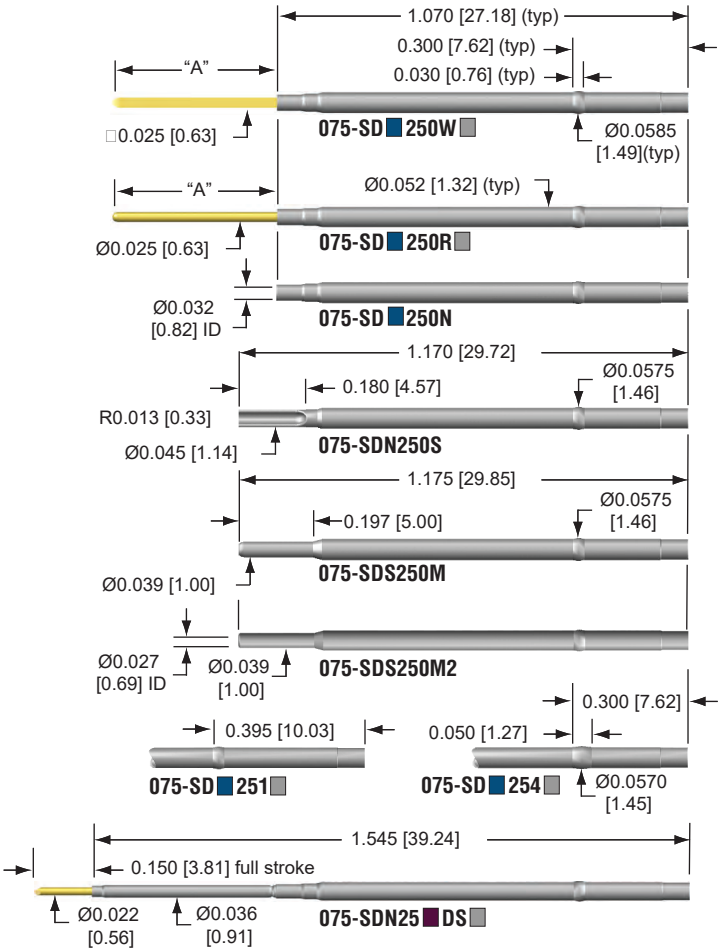


20 Flat

40 Round

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0530 / 0.0550 [1.346 / 1.397]; Drill Size #54 or 1.4mm



SOCKET P/N 075-SD■25■■ example: 075-SDG250W

	Letter	Material/Finish
Tube	G	Nickel silver/OD gold plated ④
	N	Nickel silver/no finish
	S	Stainless steel/no finish ①⑥

	Digit	Description
Press Ring	0	Single press ring located at 0.300 [7.62]
	1	Single press ring located at 0.395 [10.03] ④
	4	Single extra long press ring located at 0.300 [7.62] ④

	Letter	Description	A in (mm)
Termination	DS	Double-ended for wireless testing. See page 43 for ordering details.	
	M	Male round tube ①⑤	
	M2	Male round tube ①⑤	
	N	No termination	
	S	Solder cup ①②③	
	R*	Round pin ③	0.410 [10.41]
	R1*	Round pin ③	0.547 [13.89]
	R3*	Round pin ③	0.216 [5.49]
	R5*	Round pin ③	0.947 [24.05]
	W*	Square wire wrap pin ③	0.429 [10.90]
	W1*	Square wire wrap pin ③	0.694 [17.63]
	W2*	Square wire wrap pin ③	1.044 [26.52]
	W5*	Square wire wrap pin ③	0.500 [12.70]

NOTES:

① Not available in 1 or 4 press ring

② Not available in G tube material

③ Not available in S tube material

④ Not available in M or S termination

⑤ Available only in S tube material and 0 press ring

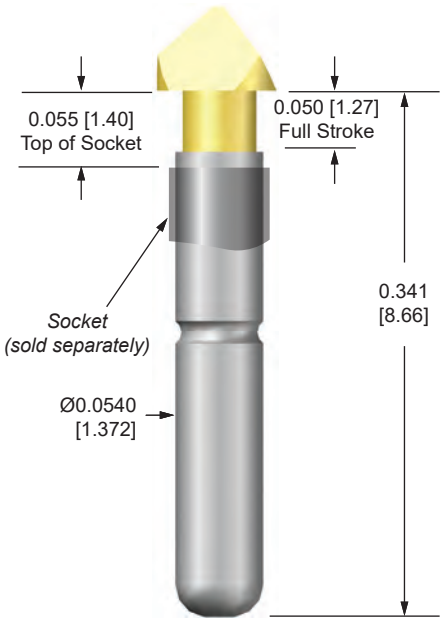
⑥ Available only in M termination

* Pin material: Phosphor bronze/ gold plated over nickel

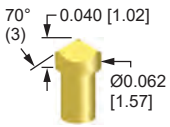
US Patent No. 4,885,533

100-05 Series

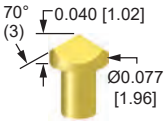
0.100 [2.54] Centers | 0.050 [1.27] Full Stroke



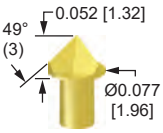
CHISEL



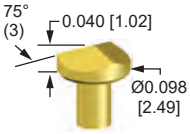
13 Chisel



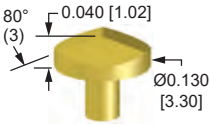
03 Chisel



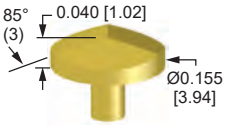
63 Chisel



23 Chisel
0.120 [3.05] Min. Center

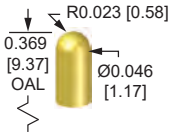


33 Chisel
0.150 [3.81] Min. Center

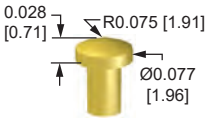


53 Chisel
0.175 [4.45] Min. Center

ROUND

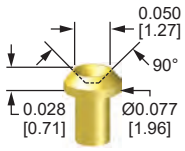


40 Round



30 Round

CUP



02 Cup

PROBE P/N 100-PL■05■■■ example: 100-PLP0503L

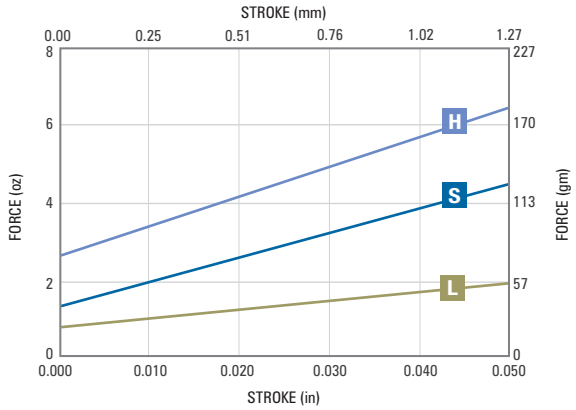
	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P[2]	Nickel silver/ID precious metal clad	< 45 mOhms	13.2 (18.1)[3]
	N	Nickel silver/no finish	< 65 mOhms	12.0 (18.5)[3]

	Digits	Material/Finish
Tip Style	See Tips	Heat treated BeCu/plated gold over nickel.

	Letter	Spring Force	Preload	@ 0.050 [1.27] Stroke	Material	Cycle Life @ 0.050 [1.27] Stroke
Spring	L	Low	0.7 [20g/0.19N]	2.0 [57g/0.56N]	SS	1,000,000
	S	Standard	1.3 [37g/0.36N]	4.5 [128g/1.25N]	MW	1,000,000
	H	High	2.7 [77g/0.75N]	6.5 [184g/1.81N]	SS	1,000,000

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] P tube has Ø0.016 [0.41] hole in end for identification only.
[3] Working Temperature Range: up to 120°C. SS springs can be used up to 204°C.

SPRING FORCE

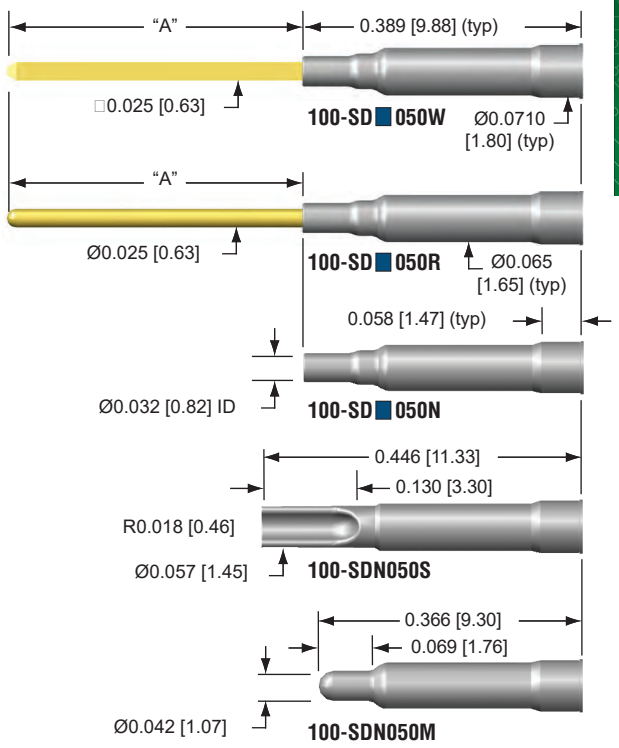


TOOLS & ACCESSORIES

See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0670 / 0.0690 [1.702 / 1.753]; Drill Size 1.75mm



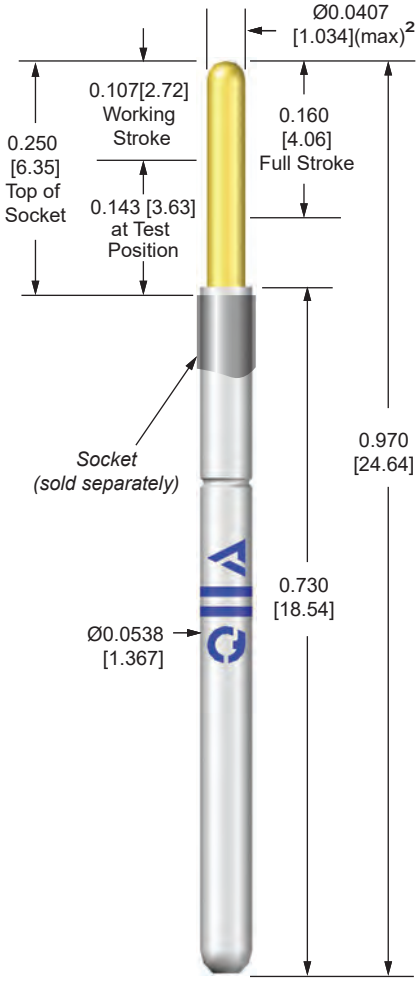
TIP STYLE	HEAD LENGTH	DISTANCE FROM TOP OF SOCKET TO TIP	OVERALL PROBE LENGTH
02	0.028 [0.71]	0.083 [2.11]	0.369 [9.37]
03	0.040 [1.02]	0.095 [2.41]	0.381 [9.68]
13	0.040 [1.02]	0.095 [2.41]	0.381 [9.68]
23	0.040 [1.02]	0.095 [2.41]	0.381 [9.68]
30	0.028 [0.71]	0.083 [2.11]	0.369 [9.37]
33	0.040 [1.02]	0.095 [2.41]	0.381 [9.68]
40	–	0.083 [2.11]	0.369 [9.37]
53	0.040 [1.02]	0.095 [2.41]	0.381 [9.68]
63	0.052 [1.32]	0.107 [2.72]	0.393 [9.98]

SOCKET P/N

100-SD■050■ example: 100-SDN050S

	Letter	Material/Finish	
Tube	G	Nickel silver/OD gold plated	
	N	Nickel silver/no finish	
	Letter	**Description**	**A in (mm)**
Termination	M	Male round tube ①	
	N	No termination	
	S	Solder cup ①	
	R*	Round pin	0.410 [10.41]
	R1*	Round pin	0.547 [13.89]
	R3*	Round pin	0.216 [5.49]
	R5*	Round pin	0.947 [24.05]
	W*	Square wire wrap pin	0.429 [10.90]
	W1*	Square wire wrap pin ①	0.694 [17.63]
	W2*	Square wire wrap pin ①	1.044 [26.52]
	W3*	Square wire wrap	0.164 [4.16]
	W5*	Square wire wrap pin ①	0.500 [12.70]

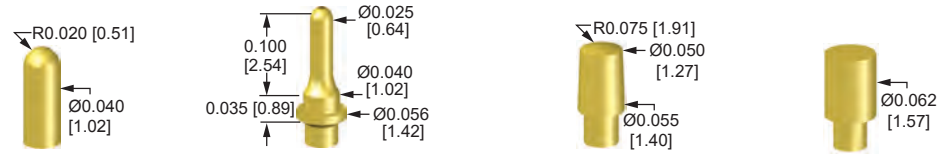
NOTES: ①Not available in G Tube Material
* Pin material: Phosphor bronze/gold plated over nickel



SPEAR

41 Spear | **11** Spear | **01** Spear

ROUND & FLAT

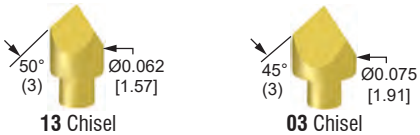


40 Round | **70** Connector 0.095 [2.41] Full Stroke | **30** Round | **10** Flat

SERRATED

64 Serrated | **09** Serrated

CHISEL



13 Chisel | **03** Chisel

CUP

42 Cup | **02** Cup

PROBE P/N 100-PL16---- example: 100-PLP1603L-B

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 20 mOhms	14.0 (21.0)[3]
	G	Nickel silver/OD gold plated	< 25 mOhms	12.0 (16.5)[3]
	N	Nickel silver/no finish	< 45 mOhms	10.0 (15.5)[3]

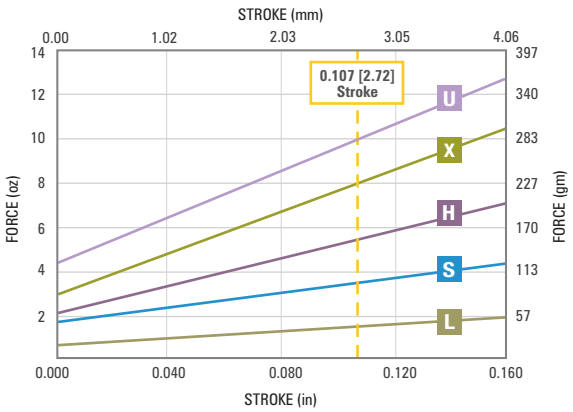
	Digits	Material/Finish
Tip Style	See Tips	Heat treated BeCu/gold plated over nickel.

	Letter	Spring Force	Preload	@ 0.107 [2.72] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke
Spring	L	Low	0.7 [20g/0.19N]	1.5 [43g/0.42N]	SS	1,000,000
	S	Standard	1.7 [48g/0.47N]	3.5 [99g/0.97N]	SS	1,000,000
	H	High	2.2 [62g/0.61N]	5.5 [156g/1.53N]	MW	1,000,000
	X	Extra	3.0 [85g/0.83N]	8.0 [227g/2.22N]	MW	1,000,000
	U	Ultra	4.5 [128g/1.25N]	10.0 [283g/2.78N]	MW	250,000

	Letter	Description
Option	B	Curved tube (pylon replacement)
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

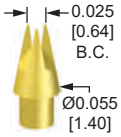
SPRING FORCE



TOOLS & ACCESSORIES

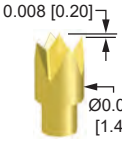
See pages 75-79 for order information.

TRIAD



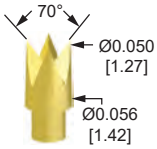
08 Triad

TORCH



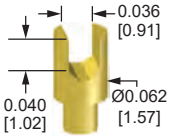
05 Torch

CROWN



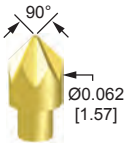
24 Crown

SLOTTED



62 Slotted

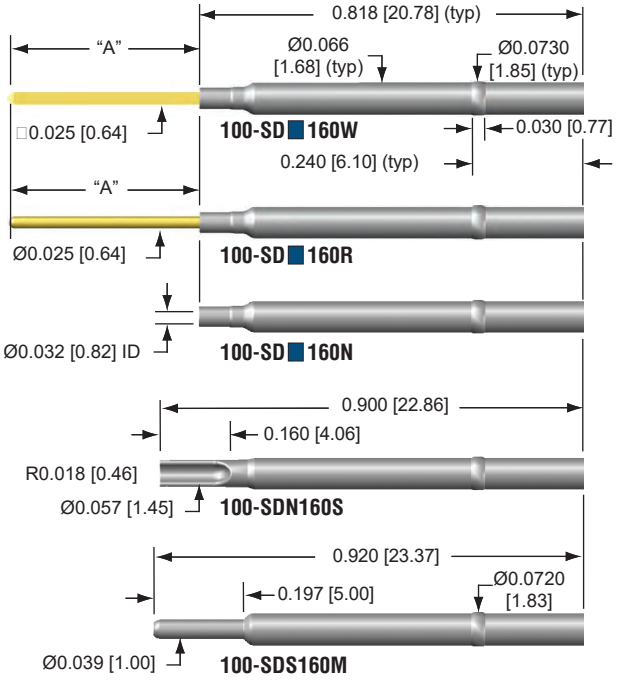
STAR



06 Star

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0670 / 0.0690 [1.702 / 1.753]; Drill Size 1.75mm



SOCKET P/N 100-SD■160■ example: 100-SDG160R

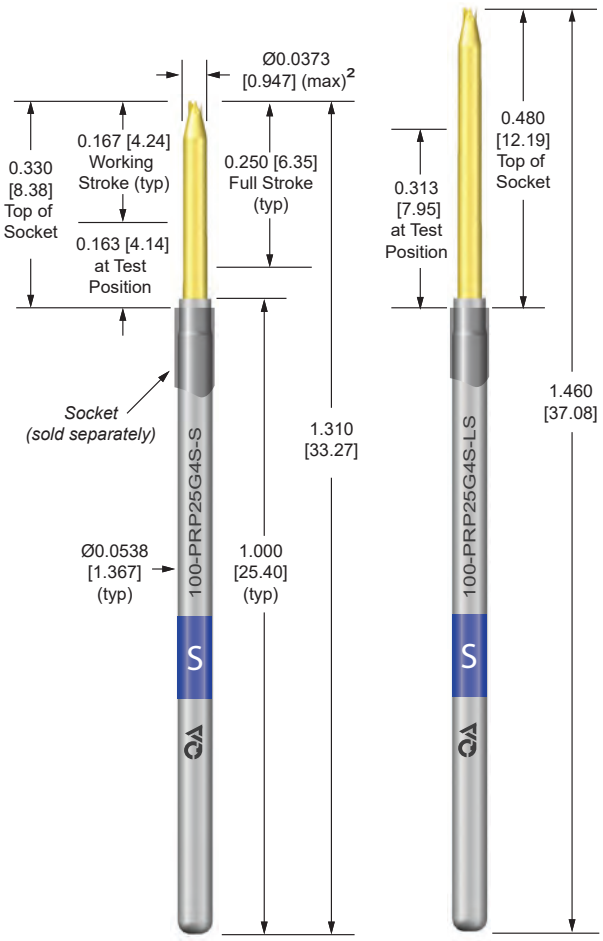
	Letter	Material/Finish	
Tube	G	Nickel silver/OD gold plated ⑤	
	N	Nickel silver/no finish	
	S	Stainless steel/no finish ③	
	Letter	**Description**	**A in (mm)**
Termination	M	Male round tube ④	
	N	No termination ②	
	S	Solder cup ①②	
	R*	Round pin ②	0.410 [10.41]
	R1*	Round pin ②	0.547 [13.89]
	R3*	Round pin ②	0.216 [5.49]
	R5*	Round pin ②	0.947 [24.05]
	W*	Square wire wrap pin ②	0.429 [10.90]
	W1*	Square wire wrap pin ①②	0.694 [17.63]
	W2*	Square wire wrap pin ①②	1.044 [26.52]
	W5*	Square wire wrap pin ①②	0.500 [12.70]

NOTES:
① Not available in G tube material
② Not available in S tube material
③ Available only in M termination
④ Available only in S tube material
⑤ Not available in M or S termination
* Pin material: Phosphor bronze/ gold plated over nickel

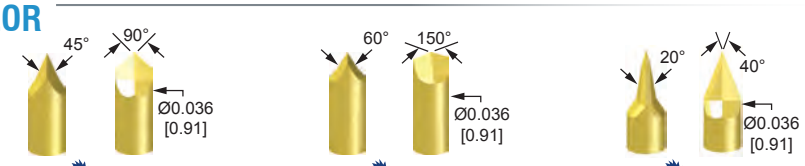
100-25 Series

0.100 [2.54] Centers | 0.250 [6.35] Full Stroke

Long Plunger (-L) Option

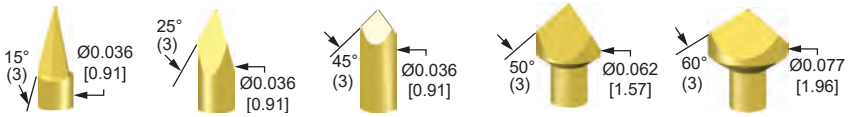


RAZOR



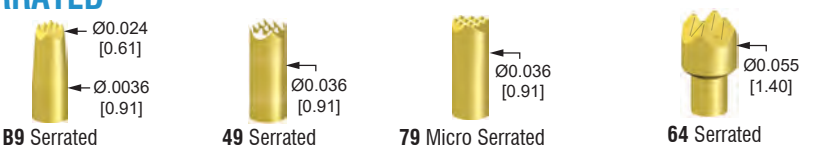
6R Razor | **8R** Razor | **9R** Razor

CHISEL



53 or 53 Chisel | **63 or 63** Chisel | **43 or 43** Chisel | **03 or 03** Chisel | **23** Chisel

SERRATED



B9 Serrated | **49** Serrated | **79** Micro Serrated | **64** Serrated

09 or 09 Serrated | **59** Micro Serrated | **29** Serrated | **19** Serrated

0.140 [3.56] Min. Centers

STAR

36 Flat Star | **46** Flat Star | **76** Center Point Star | **N6 or N6** Star

06 Star | **16** Flat Star | **26** Center Point Star

PROBE P/N 100-PR__25___-__ example: 100-PRH2509S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 15 mOhms	11.8 (16.2)[3]
	V	Nickel silver or phos bronze/OD silver plated	< 20 mOhms	12.7 (17.4)[3]
	G	Nickel silver or phos bronze/OD gold plated	< 20 mOhms	12.3 (17.3)[3]
	N	Nickel silver/no finish	< 165 mOhms	10.2 (15.3)[3]
	H	High conductivity proprietary alloy/gold plated	< 10 mOhms	19.8 (28.3)[3]

	Digits	Material/Finish
Tip Style	See Tips	Standard material is heat treated BeCu/gold plated over nickel. (see S option for steel plungers)

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	L	Low	1.3 [37g/0.36N]	3.5 [99g/0.97N]	SS	1,000,000
	S	Standard	1.6 [45g/0.44N]	5.5 [156g/1.53N]	MW	1,000,000
	H	High	2.8 [79g/0.78N]	6.5 [184g/1.81N]	SS	1,000,000
	Y	Elevated	2.3 [65g/0.64N]	8.1 [230g/2.25N]	MW	1,000,000
	X	Extra	3.6 [102g/1.00N]	10.8 [306g/3.00N]	MW	1,000,000
	U	Ultra	3.3 [94g/0.92N]	17.1 [485g/4.75N]	MW	100,000
	High Preload Spring – *Only available with headless $ steel tip styles and P tube material.*					
	E	High Preload	6.0 [170g/1.67N]	8.0 [227g/2.22N]	SS	1,000,000
	F	High Preload	7.6 [215g/2.12N]	11.0 [312g/3.06N]	SS	300,000

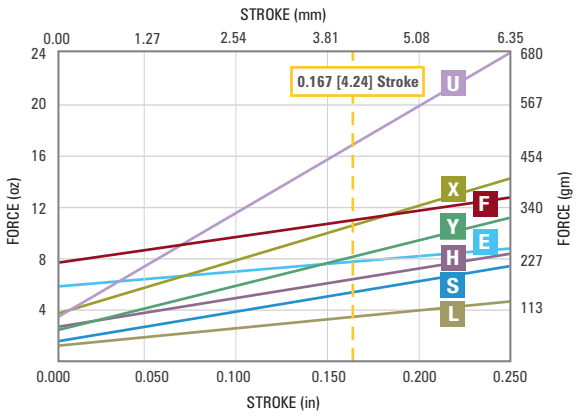
	Letter	Description
Option	B	Curved tube (pylon replacement)
	L	Long plunger. Must select from 100-40 tip styles
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

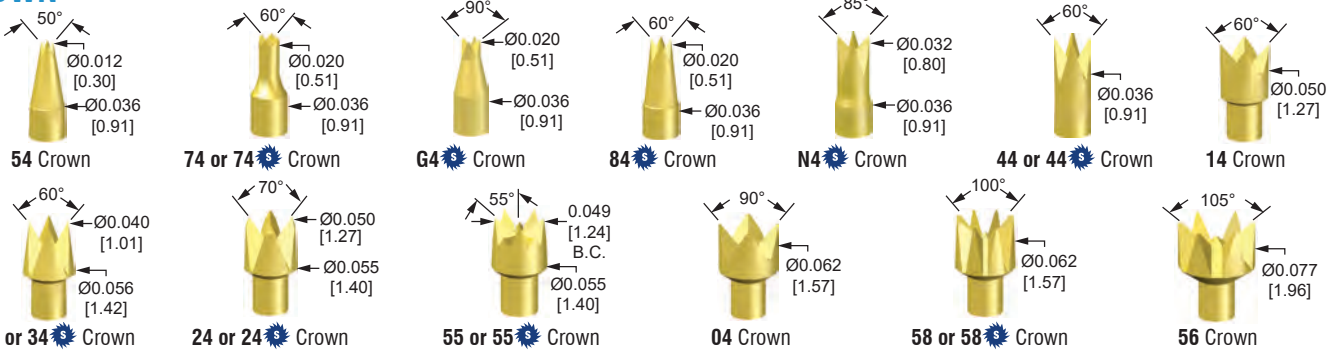
SPRING FORCE



TOOLS & ACCESSORIES

See pages 75-79 for order information.

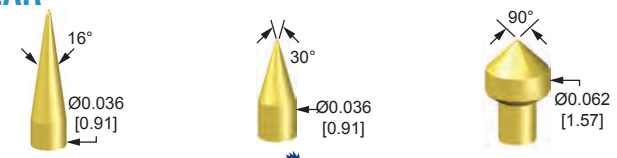
CROWN



54 Crown | **74 or 74$** Crown | **G4$** Crown | **84$** Crown | **N4$** Crown | **44 or 44$** Crown | **14** Crown

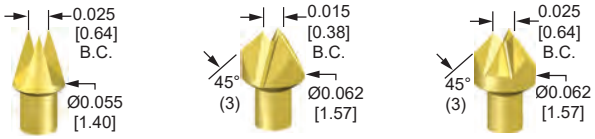
34 or 34$** Crown | **24 or 24$ Crown | **55 or 55$** Crown | **04** Crown | **58 or 58$** Crown | **56** Crown

SPEAR



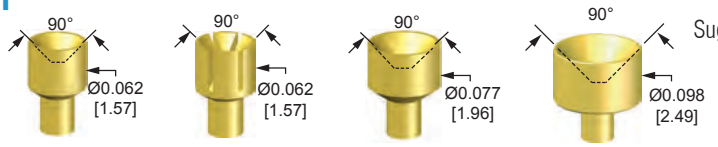
31$** Spear | **41 or 41$ Spear | **01** Spear

TRIAD



08 or 08$** Triad | **18 or 18$ Chisel Triad | **38** Chisel Triad

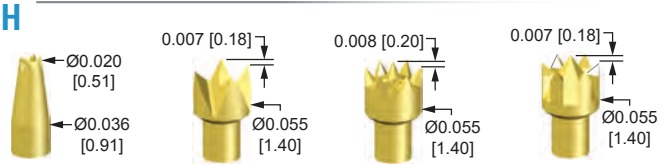
CUP



22 Cup | **52** Slotted Cup | **32** Cup | **82** Cup

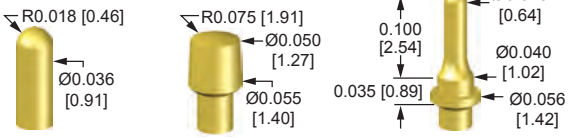
0.120 [2.05] Min. Centers

TORCH



47$ Torch | **05** Torch | **07** Torch | **17 or 17$** Torch

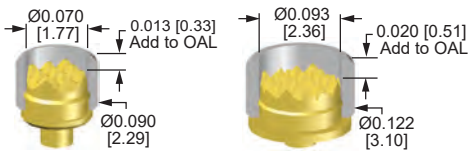
ROUND



40 Round | **30** Round | **70** Connector

0.170 [4.32] Full Stroke

INSULATOR



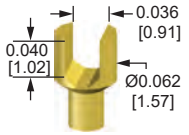
99 Insulator | **89** Insulator

0.130 [3.30] Min. Centers

FLAT

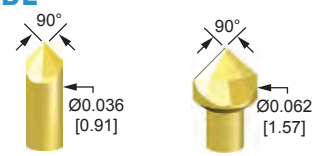
20 Flat | **10** Flat

SLOTTED



62 Slotted

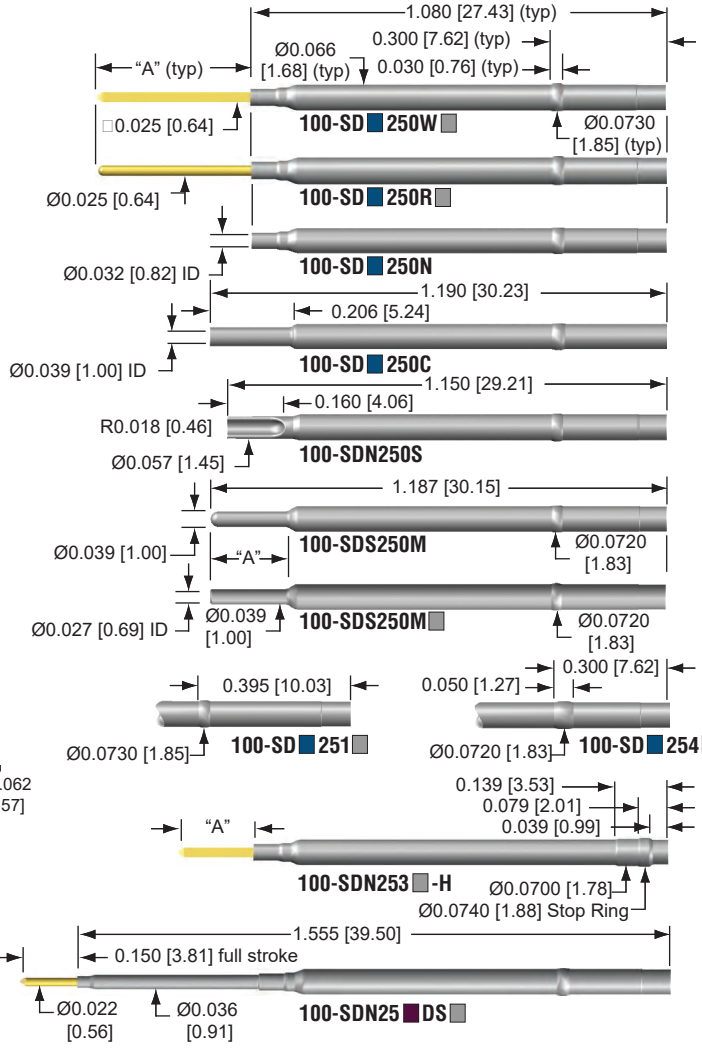
BLADE

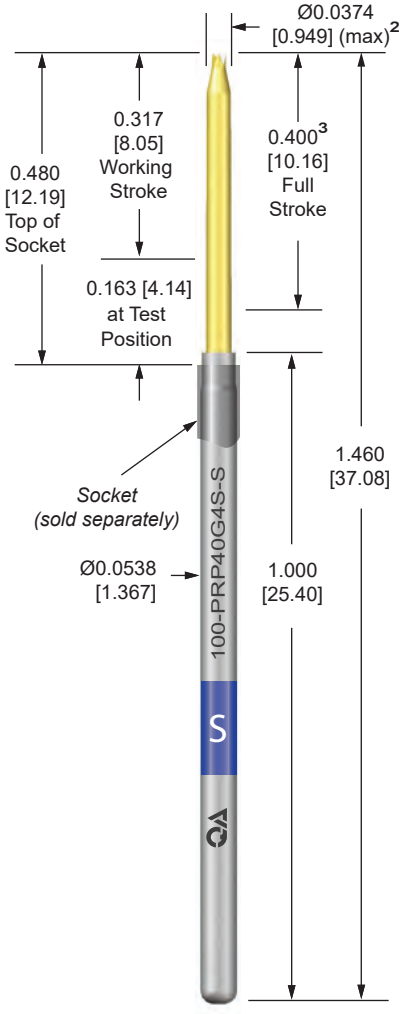


61$** Blade | **51 or 51$ Blade

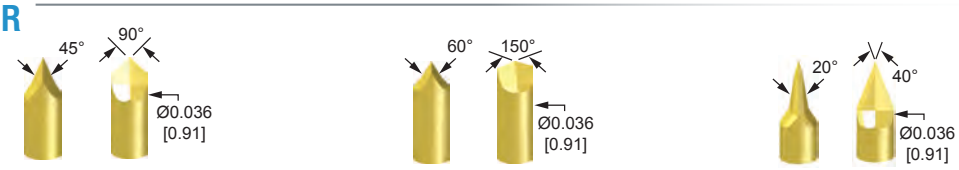
SOCKETS See page 33 for order information.

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0670 / 0.0690 [1.702 / 1.753]; Drill Size 1.75mm



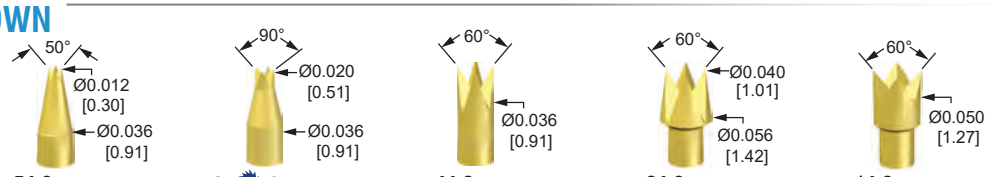


RAZOR

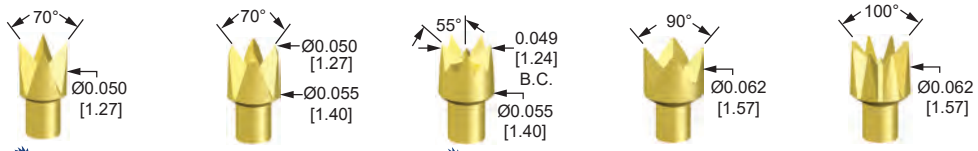


6R $ Razor | **8R** $ Razor | **9R** $ Razor

CROWN



54 Crown | **G4** $ Crown | **44** Crown | **34** Crown | **14** Crown



94 $ Crown | **24** Crown | **55** $ Crown | **04** Crown | **58** Crown

SERRATED

49 Serrated | **79** Micro Serrated | **09** Serrated | **19** Serrated

0.150 [3.81] Min. Centers

STAR

46 Flat Star | **76** Center Point Star | **06** Star

PROBE P/N 100-PR■40■■■-■ example: 100-PRP4003L

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
Tube	P	Nickel silver/ID precious metal clad	< 20 mOhms	10.2 (14.3)[4]
	V	Nickel silver or phos bronze/OD silver plated	< 20 mOhms	12.7 (17.5)[4]
	G	Nickel silver or phos bronze/OD gold plated	< 20 mOhms	12.2 (17.5)[4]
	N	Nickel silver/no finish	< 375 mOhms	8.8 (13.2)[4]
	H	High conductivity proprietary alloy/gold plated	< 15 mOhms	15.9 (22.0)[4]

	Digits	Material/Finish
Tip Style	See Tips	Heat treated BeCu/gold plated over nickel. (see S option for steel plungers)

	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
Spring	L	Low	0.8 [23g/0.22N]	3.0 [85g/0.83N]	MW	1,000,000
	S	Standard	1.5 [43g/0.42N]	5.7 [162g/1.58N]	SS	500,000
	H[3]	High	2.0 [57g/0.56N]	7.0 [198g/1.95N]	SS	300,000
	U[3]	Ultra	2.5 [71g/0.70N]	8.1 [230g/2.25N]	MW	10,000

	Letter	Description
Option	B	Curved tube (pylon replacement)
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[4]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

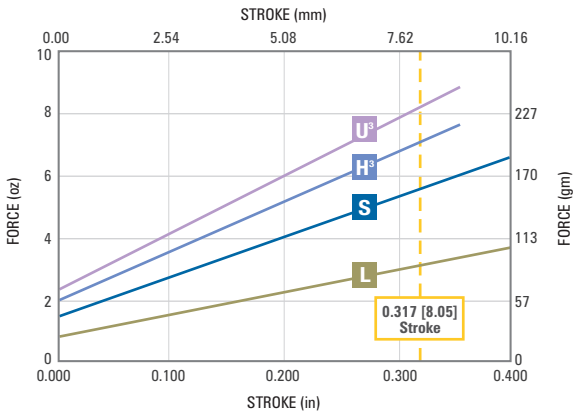
[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] 0.350 [8.89] max stroke for H & U spring.

[4] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

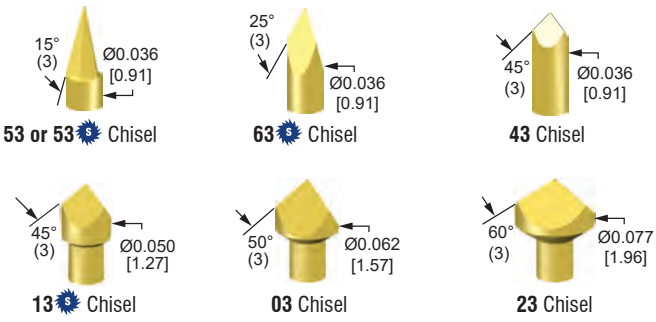
SPRING FORCE



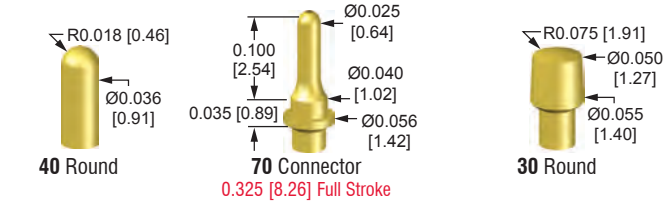
TOOLS & ACCESSORIES

See pages 75-79 for order information.

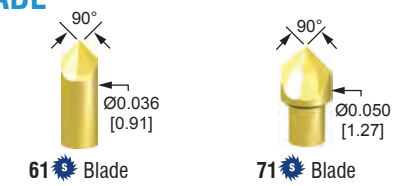
CHISEL



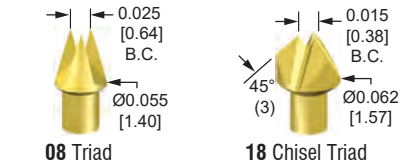
ROUND



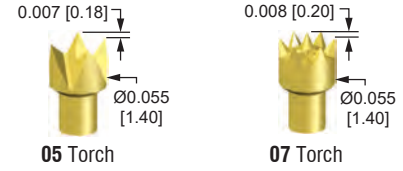
BLADE



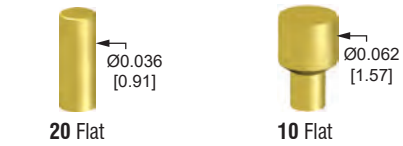
TRIAD



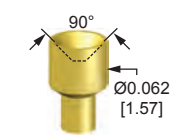
TORCH



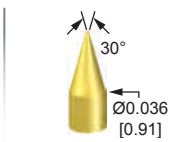
FLAT



CUP

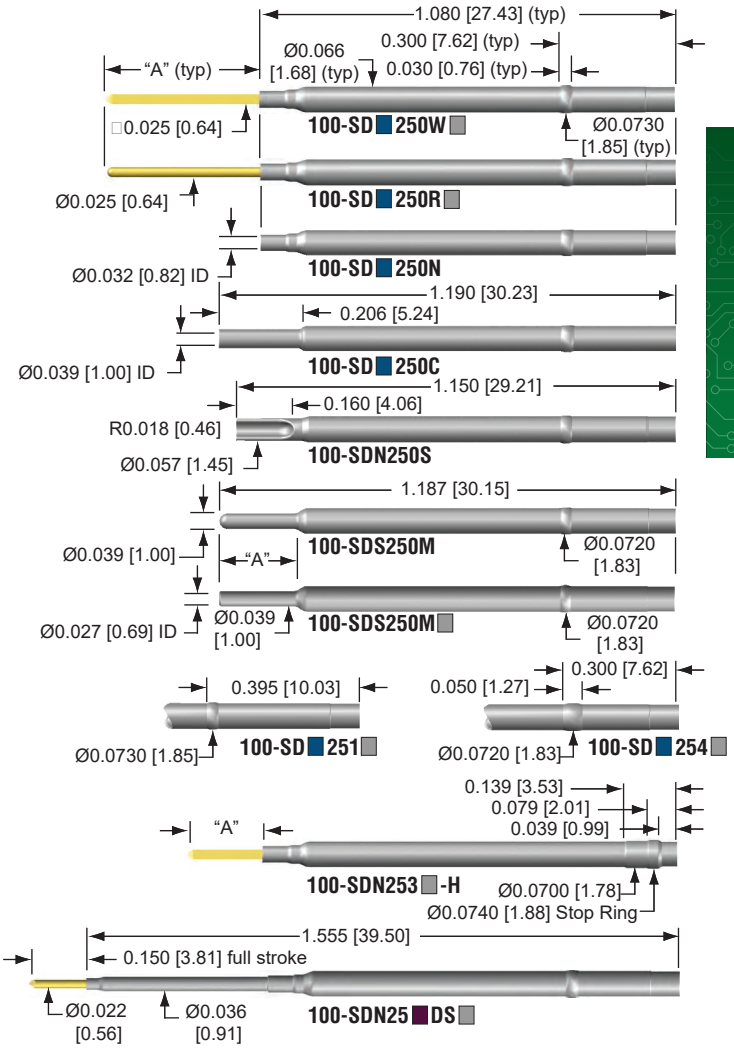


SPEAR



SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0670 / 0.0690 [1.702 / 1.753]; Drill Size 1.75mm



SOCKET P/N 100-SD 25 - example: 100-SDN250W

	Letter	Material/Finish
Tube	G	Nickel silver/OD gold plated ⑦⑨
	H	High conductivity copper alloy/gold plated ④⑤⑦
	N	Nickel silver/no finish
	S	Stainless steel/no finish ①④⑦

	Digit	Description
Press Ring	0	Single press ring located at 0.300 [7.62]
	1	Single press ring located at 0.395 [10.03] ⑤⑦⑧⑩
	3	Single press ring located at 0.139 [3.53] ⑤⑪
	4	Single extra long press ring located at 0.300 [7.62] ⑤⑦⑧⑩

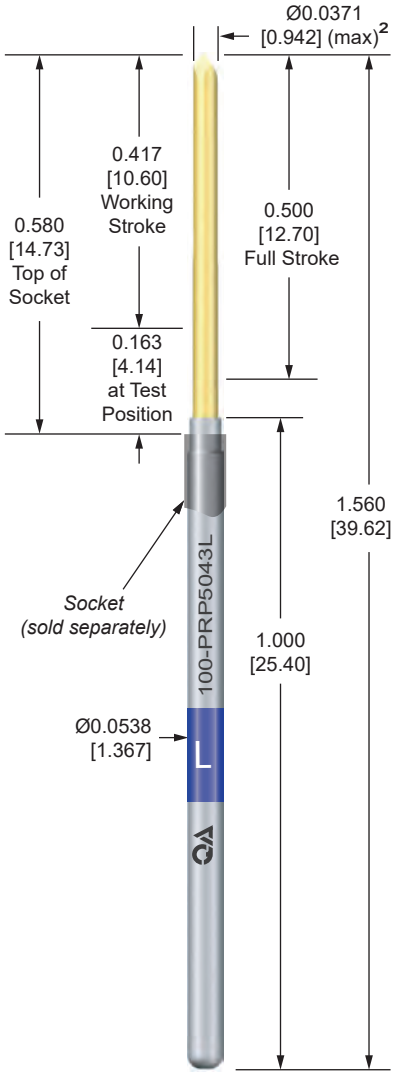
	Letter	Description	A in (mm)
Termination	C	Crimp ②④⑦⑧	
	DS	Double-ended for wireless testing. See page 43 for ordering details.	
	M	Male round tube ③④⑦	0.197 [5.00]
	M1	Male round tube ③④⑦	0.315 [8.00]
	M2	Male round tube ③④⑦	0.197 [5.00]
	N	No termination ②⑩	
	S	Solder cup ④⑥⑦⑧⑩⑪	
	R*	Round pin	0.410 [10.41]
	R1*	Round pin	0.547 [13.89]
	R3*	Round pin	0.216 [5.49]
	R5*	Round pin	0.947 [24.05]
	W*	Square wire wrap pin	0.429 [10.90]
	W1*	Square wire wrap pin	0.694 [17.63]
	W2*	Square wire wrap pin	1.044 [26.52]
	W3*	Square wire wrap pin	0.164 [4.17]
	W5*	Square wire wrap pin	0.500 [12.70]

	Letter	Description
Options	H	High force probe indent ④⑤⑥⑧⑪
	(Blank)	No option required

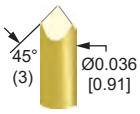
NOTES:
① Available only in M Termination
② Available only in N & G Tube Material
③ Available only in S Tube Material
④ Not available in 1 or 4 Press Ring
⑤ Not available in C, M or S Termination
⑥ Not available in G Tube Material
⑦ Not available in H Option
⑧ Not available in H Tube Material
⑨ Not available in M or S Termination
⑩ Not available in S Tube Material
⑪ Available only in N Material

* Pin material: Phosphor bronze/ gold plated over nickel

US Patent No. 4,885,533

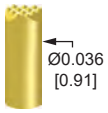


CHISEL



43 Chisel

SERRATED



79 Micro Serrated

PROBE P/N 100-PRP50[ ][ ]L example: 100-PRP5079L

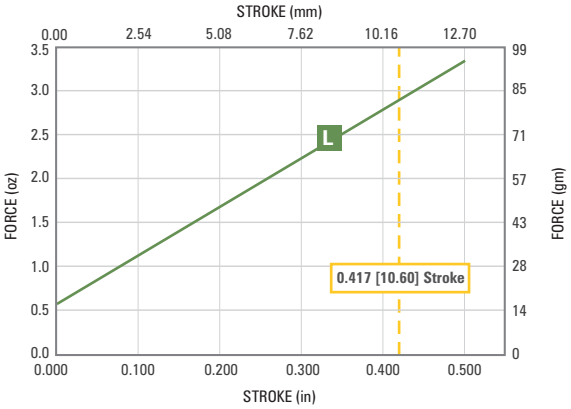
	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 30 mOhms	10.0 (13.7)[3]
Tip Style	**Digits**	**Material/Finish**		
	See Tips	Heat treated BeCu/plated over nickel		
Spring	**Letter**	**Spring Force**	**Preload**	**@ 0.417 [10.60] Stroke**	**Material**	**Cycle Life @ 0.417 [10.60] Stroke**
	L	Low	0.56 [16g/0.16N]	2.9 [82g/0.81N]	SS	80,000

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

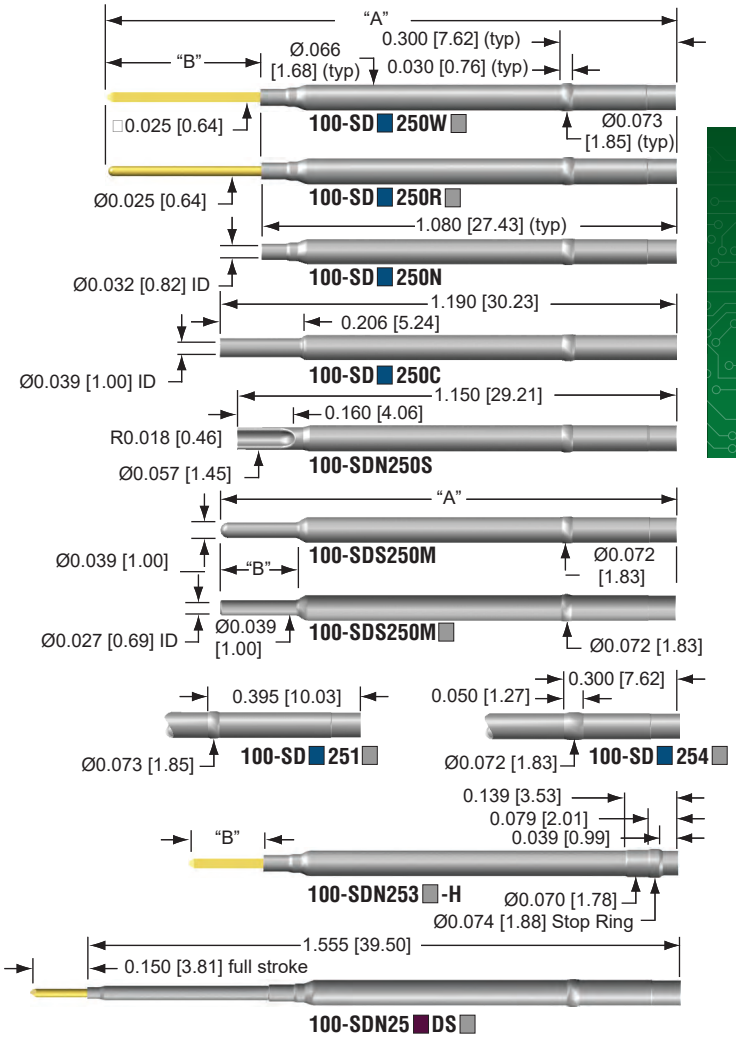


TOOLS & ACCESSORIES

See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0670 / 0.0690 [1.702 / 1.753]; Drill Size 1.75mm



SOCKET P/N 100-SD 25 - example: 100-SDN250W

Tube

Letter	Material/Finish
G	Nickel silver/OD gold plated ⑦⑨
H	High conductivity copper alloy/gold plated ④⑤⑦
N	Nickel silver/no finish
S	Stainless steel/no finish ①④⑦

Press Ring

Digit	Description
0	Single press ring located at 0.300 [7.62]
1	Single press ring located at 0.395 [10.03] ⑤⑦⑧⑩
3	Single press ring located at 0.139 [3.53] ⑤⑪
4	Single extra long press ring located at 0.300 [7.62] ⑤⑦⑧⑩

Termination

Letter	Description	A in (mm)
C	Crimp ②④⑦⑧	
DS	Double-ended for wireless testing. See page 43 for ordering details.	
M	Male round tube ③④⑦	0.197 [5.00]
M1	Male round tube ③④⑦	0.315 [8.00]
M2	Male round tube ③④⑦	0.197 [5.00]
N	No termination ②⑩	
S	Solder cup ④⑥⑦⑧⑩⑪	
R*	Round pin	0.410 [10.41]
R1*	Round pin	0.547 [13.89]
R3*	Round pin	0.216 [5.49]
R5*	Round pin	0.947 [24.05]
W*	Square wire wrap pin	0.429 [10.90]
W1*	Square wire wrap pin	0.694 [17.63]
W2*	Square wire wrap pin	1.044 [26.52]
W3*	Square wire wrap pin	0.164 [4.17]
W5*	Square wire wrap pin	0.500 [12.70]

Options

Letter	Description
H	High force probe indent ④⑤⑥⑧⑪
(Blank)	No option required

NOTES:

① Available only in M Termination

② Available only in N & G Tube Material

③ Available only in S Tube Material

④ Not available in 1 or 4 Press Ring

⑤ Not available in C, M or S Termination

⑥ Not available in G Tube Material

⑦ Not available in H Option

⑧ Not available in H Tube Material

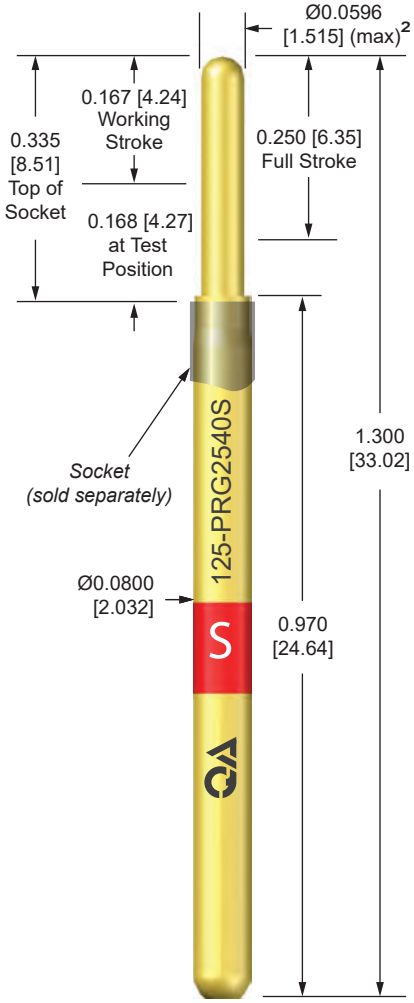
⑨ Not available in M or S Termination

⑩ Not available in S Tube Material

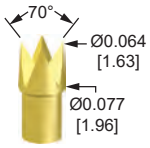
⑪ Available only in N Material

* Pin material: Phosphor bronze/ gold plated over nickel

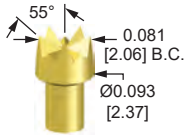
US Patent No. 4,885,533



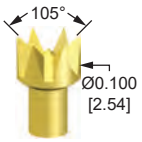
CROWN



24 Crown

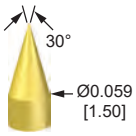


55 Crown

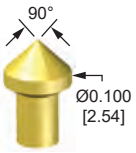


56 Crown

SPEAR

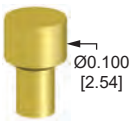


41 Spear



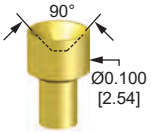
01 Spear

FLAT



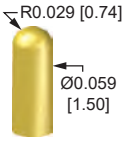
10 Flat

CUP



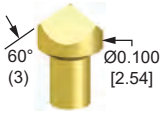
22 Cup

ROUND



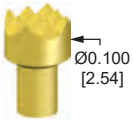
40 Round

CHISEL



03 Chisel

SERRATED



09 Serrated

PROBE P/N 125-PR■25■■■-■ example: 125-PRH2509S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	G	Nickel silver OD gold plated	< 15 mOhms	16.9 (23.0)[3]
	H	High conductivity proprietary alloy/gold plated	< 10 mOhms	30.0 (41.0)[3]
	N	Nickel silver/no finish	< 25 mOhms	13.7 (18.8)[3]
	S	High conductivity proprietary alloy/silver plated	< 10 mOhms	32.8 (48.0)[3]

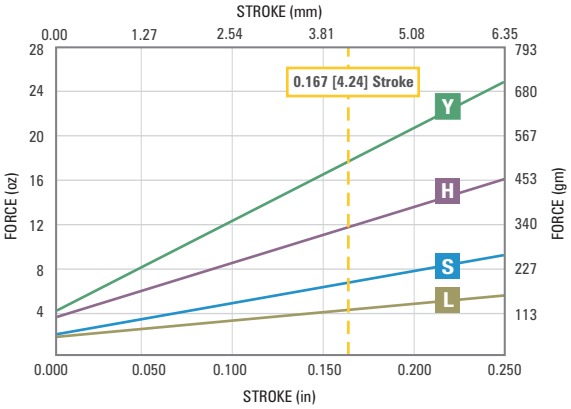
	Digits	Material/Finish
Tip Style	See Tips	Heat treated BeCu/gold plated over nickel

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	L	Low	1.9 [54g/0.53N]	4.5 [128g/1.25N]	SS	1,000,000
	S	Standard	2.2 [62g/0.61N]	7.0 [198g/1.95N]	SS	1,000,000
	H	High	3.7 [105g/1.03N]	12.0 [340g/3.34N]	SS	1,000,000
	Y	Elevated	4.4 [125g/1.21N]	18.0 [510g/5.00N]	SS	100,000

	Letter	Description
Option	B	Curved tube (pylon replacement)
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

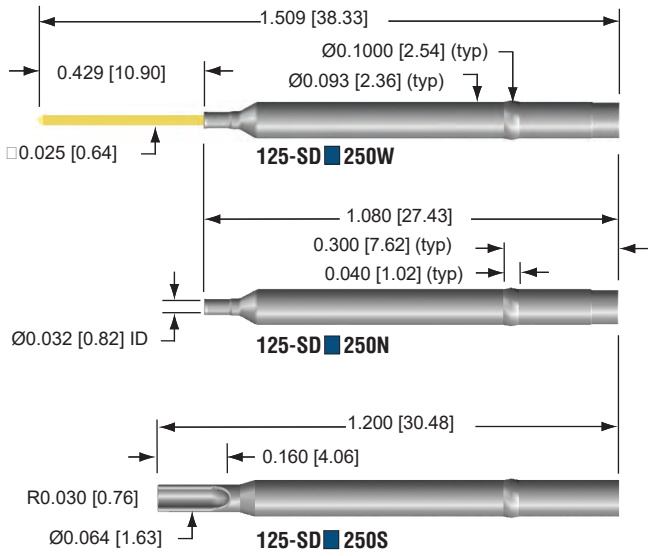


TOOLS & ACCESSORIES

See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.0940 / 0.0960 [2.390 / 2.440]; Drill Size 2.4mm or #41



SOCKET P/N

125-SD■250■ example: 125-SDN250W

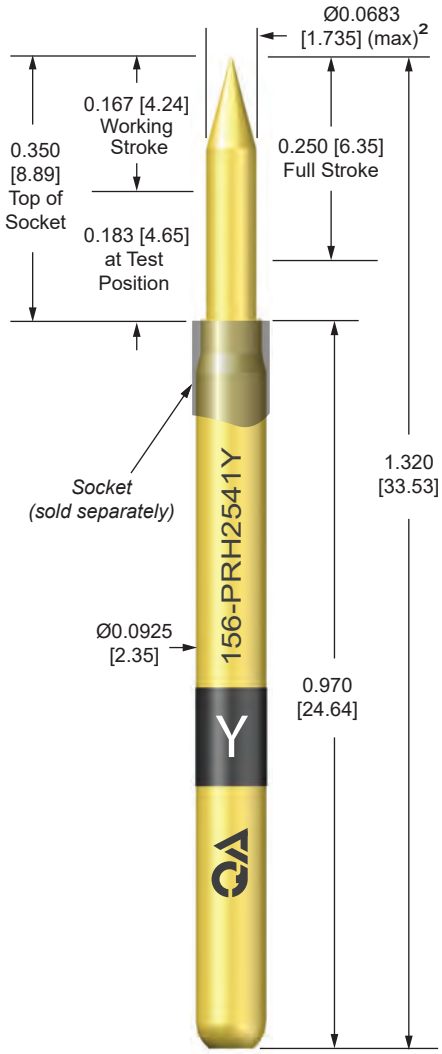
	Letter	Material/Finish
Tube	N	Nickel silver/no finish
	G	Nickel silver/OD gold plated ②
	H	High conductivity copper alloy/gold plated ③
Termination	**Letter**	**Description**
	N	No termination
	S	Solder cup ①
	W	Square wire wrap pin, Phospor bronze/gold plated over nickel

NOTES: ① Not available in G tube material
② Not available in S termination
③ Only available in S termination

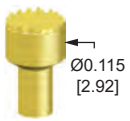
US Patent No. 4,885,533

156-25 Series

0.156 [3.96] Centers | 0.250 [6.35] Full Stroke



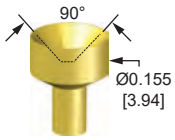
SERRATED



19 Serrated

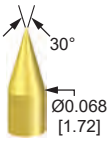
09 Serrated
0.187 [4.75] Min. Centers

CUP



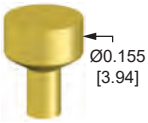
22 Cup
0.187 [4.75] Min. Centers

SPEAR



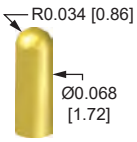
41 Spear

FLAT



10 Flat
0.187 [4.75] Min. Centers

ROUND



40 Round

PROBE P/N 156-PR■25■■■-■ example: 156-PRH2509S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	N	Nickel silver/no finish	< 15 mOhms	16 (22)[3]
	H	High conductivity proprietary alloy/gold plated	< 10 mOhms	31 (43)[3]
	S	High conductivity proprietary alloy/silver plated	< 10 mOhms	34 (47)[3]

	Digits	Material/Finish
Tip Style	See Tips	Heat treated BeCu/gold plated over nickel

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	S	Standard	2.2 [62g/0.61N]	6.0 [170g/1.67N]	SS	1,000,000
	H	High	3.6 [102g/1.00N]	10.0 [283g/2.78N]	SS	1,000,000
	Y	Elevated	5.4 [153g/1.50N]	16.0 [454g/4.45N]	SS	1,000,000

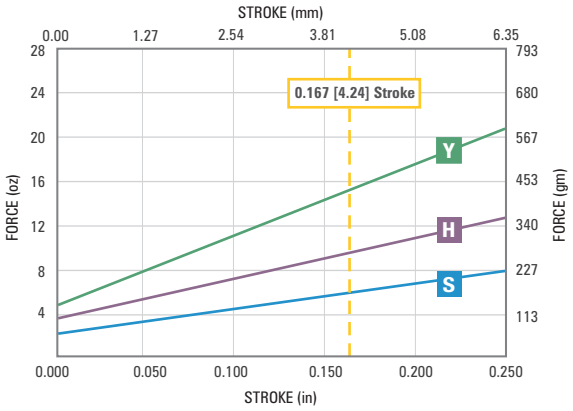
	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

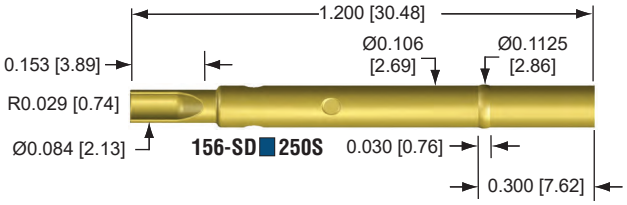


TOOLS & ACCESSORIES

See pages 75-79 for order information.

SOCKETS

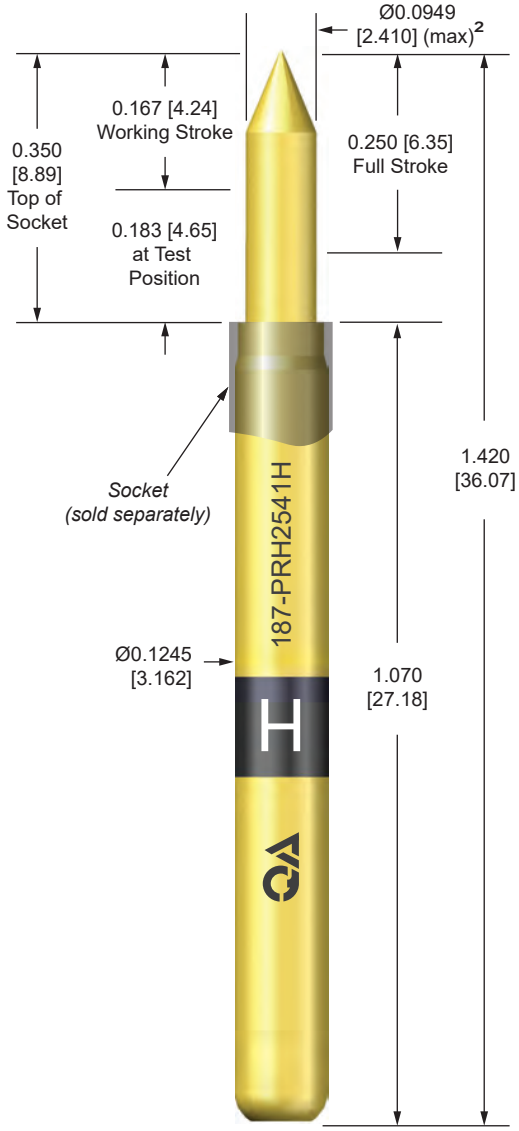
Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.108 / 0.110 [2.74 / 2.79]; Drill Size 7/64" or 2.80mm



SOCKET P/N 156-SD■250S example: 156-SDH250S

	Letter	Material/Finish
Tube	N	Nickel silver/no finish
	H	High conductivity copper alloy/gold plated
Term.	Letter	Description
	S	Solder cup

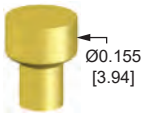
US Patent No. 4,885,533



SERRATED

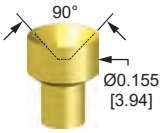
09 Serrated

FLAT



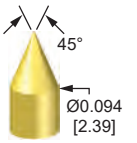
10 Flat

CUP



22 Cup

SPEAR



41 Spear

PROBE P/N 187-PR■25■■H-■ example: 187-PRH2509H

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	N	Nickel silver/no finish	< 20 mOhms	24 (32)[3]
	H	High conductivity proprietary alloy/gold plated	< 10 mOhms	39 (55)[3]
	S	High conductivity proprietary alloy/silver plated	< 5 mOhms	48 (59)[3]

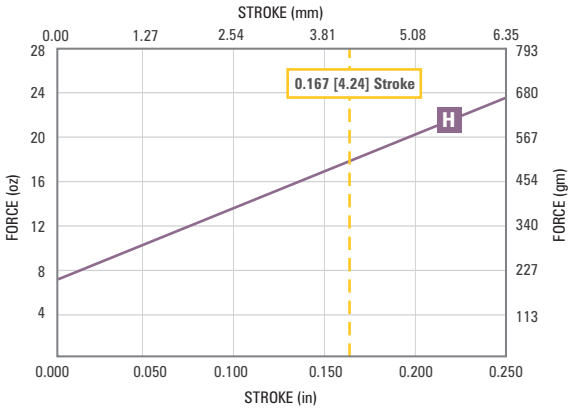
	Digits	Material/Finish
Tip Style	See Tips	Heat treated BeCu/gold plated over nickel

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	H	High	7.0 [198g/1.95N]	18.0 [510g/5.00N]	SS	1,000,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

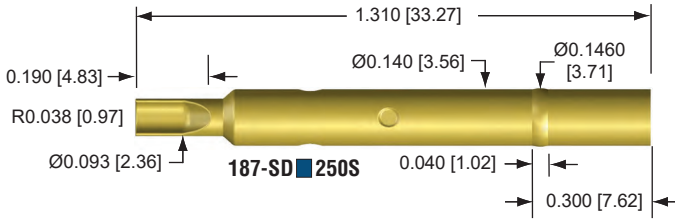


TOOLS & ACCESSORIES

See pages 75-79 for order information.

SOCKETS

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged at: 0.141 / 0.143 [3.58 / 3.63]; Drill Size 3.60mm



SOCKET P/N 187-SD■250S example: 187-SDH250S

	Letter	Material/Finish
Tube	N	Nickel silver/no finish
	H	High conductivity copper alloy/gold plated
Term.	Letter	Description
	S	Solder cup

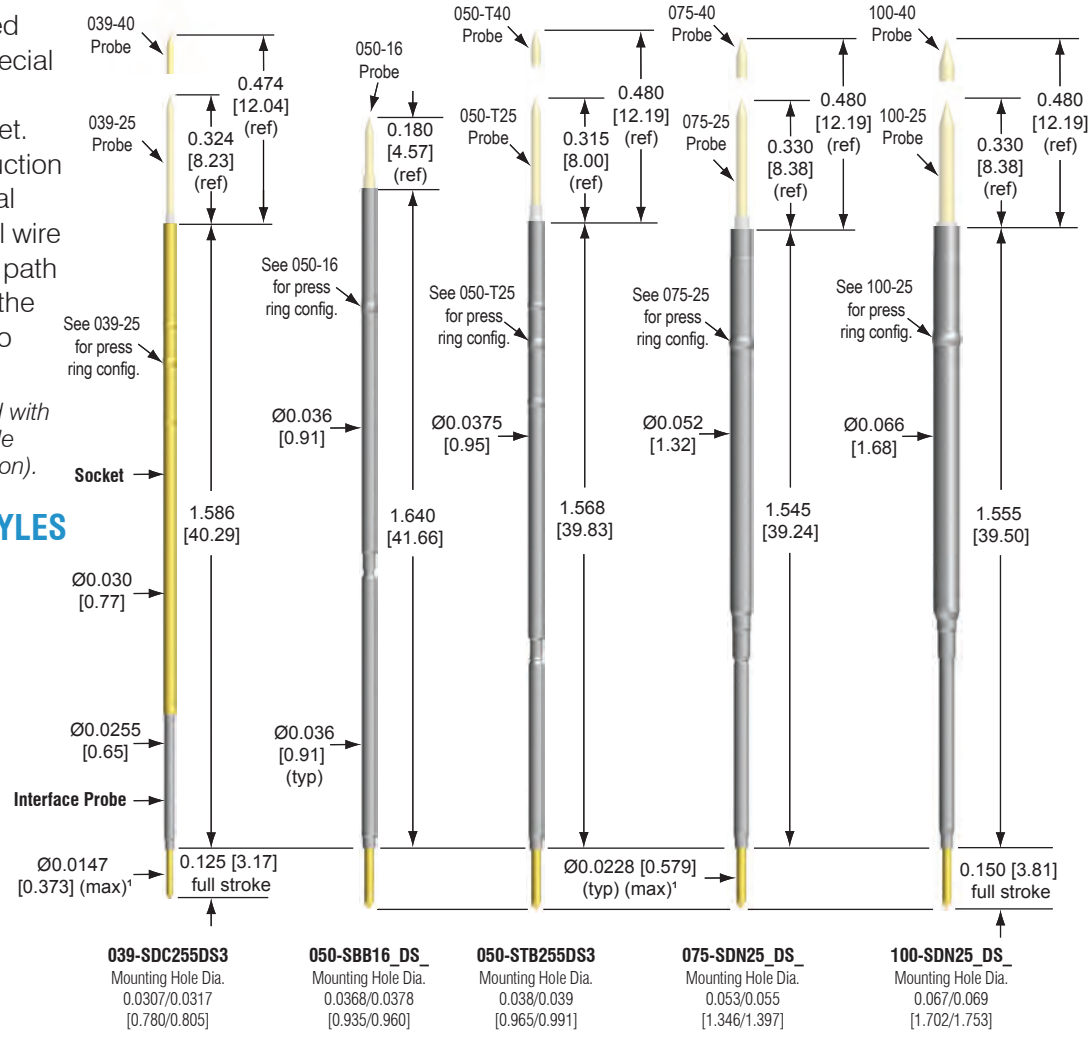
US Patent No. 4,885,533

Wireless Sockets

Wireless sockets are comprised of a standard socket with a special interface probe permanently attached to the tail of the socket. Wireless sockets allow construction of fixtures with far shorter signal path lengths than conventional wire wrapped designs. The shorter path length allows better control of the signal from the tester circuits to the Unit Under Test (UUT).

Note: Top test probe is not included with the wireless sockets. (See applicable product series for ordering information).

INTERFACE PROBE TIP STYLES



039-SDC255DS3
Mounting Hole Dia.
0.0307/0.0317
[0.780/0.805]

050-SBB16_DS_
Mounting Hole Dia.
0.0368/0.0378
[0.935/0.960]

050-STB255DS3
Mounting Hole Dia.
0.038/0.039
[0.965/0.991]

075-SDN25_DS_
Mounting Hole Dia.
0.053/0.055
[1.346/1.397]

100-SDN25_DS_
Mounting Hole Dia.
0.067/0.069
[1.702/1.753]

P/N: 039-SDC255DS3

	Letter	Material/Finish
Tube	C	Heat treated BeCu/gold plated over nickel
	Digits	**Material/Finish**
Tip Style	3	Chisel. Heat treated BeCu/gold plated over nickel

P/N: 050-SBB16■DS■ example: 050-SBB160DS3

	Letter	Material/Finish
Tube	B	Heat treated BeCu/nickel clad ID/OD
	Digits	**Press Ring**
Press Ring	0	Single press ring located at 0.310 [7.87]
	1	Single press ring located at 0.400 [10.16]
	2	Single press ring located at 0.434 [11.02]
	3	Single press ring located at 0.524 [13.31]
	Digits	**Material/Finish**
Tip Style	0	Spherical. Heat treated BeCu/gold plated over nickel
	3	Chisel. Heat treated BeCu/gold plated over nickel

P/N: 050-STB255DS■ example: 050-STB255DS3

	Letter	Material/Finish
Tube	B	Heat treated BeCu/nickel plated
	Digits	**Material/Finish**
Tip Style	0	Spherical. Heat treated BeCu/gold plated over nickel
	3	Chisel. Heat treated BeCu/gold plated over nickel

INTERFACE PROBE SPECIFICATIONS

Tube Material: Nickel silver/ID precious metal clad

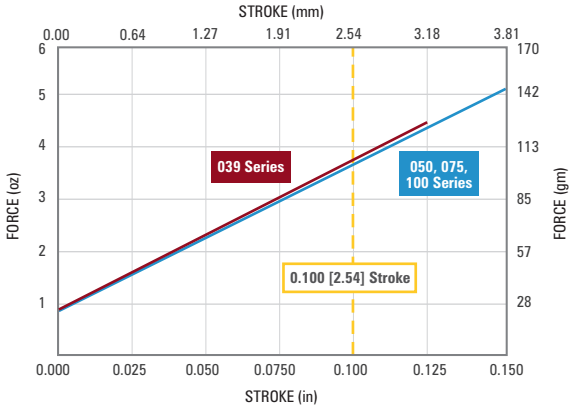
Working Stroke: Up to 0.100 [2.54]

Working Temperature Range: Up to 204°C

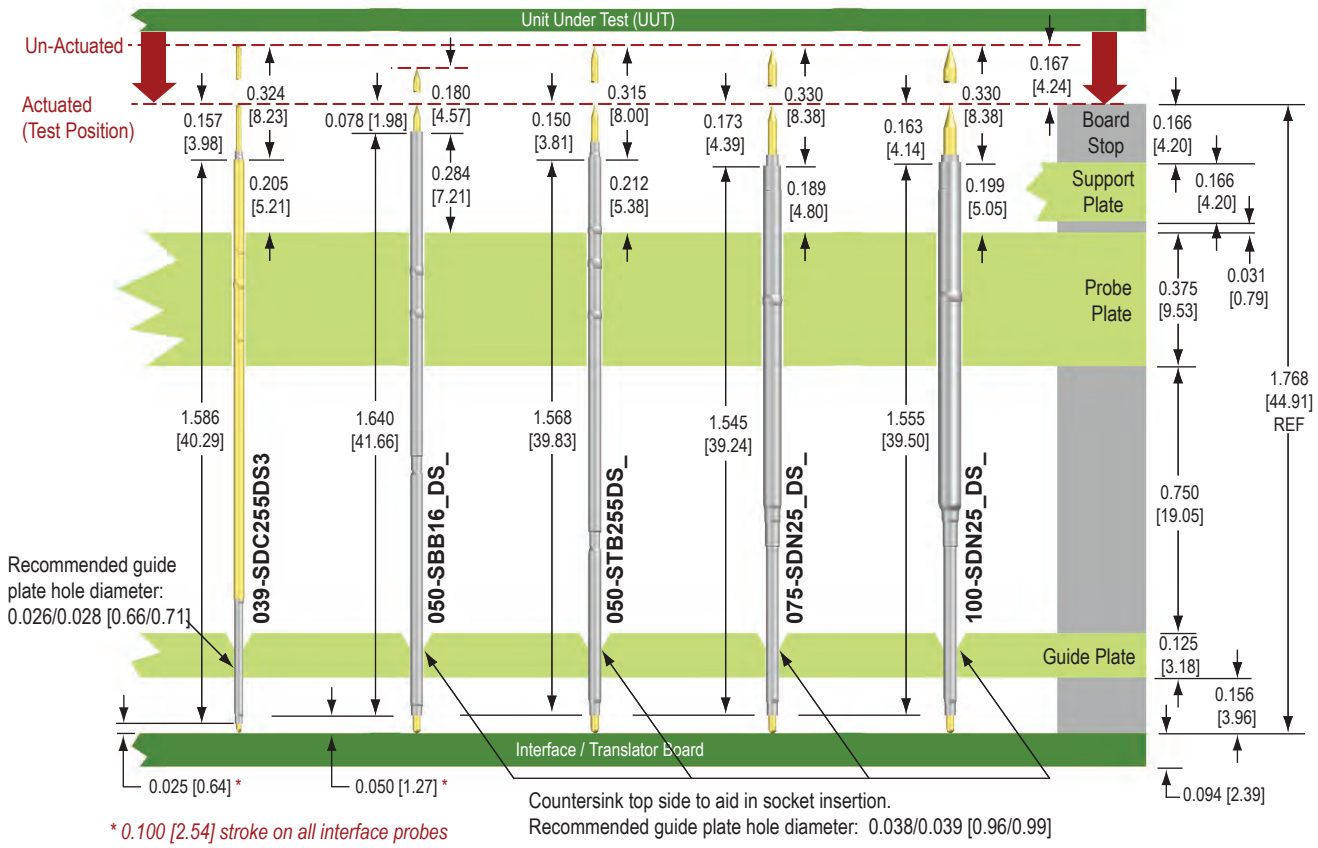
Spring Force:

	Preload	@ 0.100 [2.54] Stroke	Material	Cycle Life @ 0.100 [2.54] Stroke
*039-25	0.8 [23g/0.21N]	3.9 [111g/1.07N]	SS	10,000
All Others	0.8 [23g/0.22N]	3.8 [108g/1.04N]	SS	100,000

Spring Force



SUGGESTED MOUNTING FIXTURE



TOOLS & ACCESSORIES

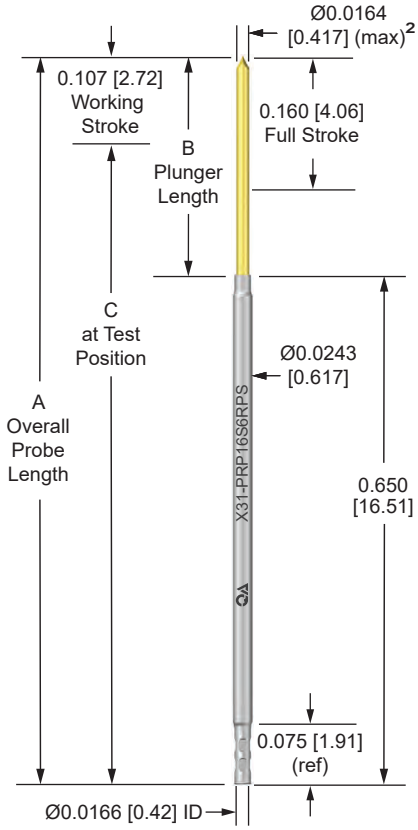
See pages 75-79 for order information.

P/N: 075-SDN25■DS■ example: 075-SDN250DS3

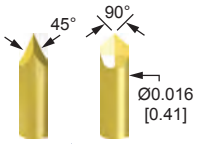
Tube	Letter	Material/Finish
	N	Nickel silver/no finish
Press Ring	Digits	Press Ring
	0	Single press ring located at 0.300 [7.62]
	1	Single press ring located at 0.395 [10.03]
	4	Single extra long press ring located at 0.300 [7.62]
Tip Style	Digits	Material/Finish
	0	Spherical. Heat treated BeCu/gold plated over nickel
	3	Chisel. Heat treated BeCu/gold plated over nickel

P/N: 100-SDN25■DS■ example: 100-SDN250DS3

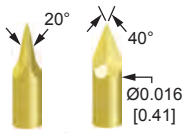
Tube	Letter	Material/Finish
	N	Nickel silver/no finish
Press Ring	Digits	Press Ring
	0	Single press ring located at 0.300 [7.62]
	1	Single press ring located at 0.395 [10.03]
	4	Single extra long press ring located at 0.300 [7.62]
Tip Style	Digits	Material/Finish
	0	Spherical. Heat treated BeCu/gold plated over nickel
	3	Chisel. Heat treated BeCu/gold plated over nickel



RAZOR

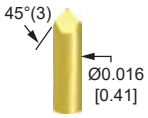


S6RP Razor



S9RP Razor

CHISEL



S43P Chisel

PROBE P/N X31-PRP16 example: X31-PRP16S6RPL

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 64mOhms	3.4 (4.7)[3]

	Letter	Material/Finish
Tip Material	S	Heat treated steel/gold plated over nickel

	Digits	Description
Tip Style	See Tips	Tip style geometry based on target type

	Letter	Tip Style Availability	Overall Probe Length (A)	Plunger Length (B)	@ Test Position (C)
Plunger Length	P	43, 6R, 9R	0.930 [23.62]	0.280 [7.11]	0.823 [20.90]

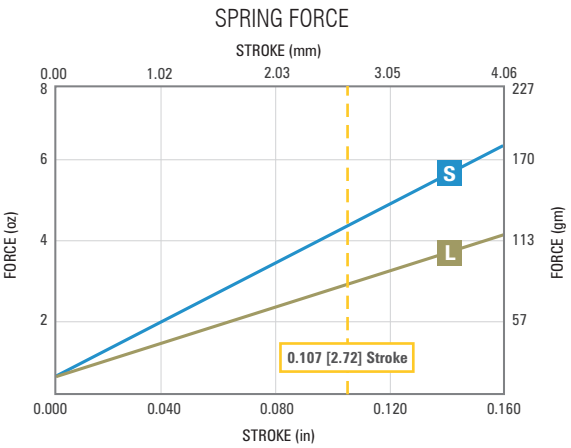
	Letter	Spring Force	Preload	@ 0.107 [2.72] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke
Spring	L	Low	0.7 [20g/0.19N]	3.0 [85g/0.83N]	SS	300,000
	S	Standard	0.7 [20g/0.19N]	4.5 [128g/1.25N]	SS	25,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

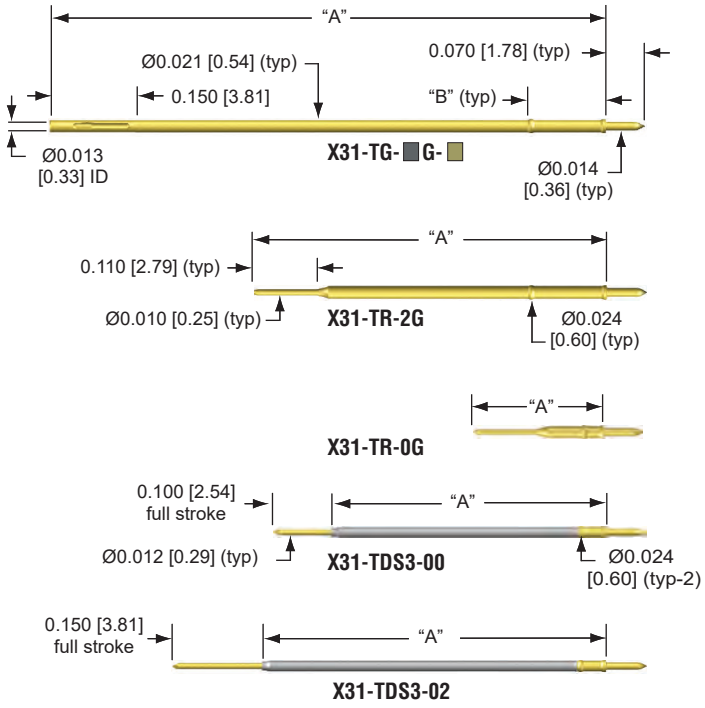


TOOLS & ACCESSORIES

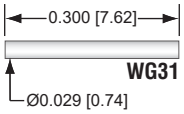
See pages 75-79 for order information.

TERMINATION PIN

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0250 / 0.0260 [0.635 / 0.660]; Drill Size #71 or 0.65mm and back plate at 0.0217 / 0.0225 [0.551 / 0.572]; Drill Size #74 or 0.58mm



WIRE GRIP SLEEVE For use with G termination pins.



P/N: WG31

Description
To accept 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05] (not included) Nylon sleeve, clear

TERMINATION PIN P/N

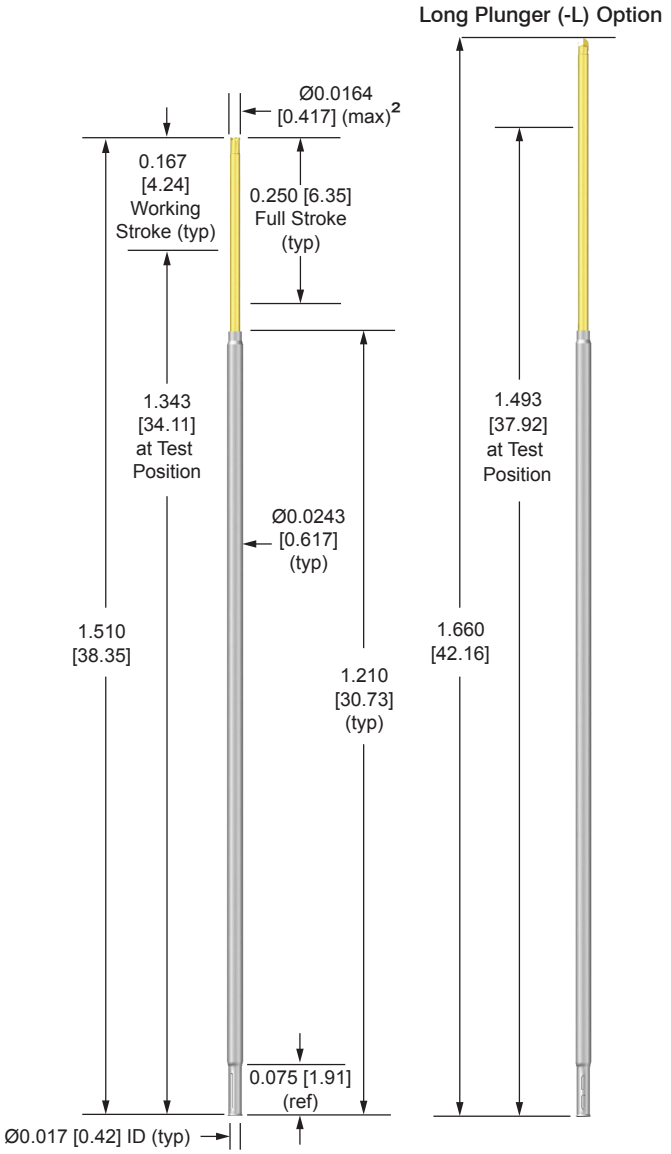
X31-T■-■G-■ example: X31-TG-2G

	Letter	Material/Finish
Termination	DS3	Double-Ended for wireless testing. Order by part number above.
	G	Wire Grip: Heat treated BeCu/gold plated, accepts wire grip sleeve.
	R	Round Post. Heat treated Becu/gold plated over nickel.

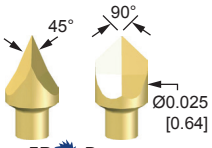
	Digit	Description	A in (mm)	B in (mm)
Body	0	Only available in TR	0.230 [5.84]	0.040 [1.02]
	2	Only available in TR	0.615 [15.62]	0.137 [3.48]
		Only available in TG	0.628 [15.95]	0.077 [1.96]
	3	Only available in TG	0.915 [23.24]	0.137 [3.48]
	00	Only available in DS3	0.475 [12.07]	0.048 [1.22]
	02	Only available in DS3	0.583 [14.81]	0.048 [1.22]

	Digit	Description
Option	1	X31-TG-2G with WG31 wire grip sleeve
	(Blank)	No option required

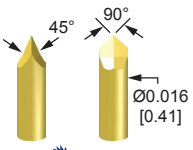
US Patent No. 6,570,399 & 4,885,533



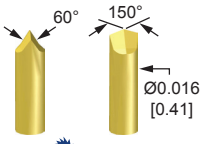
RAZOR



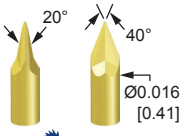
5R $ Razor
0.039 [1.00] Min. Centers



6R $ Razor

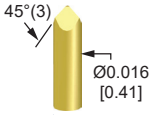


8R $ Razor

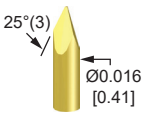


9R $ Razor

CHISEL

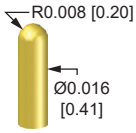


43 $ Chisel



63 $ Chisel

ROUND



40 Round

PROBE P/N X31-PRP25[ ][ ][ ]-[ ] example: X31-PRP256RH-S

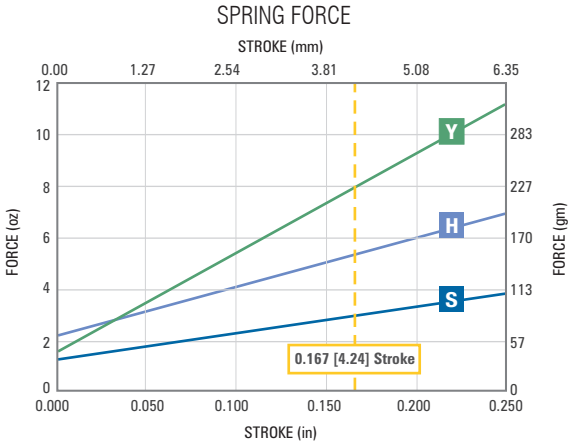
	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 65 mOhms	2.6 (3.6)[3]

	Digits	Material/Finish
Tip Style	See Tips	Standard material is heat treated BeCu/gold plated over nickel. (see S option for steel plungers)

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	S	Standard	1.5 [43g/0.42N]	3.6 [102g/1.00N]	MW	1,000,000
	H	High	2.2 [62g/0.62N]	5.4 [153g/1.50N]	SS	50,000
	Y	Elevated	1.5 [43g/0.42N]	8.0 [227g/2.22N]	SS	25,000

	Letter	Description
Option	L	Long plunger. Must select from X31-40 tip styles
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.



TOOLS & ACCESSORIES

See pages 75-79 for order information.

CROWN

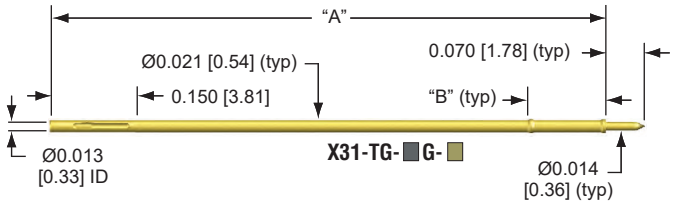
44 $ Crown

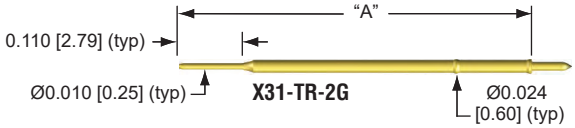
TORCH

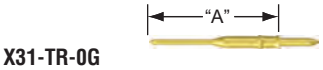
47 $ Torch

TERMINATION PIN

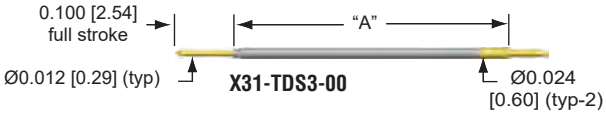
Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0250 / 0.0260 [0.635 / 0.660]; Drill Size #71 or 0.65mm and back plate at 0.0217 / 0.0225 [0.551 / 0.572]; Drill Size #74 or 0.58mm

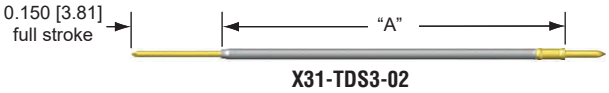






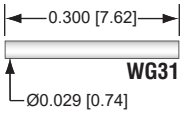
X31-TR-0G





X31-TDS3-02

WIRE GRIP SLEEVE For use with G termination pins.



P/N: WG31

Description
To accept 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05] (not included) Nylon sleeve, clear

TERMINATION PIN P/N

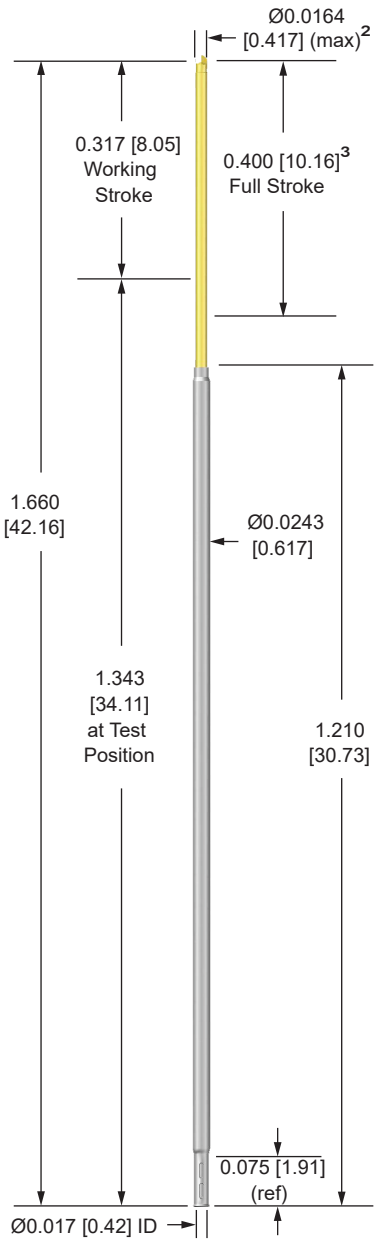
X31-T■-■G-■ example: X31-TG-3G

	Letter	Material/Finish
Termination	DS3	Double-Ended for wireless testing. Order by part number above.
	G	Wire Grip: Heat treated BeCu/gold plated, accepts wire grip sleeve.
	R	Round Post. Heat treated Becu/gold plated over nickel.

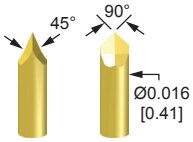
	Digit	Description	A in (mm)	B in (mm)
Body	0	Only available in TR	0.230 [5.84]	0.040 [1.02]
	2	Only available in TR	0.615 [15.62]	0.137 [3.48]
		Only available in TG	0.628 [15.95]	0.077 [1.96]
	3	Only available in TG	0.915 [23.24]	0.137 [3.48]
	00	Only available in DS3	0.475 [12.07]	0.048 [1.22]
	02	Only available in DS3	0.583 [14.81]	0.048 [1.22]

	Digit	Description
Option	1	X31-TG-3G with WG31 wire grip sleeve
	(Blank)	No option required

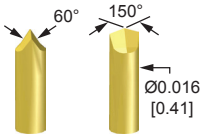
US Patent No. 6,570,399 & 4,885,533



RAZOR



6R Razor



8R Razor

TORCH

47 Torch

PROBE P/N X31-PRP40■■■-■ example: X31-PRP406RS-S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
Tube	P	Nickel silver/ID precious metal clad	< 100mOhms	2.5 (3.6)[4]

	Digits	Description
Tip Style	See Tips	Heat treated steel/plated gold over nickel

	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
Spring	S	Standard	0.7 [20g/0.19N]	4.0 [113g/1.11N]	SS	50,000
	H[3]	High	1.8 [51g/0.50N]	6.0 [170g/1.67N]	SS	50,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[4]
	S	Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

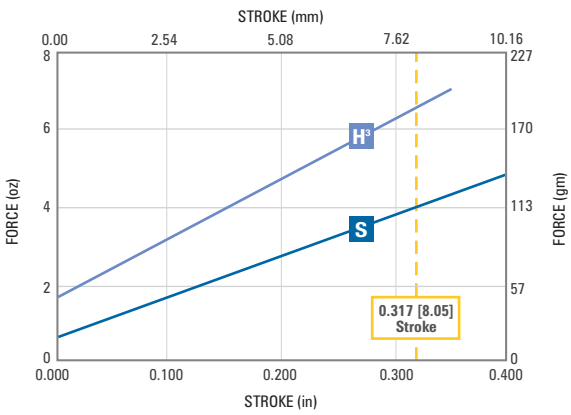
[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] 0.350 [8.89] max stroke for H spring.

[4] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

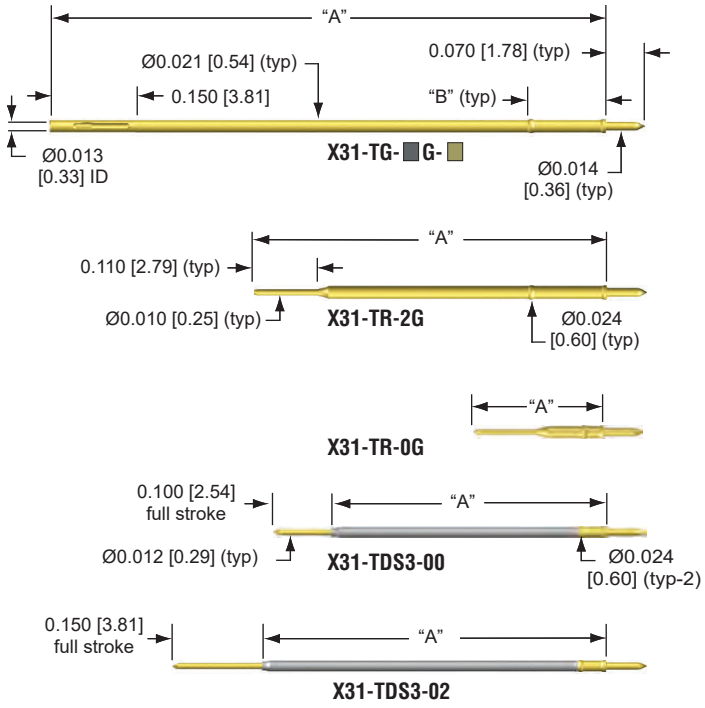


TOOLS & ACCESSORIES

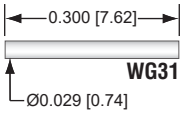
See pages 75-79 for order information.

TERMINATION PIN

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0250 / 0.0260 [0.635 / 0.660]; Drill Size #71 or 0.65mm and back plate at 0.0217 / 0.0225 [0.551 / 0.572]; Drill Size #74 or 0.58mm



WIRE GRIP SLEEVE For use with G termination pins.



P/N: WG31

Description
To accept 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05] (not included) Nylon sleeve, clear

TERMINATION PIN P/N

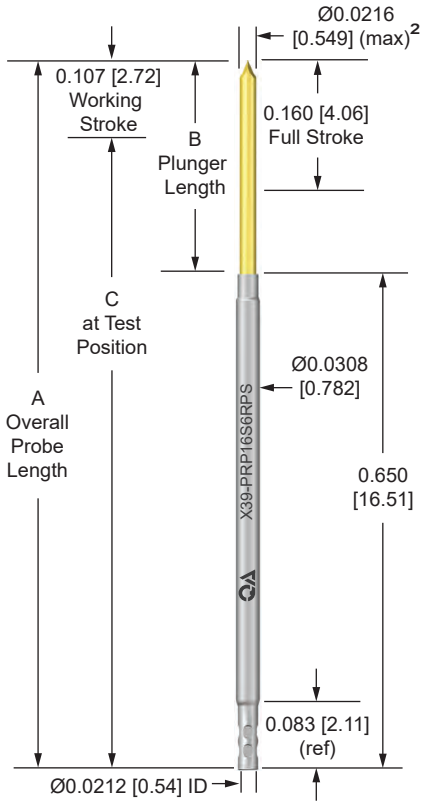
X31-T■-■G-■ example: X31-TG-3G

	Letter	Material/Finish
Termination	DS3	Double-Ended for wireless testing. Order by part number above.
	G	Wire Grip: Heat treated BeCu/gold plated, accepts wire grip sleeve.
	R	Round Post. Heat treated Becu/gold plated over nickel.

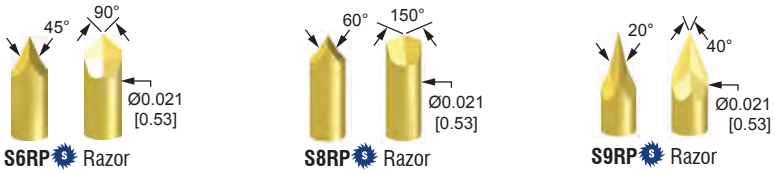
	Digit	Description	A in (mm)	B in (mm)
Body	0	Only available in TR	0.230 [5.84]	0.040 [1.02]
	2	Only available in TR	0.615 [15.62]	0.137 [3.48]
		Only available in TG	0.628 [15.95]	0.077 [1.96]
	3	Only available in TG	0.915 [23.24]	0.137 [3.48]
	00	Only available in DS3	0.475 [12.07]	0.048 [1.22]
	02	Only available in DS3	0.583 [14.81]	0.048 [1.22]

	Digit	Description
Option	1	X31-TG-3G with WG31 wire grip sleeve
	(Blank)	No option required

US Patent No. 6,570,399 & 4,885,533



RAZOR

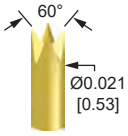


S6RP Razor **S8RP** Razor **S9RP** Razor

CHISEL

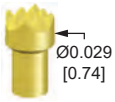
S43P Chisel **S63P** Chisel

CROWN



S44H Crown

SERRATED



B39H Serrated

PROBE P/N X39-PRP16

example: X39-PRP16S43PS

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 42 mOhms	4.5 (6.2)[3]

	Letter	Material/Finish
Tip Material	B	Heat treated BeCu/gold plated over nickel
	S	$ Heat treated steel/gold plated over nickel

	Digits	Description
Tip Style	See Tips	Tip style geometry based on target type

	Letter	Tip Style Availability	Overall Probe Length (A)	Plunger Length (B)	@ Test Position (C)
Plunger Length	H	39, 44	0.870 [22.10]	0.220 [5.59]	0.763 [19.38]
	P	43, 63, 6R, 8R, 9R	0.930 [23.62]	0.280 [7.11]	0.823 [20.90]

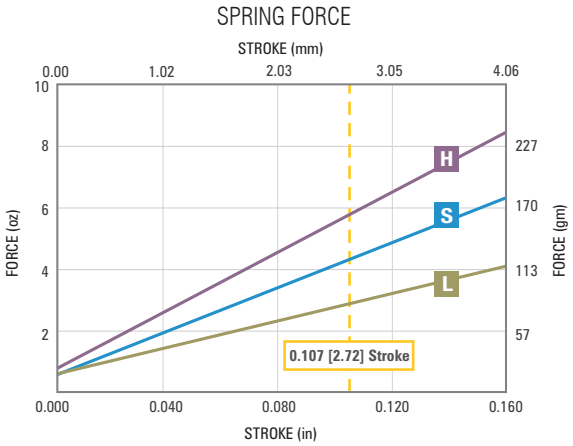
	Letter	Spring Force	Preload	@ 0.107 [2.72] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke
Spring	L	Low	0.8 [23g/0.22N]	3.0 [85g/0.83N]	SS	300,000
	S	Standard	0.8 [23g/0.22N]	4.5 [128g/1.25N]	SS	300,000
	H	High	1.0 [28g/0.28N]	6.0 [170g/1.67N]	SS	50,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

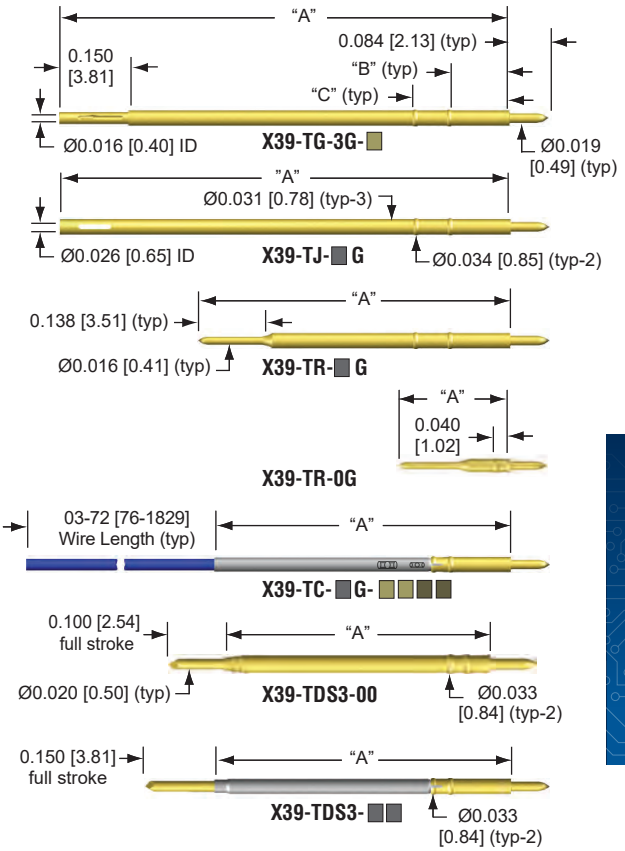


TOOLS & ACCESSORIES

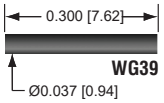
See pages 75-79 for order information.

TERMINATION PIN

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0315 / 0.0325 [0.800 / 0.826]; Drill Size #66 or 0.84mm and back plate at 0.0315 / 0.0325 [0.800 / 0.826]; Drill Size #66 or 0.84mm



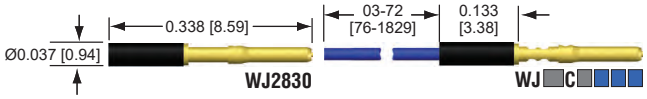
WIRE GRIP SLEEVE For use with G termination pins.



P/N: WG39

Description/Material
To accept 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05], (not included) Nylon sleeve, black

WIRE JACK For use with J termination pins.



P/N: WJ - example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.
Wire	Colors Available for 28C & 30C Termination	
	0 Black, 1 Brown, 2 Red, 3 Orange, 4 Yellow, 5 Green, 6 Blue, 7 Violet, 8 Gray, 9 White	
	Wire Length Available for 28C & 30C Termination	
		Specify Length in inches: 03 – 72 [76-1829]
Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

TERMINATION PIN P/N

X39-T -G- example: X39-TJ-2G

	Letter	Material/Finish
Termination	C	Crimped. Termination material: Heat treated BeCu/gold plated over nickel. Tube material: ID precious metal clad.
	DS3	Double-ended for wireless testing. See page 69 for ordering details.
	G	Wire Grip. Heat treated BeCu/gold plated over nickel, accepts wire grip sleeve.
	J	Wire Jack. Heat treated BeCu/gold plated over nickel, accepts wire jack.
	R	Round post. Heat treated BeCu/gold plated over nickel.

	Digits	Description	A in (mm)	B in (mm)	C in (mm)
Body	0	Only available in TC	0.582 [14.78]	0.113 [2.87]	0.065 [1.65]
		Only available in TR	0.261 [6.63]	0.040 [1.02]	0.000 [0.00]
	1	Only available in TC	0.642 [16.31]	0.173 [4.39]	0.125 [3.18]
	2	Only available in TJ	0.628 [15.95]	0.077 [1.96]	0.036 [0.91]
		Only available in TR	0.675 [17.15]	0.210 [5.33]	0.125 [3.18]
	3	Only available in TG	0.975 [24.77]	0.210 [5.33]	0.125 [3.18]
		Only available in TJ	0.975 [24.77]	0.210 [5.33]	0.125 [3.18]
	4	Only available in TJ	1.100 [27.94]	0.210 [5.33]	0.125 [3.18]
	5	Only available in TJ	1.225 [31.12]	0.210 [5.33]	0.125 [3.18]
	8	Only available in TJ	1.600 [40.64]	0.210 [5.33]	0.125 [3.18]

	Digits	Available for TG Termination Only
Options	2	X39-TG-3G with WG39 wire grip sleeve

	Digits	Wire Size Available for TC Termination Only
Options	3	30 AWG Kynar insulated solid wire, pre-attached. Specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached. Specify color and length

Wire Colors Available for TC Termination Only

0 Black, 1 Brown, 2 Red, 3 Orange, 4 Yellow, 5 Green, 6 Blue, 7 Violet, 8 Grey, 9 White

Wire Length Available for TC Termination

Specify Length in inches: 03 – 72 [76-1829]

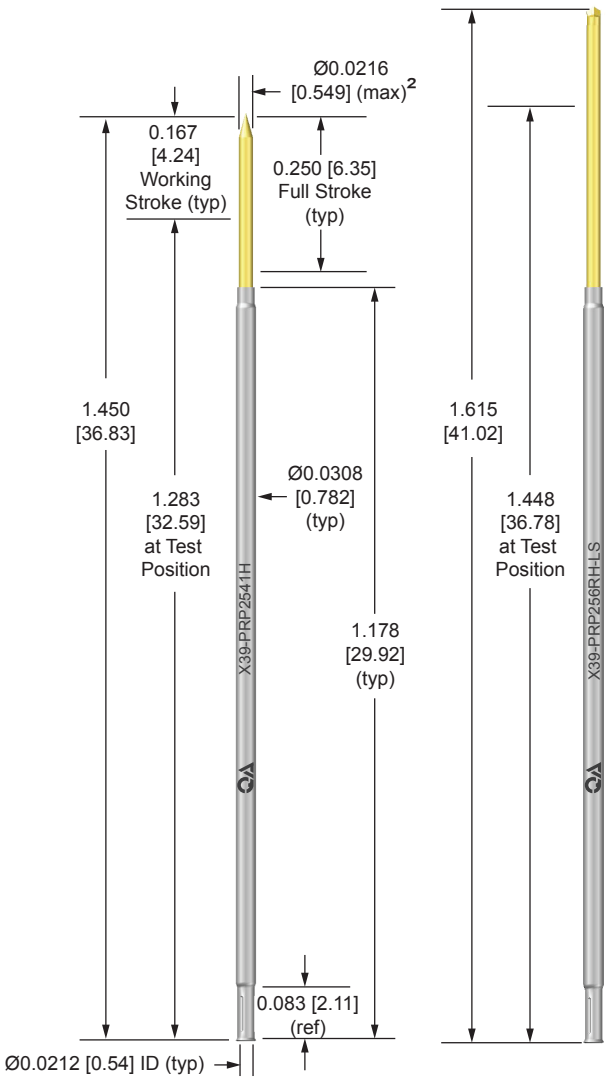
(Blank) No option required

US Patent No. 6,570,399 & 4,885,533

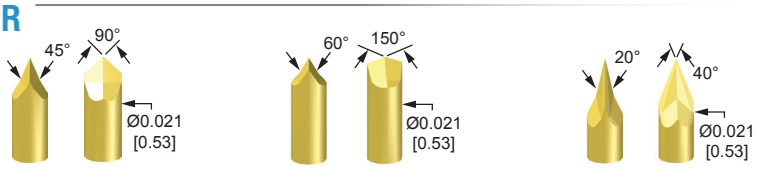
X39-25 Series

0.039 [1.00] Centers | 0.250 [6.35] Full Stroke

Long Plunger (-L) Option

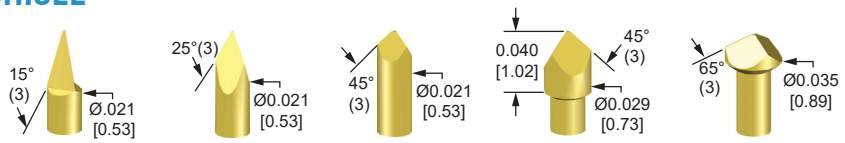


RAZOR



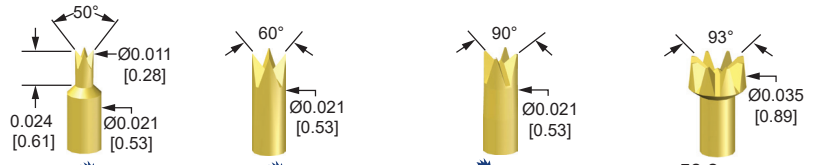
6R$ Razor | **8R**$ Razor | **9R**$ Razor

CHISEL



53 or 53$ Chisel | **63 or 63**$ Chisel | **43 or 43**$ Chisel | **13**$ Chisel 0.232 [5.89] Full Stroke | **03 or 03**$ Chisel 0.045 [1.14] Min. Centers

CROWN



14 or 14$ Crown | **44 or 44**$ Crown | **G4**$ Crown | **58** Crown 0.045 [1.14] Min. Centers

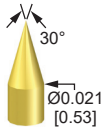
STAR

46 Flat Star | **76** Center Point Star | **16** Flat Star 0.045 [1.14] Min. Centers | **26** Center Point Star 0.045 [1.14] Min. Centers

SERRATED

79 Micro Serrated | **59** Micro Serrated 0.045 [1.14] Min. Centers | **09 or 09**$ Serrated 0.045 [1.14] Min. Centers

SPEAR



41 or 41$ Spear

PROBE P/N X39-PRP25[ ][ ][ ]-[ ] example: X39-PRP2543S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 25 mOhms	3.4 (4.7)[3]
Tip Style	Digits	Material/Finish		
	See Tips	Standard material is heat treated BeCu/plated gold over nickel. (see S option for steel plungers)		

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	L	Low	1.2 [34g/0.33N]	3.0 [85g/0.83N]	MW	1,000,000
	S	Standard	1.1 [31g/0.31N]	4.3 [122g/1.20N]	MW	1,000,000
	H	High	2.4 [68g/0.67N]	5.6 [159g/1.56N]	MW	1,000,000
	Y	Elevated	3.2 [91g/0.89N]	8.0 [227g/2.22N]	SS	25,000
		High Preload Spring – *Only available with headless* $ *steel tip styles.*				
	E	High Preload	4.2 [119g/1.17N]	8.0 [227g/2.22N]	SS	10,000

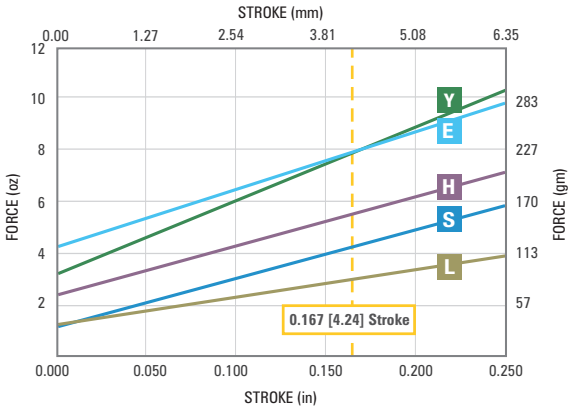
	Letter	Description
Option	L	Long plunger. Must select from X39-40 tip styles
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

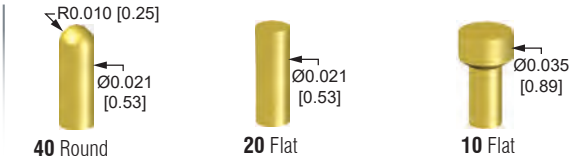
SPRING FORCE



TOOLS & ACCESSORIES

See pages 75-79 for order information.

ROUND & FLAT

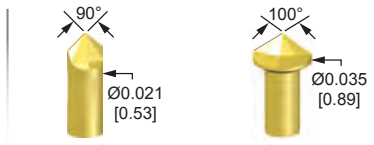


40 Round **20** Flat **10** Flat

CUP

42 Cup **22** Cup
0.045 [1.14] Min. Centers

BLADE



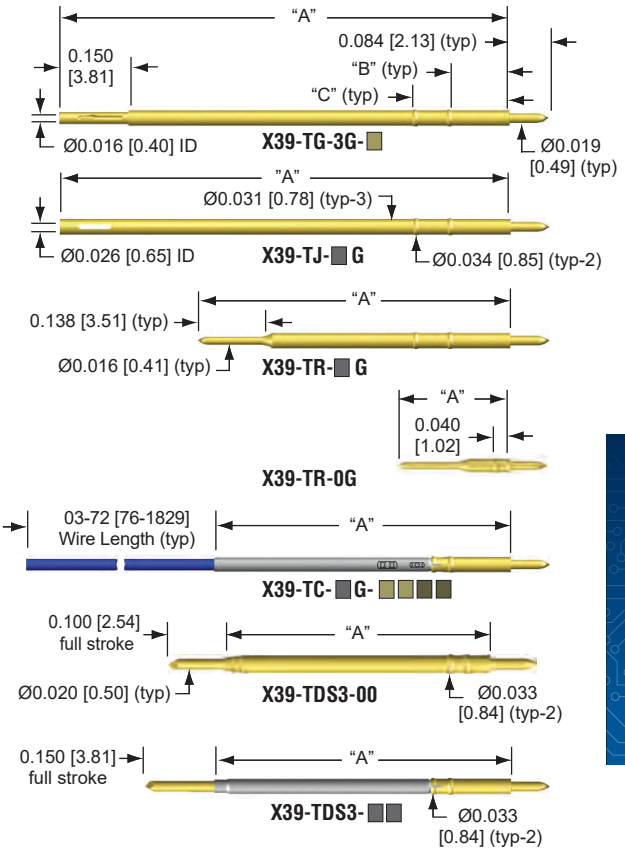
61 or 61$ Blade **51**$ Blade
0.045 [1.14] Min. Centers

TORCH

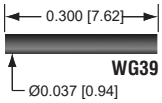
47$ Torch

TERMINATION PIN

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0315 / 0.0325 [0.800 / 0.826]; Drill Size #66 or 0.84mm and back plate at 0.0315 / 0.0325 [0.800 / 0.826]; Drill Size #66 or 0.84mm



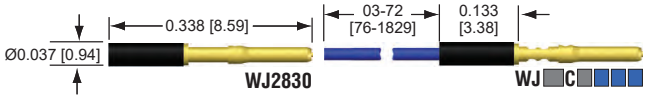
WIRE GRIP SLEEVE For use with G termination pins.



P/N: WG39

Description/Material
To accept 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05], (not included) Nylon sleeve, black

WIRE JACK For use with J termination pins.



P/N: WJ - example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.
Wire	Colors Available for 28C & 30C Termination	
	0 Black, 1 Brown, 2 Red, 3 Orange, 4 Yellow, 5 Green, 6 Blue, 7 Violet, 8 Gray, 9 White	
	Wire Length Available for 28C & 30C Termination	
		Specify Length in inches: 03 – 72 [76-1829]
Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

TERMINATION PIN P/N

X39-T -G- example: X39-TJ-3G

	Letter	Material/Finish
Termination	C	Crimped. Termination material: Heat treated BeCu/gold plated over nickel. Tube material: ID precious metal clad.
	DS3	Double-ended for wireless testing. See page 69 for ordering details.
	G	Wire Grip. Heat treated BeCu/gold plated over nickel, accepts wire grip sleeve.
	J	Wire Jack. Heat treated BeCu/gold plated over nickel, accepts wire jack.
	R	Round post. Heat treated BeCu/gold plated over nickel.

	Digits	Description	A in (mm)	B in (mm)	C in (mm)
Body	0	Only available in TC	0.582 [14.78]	0.113 [2.87]	0.065 [1.65]
		Only available in TR	0.261 [6.63]	0.040 [1.02]	0.000 [0.00]
	1	Only available in TC	0.642 [16.31]	0.173 [4.39]	0.125 [3.18]
	2	Only available in TJ	0.628 [15.95]	0.077 [1.96]	0.036 [0.91]
		Only available in TR	0.675 [17.15]	0.210 [5.33]	0.125 [3.18]
	3	Only available in TG	0.975 [24.77]	0.210 [5.33]	0.125 [3.18]
		Only available in TJ	0.975 [24.77]	0.210 [5.33]	0.125 [3.18]
	4	Only available in TJ	1.100 [27.94]	0.210 [5.33]	0.125 [3.18]
	5	Only available in TJ	1.225 [31.12]	0.210 [5.33]	0.125 [3.18]
	8	Only available in TJ	1.600 [40.64]	0.210 [5.33]	0.125 [3.18]

	Digits	Available for TG Termination Only
Options	2	X39-TG-3G with WG39 wire grip sleeve

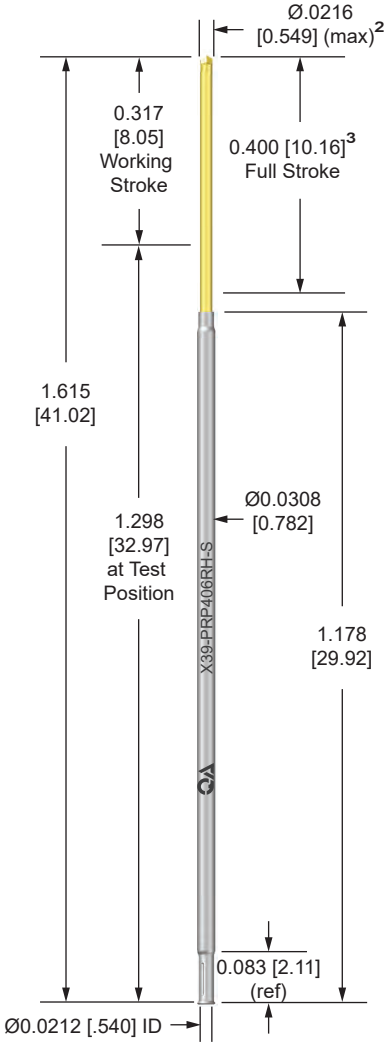
	Digits	Wire Size Available for TC Termination Only
Options	3	30 AWG Kynar insulated solid wire, pre-attached. Specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached. Specify color and length

Wire Colors Available for TC Termination Only
0 Black, 1 Brown, 2 Red, 3 Orange, 4 Yellow, 5 Green, 6 Blue, 7 Violet, 8 Grey, 9 White

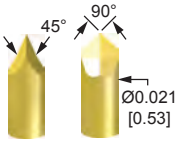
Wire Length Available for TC Termination
Specify Length in inches: 03 – 72 [76-1829]
(Blank) No option required

US Patent No. 6,570,399 & 4,885,533

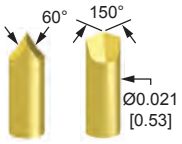
X39-25 Series



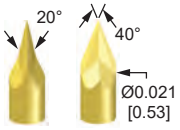
RAZOR



6R Razor

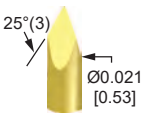


8R Razor

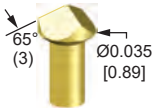


9R Razor

CHISEL

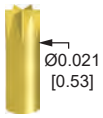


63 Chisel



03 Chisel
0.045 [1.14] Min. Centers

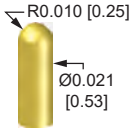
STAR



46 Flat Star

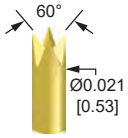
76 Center Point Star

ROUND

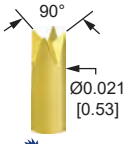


40 Round

CROWN



44 Crown

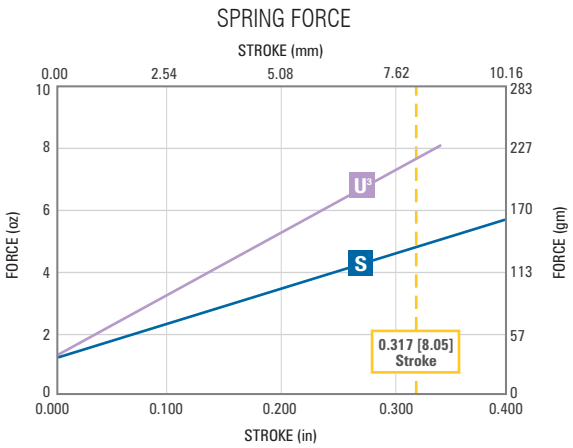


G4 Crown

PROBE P/N X39-PRP40■■■-■ example: X39-PRP408RS-S

	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
Tube	P	Nickel silver/ID precious metal clad			< 55 mOhms	3.3 (4.5)[4]
Tip Style	Digits	Material/Finish				
	See Tips	Standard material is heat treated BeCu/plated gold over nickel (see S option for steel plungers)				
Springs	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
	S	Standard	1.2 [34g/0.33N]	4.8 [136g/1.32N]	SS	100,000
	U[3]	Ultra	1.3 [37g/0.36N]	7.5 [213g/2.09N]	SS	10,000
Option	Letter	Description				
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[4]				
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)				
	(Blank)	No option required				

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] 0.350 [8.89] max stroke for U spring.
[4] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

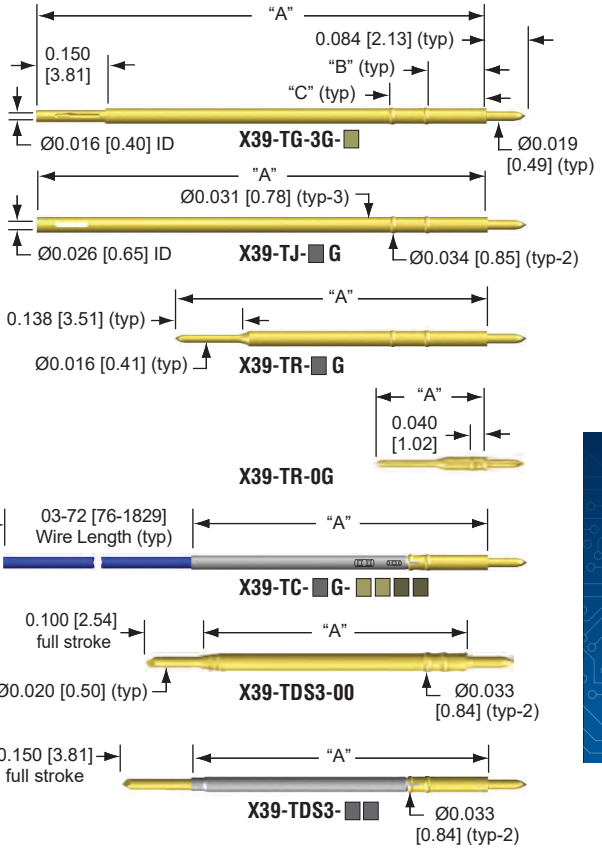


TOOLS & ACCESSORIES

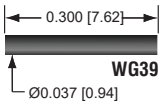
See pages 75-79 for order information.

TERMINATION PIN

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0315 / 0.0325 [0.800 / 0.826]; Drill Size #66 or 0.84mm and back plate at 0.0315 / 0.0325 [0.800 / 0.826]; Drill Size #66 or 0.84mm



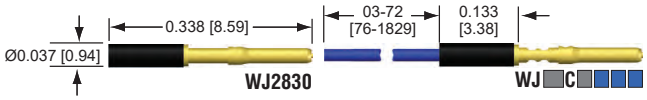
WIRE GRIP SLEEVE For use with G termination pins.



P/N: WG39

Description/Material
To accept 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05], (not included) Nylon sleeve, black

WIRE JACK For use with J termination pins.



P/N: WJ-

example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.

Wire	Colors Available for 28C & 30C Termination									
	0	Black	2	Red	4	Yellow	6	Blue	8	Gray
	1	Brown	3	Orange	5	Green	7	Violet	9	White

Wire	Wire Length Available for 28C & 30C Termination
	Specify Length in inches: 03 – 72 [76-1829]

Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

TERMINATION PIN P/N

X39-T-G- example: X39-TJ-3G

Termination	Letter	Material/Finish
	C	Crimped. Termination material: Heat treated BeCu/gold plated over nickel. Tube material: ID precious metal clad.
	DS3	Double-ended for wireless testing. See page 69 for ordering details.
	G	Wire Grip. Heat treated BeCu/gold plated over nickel, accepts wire grip sleeve.
	J	Wire Jack. Heat treated BeCu/gold plated over nickel, accepts wire jack.
	R	Round post. Heat treated BeCu/gold plated over nickel.

Body	Digits	Description	A in (mm)	B in (mm)	C in (mm)
	0	Only available in TC	0.582 [14.78]	0.113 [2.87]	0.065 [1.65]
		Only available in TR	0.261 [6.63]	0.040 [1.02]	0.000 [0.00]
	1	Only available in TC	0.642 [16.31]	0.173 [4.39]	0.125 [3.18]
	2	Only available in TJ	0.628 [15.95]	0.077 [1.96]	0.036 [0.91]
		Only available in TR	0.675 [17.15]	0.210 [5.33]	0.125 [3.18]
	3	Only available in TG	0.975 [24.77]	0.210 [5.33]	0.125 [3.18]
		Only available in TJ	0.975 [24.77]	0.210 [5.33]	0.125 [3.18]
	4	Only available in TJ	1.100 [27.94]	0.210 [5.33]	0.125 [3.18]
	5	Only available in TJ	1.225 [31.12]	0.210 [5.33]	0.125 [3.18]
	8	Only available in TJ	1.600 [40.64]	0.210 [5.33]	0.125 [3.18]

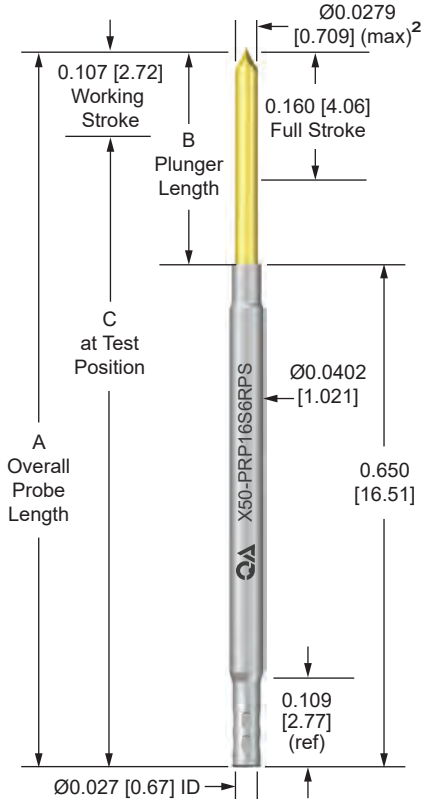
Options	Digits	Available for TG Termination Only
	2	X39-TG-3G with WG39 wire grip sleeve

Options	Digits	Wire Size Available for TC Termination Only
	3	30 AWG Kynar insulated solid wire, pre-attached. Specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached. Specify color and length

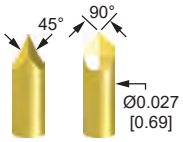
Options	Wire Colors Available for TC Termination Only									
	0	Black	2	Red	4	Yellow	6	Blue	8	Grey
	1	Brown	3	Orange	5	Green	7	Violet	9	White

Options	Wire Length Available for TC Termination
	Specify Length in inches: 03 – 72 [76-1829]
	(Blank) No option required

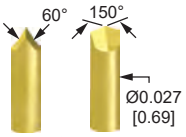
US Patent No. 6,570,399 & 4,885,533



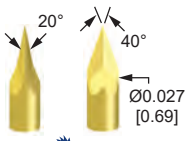
RAZOR



S6RP Razor

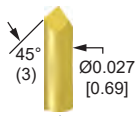


S8RP Razor

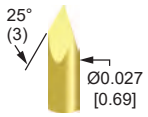


S9RP Razor

CHISEL

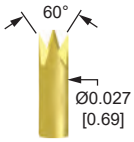


S43P Chisel



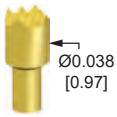
S63P Chisel

CROWN



S44H Crown

SERRATED



B39H Serrated

PROBE P/N X50-PRP16

example: X50-PRP16S43PS

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 41 mOhms	5.7 (7.8)[3]

	Letter	Material/Finish
Tip Material	B	Heat treated BeCu/gold plated over nickel
	S	Ⓢ Heat treated steel/gold plated over nickel

	Digits	Description
Tip Style	See Tips	Tip style geometry based on target type

	Letter	Tip Style Availability	Overall Probe Length (A)	Plunger Length (B)	@ Test Position (C)
Plunger Length	H	39, 44	0.870 [22.10]	0.220 [5.59]	0.763 [19.38]
	P	43, 63, 6R, 8R, 9R	0.930 [23.62]	0.280 [7.11]	0.823 [20.90]

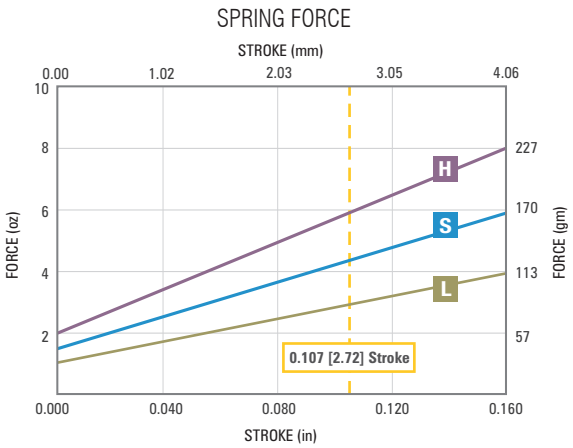
	Letter	Spring Force	Preload	@ 0.107 [2.72] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke
Spring	L	Low	1.1 [31g/0.31N]	3.0 [85g/0.83N]	SS	300,000
	S	Standard	1.5 [43g/0.42N]	4.5 [128g/1.25N]	SS	300,000
	H	High	2.0 [57g/0.56N]	6.0 [170g/1.67N]	SS	100,000

	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

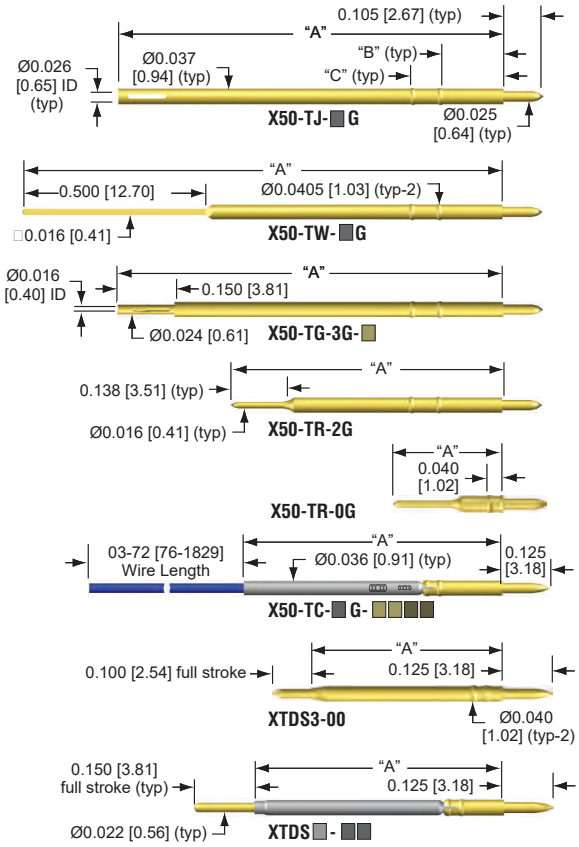


TOOLS & ACCESSORIES

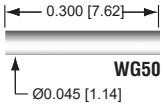
See pages 75-79 for order information.

TERMINATION PIN

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0415 / 0.0430 [1.054 / 1.092]; Drill Size #57 or 1.1mm and back plate at 0.0380 / 0.0390 [0.965 / 0.990]; Drill Size 1.0mm



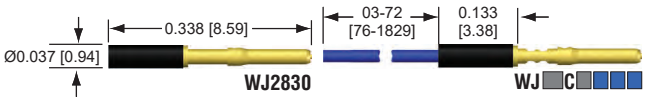
WIRE GRIP SLEEVE For use with G termination pins.



P/N: WG50

Description/Material
To accept 28AWG or 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05], (not included) Nylon sleeve, white

WIRE JACK For use with J termination pins.



P/N: WJ■■■■■■■■-■ example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.
Wire	Colors Available for 28C & 30C Termination	
	0 Black, 1 Brown, 2 Red, 3 Orange, 4 Yellow, 5 Green, 6 Blue, 7 Violet, 8 Gray, 9 White	
	Wire Length Available for 28C & 30C Termination	
	■	Specify Length in inches: 03 – 72 [76-1829]
Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

TERMINATION PIN P/N

X50-T■-■G-■■■■ example: X50-TW-2G

	Letter	Material/Finish
Termination	C	Crimped. Termination material: Heat treated BeCu/gold plated over nickel. Tube material: ID precious metal clad.
	DS3	Double-Ended for wireless testing. See page 69 for ordering details.
	J	Wire Jack. Heat treated Becu/gold plated over nickel, accepts wire jacks.
	R	Round Post. Heat treated BeCu/gold plated over nickel.
	W	Wire Wrap. Heat treated BeCu/gold plated over nickel.

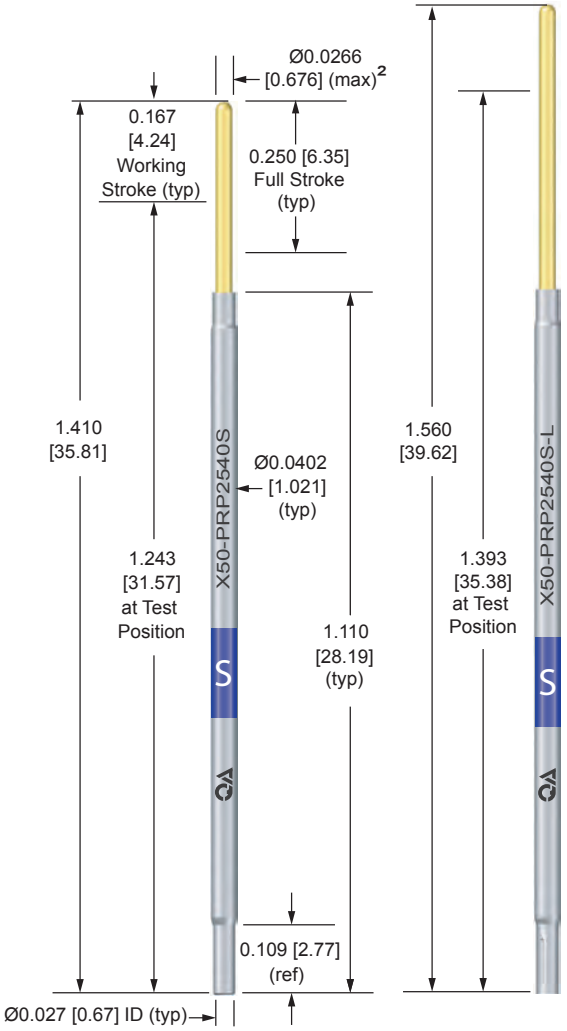
	Digits	Description	A in (mm)	B in (mm)	C in (mm)
Body	0	Only available in TC	0.623 [15.82]	0.149 [3.78]	0.100 [2.54]
		Only available in TR	0.265 [6.73]	0.040 [1.02]	0.000 [0.00]
	1	Only available in TC	0.683 [17.35]	0.209 [5.31]	0.160 [4.06]
	2	Only available in TJ	0.628 [15.95]	0.078 [1.98]	0.035 [0.89]
		Only available in TR	0.715 [18.16]	0.245 [6.22]	0.160 [4.06]
		Only available in TW	0.878 [22.30]	0.078 [1.98]	0.035 [0.89]
	3	Only available in TJ or TG	1.015 [25.78]	0.245 [6.22]	0.160 [4.06]
	5	Only available in TJ or TW	1.265 [32.13]	0.245 [6.22]	0.160 [4.06]
	7	Only available in TW	1.765 [44.83]	0.245 [6.22]	0.160 [4.06]
	00	Only available in DS	0.475 [12.07]	0.035 [0.89]	0.078 [1.98]
	08	Only available in DS	0.623 [15.82]	0.100 [2.54]	0.149 [3.78]
	14	Only available in DS	0.683 [17.35]	0.159 [4.04]	0.209 [5.31]

	Digits	Wire Size Available for TC Termination Only
Options	3	30 AWG Kynar insulated solid wire, pre-attached. Specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached. Specify color and length
	Wire Colors Available for TC Termination Only	
	0 Black, 1 Brown, 2 Red, 3 Orange, 4 Yellow, 5 Green, 6 Blue, 7 Violet, 8 Grey, 9 White	
	Wire Length Available for TC Termination	
	■	Specify Length in inches: 03 – 72 [76-1829]
	(Blank)	No option required

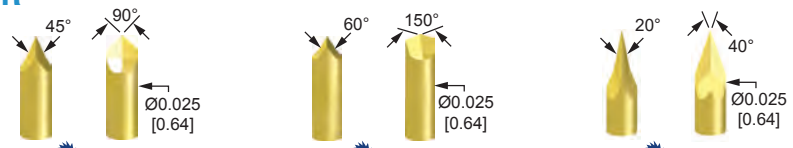
US Patent No. 6,570,399 & 4,885,533

X50-16 Series

Long Plunger (-L) Option

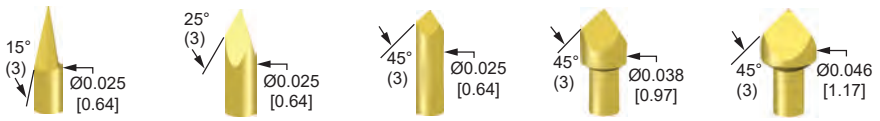


RAZOR



6R $ Razor | **8R** $ Razor | **9R** $ Razor

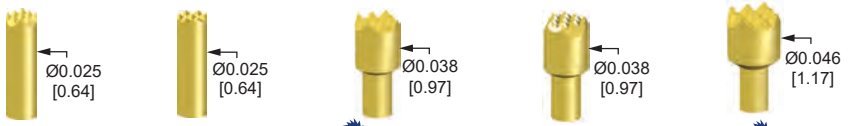
CHISEL



53 or 53 $ Chisel | **63 or 63** $ Chisel | **43 or 43** $ Chisel | **13** $ Chisel | **03 or 03** $ Chisel

0.060 [1.52] Min. Centers

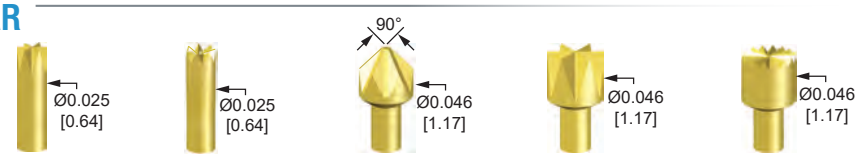
SERRATED



49 Serrated | **79** Micro Serrated | **39** $ Serrated | **59** Micro Serrated | **09 or 09** $ Serrated

0.060 [1.52] Min. Centers

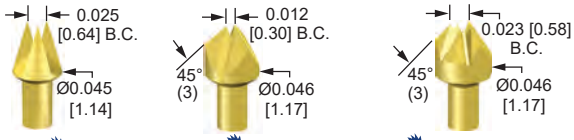
STAR



46 Flat Star | **76** Center Point Star | **06** Star | **16** Flat Star | **26** Center Point Star

0.060 [1.52] Min. Centers | 0.060 [1.52] Min. Centers | 0.060 [1.52] Min. Centers

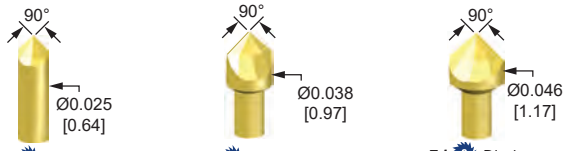
TRIAD



08 or 08 $ Triad | **18 or 18** $ Chisel Triad | **38** $ Chisel Triad

0.060 [1.52] Min. Centers | 0.060 [1.52] Min. Centers | 0.060 [1.52] Min. Centers

BLADE



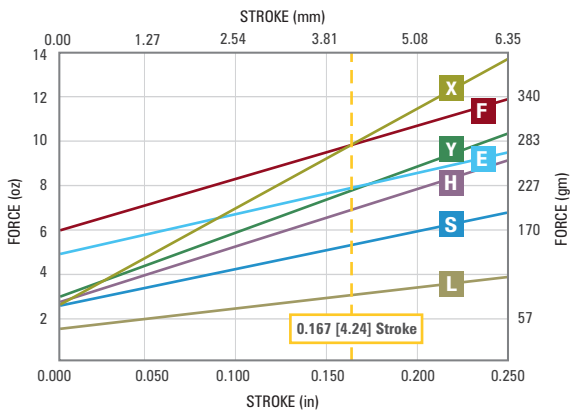
61 $ Blade | **71** $ Blade | **51** $ Blade

0.060 [1.52] Min. Centers

PROBE P/N X50-PRP25[ ][ ][ ]-[ ] example: X50-PRP2584X-S

	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad			< 35 mOhms	5.6 (7.8)[3]
Tip Style	Digits	Material/Finish				
	See Tips	Standard material is heat treated BeCu/plated gold over nickel. (see S option for steel plungers)				
Spring	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
	L	Low	1.5 [43g/0.42N]	3.1 [88g/0.86N]	MW	1,000,000
	S	Standard	2.7 [77g/0.75N]	5.5 [156g/1.53N]	MW	1,000,000
	H	High	2.7 [77g/0.75N]	7.0 [198g/1.95N]	SS	1,000,000
	Y	Elevated	3.1 [88g/0.86N]	8.0 [227g/2.22N]	MW	250,000
	X	Extra	2.7 [77g/0.75N]	10.1 [286g/2.81N]	MW	100,000
		High Preload Spring – *Only available with headless* $ *steel tip styles.*				
	E	High Preload	5.0 [142g/1.39N]	8.0 [227g/2.22N]	SS	300,000
	F	High Preload	6.0 [170g/1.67N]	10.0 [283g/2.78N]	SS	300,000
Option	Letter	Description				
	L	Long plunger. Must select from X50-40 tip styles				
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]				
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)				
	(Blank)	No option required				

SPRING FORCE

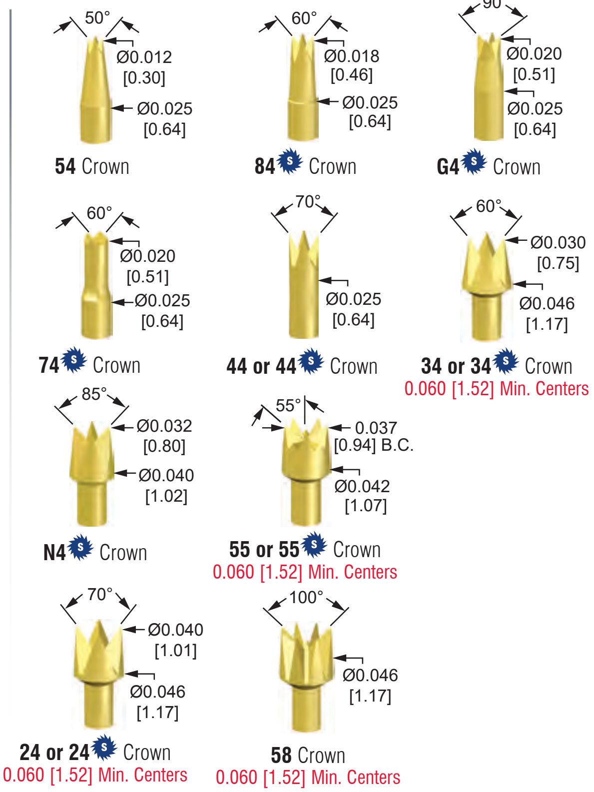


[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

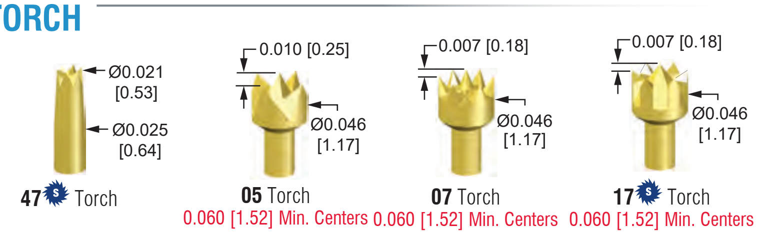
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

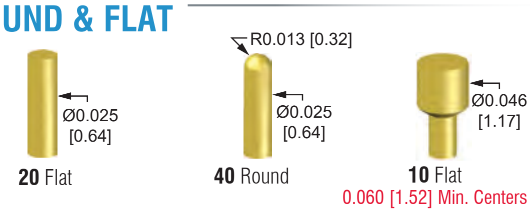
CROWN



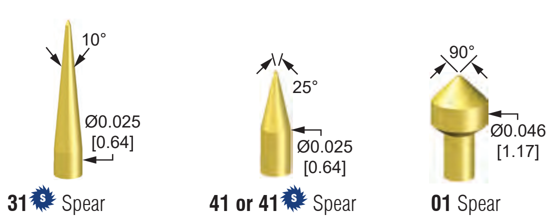
TORCH



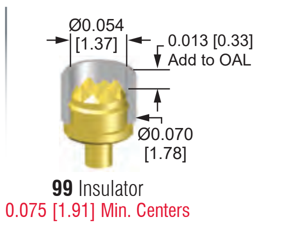
ROUND & FLAT



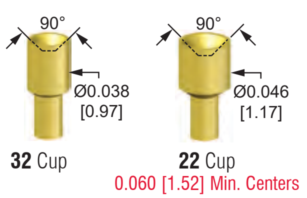
SPEAR



INSULATOR



CUP

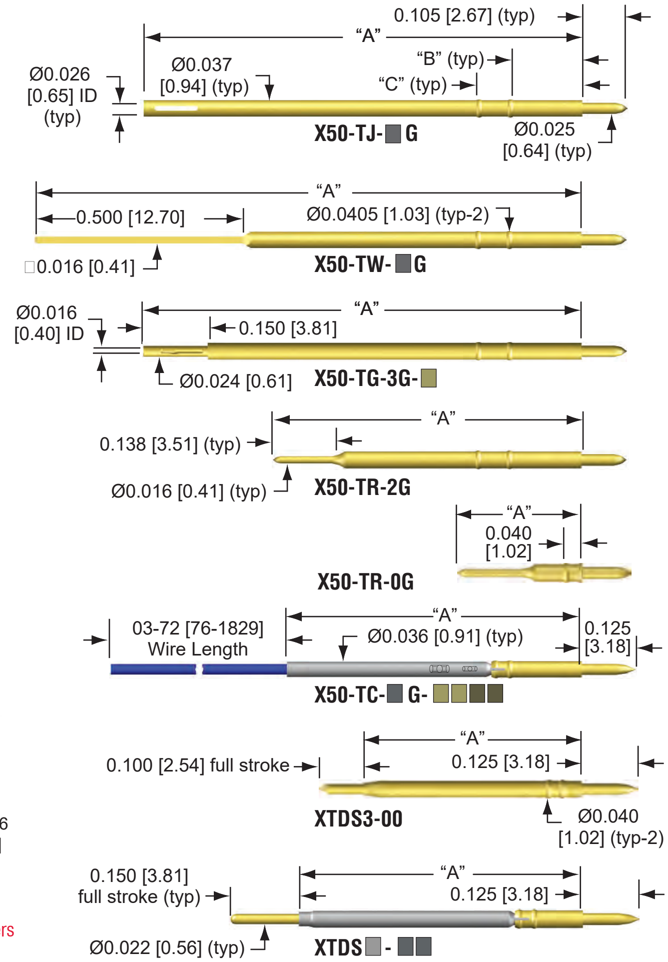


TOOLS & ACCESSORIES

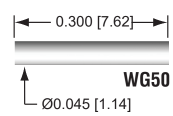
See pages 75-79 for order information.

TERMINATION PIN See page 61 for order information.

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0415 / 0.0430 [1.054 / 1.092]; Drill Size #57 or 1.1mm and back plate at 0.0380 / 0.0390 [0.965 / 0.990]; Drill Size 1.0mm



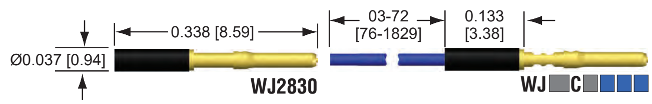
WIRE GRIP SLEEVE For use with G termination pins.



P/N: WG50

Description/Material
To accept 28AWG or 30AWG solid insulated wire, stripped at 0.120 [3.05], (not included) Nylon sleeve, white

WIRE JACK For use with J termination pins.



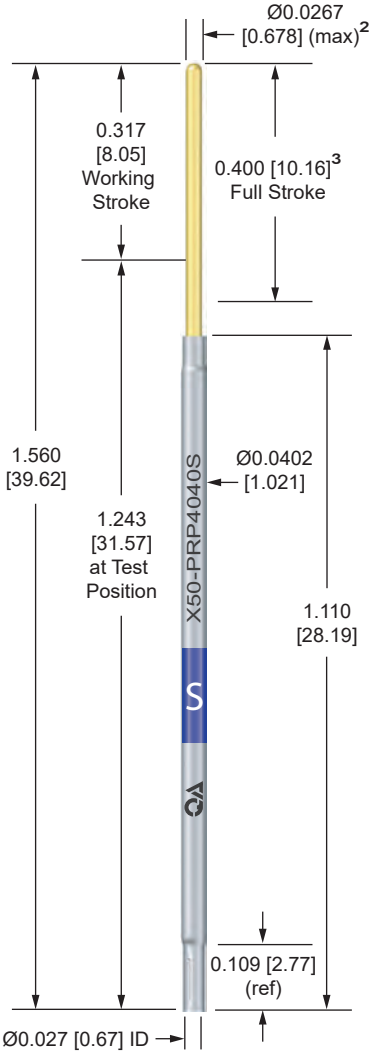
P/N: WJ■■■■■■-■ example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.

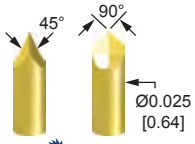
Wire	Colors Available for 28C & 30C Termination							
	0	Black	2	Red	4	Yellow	6	Blue	8	Gray
	1	Brown	3	Orange	5	Green	7	Violet	9	White

Wire	Wire Length Available for 28C & 30C Termination
	Specify Length in inches: 03 – 72 [76-1829]

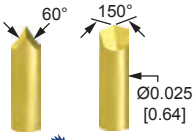
Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches



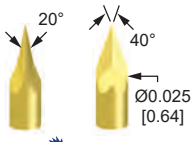
RAZOR



6R $ Razor

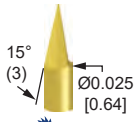


8R $ Razor

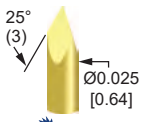


9R $ Razor

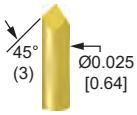
CHISEL



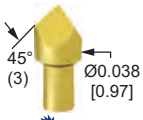
53 $ Chisel



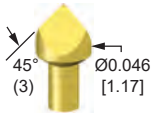
63 $ Chisel



43 Chisel

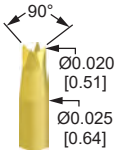


13 $ Chisel

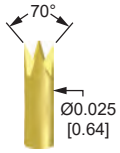


03 Chisel
0.060 [1.52] Min. Centers

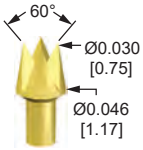
CROWN



G4 $ Crown

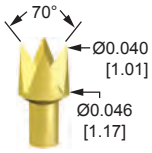


44 Crown



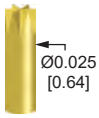
34 Crown
0.060 [1.52] Min. Centers

94 $ Crown



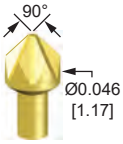
24 Crown
0.060 [1.52] Min. Centers

STAR



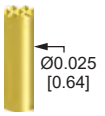
46 Flat Star

76 Center Point Star

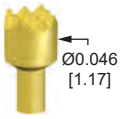


06 Star
0.060 [1.52] Min. Centers

SERRATED

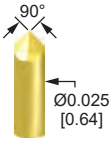


79 Micro Serrated

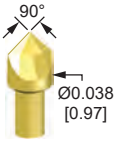


09 Serrated
0.060 [1.52] Min. Centers

BLADE

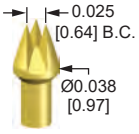


61 $ Blade

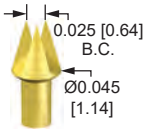


71 $ Blade

TRIAD



28 $ Triad



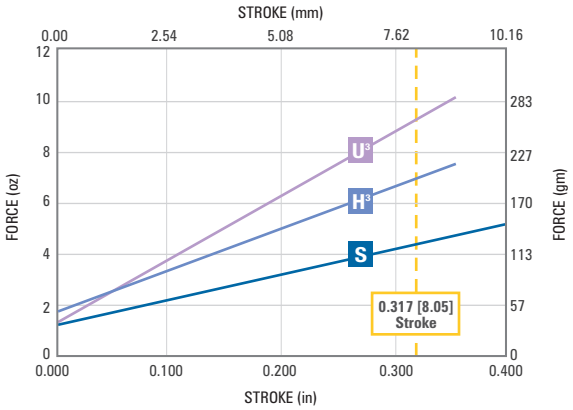
08 Triad
0.060 [1.52] Min. Centers

PROBE P/N X50-PRP40■■■-■ example: X50-PRP4044S

	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
Tube	P	Nickel silver/ID precious metal clad			< 35 mOhms	5.3 (7.8)[4]
	Digits	Material/Finish				
Tip Style	See Tips	Heat treated BeCu/plated gold over nickel. (see S option for steel plungers)				
	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
Spring	S	Standard	1.2 [34g/0.33N]	4.3 [122g/1.20N]	SS	500,000
	H[3]	High	1.7 [48g/0.47N]	7.0 [198g/1.95N]	SS	300,000
	U[3]	Ultra	1.3 [37g/0.36N]	9.3 [264g/2.59N]	MW	10,000
	Letter	Description				
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[4]				
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)				
	(Blank)	No option required				

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] 0.350 [8.89] max stroke for H & U spring.
[4] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE



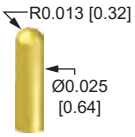
TOOLS & ACCESSORIES

See pages 75-79 for order information.

SPEAR

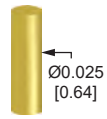
41 Spear

ROUND



40 Round

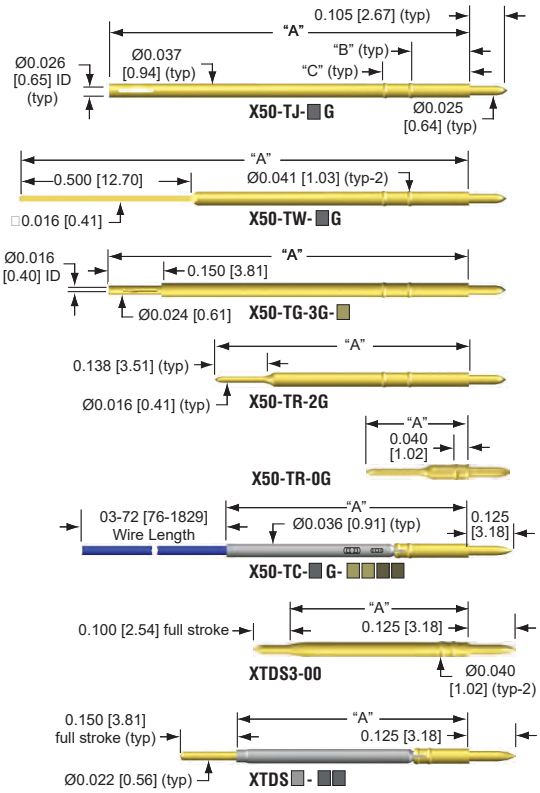
FLAT



20 Flat

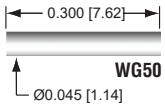
TERMINATION PIN

Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0415 / 0.0430 [1.054 / 1.092]; Drill Size #57 or 1.1mm and back plate at 0.0380 / 0.0390 [0.965 / 0.990]; Drill Size 1.0mm



WIRE GRIP SLEEVE

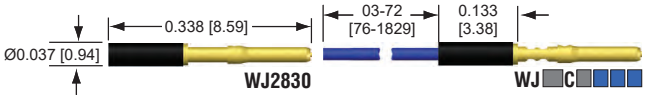
For use with G termination pins.



P/N: WG50

Description/Material
To accept 28AWG or 30AWG Kynar solid insulated wire, stripped at 0.120 [3.05], (not included) Nylon sleeve, white

WIRE JACK For use with J termination pins.



P/N: WJ■■■■■■■■-■ example: WJ28C8230

	Digit	Description
Size	2830	Wire Jack only (customer to crimp wire) brass/gold plated with nylon insulator.
	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length.
	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length.
Wire	Colors Available for 28C & 30C Termination	
	0 Black, 1 Brown, 2 Red, 3 Orange, 4 Yellow, 5 Green, 6 Blue, 7 Violet, 8 Gray, 9 White	
	Wire Length Available for 28C & 30C Termination	
	■	Specify Length in inches: 03 – 72 [76-1829]
Option	Letter	Description
	S	Stripped Length 0.000/0.669 [0.00/16.99]; Customer to specify in inches

TERMINATION PIN P/N

X50-T■-■G-■■■ example: X50-TW-5G

	Letter	Material/Finish
Termination	C	Crimped. Termination material: Heat treated BeCu/gold plated over nickel. Tube Material: ID precious metal clad.
	DS	Double-ended for wireless testing. See page 69 for ordering details.
	G	Wire Grip. Heat treated BeCu/gold plated over nickel, accepts wire grip sleeve.
	J	Wire Jack. Heat treated BeCu/gold plated over nickel, accepts wire jack.
	R	Round post. Heat treated BeCu/gold plated over nickel.
	W	Wire Wrap. Heat treated BeCu/gold plated over nickel.

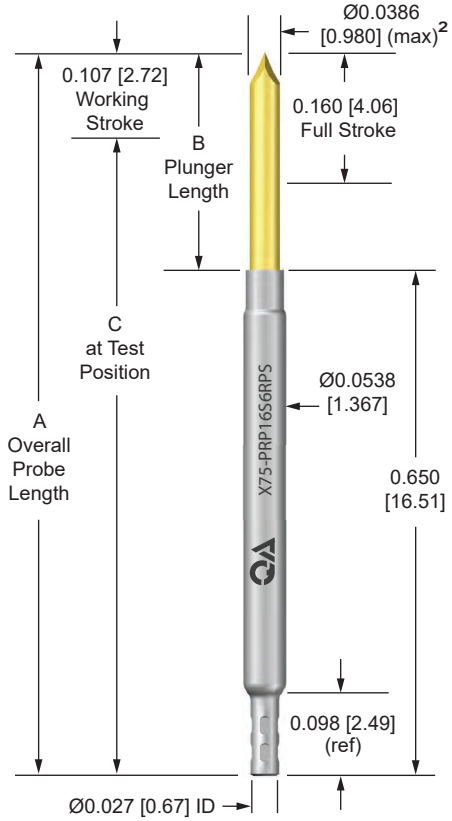
	Digits	Description	A in (mm)	B in (mm)	C in (mm)
Body	0	Only available in TC	0.623 [15.82]	0.149 [3.78]	0.100 [2.54]
		Only available in TR	0.265 [6.73]	0.040 [1.02]	0.000 [0.00]
	1	Only available in TC	0.683 [17.35]	0.209 [5.31]	0.160 [4.06]
	2	Only available in TJ	0.628 [15.95]	0.078 [1.98]	0.035 [0.89]
		Only available in TR	0.715 [18.16]	0.245 [6.22]	0.160 [4.06]
		Only available in TW	0.878 [22.30]	0.078 [1.98]	0.035 [0.89]
	3	Only available in TJ or TG	1.015 [25.78]	0.245 [6.22]	0.160 [4.06]
	5	Only available in TJ or TW	1.265 [32.13]	0.245 [6.22]	0.160 [4.06]
	7	Only available in TW	1.765 [44.83]	0.245 [6.22]	0.160 [4.06]
	00	Only available in DS	0.475 [12.07]	0.035 [0.89]	0.078 [1.98]
	08	Only available in DS	0.623 [15.82]	0.100 [2.54]	0.149 [3.78]
	14	Only available in DS	0.683 [17.35]	0.159 [4.04]	0.209 [5.31]

	Digits	Available for TG Termination Only
Options	3	X50-TG-3G with WG50 wire grip sleeve

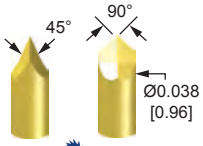
	Digits	Wire Size Available for TC Termination Only
Options	3	30 AWG Kynar insulated solid wire, pre-attached. Specify color and length
	8	28 AWG Kynar insulated solid wire, pre-attached. Specify color and length

Wire Colors Available for TC Termination Only										
0	Black	2	Red	4	Yellow	6	Blue	8	Grey
1	Brown	3	Orange	5	Green	7	Violet	9	White

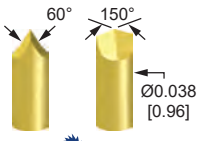
Wire Length Available for TC Termination	
■	Specify Length in inches: 03 – 72 [76-1829]
(Blank)	No option required



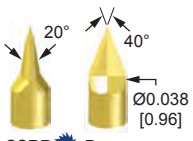
RAZOR



S6RP Razor

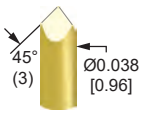


S8RP Razor

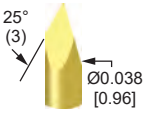


S9RP Razor

CHISEL

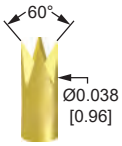


S43P Chisel

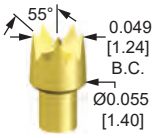


S63P Chisel

CROWN



S44H Crown



S55H Crown

PROBE P/N X75-PRP16 example: X75-PRP16S63PS

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	P	Nickel silver/ID precious metal clad	< 26 mOhms	6.9 (9.5)[3]

	Letter	Material/Finish
Tip Material	B	Heat treated BeCu/gold plated over nickel
	S	Heat treated steel/gold plated over nickel

	Digits	Description
Tip Style	See Tips	Tip style geometry based on target type

	Letter	Tip Style Availability	Overall Probe Length (A)	Plunger Length (B)	@ Test Position (C)
Plunger Length	H	09, 44, 55	0.870 [22.10]	0.220 [5.59]	0.763 [19.38]
	P	43, 51, 63, 6R, 8R, 9R	0.930 [23.62]	0.280 [7.11]	0.823 [20.90]

	Letter	Spring Force	Preload	@ 0.107 [2.72] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke
Spring	L	Low	1.3 [37g/0.36N]	3.0 [85g/0.83N]	SS	300,000
	S	Standard	1.9 [54g/0.53N]	4.5 [128g/1.25N]	SS	300,000
	H	High	2.3 [65g/0.64N]	6.0 [170g/1.67N]	SS	300,000
	Y	Elevated	3.0 [85g/0.83N]	8.0 [227g/2.22N]	SS	100,000

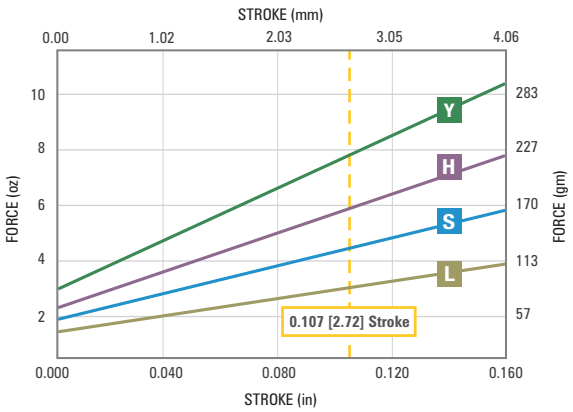
	Letter	Description
Option	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]
	(Blank)	No option required

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

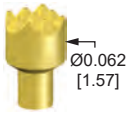
SPRING FORCE



TOOLS & ACCESSORIES

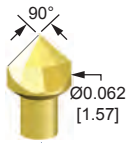
See pages 75-79 for order information.

SERRATED



B09H Serrated

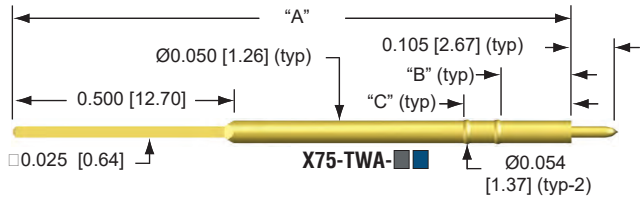
BLADE

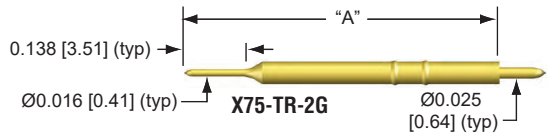


S51P Blade

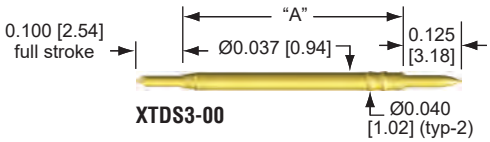
TERMINATION PIN

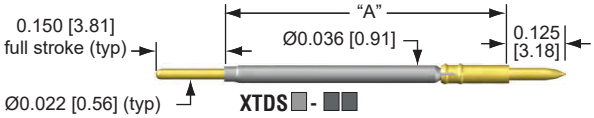
Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0545 / 0.0560 [1.384 / 1.422]; Drill Size #54 or 1.40mm and wired back plate at 0.0515 / 0.0525 [1.308 / 1.333]; Drill Size #55 or 1.35mm or wireless back plate at 0.0380 / 0.0390 [0.965 / 0.990]; Drill Size 1.0mm





X75-TR-0G





TERMINATION PIN P/N

X75-T□-■■ example: X75-TWA-2G

	Letter	Material/Finish
Termination	DS3	Double-Ended for wireless testing. See page 69 for ordering details.
	R	Round Post. Heat treated BeCu or phos bronze/gold plated over nickel.
	WA	Wire Wrap. Heat treated BeCu or copper alloy/gold or silver plated over nickel.

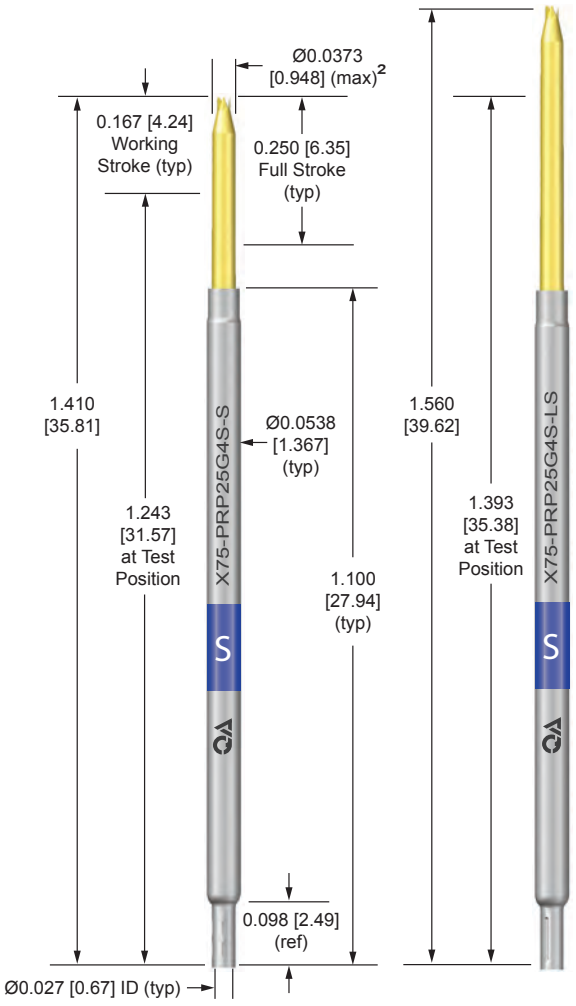
	Digits	Description	A in (mm)	B in (mm)	C in (mm)
Body	0	Only available in TR	0.271 [6.88]	0.039 [0.99]	0.000 [0.00]
	2	Only available in TWA	0.878 [22.30]	0.079 [2.00]	0.034 [0.86]
		Only available in TR	0.715 [18.16]	0.245 [6.22]	0.160 [4.06]
	5	Only available in TWA	1.265 [32.13]	0.245 [6.22]	0.160 [4.06]
	7	Only available in TW	1.765 [44.83]	0.245 [6.22]	0.160 [4.06]
	00	Only available in DS	0.475 [12.07]	0.035 [0.89]	0.078 [1.98]
	08	Only available in DS	0.623 [15.82]	0.100 [2.54]	0.149 [3.78]
	14	Only available in DS	0.683 [17.34]	0.159 [4.04]	0.209 [5.31]

	Letter	Material
Plating	G	Gold plated over nickel.
	S	Silver plated over nickel. ①

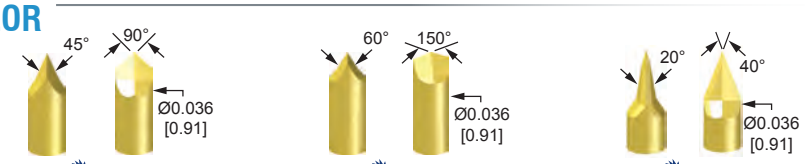
NOTES: ① Only Available TWA-5

US Patent No. 6,570,399 & 4,885,533

Long Plunger (-L) Option

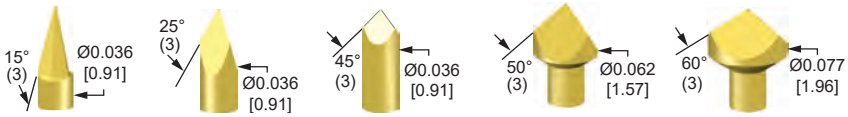


RAZOR



6R Razor | **8R** Razor | **9R** Razor

CHISEL

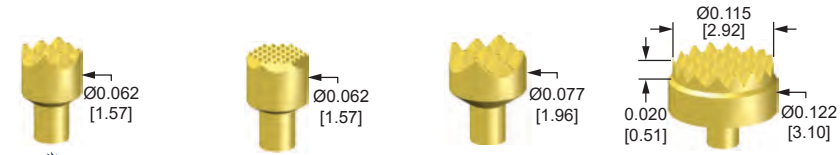


53 or 53 Chisel | **63 or 63** Chisel | **43 or 43** Chisel | **03 or 03** Chisel | **23** Chisel

0.095 [2.41] Min. Centers

SERRATED

B9 Serrated | **49** Serrated | **79** Micro Serrated | **64** Serrated



09 or 09 Serrated | **59** Micro Serrated | **29** Serrated | **19** Serrated

0.095 [2.41] Min. Centers

0.130 [3.56] Min. Centers

STAR

36 Flat Star | **46** Flat Star | **76** Center Point Star | **N6 or N6** Star

06 Star | **16** Flat Star | **26** Center Point Star

PROBE P/N X75-PRP25[ ][ ][ ]-[ ] example: X75-PRP2503S

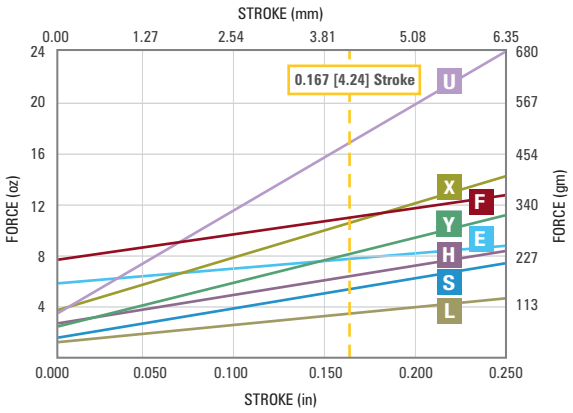
Tube	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
	P	Nickel silver/ID precious metal clad			< 25 mOhms	8.4 (12.0)[3]
Tip Style	Digits	Material/Finish				
	See Tips	Standard material is heat treated BeCu/plated gold over nickel. (see S option for steel plungers)				
Spring	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
	L	Low	1.3 [37g/0.36N]	3.5 [99g/0.97N]	SS	1,000,000
	S	Standard	1.6 [45g/0.44N]	5.5 [156g/1.53N]	MW	1,000,000
	H	High	2.8 [79g/0.78N]	6.5 [184g/1.81N]	SS	1,000,000
	Y	Elevated	2.3 [65g/0.64N]	8.1 [230g/2.25N]	MW	1,000,000
	X	Extra	3.6 [102g/1.00N]	10.8 [306g/3.00N]	MW	1,000,000
	U	Ultra	3.3 [94g/0.92N]	17.1 [485g/4.75N]	MW	100,000
		High Preload Spring – *Only available with headless S steel tip styles*				
	E	High Preload	6.0 [170g/1.67N]	8.0 [227g/2.22N]	SS	1,000,000
	F	High Preload	7.6 [215g/2.12N]	11.0 [312g/3.06N]	SS	300,000
Option	Letter	Description				
	L	Long plunger. Must select from 039-40 tip styles				
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[3]				
	S	S Heat treated steel/plated gold over nickel (see tip style for availability)				
	(Blank)	No option required				

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE



TOOLS & ACCESSORIES

See pages 75-79 for order information.

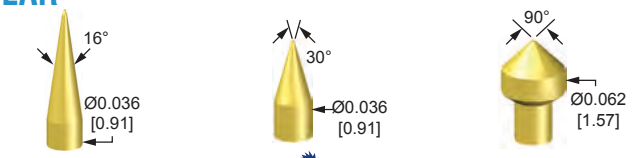
CROWN

54 Crown | **74 or 74$** Crown | **G4$** Crown | **84$** Crown | **N4$** Crown | **44 or 44$** Crown | **14** Crown

34 or 34$** Crown | **24 or 24$ Crown | **55 or 55$** Crown | **04** Crown | **58 or 58$** Crown | **56** Crown

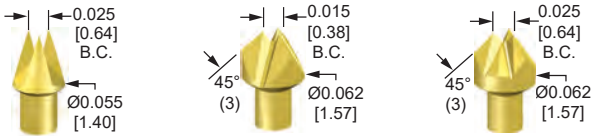
0.095 [2.41] Min. Centers

SPEAR



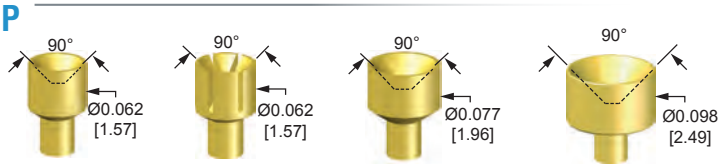
31$** Spear | **41 or 41$ Spear | **01** Spear

TRIAD



08 or 08$** Triad | **18 or 18$ Chisel Triad | **38** Chisel Triad

CUP

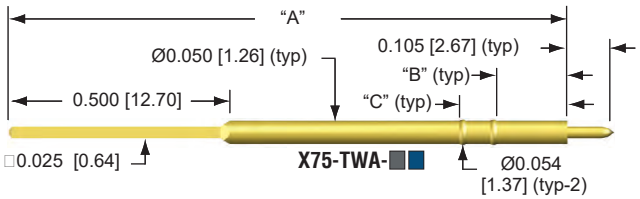


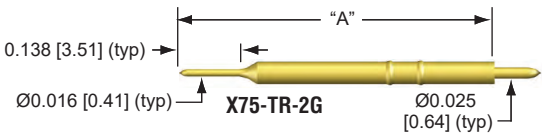
22 Cup | **52** Slotted Cup | **32** Cup | **82** Cup

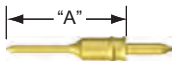
0.095 [2.41] Min. Centers | 0.120 [2.05] Min. Centers

TERMINATION PIN **See page 67 for order information.**

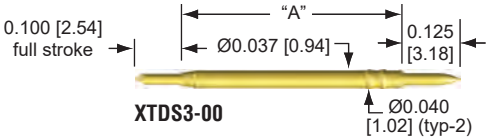
Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0545 / 0.0560 [1.384 / 1.422]; Drill Size #54 or 1.40mm and wired back plate at 0.0515 / 0.0525 [1.308 / 1.333]; Drill Size #55 or 1.35mm or wireless back plate at 0.0380 / 0.0390 [0.965 / 0.990]; Drill Size 1.0mm



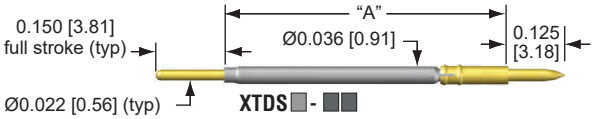




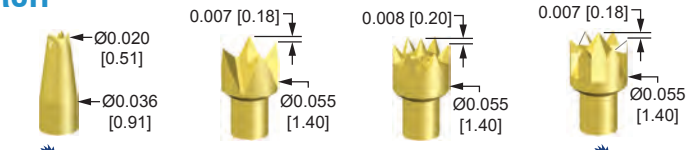
X75-TR-0G



XTDS3-00

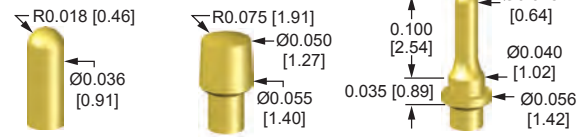


TORCH



47$ Torch | **05** Torch | **07** Torch | **17 or 17$** Torch

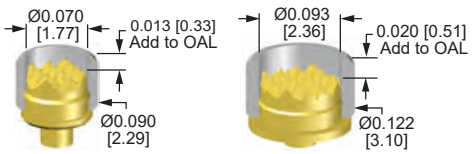
ROUND



40 Round | **30** Round | **70** Connector

0.170 [4.32] Full Stroke

INSULATOR



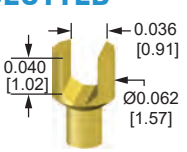
99 Insulator | **89** Insulator

0.100 [2.54] Min. Center | 0.130 [3.30] Min. Centers

FLAT

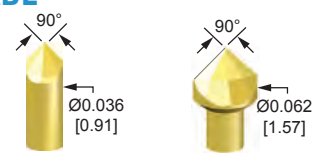
20 Flat | **10** Flat

SLOTTED



62 Slotted

BLADE

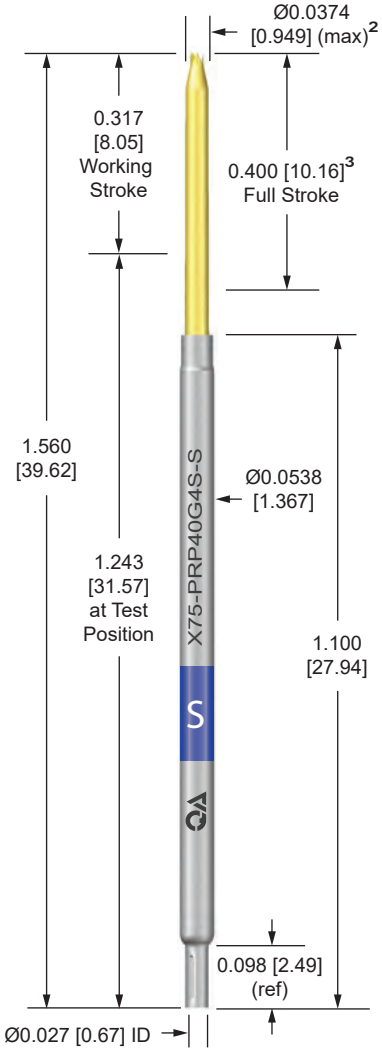


61$** Blade | **51 or 51$ Blade

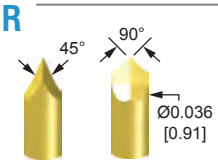
X75-25 Series

X75-40 Series

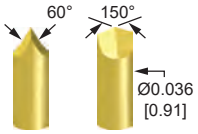
0.075 [1.91] Centers | 0.400 [10.16] Full Stroke



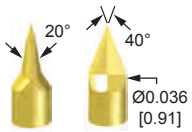
RAZOR



6R $ Razor

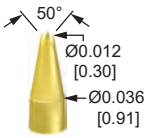


8R $ Razor

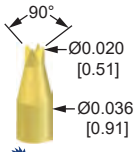


9R $ Razor

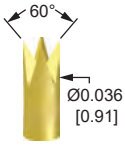
CROWN



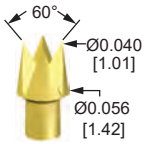
54 Crown



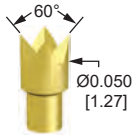
G4 $ Crown



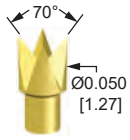
44 Crown



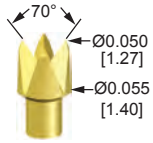
34 Crown



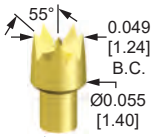
14 Crown



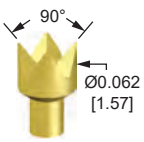
94 Crown



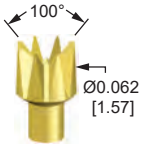
24 Crown



55 $ Crown

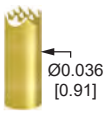


04 Crown

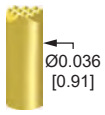


58 Crown

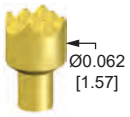
SERRATED



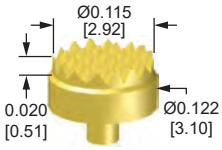
49 Serrated



79 Micro Serrated



09 Serrated

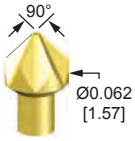


19 Serrated
0.150 [3.81] Min. Centers

STAR

46 Flat Star

76 Center Point Star

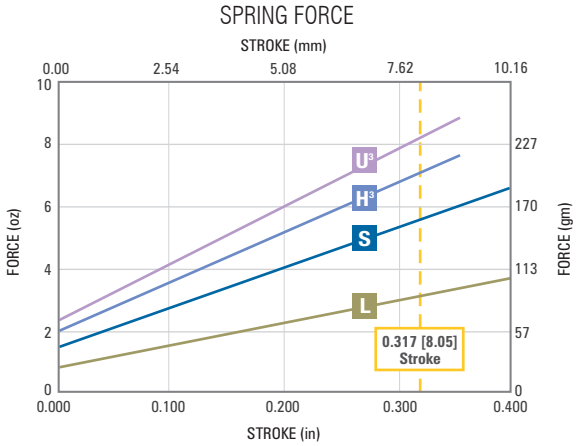


06 Star

PROBE P/N X75-PRP40[ ][ ][ ]-[ ] example: X75-PRP4003L

Tube	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[4]
	P	Nickel silver/ID precious metal clad			< 20 mOhms	7.9 (11.3)[4]
Tip Style	Digits	Material/Finish				
	See Tips	Heat treated BeCu/plated gold over nickel. (see S option for steel plungers)				
Spring	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
	L	Low	0.8 [23g/0.22N]	3.0 [85g/0.83N]	MW	1,000,000
	S	Standard	1.5 [43g/0.42N]	5.7 [162g/1.58N]	SS	500,000
	H[3]	High	2.0 [57g/0.56N]	7.0 [198g/1.95N]	SS	300,000
	U[3]	Ultra	2.5 [71g/0.70N]	8.1 [230g/2.25N]	MW	10,000
Option	Letter	Description				
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range, see Testing in Extreme Working Temperatures application note for more details.[4]				
	S	$ Heat treated steel/plated gold over nickel (see tip style for availability)				
	(Blank)	No option required				

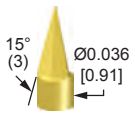
[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] 0.350 [8.89] max stroke for H & U spring.
[4] Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.



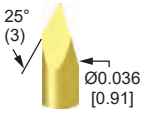
TOOLS & ACCESSORIES

See pages 75-79 for order information.

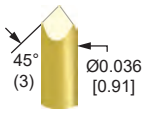
CHISEL



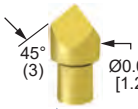
53 or 53S Chisel



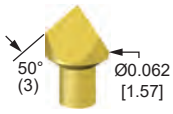
63S Chisel



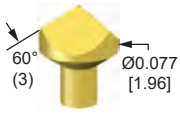
43 Chisel



13S Chisel

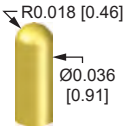


03 Chisel

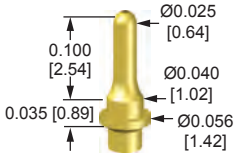


23 Chisel
0.095 [2.41] Min. Centers

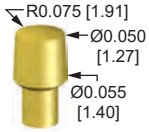
ROUND



40 Round

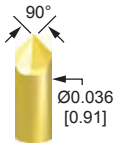


70 Connector
0.325 [8.26] Full Stroke

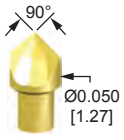


30 Round

BLADE

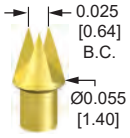


61S Blade

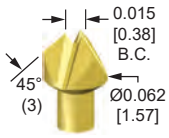


71S Blade

TRIAD

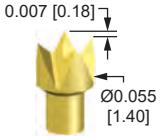


08 Triad

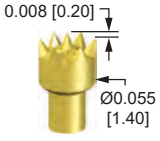


18 Chisel Triad

TORCH

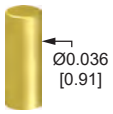


05 Torch

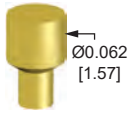


07 Torch

FLAT

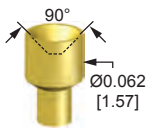


20 Flat



10 Flat

CUP



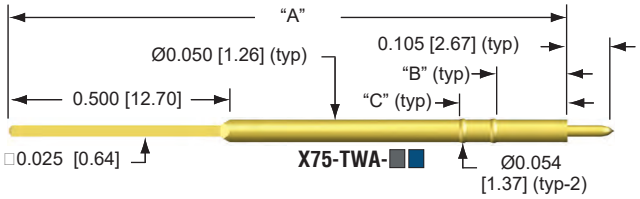
22 Cup

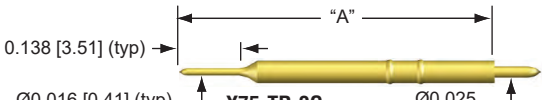
SPEAR

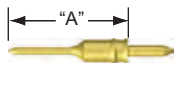
41 Spear

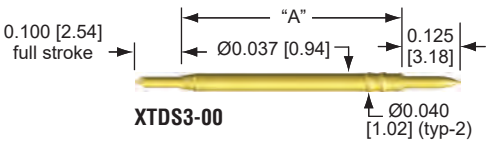
TERMINATION PIN

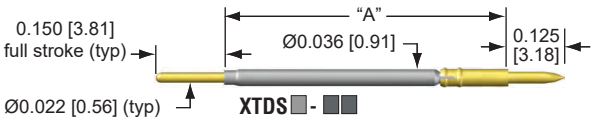
Suggested mounting holes and drill sizes in AT7000, G10/FR4 or similar materials should be gauged in probe plate at 0.0545 / 0.0560 [1.384 / 1.422]; Drill Size #54 or 1.40mm and wired back plate at 0.0515 / 0.0525 [1.308 / 1.333]; Drill Size #55 or 1.35mm or wireless back plate at 0.0380 / 0.0390 [0.965 / 0.990]; Drill Size 1.0mm











TERMINATION PIN P/N

**X75-T - ** example: X75-TWA-5G

	Letter	Material
Termination	DS	Double-Ended for wireless testing. See page 69 for ordering details.
	R	Round Post. Heat treated BeCu/gold plated over nickel.
	WA	Wire Wrap. Heat treated BeCu. See plating options.

	Digits	Description	A in (mm)	B in (mm)	C in (mm)
Body	0	Only available in TR	0.271 [6.88]	0.039 [0.99]	0.000 [0.00]
	2	Only available in TWA	0.878 [22.30]	0.079 [2.00]	0.034 [0.86]
		Only available in TR	0.715 [18.16]	0.245 [6.22]	0.160 [4.06]
	5	Only available in TWA	1.265 [32.13]	0.245 [6.22]	0.160 [4.06]
	7	Only available in TW	1.765 [44.83]	0.245 [6.22]	0.160 [4.06]
	00	Only available in DS	0.475 [12.07]	0.035 [0.89]	0.078 [1.98]
	08	Only available in DS	0.623 [15.82]	0.100 [2.54]	0.149 [3.78]
	14	Only available in DS	0.683 [17.34]	0.159 [4.04]	0.209 [5.31]

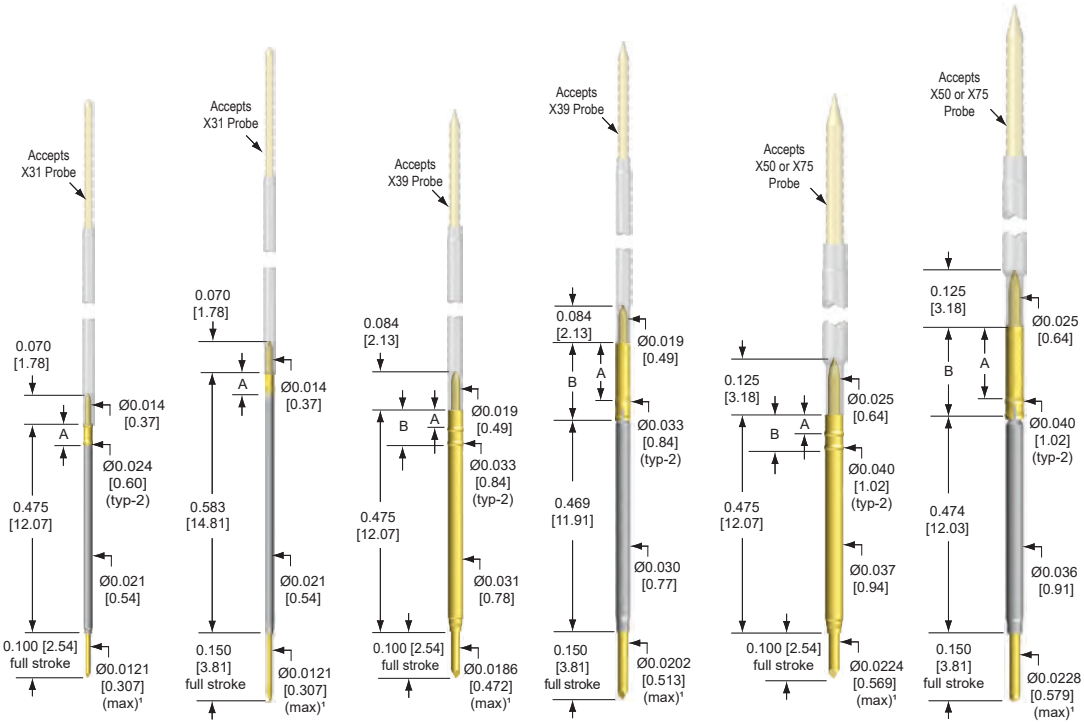
	Letter	Material
Plating	G	Gold plated over nickel.
	S	Silver plated over nickel. ①

NOTES: ① Only Available TWA-5

US Patent No. 6,570,399 & 4,885,533

Wireless Termination Pin

Wireless termination pins allow construction of X Probe socketless fixtures with far shorter signal path lengths than conventional wire wrap designs. The shorter path length allows better control of the signal from the tester circuits to the Unit Under Test (UUT). Note: Top test probe is not included with the wireless termination. (See applicable product series for ordering information).



X31-TDS3-00
Mounting Hole Dia.
0.0217/0.0225
[0.551/0.572]

X31-TDS3-02
Mounting Hole Dia.
0.0217/0.0225
[0.551/0.572]

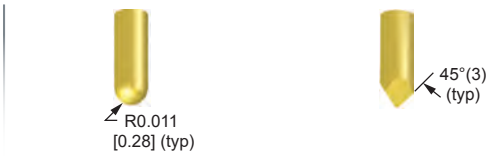
X39-TDS3-00
Mounting Hole Dia.
0.0315/0.0325
[0.800/0.826]

X39-TDS3-__
Mounting Hole Dia.
0.0315/0.0325
[0.800/0.826]

XTDS3-00
Mounting Hole Dia.
0.0380/0.0390
[0.965/0.990]

XTDS_-__
Mounting Hole Dia.
0.0380/0.0390
[0.965/0.990]

INTERFACE PROBE TIP STYLES



0 Round

3 Chisel

P/N: X31-TDS3-■■ example: X31-TDS3-02

	Digit	Description
Tip Style	3	Chisel. Heat treated BeCu/gold plated over nickel

	Digit	Tube Material	A in(mm)
Set Height	00	Nickel silver/ID precious metal clad	0.048 [1.22]
	02	Nickel silver/ID precious metal clad	0.048 [1.22]

[1] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

US Patent No. 6,570,399 & 4,885,533

INTERFACE PROBE SPECIFICATIONS

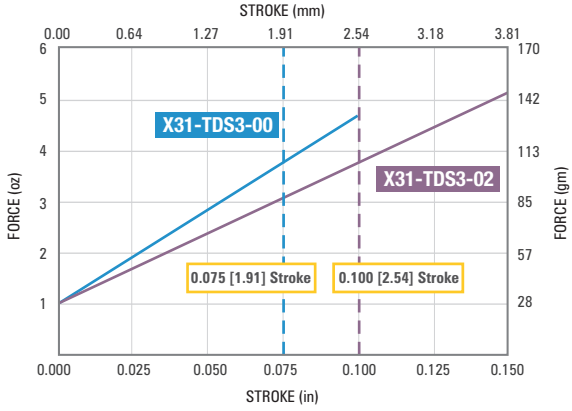
Working Stroke: Up to 0.100 [2.54]/0.075 [1.91] all - 00

Working Temperature Range: Up to 204°C

Spring Force:

Series	Preload	@ 0.100 [2.54] Stroke	Material	Cycle Life @ 0.100 [2.54] Stroke
X31-00	1.0 [28g/0.28N]	3.8 [108g/1.04N]	SS	10,000*
X31-02	1.0 [28g/0.28N]	3.8 [108g/1.04N]	SS	10,000
X39-00	1.0 [28g/0.28N]	4.5 [128g/1.25N]	SS	25,000
X39-04/10	1.0 [28g/0.28N]	4.3 [122g/1.18N]	SS	25,000
XTD-00	1.0 [28g/0.28N]	4.5 [128g/1.25N]	SS	10,000
XTD-08/14	0.8 [23g/0.23N]	3.8 [108g/1.04N]	SS	100,000

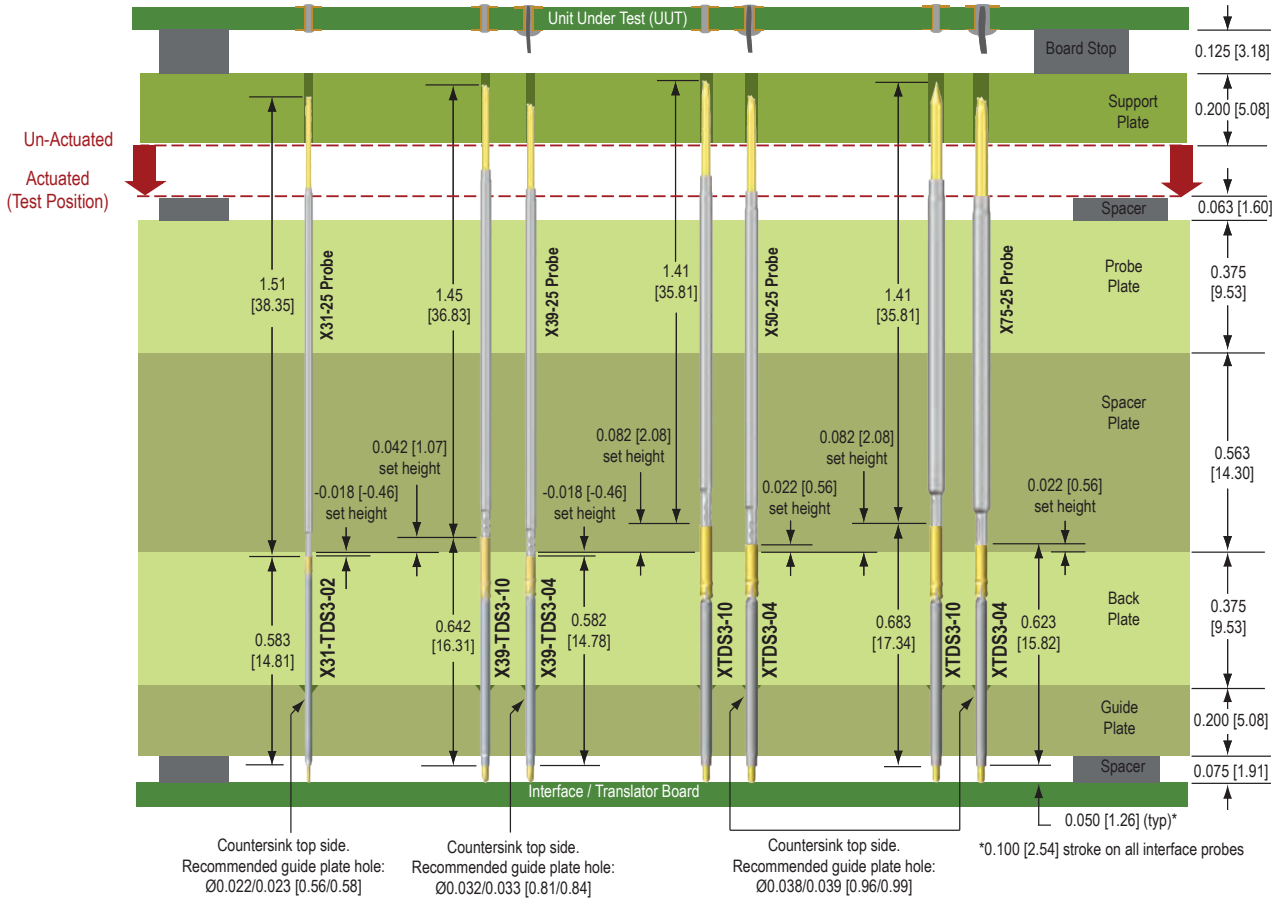
* Working stroke @ 0.075 [1.91]



TOOLS & ACCESSORIES

See pages 75-79 for order information.

SUGGESTED MOUNTING FIXTURE

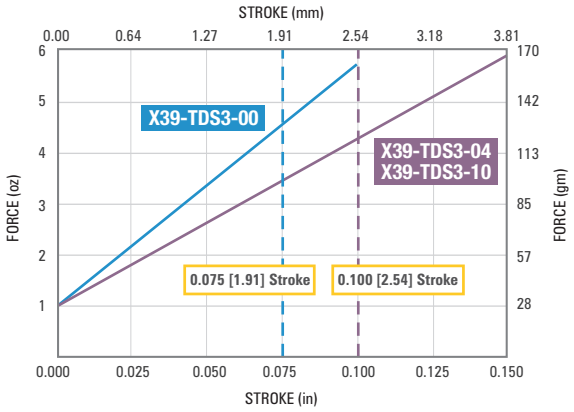


P/N: X39-TDS3-■■ example: X39-TDS3-04

	Digit	Description
Tip Style	3	Chisel. Heat treated BeCu/gold plated over nickel

	Digit	Tube Material	A in(mm)	B in(mm)
Set Height	00	Heat treated BeCu/gold plated over nickel	0.036 [0.92]	0.077 [1.95]
	04	Nickel silver/ID precious metal clad	0.065 [1.65]	0.113 [2.87]
	10	Nickel silver/ID precious metal clad	0.125 [3.18]	0.173 [4.39]

[1] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

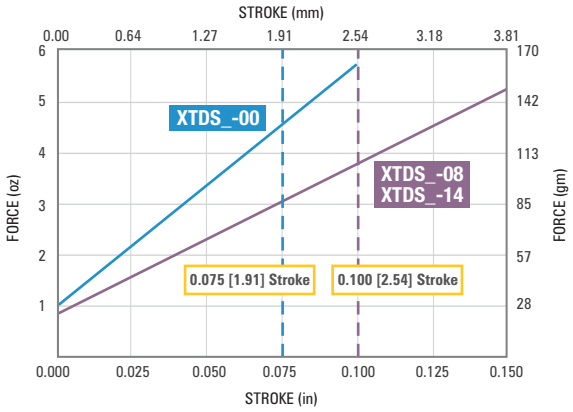


P/N: XTDS■-■■ example: XTDS3-08

	Digit	Description
Tip Style	0	Spherical. Heat treated BeCu/gold plated over nickel
	3	Chisel. Heat treated BeCu/gold plated over nickel

	Digit	Tube Material	A in(mm)	B in(mm)
Set Height	00	Heat treated BeCu/gold plated over nickel	0.035 [0.89]	0.078 [1.98]
	08	Nickel silver/ID precious metal clad	0.100 [2.54]	0.149 [3.78]
	14	Nickel silver/ID precious metal clad	0.159 [4.04]	0.209 [5.31]

[1] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.



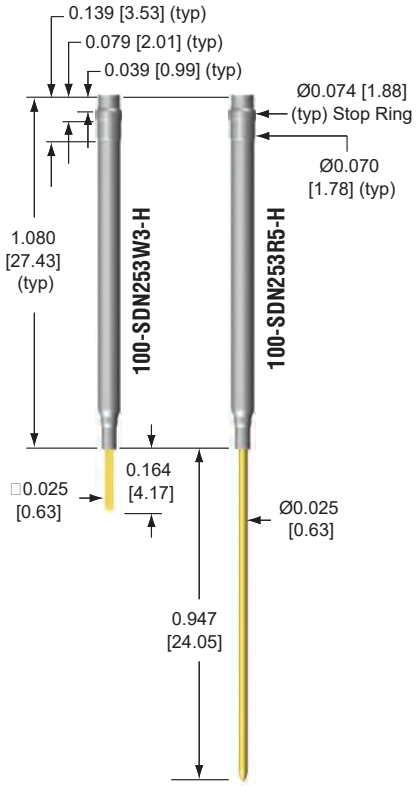
Tester Interface Probes

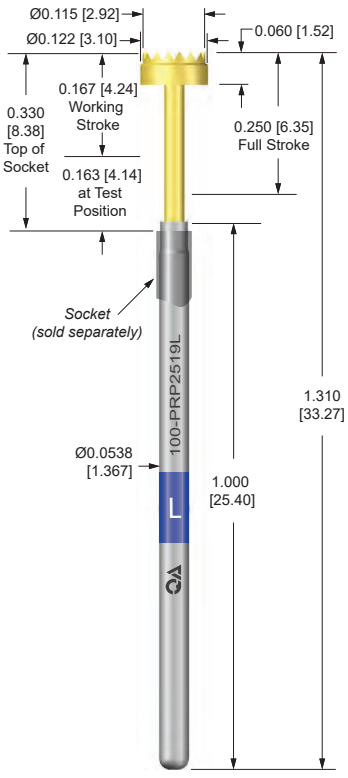
KEYSIGHT/AGILENT
100-SDN253■■H

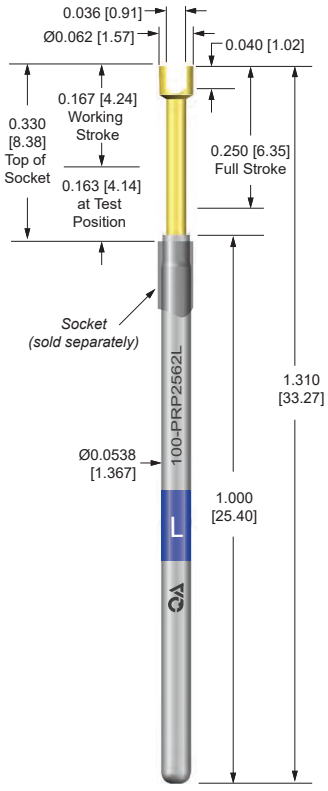
KEYSIGHT/AGILENT
100-PRP2519L

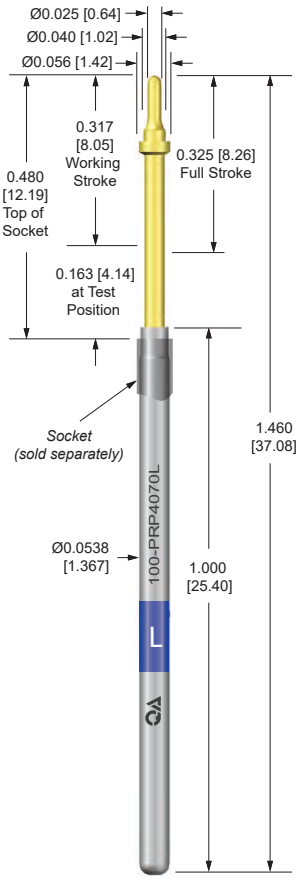
KEYSIGHT/AGILENT
100-PRP2562L

KEYSIGHT/AGILENT
100-PRP4070L









Interface Probes are used in testers for electromechanical contact between the fixture and tester. QA Technology has listed the part numbers that correspond with the applicable testers. These part numbers are QA's recommended direct replacements.

KEYSIGHT/AGILENT	QA PROBE/SOCKET PART NUMBER
All 3070 ICT Testers	100-PRP2519L/100-SDN253R5-H
Polarity Check	100-PRP2562L/100-SDN253W3-H
Test Jet	100-PRP4070L/100-SDN253W3-H

P/N: 100-PRP2519L

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)
Tube	P	Nickel silver/ID precious metal clad	< 15 mOhms	11.8 (16.2)

	Digit	Material/Finish
Tip Style	19	Heat treated BeCu/gold plated over nickel

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24] Stroke
Spring	L	Low	1.3 [37g/0.36N]	3.5 [99g/0.97N]	SS	1,000,000

P/N: 100-PRP4070L

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)
Tube	P	Nickel silver/ID precious metal clad	< 20 mOhms	10.2 (14.3)

	Digit	Material/Finish
Tip Style	70	Heat treated BeCu/gold plated over nickel

	Letter	Spring Force	Preload	@ 0.317 [8.05] Stroke	Material	Cycle Life @ 0.317 [8.05] Stroke
Spring	L	Low	0.8 [23g/0.22N]	3.0 [85g/0.83N]	MW	1,000,000

P/N: 100-PRP2562L

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)
Tube	P	Nickel silver/ID precious metal clad	< 15 mOhms	11.8 (16.2)

	Digit	Material/Finish
Tip Style	62	Heat treated BeCu/gold plated over nickel

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24]Stroke
Spring	L	Low	1.3 [37g/0.36N]	3.5 [99g/0.97N]	SS	1,000,000

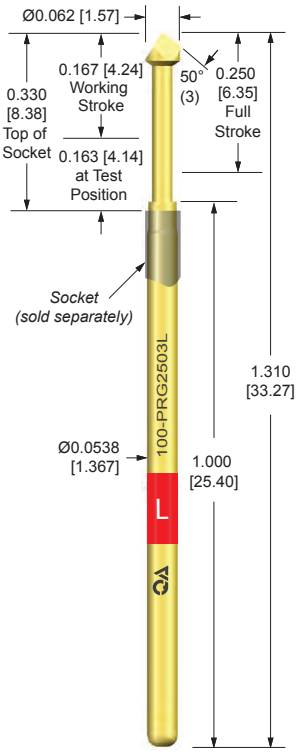
P/N: 100-PRG2503L

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)
Tube	G	Nickel silver/OD gold plated	< 15 mOhms	12.3 (17.3)

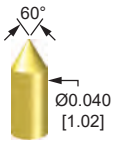
	Digit	Material/Finish
Tip Style	03	Heat treated BeCu/gold plated over nickel

	Letter	Spring Force	Preload	@ 0.167 [4.24] Stroke	Material	Cycle Life @ 0.167 [4.24]Stroke
Spring	L	Low	1.3 [37g/0.36N]	3.5 [99g/0.97N]	SS	1,000,000

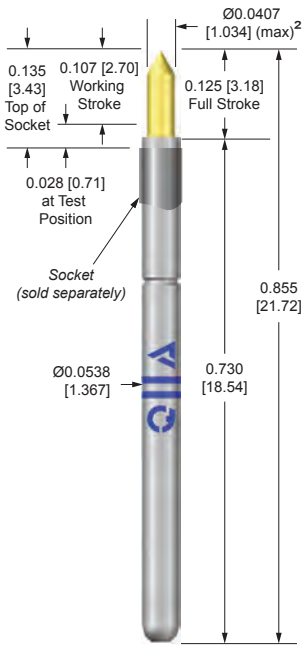
TERADYNE
100-PRG2503L



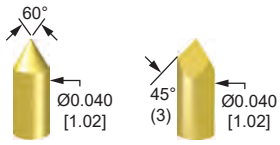
TERADYNE/GENRADE
100-PL■1241■-■



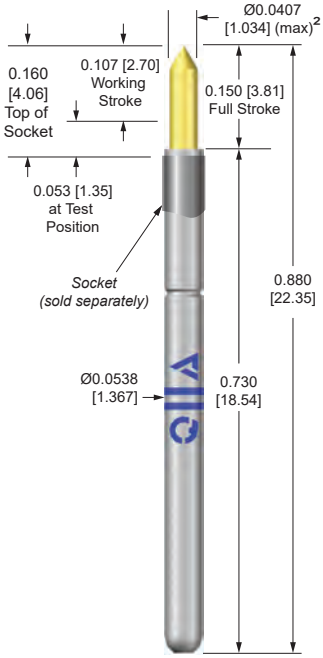
41 Spear



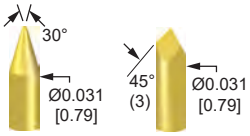
TERADYNE/GENRADE
100-PL■15■■■-■



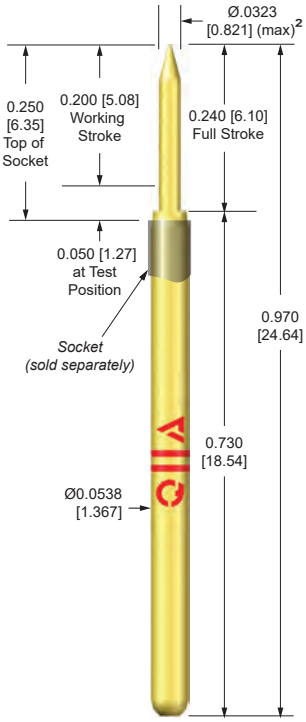
41 Spear **43** Chisel



TERADYNE/GENRADE
100-PRG24■■S-■



41 Spear **43** Chisel



TERADYNE/GENRADE	QA PART NUMBER
1800 Series 7878, 8852, 8855	100-PRG2503L See page 29 for sockets
2270, 2271, 2272, 2282 (any model), 2283, 2284, 2286, 2287 built before 7/95	100-PLP1241S and/or 100-PLP1241S-B See page 29 for sockets
TS121, TS124, TS128, TS81, TS84, TS86, TS87, 2280, 2281, 2281a, 2287a 228x ICA (any model), 2283, 2284, 2286, 2287 built after 7/95	100-PLP1541S and/or 100-PLP1541S-B See page 29 for sockets
2287L, 2287LX, TS87L, TS87LX, TS128L, TS124LX, TSLH, TSLX, TSH52, TSH51, TSMS, TSA, Tester model numbers ending in "L" (high density capacity)	100-PRG2441S and/or 100-PLP1541S See page 29 for sockets

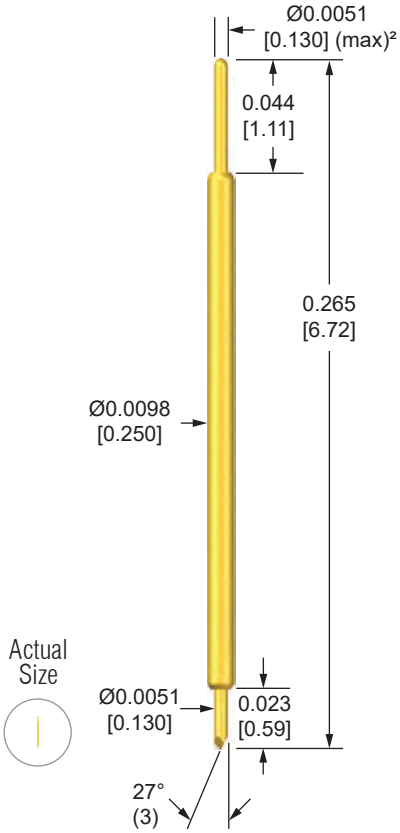
P/N: 100-PL■1241■-■ 100-PL■15■■■-■ 100-PRG24■■S-■

	Letter	Material/Finish				Average Resistance		
Tube	P	Nickel silver/ID precious metal clad				< 20 mOhms	< 20 mOhms	NA
	G	Nickel silver/OD gold plated				< 25 mOhms	< 25 mOhms	< 15 mOhms
	N	Nickel silver/no finish				< 45 mOhms	< 45 mOhms	NA
Tip Style	Digits	Material/Finish						
	41	Heat treated BeCu/gold plated over nickel, spear				41	41	41
	43	Heat treated BeCu/gold plated over nickel, chisel				NA	43	43
Spring	Letter	Spring Force	Preload	@ 0.107 [2.70] Stroke	Material	Cycle Life @ 0.107 [2.72] Stroke	Cycle Life @ 0.107 [2.72] Stroke	Cycle Life @ 0.200 [5.08] Stroke
	L	Low	0.7 [20g/0.19N]	1.5 [43g/0.42N]	SS	1,000,000	1,000,000	NA
	S	Standard	1.7 [48g/0.47N]	3.5 [99g/0.97N]	SS	1,000,000	1,000,000	NA
	S	Standard	1.8 [51g/0.50N]	3.5 [99g/0.97N]	SS	NA	NA	1,000,000
	H	High	2.2 [62g/0.61N]	5.5 [156g/1.53N]	MW	1,000,000	1,000,000	NA
	X	Extra	3.0 [85g/0.83N]	8.0 [227g/2.22N]	MW	1,000,000	1,000,000	NA
	U	Ultra	4.5 [128g/1.25N]	10.0 [283g/2.78N]	MW	250,000	250,000	NA
	B	High Preload	2.0 [57g/0.56N]	2.6 [74g/0.72N]	SS	NA	NA	1,000,000
Option	Letter	Description						
	B	Curved tube (pylon replacement)						
	N	No probe lubrication. Removing lubrication greatly reduces cycle life and should only be used in applications outside of the working temperature range						
	(Blank)	No option required						

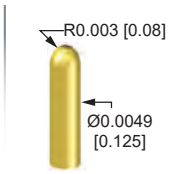
Working Temperature Range: -55°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

[1] Current rating is affected by spring material an lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

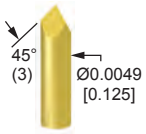
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.



TIP STYLES FOR DUT SIDE ONLY

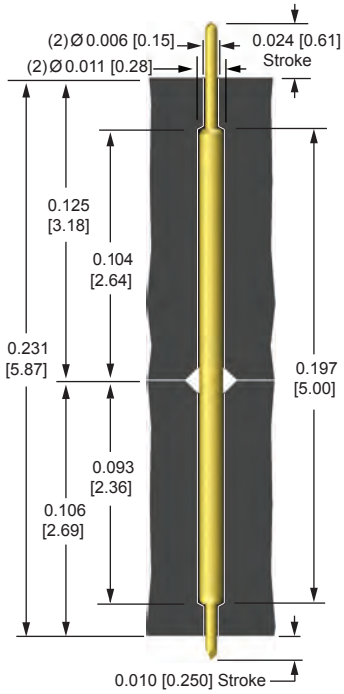


40 Round



43 Chisel

EXAMPLE OF MOUNTING CONFIGURATION



Actual stroke and plate thicknesses may vary based on application.

PROBE P/N M035PRH14■■S-S example: M035PRH1443S-S

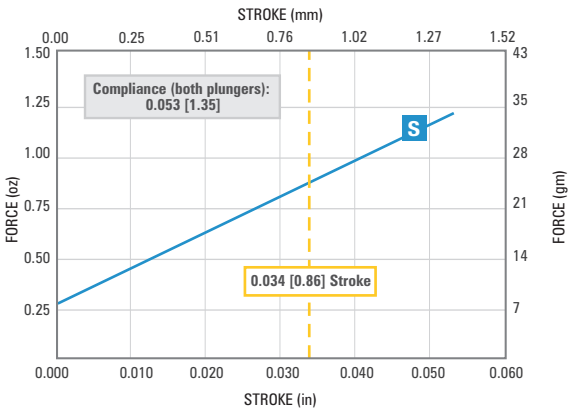
	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	H	Phosphor Bronze/precious metal ID/OD			< 200 mOhms	1.6 (2.2)[3]
Tip Style	Digits	Material/Finish				
	See Tips	Heat treated steel/gold plated over nickel				
Spring	Letter	Spring Force	Preload	@ 0.86mm Stroke	Material	Cycle Life @ 0.86mm Stroke
	S	Standard	0.28 [7.8g/0.08N]	0.88 [25.0g/0.25N]	MW	100,000
Option	Letter	Description				
	S	ⓢ Heat treated steel/plated over nickel (see tip style for availability)				

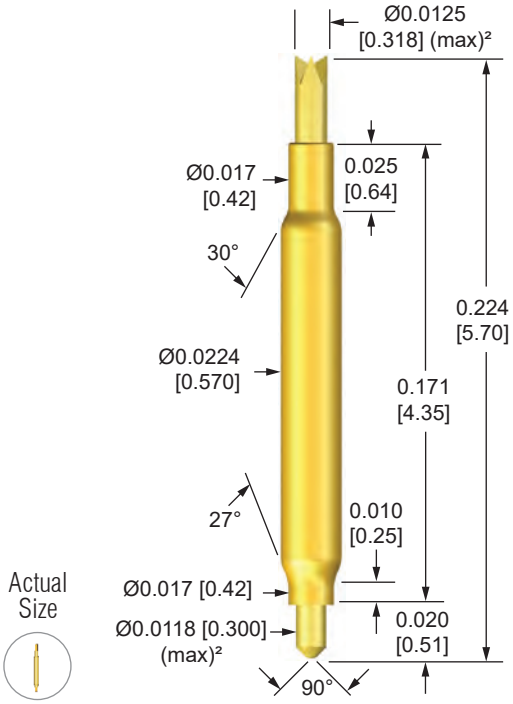
[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

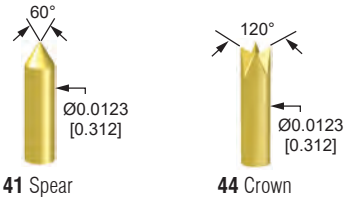
[3] Working Temperature Range: up to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

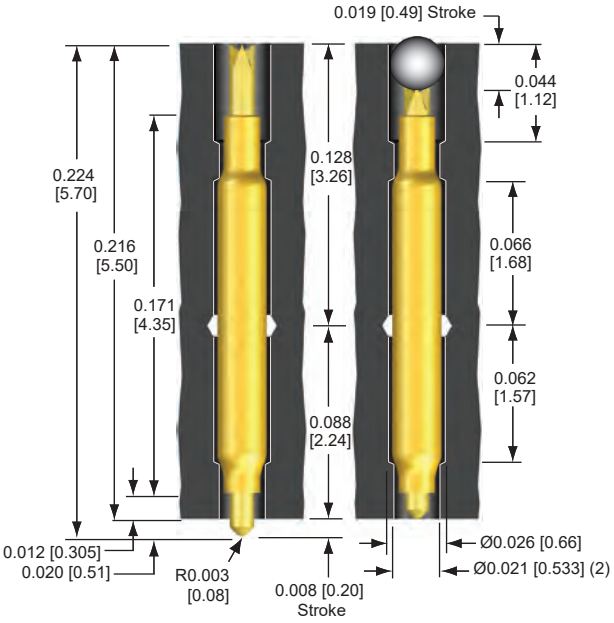




TIP STYLE FOR DUT SIDE ONLY



EXAMPLE OF MOUNTING CONFIGURATION



Actual stroke and plate thickness may vary based on application.

PROBE P/N M08-PRG89 ■■■ example: M08-PRG8941S

	Letter	Material/Finish	Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
Tube	G	Copper alloy/gold plated	< 40 mOhms	4.4 (6.1)[3]
Tip Style	Digits	Material/Finish		
	See Tips	Heat treated BeCu/gold plated over nickel		

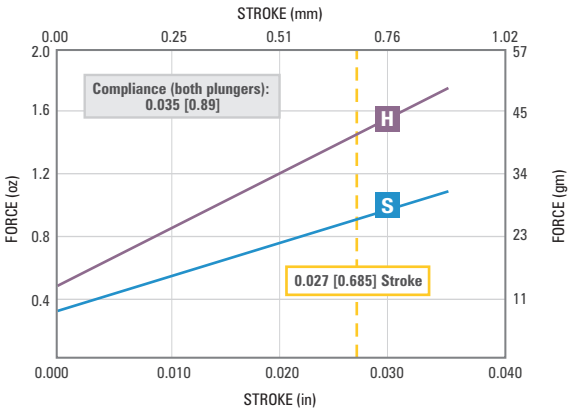
	Letter	Spring Force	Preload	@ 0.027 [0.69] Stroke	Material	Cycle Life @ 0.027 [0.69] Stroke
Spring	S	Standard	0.32 [9.1g/0.09N]	0.95 [26.9g/0.26N]	SS	1,000,000
	H	High	0.49 [13.9g/0.14N]	1.48 [42.0g/0.41N]	SS	1,000,000

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.

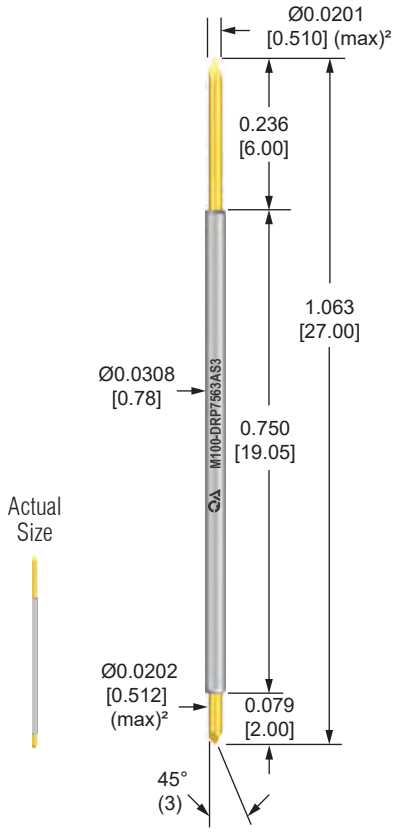
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.

[3] Working Temperature Range: up to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE

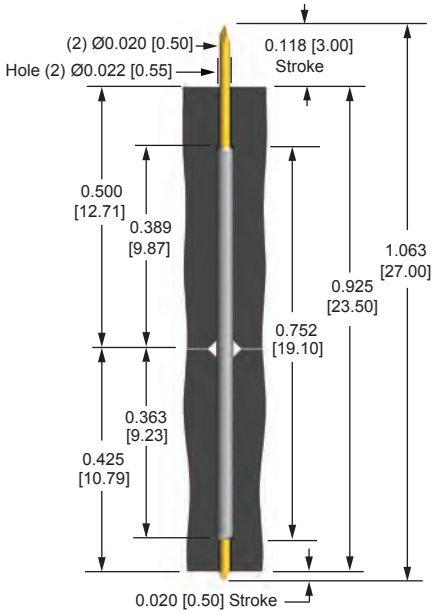


Double-Ended Probes



TIP STYLES FOR DUT SIDE ONLY

EXAMPLE OF MOUNTING CONFIGURATION



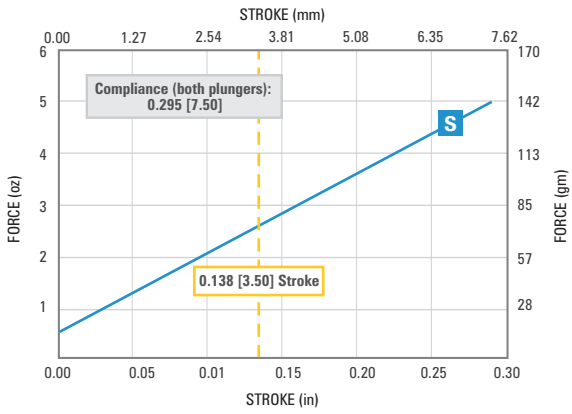
Actual stroke and plate thicknesses may vary based on application.

PROBE P/N M100-DRP7563AS3

Tube	Letter	Material/Finish			Average Resistance	Current Rating AMPS[1] 120°C (204°C)[3]
	P	Nickel silver/ID precious metal clad			< 65 mOhms	3.4 (4.7)[3]
Tip Style	Digits	Material/Finish				
	See Tips	Heat treated steel/gold plated over nickel				
Spring	Letter	Spring Force	Preload	@ 0.86mm Stroke	Material	Cycle Life @ 0.86 mm Stroke
	S	Standard	0.58 [16.38g/0.16N]	2.65 [75.0g/0.74N]	SS	100,000
Tip	Digit	Description				
	3	Heat treated BeCu/plated gold over nickel				

[1] Current rating is affected by spring material and lubrication choice. Please refer to Current Carrying Capacity and Testing in Extreme Working Temperature applications notes for more details.
[2] Maximum plunger OD should be used to calculate minimum guide plate clearance holes.
[3] Working Temperature Range: -45°C to 120°C with lubrication. SS springs can be used up to 204°C without lubrication.

SPRING FORCE



Pin Gauge Tools

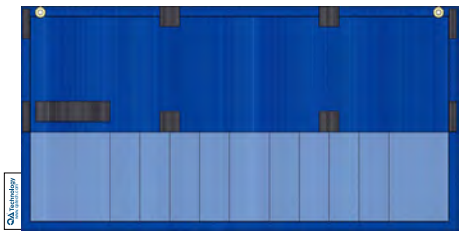
PG Pin Gauge Tools for simple Go/No-Go inspection of socket and termination pin mounting holes are available for each series.

PRODUCT SERIES	PG TOOL PART NUMBER
025-16	PG25
039-16 039-25 039-40	PG39
050-05 050-16	PG050-05/16
050-25 050-40	PG050-25
075-25 075-40	PG75
100-05 100-16 100-25 100-40	PG100
125-25	PG125
156-25	PG156
187-25	PG187

PRODUCT SERIES	PG TOOL PART NUMBER BACK PLATE	PG TOOL PART NUMBER PROBE PLATE
X31-16 X31-25 X31-40	PG-X31-T	PG-X31-P
X39-16 X39-25 X39-40	PG-X39	PG-X39
X50-16 X50-25 X50-40	PG-X50-T	PG-X50-P
X75-16 X75-25 X75-40	PG-X75A-T	PG-X75A-P

Tool Organizer

The **TRL-1** is a compact canvas tool roll to organize a variety of maintenance tools to be accessible at your fingertips (tools are sold separately).



Probe Maintenance Brush

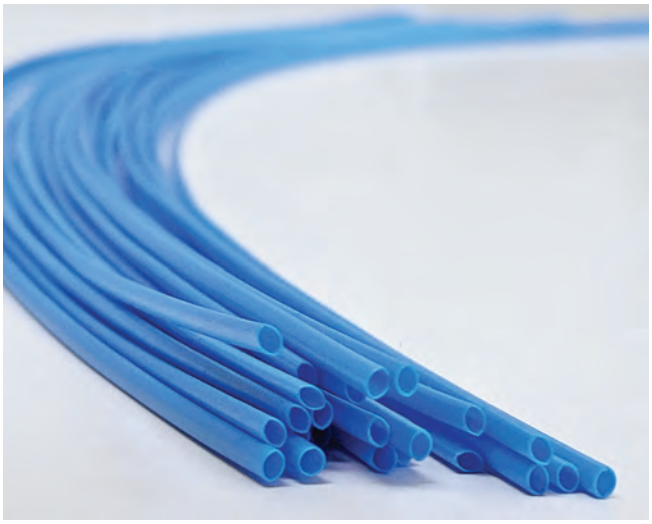
The **TBR-1** is made from a natural bristle to easily clean away fluxes and debris from your probe tips as part of your regular scheduled maintenance program.

Installation Hammer

The **THM-1** hammer is to be used in conjunction with our installation and extraction tools.

Insulated Tubing (Heat Shrinkable)

For insulating wire wrap and wire jack sockets and termination pins on 0.050 centers and smaller. Available in 24 [6.10] lengths with 0.046 [1.17] ID, this blue tubing is stiffer than other types, making installation easier. Customer to cut tubing in lengths to suit applications.



Fixture Training Kit

Efficiently installing and removing probes, sockets or termination pins for regularly scheduled maintenance or in emergency situations is a skill that takes time and experience. Attempting to learn while using existing production fixtures could result in catastrophic errors and costs if the process is carried out incorrectly. QA's **FTK-1** Fixture Training Kit will help you tackle this challenge. Used in conjunction with our instructional videos, the fixture enables you to effectively train new and existing technicians, without disrupting the production schedule.

Socket Plugs

QA Technology's Socket Plugs are a quick and easy solution to block a conventional socket where a test point is no longer needed. This eliminates the potential error of re-installing a probe which could result in a test error or board damage.

100-SPR

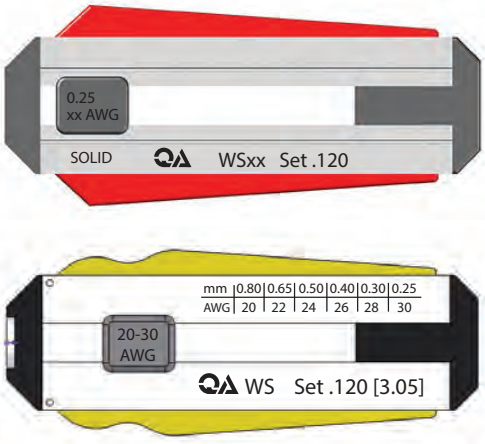
075-SPR

050-SPT

039-SPR

Wire Strippers

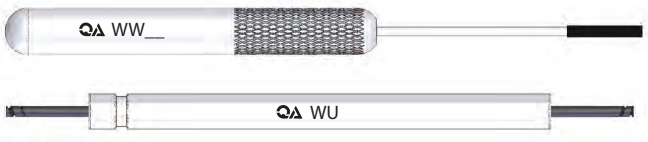
WS30 or **WS28** Wire Strippers are used to strip 28 or 30 AWG. **WS** tool has a built-in adjustment dial to accommodate various wire sizes from 20-30 AWG. All are preset to strip a length of 0.120 [3.05] for use with wire plugs, jacks or grips.



Wire Wrap Tools

Wire wrapping is the most common wiring method for the larger center spacing sockets and termination pins. For the PCB professional who needs tools for low volume production, maintenance and field repair, QA now offers high quality hand wire wrap tools that are available for 26, 28, or 30 AWG wire sizes.

These tools form modified wraps on standard 0.025 [0.635] square or round pins. Additionally, the P option can wrap pins up to 1.100 [27.94] long. Our unwrap tools are double-ended to facilitate easy removal of both clockwise and counterclockwise wire wraps and are compatible with both the standard and long pin versions.



WIRE SIZE	WIRE WRAP TOOL PART NUMBER	
	STANDARD LENGTH (0.750" [19.1mm] Hole depth)	LONG PIN OPTION (1.100" [27.9mm] Hole depth)
26 AWG	WW26	WW26P
28 AWG	WW28	WW28P
30 AWG	WW30	WW30P
Unwrap	WU	

Installation Tools

The **ATR** Adjustable Installation Tools allow insertion of conventional sockets at varying set heights in inches (millimeters).

Installation Tools, **ITR** (Flush or pre-set to your required set heights) are available for each product series.

Replacement PIN *Replacement STOP*

CONVENTIONAL SOCKETS

Replacement Tip

Replacement Tip

X PROBE SOCKETLESS

Replacement Tip

Replacement Tip

	SOCKET INSTALLATION TOOL PART NUMBERS							
PRODUCT SERIES	**ADJUSTABLE** TOOL	**ADJUSTABLE** REPLACEMENT PIN	**ADJUSTABLE** REPLACEMENT STOP	**FLUSH** TOOL	REPLACEMENT **TIP**	**PRESET** TOOL	REPLACEMENT **TIP**	SET HEIGHT (MIN TO MAX)
039-16 039-25 039-40	ATR039 ATR039M	ATR039-TIP		ITR039-FL	ITR039-FL-TIP	ITR039 Set .___	ITR039-TIP Set .___	0.001 to 0.320 [0.03 to 8.13]
050-05 050-16	ATR050 ATR050M	ATR050-PIN	ATR050-STOP	ITR050-FL	ITR050-FL-TIP	ITR050 Set .___	ITR050-TIP Set .___	0.001 to 0.360 [0.03 to 9.14]
050-25 050-40								0.001 to 0.270 [0.03 to 6.86]
075-25 075-40	ATR075 ATR075M	ATR075-PIN	ATR075-STOP	ITR075-FL	ITR075-FL-TIP	ITR075 Set .___	ITR075-TIP Set .___	0.001 to 0.345 [0.03 to 8.75]
100-05				ITR100-FL	ITR100-FL-TIP			
100-16	ATR100 ATR100M	ATR100-PIN	ATR100-STOP	ITR100-FL	ITR100-FL-TIP	ITR100 Set .___	ITR100-TIP Set .___	0.001 to 0.190 [0.03 to 4.83]
100-25 100-40								0.001 to 0.345 [0.03 to 8.76]
125-25	ATR125 ATR125M	ATR125-PIN	ATR125-STOP	ITR125-FL	ITR125-FL-TIP	ITR125 Set .___	ITR125-TIP Set .___	0.001 to 0.240 [0.03 to 6.10]
156-25				ITR156-FL	ITR156-FL-TIP	ITR156 Set .___	ITR156-TIP Set .___	0.001 to 0.250 [0.03 to 6.35]
187-25				ITR187-FL	ITR187-FL-TIP	ITR187 Set .___	ITR187-TIP Set .___	0.001 to 0.240 [0.03 to 6.10]

	TERMINATION INSTALLATION TOOL PART NUMBERS							
PRODUCT SERIES	**FLUSH** TOOL	REPLACEMENT **TIP**	**PRESET** TOOL	REPLACE-MENT **TIP**	SET HEIGHT (MIN TO MAX)	**PRESET** Negative TOOL	**PRESET** Negative REPLACEMENT **TIP**	SET HEIGHT (MIN TO MAX)
X31-16 X31-25 X31-40	ITRX31-FL	ITRX31-FL-TIP	ITRX31 Set .___	ITRX31-TIP Set .___	-0.150 to 0.050 [-3.81 to 1.27]	ITRX31E Set .___	ITRX31E-TIP Set .___	-0.435 to -0.150 [-11.05 to -3.81]
X39-16 X39-25 X39-40	ITRX39-FL	ITRX39-FL-TIP	ITRX39 Set .___	ITRX39-TIP Set .___	-0.150 to 0.100 [-3.81 to 2.54]	ITRX39E Set .___	ITRX39E-TIP Set .___	-0.435 to -0.150 [-11.05 to -3.81]
X50-16 X50-25 X50-40	ITRX50-FL	ITRX50-FL-TIP	ITRX50 Set .___	ITRX50-TIP Set .___	-0.150 to 0.150 [-3.81 to 3.81]	ITRX50E Set .___	ITRX50E-TIP Set .___	-0.435 to -0.150 [-11.05 to -3.81]
X75-16 X75-25 X75-40	ITRX75-FL	ITRX75-FL-TIP	ITRX75 Set .___	ITRX75-TIP Set .___	-0.150 to 0.150 [-3.81 to 3.81]	ITRX75E Set .___	ITRX75E-TIP Set .___	-0.435 to -0.150 [-11.05 to -3.81]

Extraction Tools

Extraction Tools, **ETR** remove sockets or termination pins without damaging the mounting hole.

To properly extract a socket or termination pin from your fixture, we recommend that it first be mounted Flush. We offer an **ETR-KIT**, which includes an ***ITR-FL*** and ***ETR*** tool for each product series.

Termination Extraction Tools **ETRX** remove termination pins without damaging the mounting hole. **ETRX_E** Tools are designed to remove and install termination pins from the back plate with the probe and optional spacer plate in place.

CONVENTIONAL SOCKETS

Replacement Tip

X PROBE SOCKETLESS

Replacement Tip

Replacement Tip

	EXTRACTION TOOL PART NUMBERS				
PRODUCT SERIES	**KIT** TOOL	**EXTRACTION** TOOL	**REPLACEMENT** TIP	**EXTENDED** EXTRACTION TOOL	**EXTENDED** REPLACEMENT TIP
039-16 039-25 039-40	ETR039-KIT	ETR039	ETR039-TIP		
050-05 050-16	ETR50-05/16-KIT	ETR050-05/16	ETR050-05/16-TIP		
050-25 050-40	ETR050-25-KIT	ETR050-25	ETR050-25-TIP		
075-25 075-40	ETR075-KIT	ETR075	ETR075-TIP		
100-05 100-16 100-25 100-40	ETR100-KIT	ETR100	ETR100-TIP		
125-25	ETR125-KIT	ETR125	ETR125-TIP		
156-25	ETR156-KIT	ETR156	ETR156-TIP		
187-25	ETR187-KIT	ETR187	ETR187-TIP		
X31-16 X31-25 X31-40	ETRX31-KIT	ETRX31	ETRX31-TIP	ETRX31E	ETRX31E-TIP
X39-16 X39-25 X39-40	ETRX39-KIT	ETRX39	ETRX39-TIP	ETRX39E	ETRX39E-TIP
X50-16 X50-25 X50-40	ETRX50-KIT	ETRX50	ETRX50-TIP	ETRX50E	ETRX50E-TIP
X75-16 X75-25 X75-40	ETRX75-KIT	ETRX75	ETRX75-TIP	ETRX75E	ETRX75E-TIP

Wire Plug Installation Tool

Replacement Tip

WTR28 or **WTR30** Wire Plug Installation Tools are used to install Wire Plug, into the back of the socket. Order **WTR28-TIP** or **WTR30-TIP** for replacement tip.

Wire Jack Installation Tool

Replacement Tip

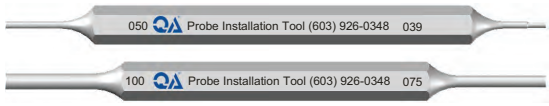
JTR2830 Wire Jack Installation Tools are used to install Wire Jacks for the wire assembly into the back of the socket or termination pin. Order **JTR2830-TIP** for replacement tip.

Wire Grip Installation Tool

Replacement Tip

GTR31, GTR39 and **GTR50** Wire Grip Installation Tools are used to install Wire Grips for the wire assembly into the back of the socket or termination pin. Order **GTR31-TIP, GTR39-TIP** or **GTR50-TIP** for replacement tip.

Probe Installation Tool



PT50/39 and **PT100/75** Probe Installation Tools ease probe installation while preventing probe tip blunting.

Probe Extraction Tool

PERX39/050, PERX50/075 or **PERX75/100** Probe Extraction Tools allow easy removal of probes with headed point styles. Order **PERX39/050-TIP**, **PERX50/075-TIP**, or **PERX75/100-TIP** for replacement tip.

Damaged Probe Tube Extraction Tool

Replacement Tip

TERX31/039, TERX39/050, TERX50/075, and **TERX75/100** tools are used to remove a damaged probe tube. Order **TERX31/039-TIP, TERX39/050-TIP, TERX50/075-TIP** or **TERX75/100-TIP** for replacement tip.

Indicator Probes

Used to measure probe stroke in a test fixture (plunger remains at deflected position).

050-25 & 050-40 SERIES

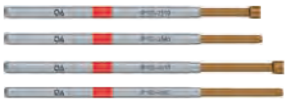
IP050-T2510
IP050-T2540
IP050-T4040
IP050-R2510
IP050-R2540
IP050-R4040

075-25 & 075-40 SERIES

IP075-2510
IP075-2540
IP075-4040

100-25 & 100-40 SERIES

IP100-2510
IP100-2540
IP100-4010
IP100-4040



X39 SERIES

IPX39-2540

X50 SERIES

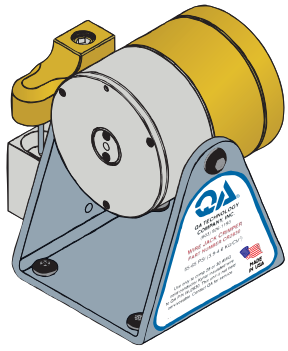
IPX50-16B40H
IPX50-16B40P
IPX50-2540
IPX50-4040

X75 SERIES

IPX75-16B40H
IPX75-16B40P
IPX75-2510
IPX75-2540
IPX75-4040
IPX75-4010

Wire Jack Crimping Tool

An air-actuated Crimper, **CR2830** is available to permanently attach customer supplied wire to wire jacks.

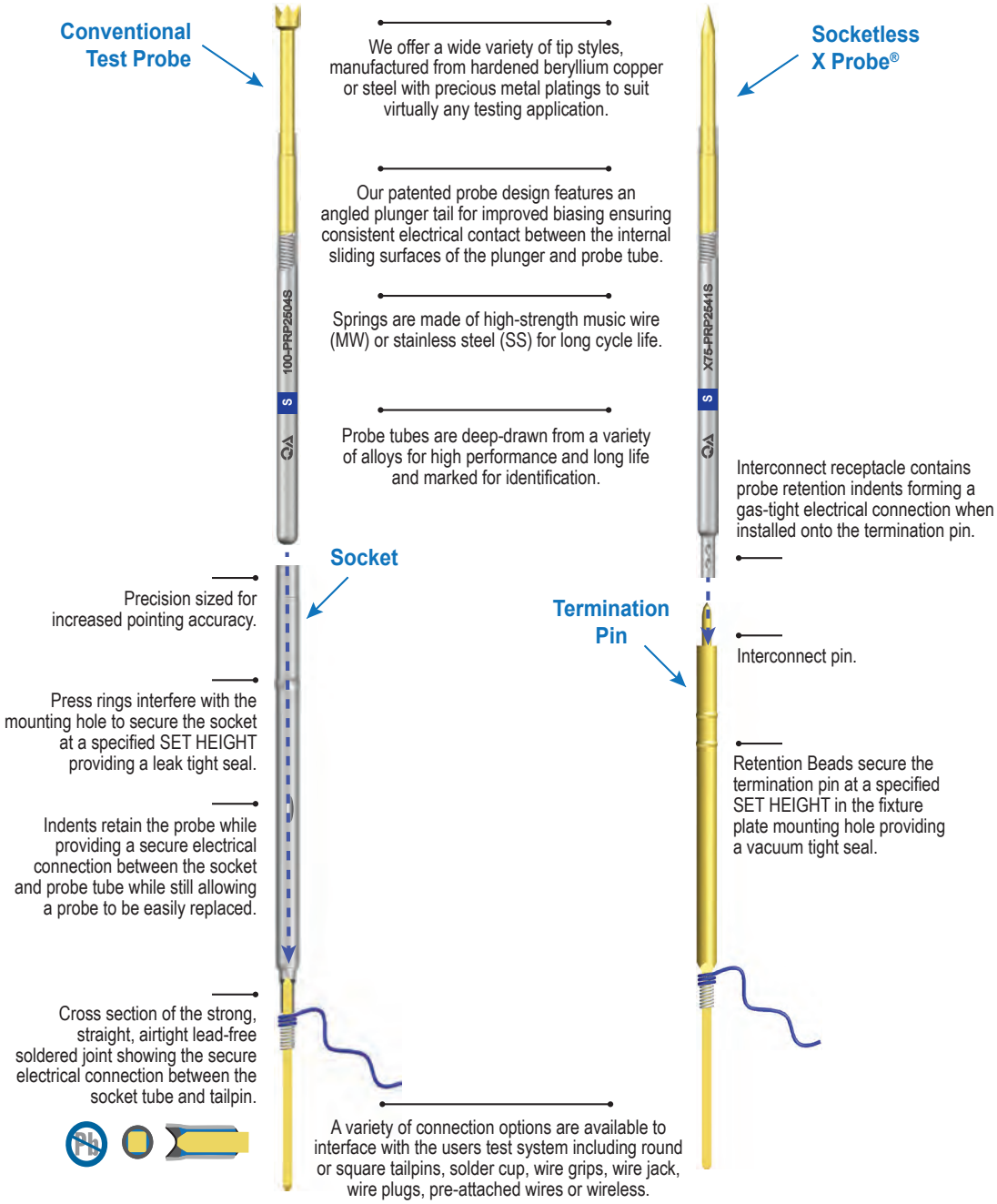


Tools

Design and Construction for QA Test Probe Products

QA Technology's test probe products are designed and primarily utilized for testing printed circuit boards, components, and for interfacing test fixtures to automatic test equipment (ATE) where compliant electrical interfaces/contacts are needed.

Our test products use a two-part system: a test probe and a socket or termination pin. This system provides a reliable electrical contact when testing the various types of UUT configurations, where variable target types, board manufacturing processes, and testing environments are encountered. Our wide range of products provide the versatility needed to work in applications including bare board, functional and in-circuit test, as well as solutions to the ever-changing industry process challenges.

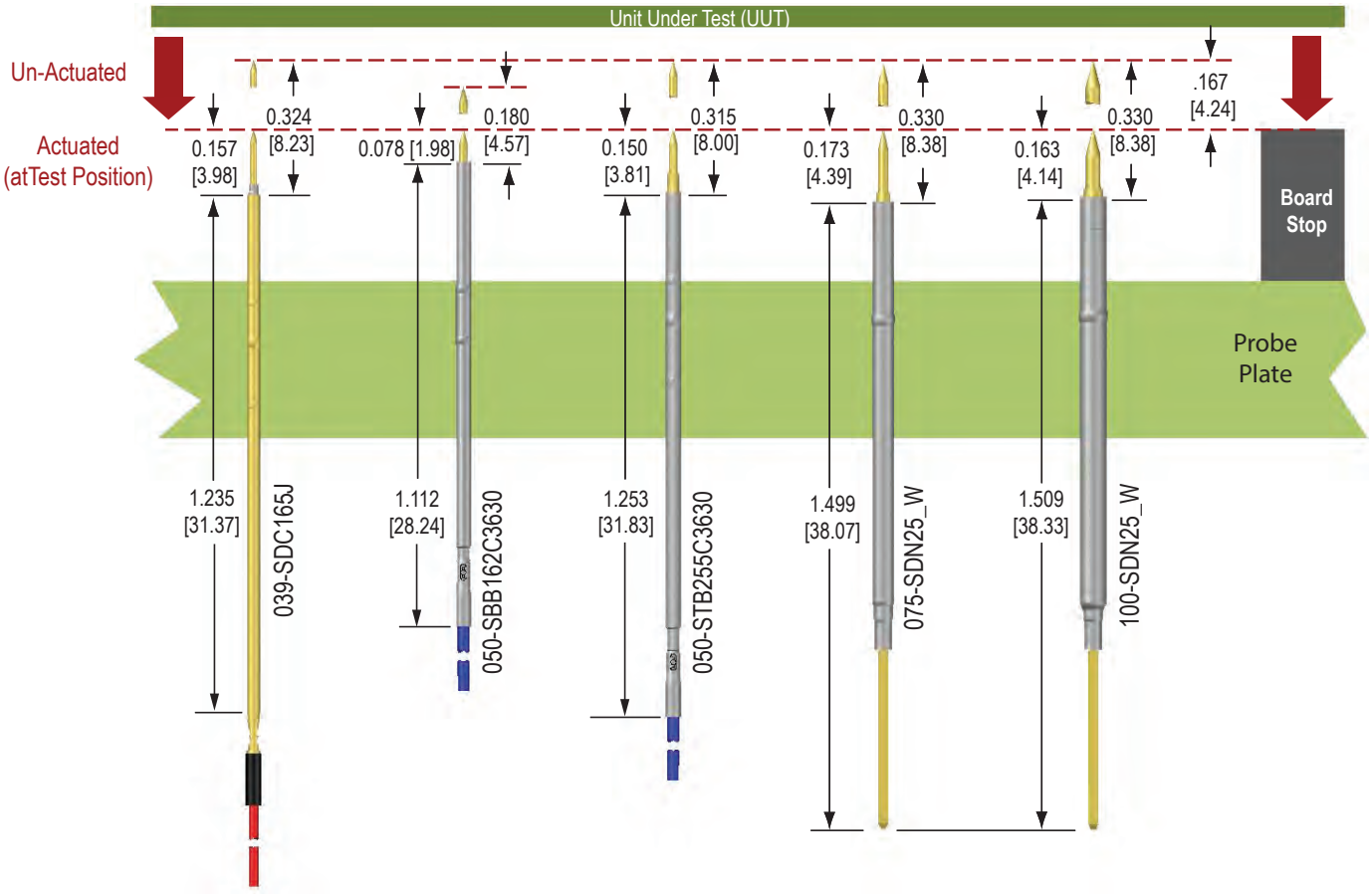


Sample Fixture Layout (Conventional)

QA Technology offers a broad range of In-circuit (ICT), Functional (FCT) and Ball Grid Array (BGA) probes, sockets and accessories. With thousands of standard tube material, tip style and spring force configurations available for delivery within 24 hours, QA's test product lineup and delivery are second to none. QA also offers complete product support, from recommending a tip style or spring force to full product application analysis with suggestions to help reduce false failure causes.

Conventional ICT, bare board and functional test probes and sockets, as well as double-ended probes are offered for center to center spacing from 0.014 [0.35] up to 0.187 [4.75]. Below you will find a general layout example of a test fixture utilizing different termination types on 39mil through 100mil center spacing. For more information regarding your application, please feel free to contact us.

Example of Wired Fixture Configuration

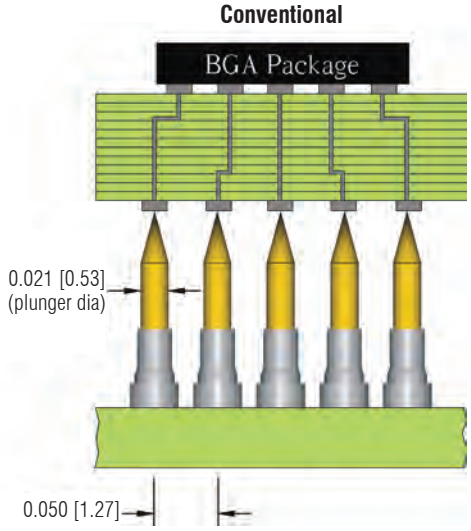


Socketless X Probe® Technology Overview

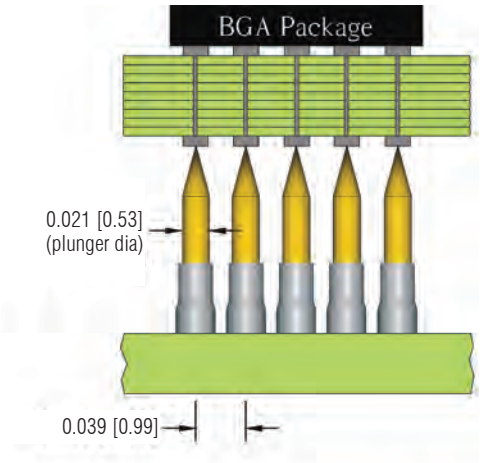
As the physical size of printed circuit boards continues to shrink faster than ever, smaller targets on closer centers have a direct correlation to the rapidly growing demand of smaller probes used in test fixtures today.

X Probe® Socketless Technology overcomes the shortcomings of using conventional probes on fine pitched targets. The X Probe socketless design utilizes a larger more robust probe and allows it to be mounted on closer centers compared to a conventional probe and socket system.

Conventional

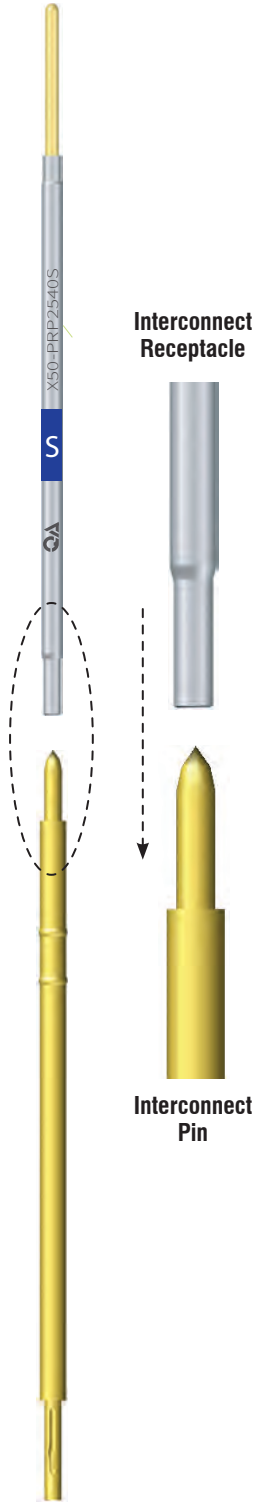


Socketless X Probes



The X Probe Socketless Series comprises two parts: a test probe and a termination pin. The probe is designed around our patented rolled probe tube design with a modified interconnect receptacle on the bottom. This interconnect receptacle increases the tube length while all other aspects of the probe are the same. The interconnect receptacle receives the precision interconnect pin located at the top of the termination pin.

The termination pin is unique in that it performs all the functions of a typical socket while staying within the diameter of the probe tube. The termination pin is the heart of the assembly. It retains the probe at the proper set height by utilizing two retention beads while providing a reliable electrical connection between the probe and the test fixture's wiring.



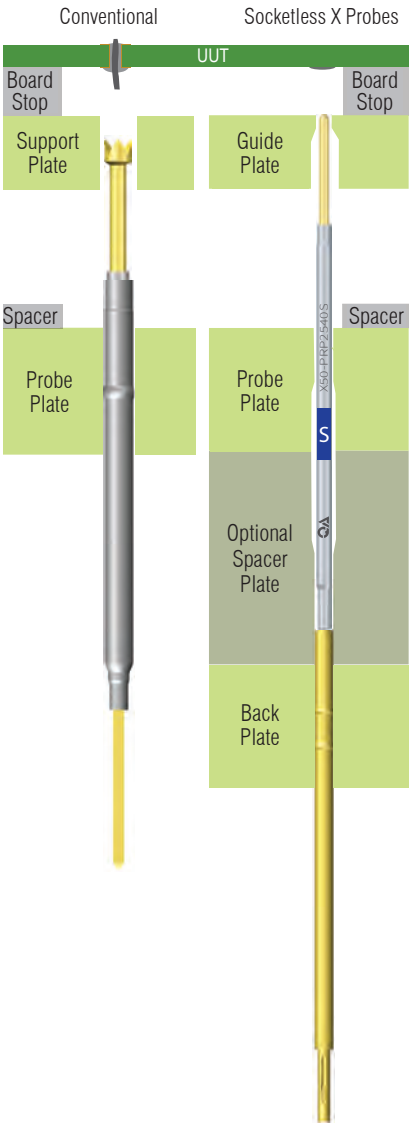
Features

- Based on “tried and true” fixture methods.
- Adjustable termination pin set heights for leads vs. pads/vias.
- Available in multiple working stroke designs for compact, standard and dual leveling test fixture designs.
- Easily incorporated into fixture designs for all test platforms: Keysight, GenRad, Teradyne and others.
- Compatible with all existing manufacturing and assembly techniques.
- Easy maintenance and increased test reliability.
- Availability and acceptance worldwide benefits board designers, OEMs, fixture houses, and test engineers.

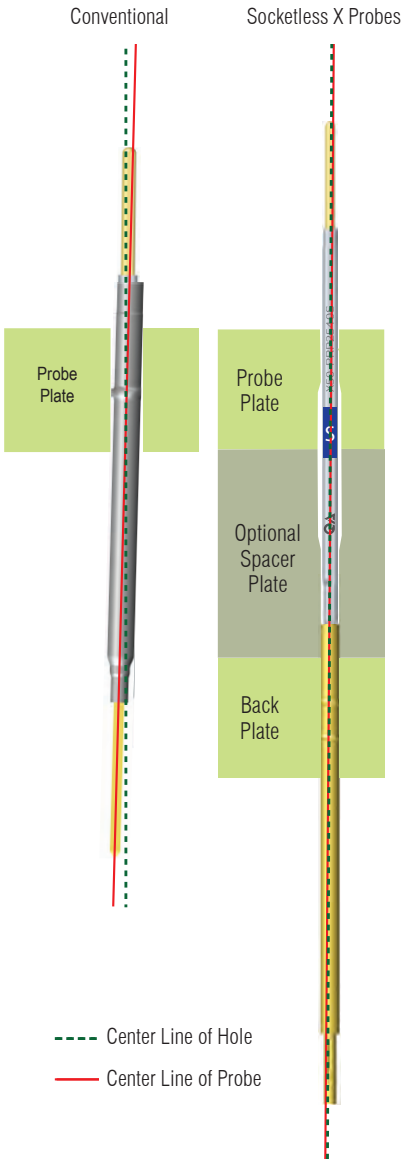
Benefits

- Large termination pin allows faster drill times.
- Solid termination pin does not wear out and provides increased durability.
- Reduces board manufacturing costs.
- A greater number of spring force and tip style selections.
- Available with all conventional wiring methods – end user friendly.
- Increased pointing accuracy helps improve first pass yields.
- Simplifies board design.

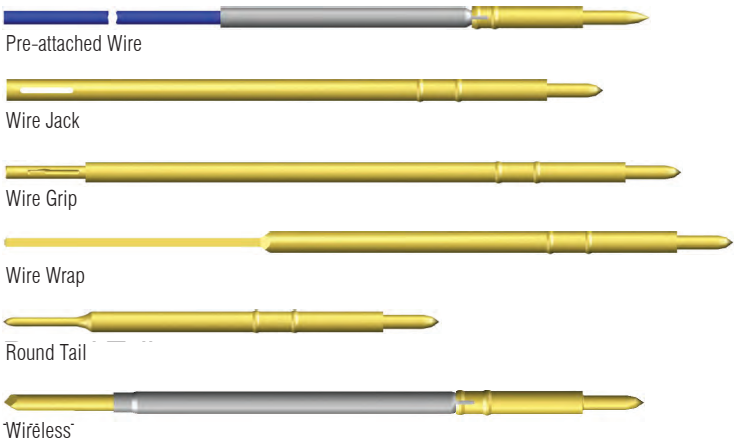
Socketless Features



Increased Pointing Accuracy



Available Wire Methods



Sample Fixture Layout (X Probe)

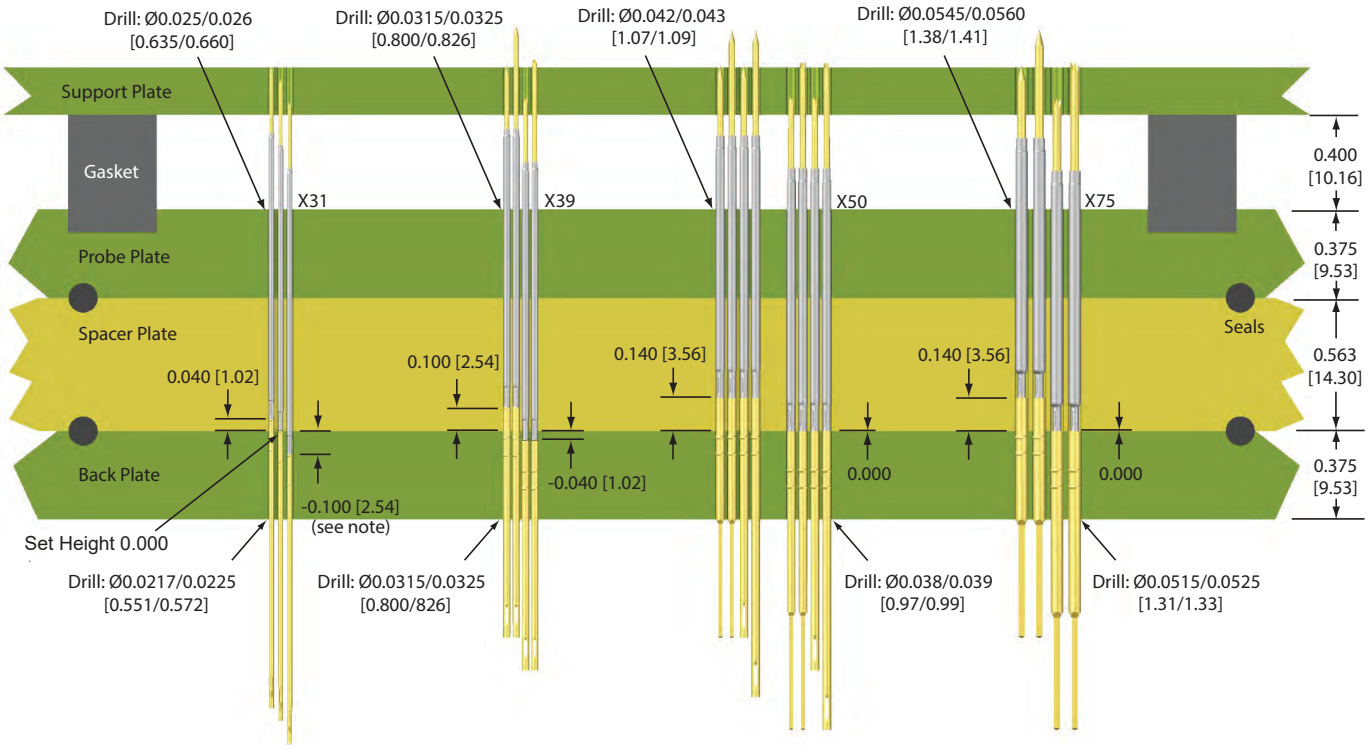
X Probe Technology is compatible with Keysight/Agilent, GenRad, Teradyne, and others. Existing fixture kits are able to accommodate X Probes even when additional plates are required. In general, the height of the fixture is increased to maintain the depth of the wiring area to accommodate the personality pins and alignment plate. A taller dress frame is required to accommodate any additional height.

With design considerations, standard test probes can be mixed mounted with the X Probe Socketless Series. A standard socket would mount in the Probe Plate and clearance holes would have to be drilled in the optional Spacer and Back Plates.

A gasket or seal method would have to be designed to maintain the integrity of the vacuum. The best approach is to cut out areas in the plates where the sockets are to be mounted and design inserts with gaskets to accommodate them.

When incorporating mix mounting into your X Probe fixture kit design or comparable, you must plan ahead to account for the added overall height of the X Probe and termination pin.

Example of Wired X Probe Fixture Configuration



Note: When using a set height of below FLUSH for X31 Terminations, back plates will need to be counter drilled at Ø0.025/0.026 [0.635/0.660] to the proper depth to allow clearance for probe tubes

Probe Tube Materials

Measurement sensitivity is a critical factor when considering probe performance. The more sensitive the measurement, the smaller the threshold between pass and fail, so it is important to match the correct probe to the application.

The tube material is an important feature when selecting the right test probe for your application. The following is a summary of the options, characteristics, and color code identification of QA probe tube materials:

"N" Style Probe Tube

The "N" tube is a nickel silver tube without plating. This tube is suitable for bare board test applications or where probe resistance below one ohm is acceptable.

"G" Style Probe Tube

The "G" tube is a nickel silver or phosphor bronze tube plated with gold. This tube is suitable for loaded board and in-circuit testing where an improvement in performance and longer life over the "N" tube is required.

"V" Style Probe Tube

The "V" tube is a nickel silver or phosphor bronze tube plated with silver. This tube is suitable for loaded board and in-circuit testing in non-corrosive environments where an improvement in performance and longer life over the "N" tube is required.

"P" Style Probe Tube

The "P" tube is a nickel silver tube with precious metals clad on the inside surface. This unique cladding process, through deep drawing, hardens the precious metal layer improving wear properties while providing a uniform surface along the entire ID of the tube. This tube is suitable for all loaded board and in-circuit testing where long life and low consistent electrical resistance is required.

"H" Style Probe Tube

The "H" tube is a high conductivity proprietary tube plated with gold. This premium tube style is suitable for high current loaded board and in-circuit applications to provide an improvement in performance compared to the "G" and "P" tubes.

"S" Style Probe Tube

The "S" tube is a high conductivity proprietary tube plated with silver. This tube style is suitable for high current, loaded board and in-circuit testing applications for use in non-corrosive environments to provide an improvement in performance compared to the "H" tube.

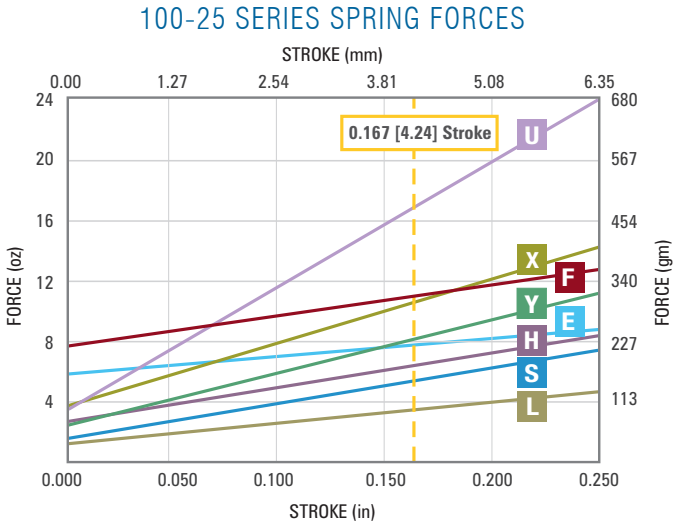
Spring Force Selection

Selecting the proper spring forces for probes used to test printed circuit boards is not a casual consideration. The right spring force can make an important impact on contact reliability and will affect the cycle life of a probe. More importantly, determining the correct overall spring force is critical to ensuring the proper actuation of a test fixture and to preventing potential damage to the unit under test (UUT).

QA Technology's springs are designed to be used at working stroke, typically 2/3 of the rated full stroke. This maximizes the cycle life of the probe without the risk of over stressing the spring.

QA's high pre-load springs (E or F) offer a higher initial force through the full stroke to generate better probe tip penetration. The spring force is more consistent when the probe stroke is affected by variations due to board flex, fixture tolerances, and target heights.

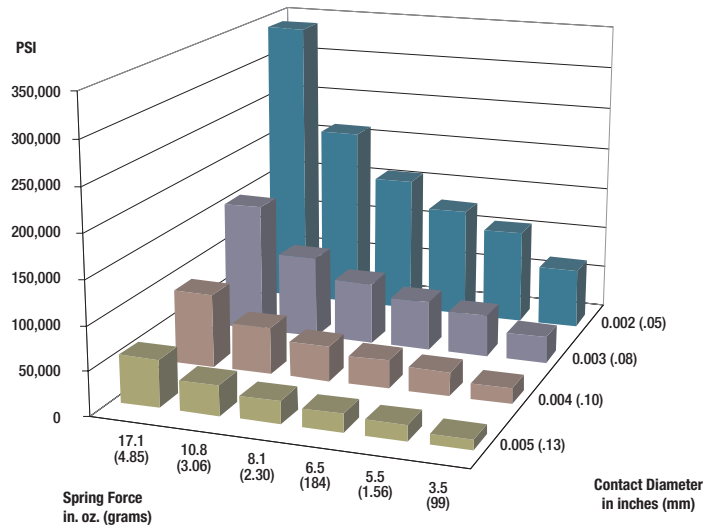
Spring material is also an important factor when considering higher current applications. Stainless steel (SS) springs will typically carry higher amperage with increased temperature limits compared to music wire (MW) springs.



Contact Force on a Test Target

It is important to consider the condition of the UUT surfaces when selecting the proper spring force. When a probe makes contact, it causes deformation of the test target materials. The contact force for each probe must be high enough to penetrate any oxides, contaminants, or flux residues that can accumulate on both the test targets and the probe tips.

Sharp probe tips have the benefit of a reduced surface area which significantly increases the contact pressure applied. This allows the designer to select lower spring forces in a fixture and still achieve good contact.



By contrast, a probe tip which is flat or rounded by design will make contact over a larger area, causing less contact pressure. This may interfere with the probe's ability to penetrate contamination layers. In these situations, a higher spring force may be necessary to achieve reliable electrical contact.

Calculating Spring Force for a Chosen Stroke

Probes are not always used at their rated working stroke. A probe's spring force at any chosen stroke can be calculated with the formula:

F = P + (S(Fw - P) ÷ Sw) WHERE:	100-25 SERIES STANDARD SPRING FORCE
F = Force at actual stroke (oz, gm, Newtons)	
S = Actual stroke (in or mm)	
P = Preload force (oz, gm, Newtons) see catalog/website	*1.6 oz [45 gm/0.44N]*
Fw = Force at known working stroke (oz, gm, Newtons) see catalog/website	*5.5 oz [156 gm/1.53N]*
Sw = Known working stroke (in or mm) see catalog/website	*0.167 [4.24]*

*Example: Find the force at **0.200** [5.08] stroke for the standard force spring in the 100-25 series:*

F = P + (S(Fw - P) ÷ Sw)]
F = 1.6 + (0.200(5.5 - 1.6) ÷ 0.167) =
6.3 oz [179 gm/1.76N]

Vacuum Fixture Considerations

The collective force of the probes must not exceed the vacuum fixture system's capability to move the tested product into contact with the probes. This formula can be used to calculate either the maximum number of probes of a given spring force, or the maximum spring force allowed for a given number of probes. An efficiency factor is added to account for fixture leaks, spring force tolerances, vacuum considerations (details below), etc. The spring force must never exceed the force applied by atmospheric pressure.

Example: 6" x 10" [15.2 cm x 25.4 cm] board and 5.5 oz [156 gm] probes.

By using the total area of the UUT in the formula, the approximate maximum number of probes in a fixture can be calculated (Example below)

Avoid densely concentrated areas of high force so as not to damage the product or cause fixture actuation problems.

Concentrations of probes around connectors or large pin packages may exceed one (1) atmosphere in a small area of the product as long as the total force is below the maximum limit. Uneven probe distribution can cause excessive flexing of the product and may affect the vacuum seal – particularly with thin boards.

Vacuum System Efficiency

When calculating spring force limitations, the efficiency factor is used to define the vacuum system's ability to overcome the total probe spring force. The two factors that are typically referenced are air flow in cubic feet per minute (CFM) and amount of vacuum in inches of mercury. Cubic feet per minute is the measure of the vacuum system's ability to move a volume of air over time. The higher the CFM, the better the vacuum system's ability to draw the product down quickly and overcome initial seal leakage. A vacuum reservoir will compensate for low pump CFM, absorbing the initial rush as the vacuum system evacuates the fixture and seats the product. Inches of mercury is the measure of the system's ability to draw a complete vacuum. Thirty inches of mercury is one atmosphere (a full vacuum). Anything less than 30 inches can be considered a percentage of one (1) atmosphere and used in the probe limit calculation above as the efficiency factor. The example used in the limit calculation was 0.60 which represents 18 inches of mercury in a high elevation facility divided by 30 inches.

Summary

Check spring force selection or changes with the fixture manufacturer since these choices are closely tied to the fixture design.

Contact pressure (a function of spring force and tip geometry) must be high enough to penetrate oxides and contaminants that accumulate on both the test targets and the probe tips.

Electrical performance depends largely on the combination of tip sharpness and geometry, as well as on the spring force of a probe. While increasing spring force applies more contact pressure to the test targets, be cautious because it also adds to the overall forces applied to the UUT.

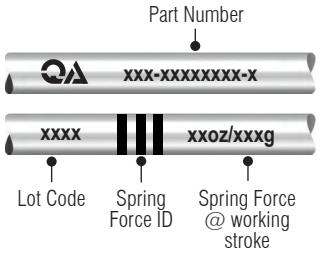
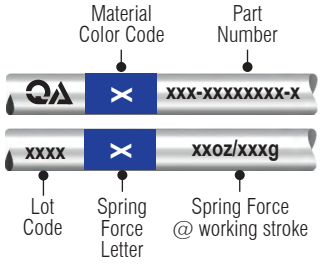
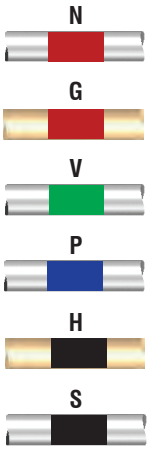
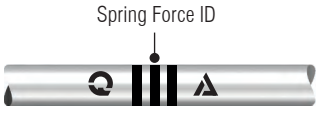
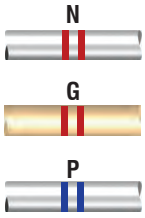
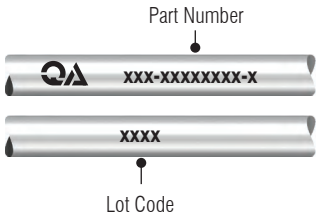
Example:

AREA OF BOARD	x	ATMOSPHERIC PRESSURE	x	FORCE UNIT CONVERSION	÷	AVE. FORCE PER PROBE	x	SYSTEM EFFICIENCY	=	MAX NO. OF PROBES
60 in^2 [387 cm^2]	x	14.7 psi [1.03 kg/cm^2]	x	16 oz/lb [1000 gm/kg]	÷	5.5 oz [155 gm]	x	60%	=	1,500

AREA OF BOARD	x	ATMOSPHERIC PRESSURE	x	FORCE UNIT CONVERSION	÷	AVE. FORCE PER PROBE	x	SYSTEM EFFICIENCY	=	MAX NO. OF PROBES
1 in^2 [6.45cm^2]	x	14.7 psi [1.03 kg/cm^2]	x	16 oz/lb [1000 gm/kg]	÷	5.5 oz [156 gm]	x	60%	=	25

Probe Identification

QA Technology uses a series of markings to ease probe selection and to help test engineers, fixture fabricators, or maintenance technicians to identify the correct part when replacing a worn out or damaged probe. The chart below identifies the markings for each of our product series.*

SERIES		PROBE TUBE COLOR BAND	SPRING FORCE MARKING
050-25 050-40 X31-16 X39-16 X39-25 X39-40 X50-16 X75-16		N/A	 L (Low) S (Standard) H (High) Y (Elevated) X (Extra High) U (Ultra)
075-25 075-40 100-25 100-40 100-50 125-25 156-25 187-25 X50-25 X50-40 X75-25 X75-40			L (Low) S (Standard) H (High) Y (Elevated) X (Extra High) U (Ultra)
100-12 100-15 100-16 100-24			 L (Low) S (Standard) H (High) X (Extra High) U (Ultra)
M100		N/A	N/A

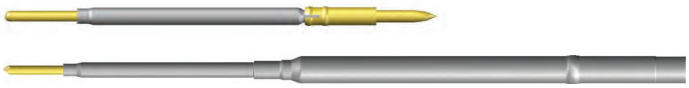
Unmarked series: 025-16, 039-16, 039-25, 039-40, 050-05, 050-16, 100-05, M035, M08, X31-25, X31-40 or any high-preload (E/F) spring probes

Wire Socket and Termination Pin Connection Options

QA Technology offers a wide variety of wire termination types to fit your application. The following is a summary of the options and their applications.

Please Note: some of these socket or termination pin styles are available only in specific probe series (refer to the QA Technology catalog or website for details).

EXAMPLE SOCKET P/N: XXX-SXXXXX ■ OR TERMINATION P/N: XXX-T ■ -XX

P/N DESIGNATION	DESCRIPTION
C	**Crimp** Used to manually attach custom wiring. Not included. 
Cxxx	**Crimp with Pre-attached Wire** Used primarily on close center or fine pitch probe sizes where wire wrap is not available. For a reliable connection, these sockets are available with a four-jaw, eight indent crimp for the wire attachment. Various wire gauges, lengths, and colors are available. 
DSx	**Double Ended** Compared to conventional wire designs, these sockets, used in wireless fixtures, offer shorter signal path lengths for improved signal integrity from the tester circuits to the unit under test (UUT). 
G	**Wire Grip** Used with our WG wire grip sleeves (sold separately) and customer supplied solid conductor wire, QA wire grips offer an easy wire connection method for socket or termination pin applications. 
J	**Wire Jack** Used with our WJ wire jack (sold separately and available with or without solid conductor wire pre-attached), QA wire jacks offer an easy wire connection method for socket or termination pin applications. 

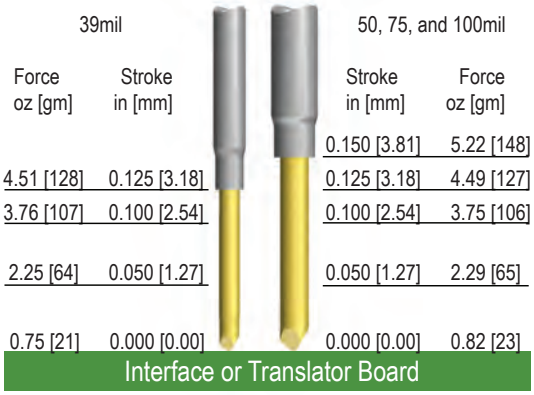
P/N DESIGNATION	DESCRIPTION
M	**Male Round Tube** QA male round tubes are typically mounted onto edge cards, ribbon cable assemblies, or other type of connectors. They are made to accept a one millimeter (1.0mm) female plug. These sockets are made of stainless steel and are recommended for corrosive environments. They are not recommended for solder applications. 
N	**No Termination** Typically used as an inexpensive option, these sockets can be soldered directly to a board, crimped or soldered into the open end. 
P	**Wire Plug** Used with our WP wire plugs (sold separately) and customer supplied wire, QA wire plugs offer an easy wire connection method to a socket. 
R	**Round Pin** QA round pins are used primarily for female connectors, or they can be soldered directly into board vias. Pins are available in a variety of lengths. 
S	**Solder Cup** QA solder cups are exceptionally reliable connections and are used primarily in low-density areas. They can be wave or hand soldered and used in vias or with wire. 
W	**Square Wire Wrap Pin** Square wrap pins are the most commonly used terminations in ATE fixturing for large-scale wiring. QA's products provide excellent electrical integrity through a gas-tight connection that prevents the effects of corrosion. They are one of the most cost-effective connection methods for skilled fixture makers because they facilitate rapid installation, reliable performance, and are inexpensive solutions. QA wire wrap pins are available in a variety of lengths. 

Sockets and Termination Pins for Wireless Testing

Wireless sockets or termination pins allow construction of fixtures with shorter signal path lengths compared to conventional wired designs. The shorter path length allows for improved signal integrity from the tester circuits to the unit under test (UUT). Fixtures built in this manner are referred to as “wireless”and they improve impedance characteristics, allow greater bandwidths for analog test signals and higher vector rates for digital testing.

A wireless socket or termination pin has a non-replaceable interface probe as its termination. This interface probe typically contacts a dedicated PCB/interface/translator board on the fixture. The bottom probe is noncycling and it is designed to last the life of the socket. Replace the wireless assembly if the socket is damaged or worn.

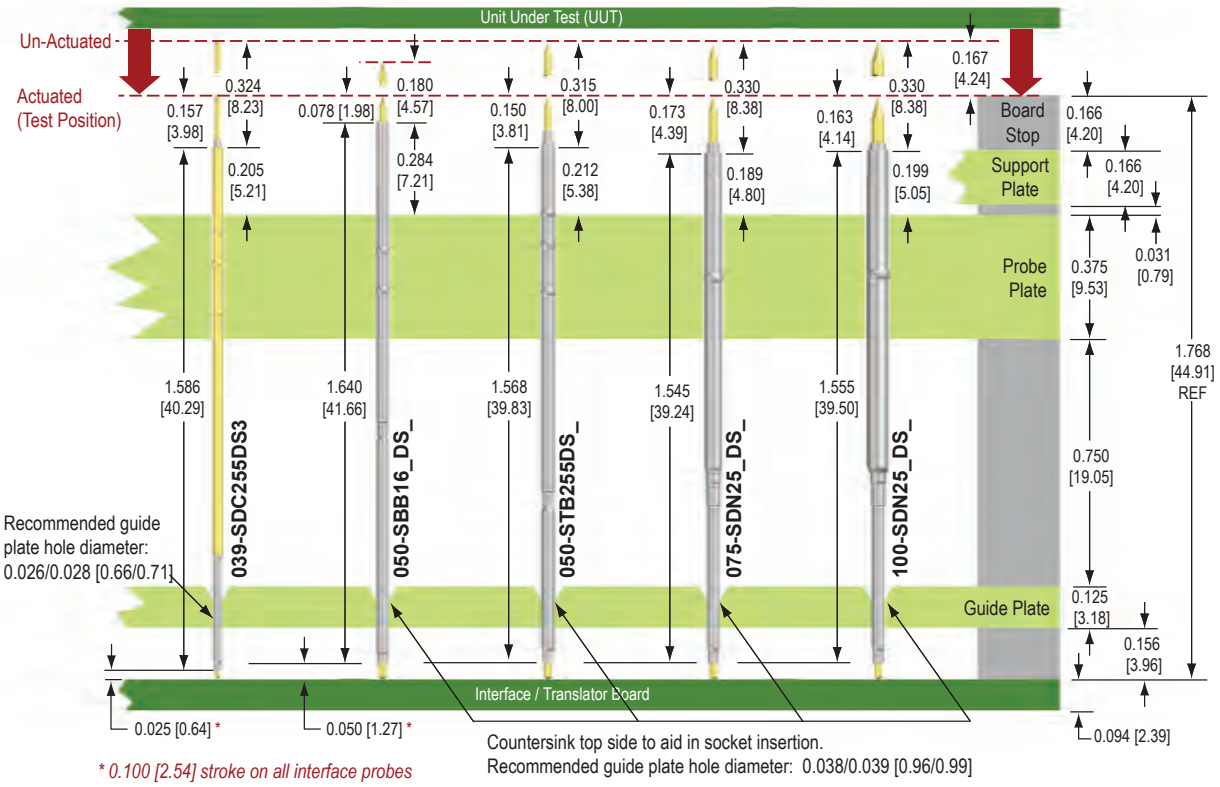
The top of the socket or termination pin accepts standard probes from the appropriately sized series and is replaceable, as routine maintenance requires. When mix mounting QA’s 39mil wireless sockets with 50mil, 75mil, and 100mil wireless sockets, the fixture designer must consider that the full plunger stroke of the 39mil wireless socket is only 0.125 [3.18] stroke versus the 0.150 [3.81] stroke for the others.



Plunger stroke and force for interface probes

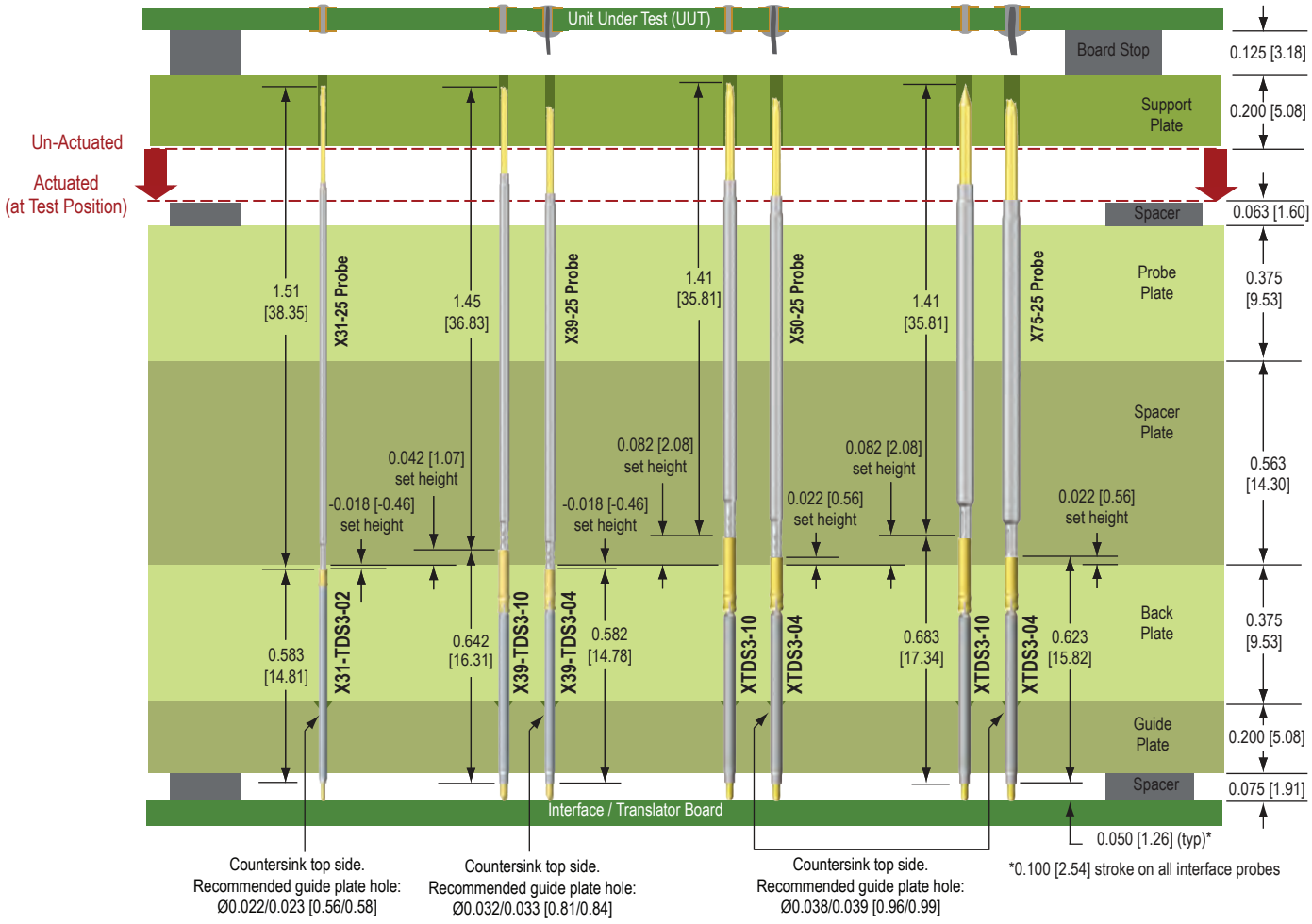
Ultimately, the set height and board layout are dependent upon the specific fixture design and application. QA recommends a guide plate to help maintain alignment between the interface probe and the contacts on the dedicated PCB/interface/translator board. Here’s a suggested layout as a reference.

Conventional Wireless Fixture Example



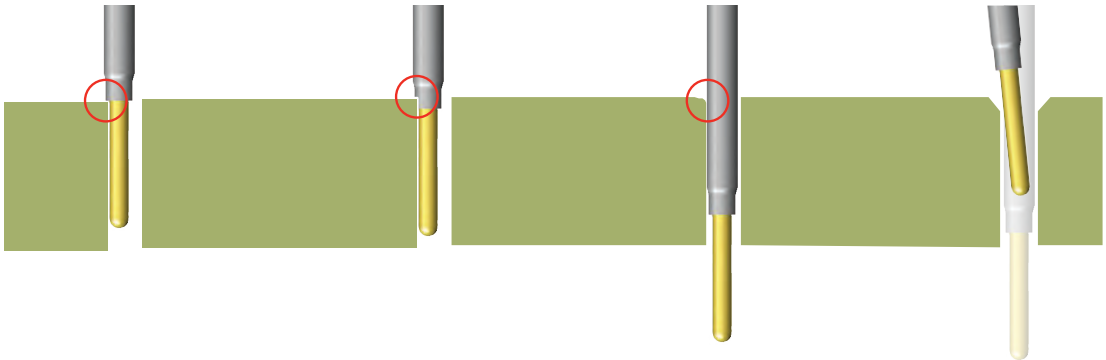
** 0.100 [2.54] stroke on all interface probes*

Socketless X Probe® Wireless Fixture Example



Advantage of Using Countersunk Holes

The illustrations below show the advantages of using a countersunk guide hole on the top of the guide plate.



Plunger aligns in the hole and catches on edge of straight hole

Socket tube can get damaged on guide plate

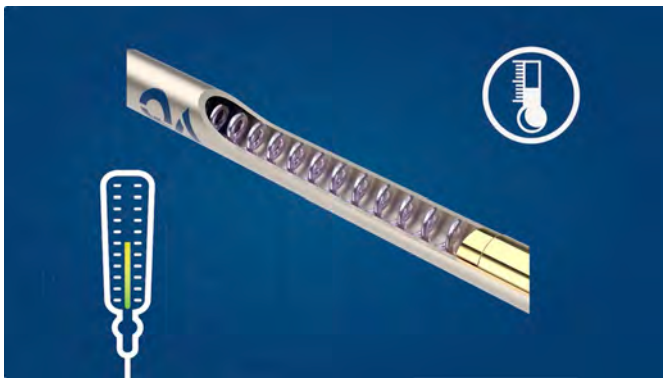
Edge of straight holes are skived by socket tube during insertion

Plunger passes easily through countersunk holes clearing the edges with no damage

Notes

Testing in Extreme Working Temperatures

QA Technology test probes are designed for optimal performance in a wide range of test environments. When testing in extreme high or low temperatures, the right probe materials are key to performing a successful test and maximizing cycle life. In a humid environment, moisture can increase the negative effects of fluxes and contaminants that collect on the probes from the unit under test.



Our probes' spring material and lubrication determine the working temperate limits of a given probe series. As with many moving parts that involve friction, probes are lubricated to prevent wear, extend cycle life, and maintain low electrical resistance.

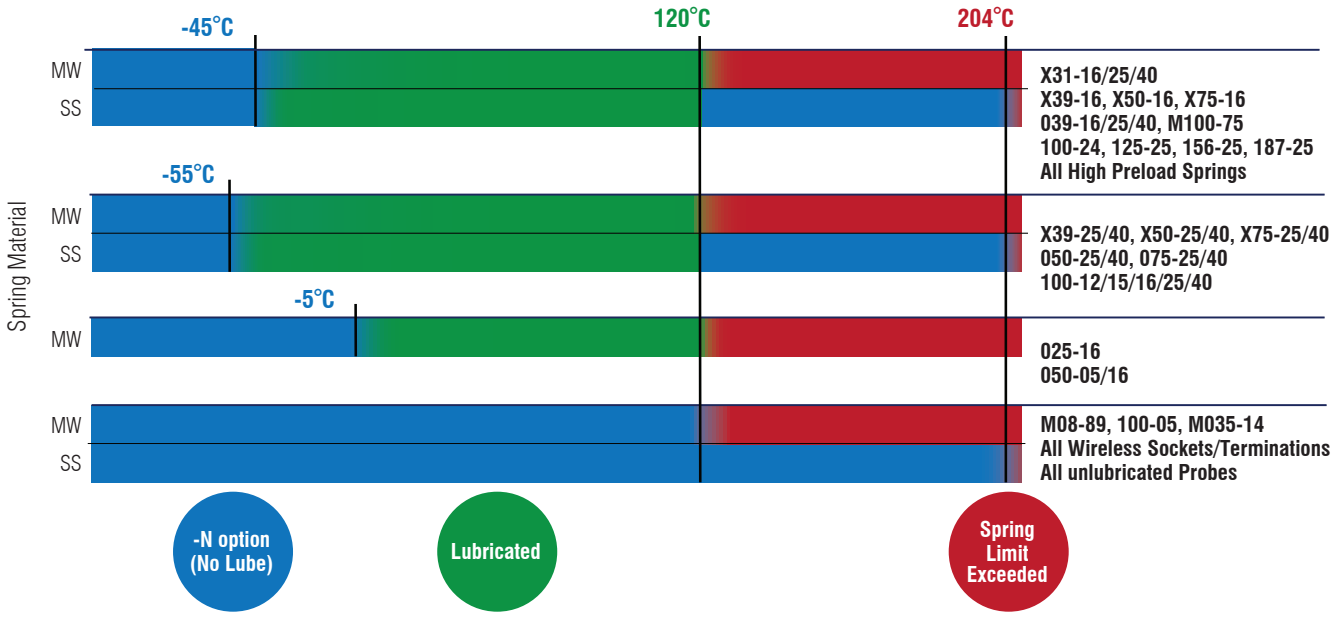
Below is a chart of the various product series we offer and their temperature limitations. More details can be found on each product series specification in our catalog or website.

At extreme high temperatures, lubrication properties could degrade and the strength of the spring material may be compromised. Although the springs are not likely to fracture in this situation, they may take a permanent set and the spring force at a given deflection will be reduced. Select probes with a stainless steel spring and non-lubricated (-N) option to withstand the higher temperature, up to 204°C, to maximize cycle life.

In extreme cold temperature environments, the lubricant's viscosity will increase as temperature decreases, causing sluggish movement of the plungers and intermittent contact. If probes are actuated below their rated temperature, the lubrication may not perform properly resulting in galling of the plunger and inside surface of the probe tube. This wear could cause the base metal to form oxides, greatly reducing the electrical performance.

If it is necessary to perform tests below the rated temperature limit, QA recommends using non-lubricated probes as there is no known lower temperature limit and they will actuate freely. Keep in mind that cycle life is reduced and resistance is higher with non-lubricated probes.

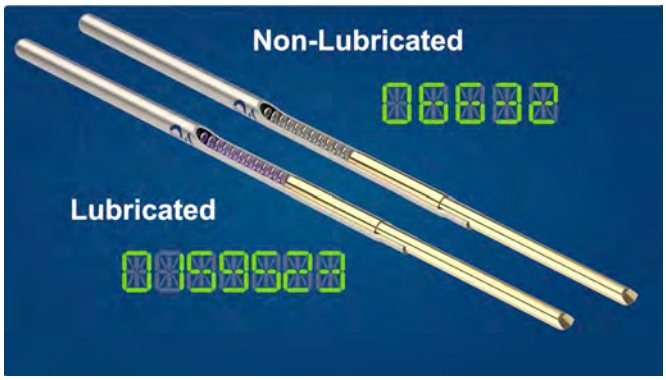
If it is necessary to use lubricated probes in extreme cold environments without doing harm to the plating or materials, actuate them at room temperature and then move them to the cold environment.

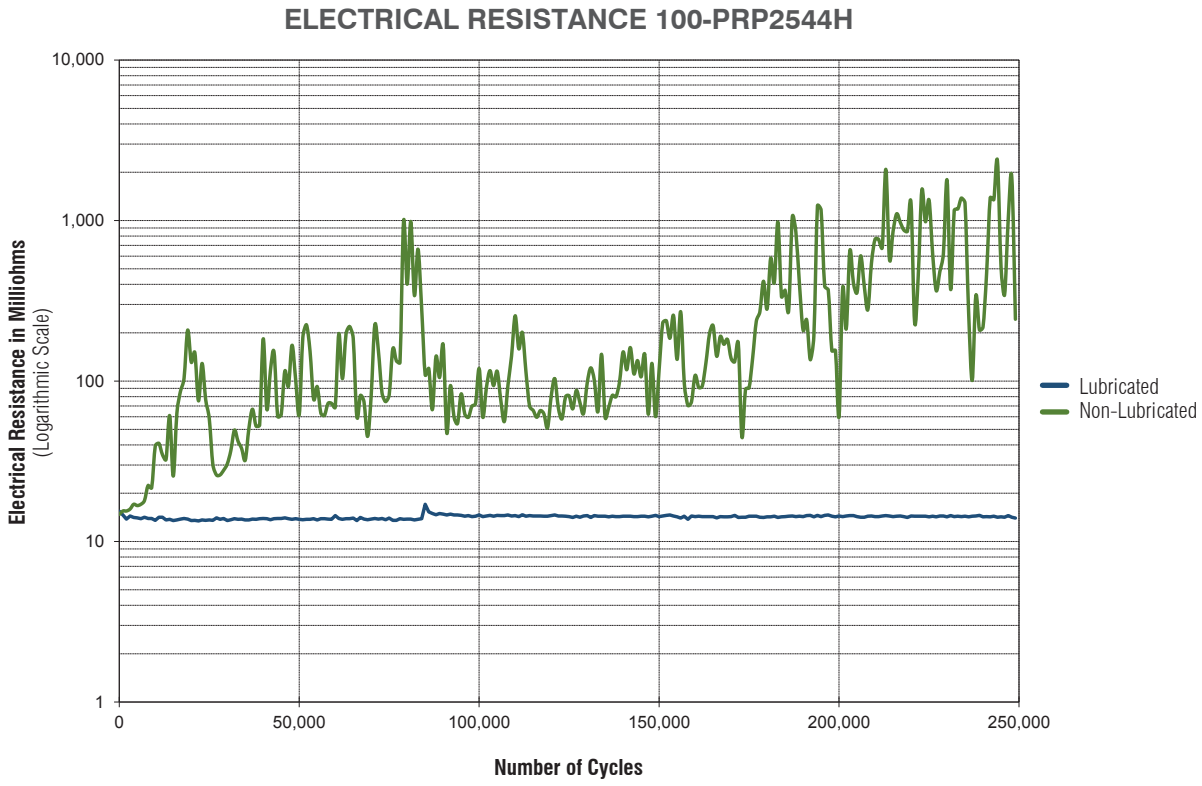


Lubricated vs. Non-lubricated Probes

While testing in extreme environments is achievable, there are significant performance differences between lubricated and non-unlubricated probes, such as cycle life and resistance.

In a side-by-side cycle test study with standard lubrication and identical probes without lubrication, resistance measurements were taken at every 2,000 cycles, and stroke measurements at every 5,000 cycles. Note that cycle counts on a tester in a controlled laboratory environment are considerably higher than in a production environment. Below is a summary of the results:





100-PRP2544H	100-PRP2544H –N
LUBRICATED	NON-LUBRICATED
No measurements greater than 24 milliohms.	Electrical resistance greater than 50 milliohms was seen as early as 8,000 cycles.
	Wear particles were present on the plunger shanks around the socket bases. This caused electrical and stroke failures.
Spring force was consistent throughout the test with no increase in spring force after 1,000,000 cycles.	Significant increase in the force required to compress the non-lubricated probe.

Tip Style Selection

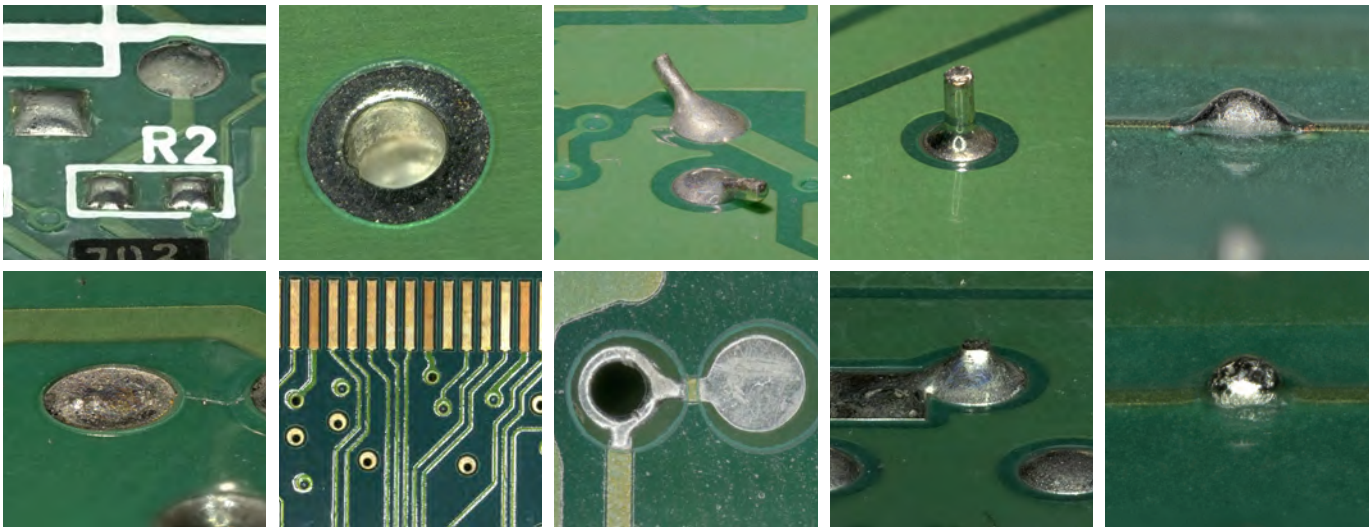
Printed Circuit Boards (PCB) are an essential part of the many electronic products we rely on every day. Both in-circuit and functional testing after manufacturing are critical steps to ensuring their dependability. QA Technology's test probes are an important part of this process, offering the best possible electrical contact with each board being tested.

While there are many probe factors that affect its ability to make reliable electrical contact, proper tip style selection is likely the most important one. Incorrect tip selection could cause false failures where no defects are found (NDF), lower your first pass yields (FPY), or in extreme cases, damage the unit under test (UUT). Selecting the right tip can reduce the overall cost of test by increasing the output of units being tested and extending the life of your test probes.

Test engineers often have very different experiences as to which is the best probe tip style to use for any given contact surface. QA offers a wide range of styles to support the various board test applications known in the industry. The following considerations will help you select the right tip style for many of today's common test targets.

Test Target Types

It is important to consider the size, shape and other features of the test targets. There are various PCB targets such as pads, vias, leads, posts, and solder bumps, which range in probe-ability from easy to difficult.



BOARD MANUFACTURING/PROCESSES

EASY

PCBs that are designed with a clean process and are produced with surface finishes such as immersion tin, silver, gold, or ENIG are generally considered easy to probe. Reliable electrical contact can be achieved by using many of the common probe tip styles.


Immersion Au (gold) **ENIG**


Immersion Ag (silver)


Immersion Au (gold)


Immersion Sn (tin)

MEDIUM

Test targets that are solder pasted using a no-clean process, or have other common finish types such as hot air solder leveling (HASL), are typically considered medium difficulty to probe. For these finishes, be sure you are using a no-clean paste that incorporates a pin-testable flux. The selection of probe tips to choose from for these applications is slightly more limited.


Hot Air Solder Leveling – HASL


Lead with wave solder/reflow

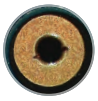
DIFFICULT

The most difficult to probe test targets typically fall into one of two categories. The first is one that is solder pasted using a flux that is NOT rated as pin-testable (PT). This type of flux leaves a residue that is more difficult to penetrate, making electrical contact less reliable. In this case, we recommend that you work with your process team to see if a probe-able flux can be used.

The second will have an organic solderability preservative (OSP) finish that is applied to a PCB to prevent oxidation on the copper surfaces. While an OSP finish generally has the benefit of a lower cost, it will likely increase the cost of test by lowering FPY and reducing probe life. In these situations, there is a very limited tip style selection. It is highly recommended to solder paste these test points prior to electrical testing.


Lead Free Solder Paste/Flux


Organic Solderability Preservative OSP


Unpasted OSP Via

Tip Materials

QA's tips are made from either beryllium copper (BeCu) or steel. Both are gold plated over nickel. The hardness of steel ranges between 58 and 60 on the Rockwell C scale, 38-42 for BeCu. As such, steel will have reduced wear and remain sharp longer.

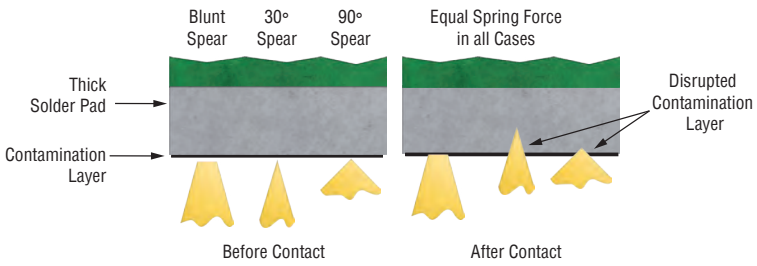
While there is a difference in the average resistance of less than 10 mOhms between the two base materials, it will not affect the vast majority of test applications.

Tip Geometry

QA offers many different tip styles, each with their unique geometry. The large number of headed or headless choices supports the wide variety of test applications.

Geometry and sharpness will determine the ability to penetrate contamination layers. A tip that is blunt or has dull edges will make contact over a larger area thus reducing its ability to penetrate contamination layers on the test targets.

A tip that has a sharp point or steep cutting edges applies a higher pressure against the solder causing it to yield. As the solder yields, any oxides or remaining flux residues are disrupted, allowing better electrical contact.

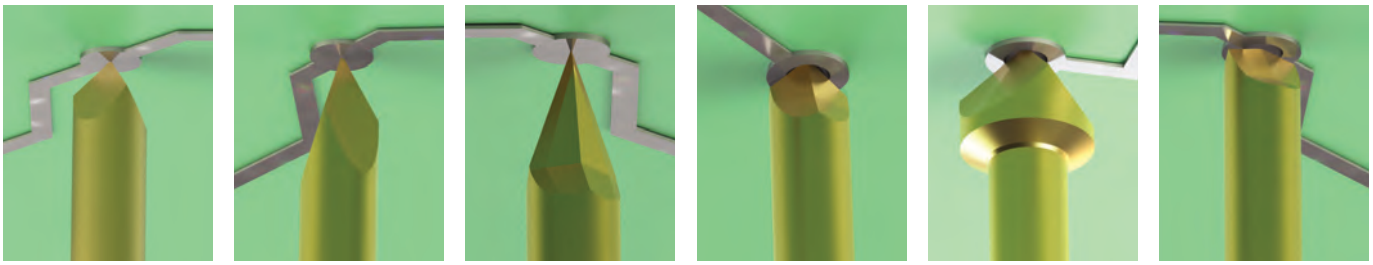


Recommended Tip Styles for Target Types

TEST PADS, VIAS AND THROUGH-HOLES

TEST PADS, VIAS and **THROUGH-HOLES** come in a wide range of sizes, surfaces, and shapes. They can be solder pasted, unpasted, concave, flat, or convex (dome).

Vias and through-holes in a PCB are typically used to pass a signal from one layer to another. When these are to be used as test points, it is necessary that they are not solder-masked so that they can be easily probed.



EASY

For gold plated pads use a **SPHERICAL** or **FLAT** tip to minimize marking.

40 30 10

For open or solder pasted holes/vias use a **BLADE, CHISEL, SPEAR,** or **STAR** tip. Reduced contact area will generate higher contact pressure.

61 51 43 03 23 01 06

For flat pads or solder domes, reduced **CROWN** tips may be considered to prevent sliding off the target.

74 54

MEDIUM

For contacting flat pads and vias pasted with pin-testable solder, **CHISEL, BLADE,** or **STAR** tips can be good choices.

43 03 23 61 51 N6

The **CHISEL TRIAD** tip is a good choice for contacting open holes/vias where flux is present. The **SPEAR** tip is used when the rim of the hole must remain free of marks.

18 38 41

DIFFICULT

RAZOR tips are made with two sharp cutting edges to increase contact reliability on a wide variety of pasted pads and vias. Although QA does not recommend testing on unpasted vias, the 6R **RAZOR** may be the best choice.

6R 8R 9R

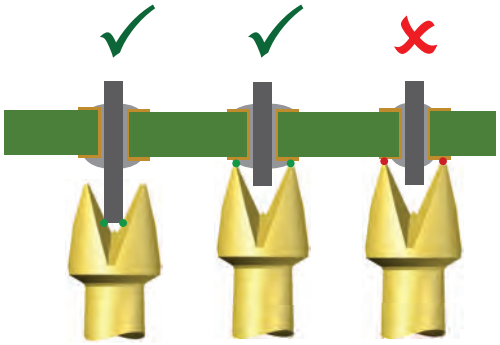
A steeper angled tip such as **SHARP CHISEL, SHARP NEEDLE,** or **TRIAD** can provide the highest penetrating pressure for reliable testing on flat or domed test pads.

53 63 31 08

LEADS AND POSTS

A lead is a terminal on a component. They could be different lengths, straight or bent. Smaller leads will require tip styles with closely spaced cutting edges to trap the leads. A post is larger in diameter and more rigid than leads.

Multi-point tips are designed to capture a target, such as a lead or a post. Some styles have steeper valleys between the tips, creating a self-cleaning feature where it allows contamination to escape.



EASY

For stability on a lead or post and to minimize side-loading, the **SERRATED** tip style is the best choice, but has a limited ability to penetrate contamination.

64 09 29

For extremely long leads, **CUP** or **TORCH** tip styles can be used, but are likely to require more maintenance.

22 32 82 07

MEDIUM

When using a pin-testable flux, a self-cleaning **CROWN** or other multi-point tip with valleys will help prevent contamination from building up.

74 84 N4 44 56

Tip styles with close points, such as **CHISEL TRIAD,** or **TORCH**, are best used on short leads.

38 05

A **SLOTTED CUP** tip is self-cleaning, while a traditional **CUP** can easily collect dust and contamination from the UUT. A traditional **CUP** is best used in a horizontal or downward-pointing orientation.

52 22

DIFFICULT

When a more difficult to test process is being used, consider using an aggressive self-cleaning **CROWN** tip design that features deeper cuts.

34 24 58

Small diameter leads require a self-cleaning tip geometry such as a **CROWN** or **TORCH** tip to prevent the lead from slipping through the valleys.

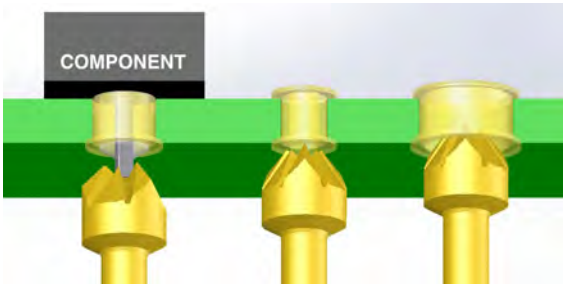
55 17

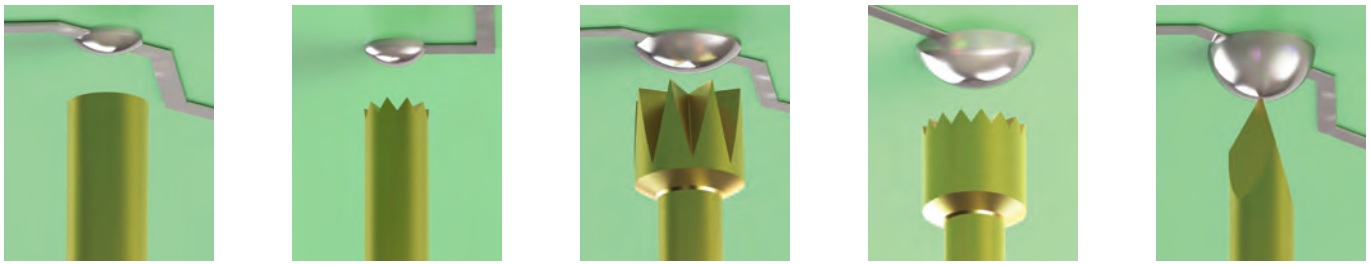
SOLDER BEAD/BUMP/DOME

Technology provides test point accessibility, using a probe to contact a variety of solder beads or bumps that are placed on a trace where the solder mask has been removed. In addition, by placing an excessive amount of solder on vias or test pads, a round dome of solder may also need to be probed.

In addition, QA offers many specialty tip styles for other important, but less common applications.

- Our **CHISEL TRIAD "38"** tip style is designed specifically to be a multi-purpose solution for boards that may or may not have leads present during testing. When a component is present, the 6 peaks aggressively capture the lead within the cutting edges. When the component is absent, the point of contact varies based on the diameter of the through-hole. With smaller holes, the three sharp points will hit the face of the via ring. When contacting a larger through-hole, the three sharp cutting edges will contact the inside of the hole, giving optimal electrical points of contact.





EASY

For clean processes where a minimal witness mark is desired, our **FLAT** tip is the best choice.

20 **10**

When light flux residues are present, a **MICRO SERRATED** tip is suggested.

B9 **79** **59**

MEDIUM

For no-clean flux targets, our moderately aggressive **FLAT STAR** tip has deep radial groves extending from the center, offering a self-cleaning benefit where contaminates or oxides tend to adhere to other tip styles.

36 **46** **16**

DIFFICULT

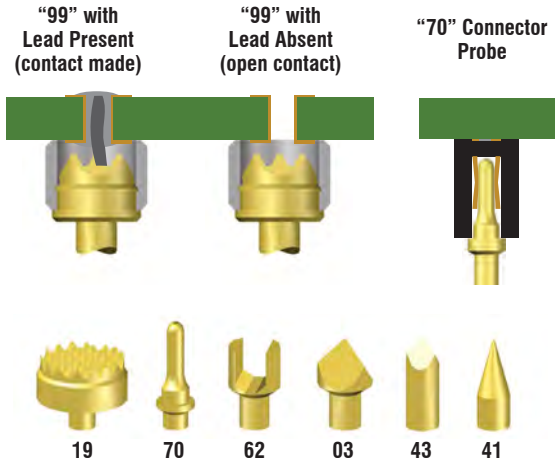
The most aggressive tip for this target type is our **CENTER POINT STAR**. Their sharp radial cutting edges, along with a sharp center point, make these ideal when difficult no-clean flux processes are being used.

76 **26**

For larger solder domes on traces and pads, a **SHARP CHISEL** or **9R RAZOR** tip may be considered. It is critical to have extremely good pointing accuracy for reliability. QA recommends a guided plate fixture design.

53 **63** **9R**

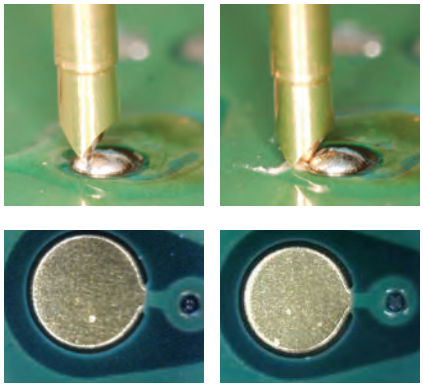
- Our **INSULATOR "89"** and **"99"** tip styles are used to test the presence or absence of a component on a PCB. An insulating sleeve around the probe keeps the probe electrically isolated from a flat contact surface, but allows the probe to make electrical contact with a lead or post.
- Our **CONNECTOR "70"** tip style is used to test a female pin connector where the rounded tip makes contact with the inner beams. A shoulder of the tip acts as a stop to prevent the tip from sliding completely through.
- QA offers the various tip styles for probes used in tester systems known throughout the industry. In our catalog and website, QA provides complete probe details that match tester manufacturers' series.

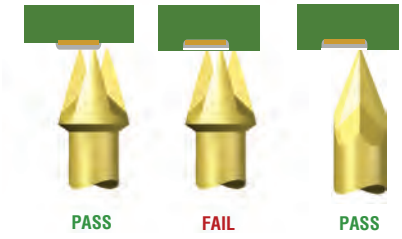


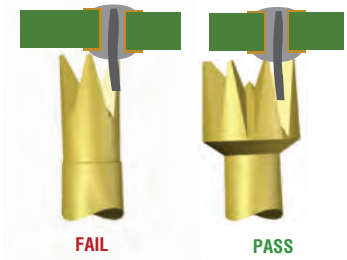
Other Considerations

- When new fixtures are built, we recommend verification of the selected tip styles once all board elements are identified. Initial processes and solder types can vary from the prototype PCB design to the production boards. In preparation for the launch of production UUT's, tip styles may need to be changed to a different geometry or a more aggressive style based on the cleanliness of the board.
- If the tip style recommendations do not generate good electrical contact, look closely at the witness mark that the probe tip should have made on the test target. Poor pointing accuracy, TIR of the probe assembly, as well as the diameter of the target can be attributed to missing the intended target. While certain tip styles may work well on flat or concave vias, when a dome is present, and pointing accuracy is not good, they may glance off the target and hit the solder mask.
- If your board process causes the solder mask to be below the test point, a multi-point tip may work even if you do not have good pointing accuracy. If your solder mask is higher than your target, one or more of these multipoint tips could prevent the others from making electrical contact. In this scenario, change to a single point probe to hit the target.
- In cases where you cannot improve the pointing accuracy on leads or posts, select a larger diameter tip style to maximize the ability to hit the test target reliably.

In summary, it is critical to select a tip style with the right number of points of contact, the correct angles, and sharpness. Improving the electrical contact to your test targets will help increase probe life and improve your FPY. Higher yields mean less time troubleshooting false failures, faster through-put, and ultimately, lower overall cost of test.



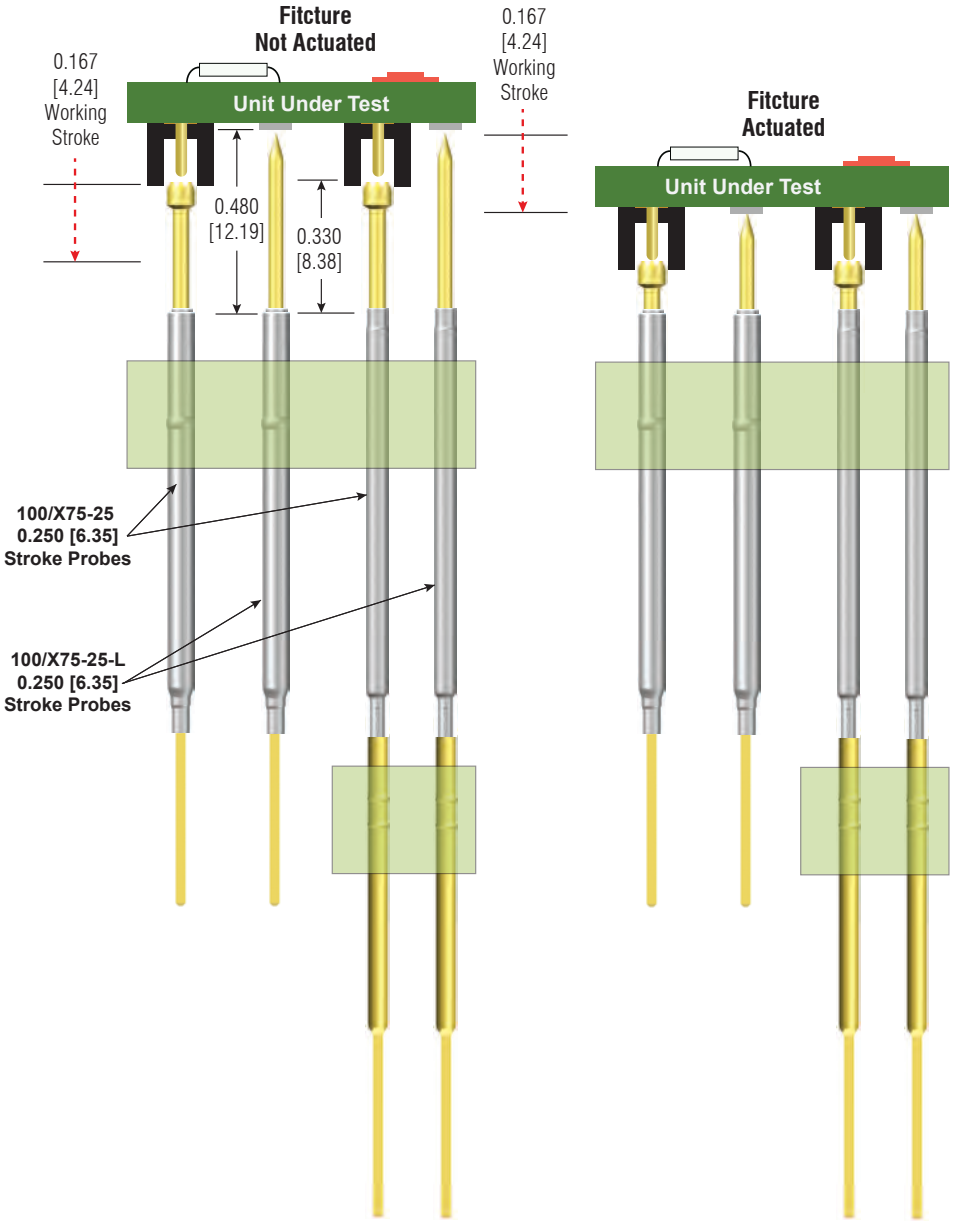




Long Plunger Option For Various Target Heights

Testing loaded printed circuit boards can be complex when various target heights are present and when you do not want to adjust the socket or termination pin set height.

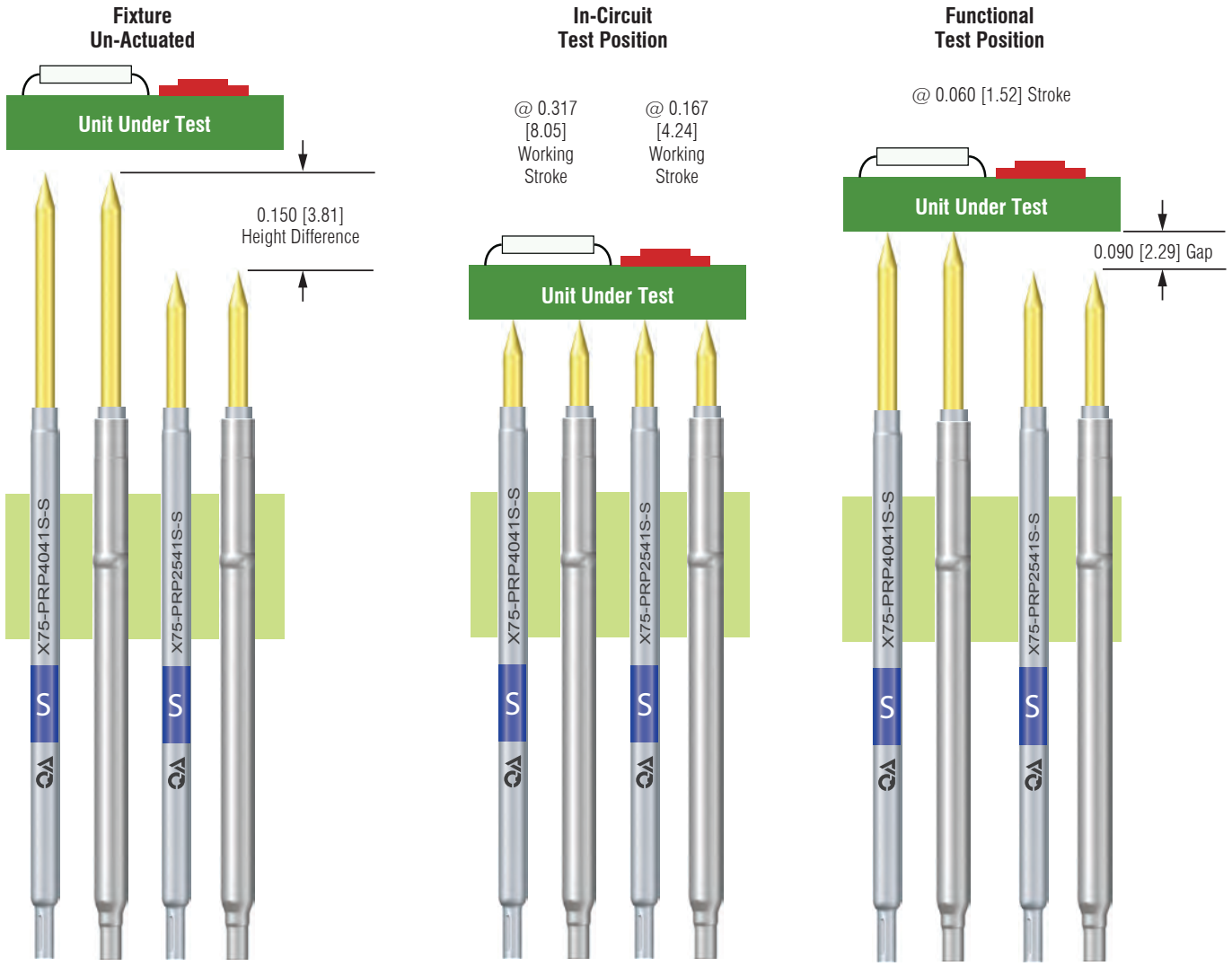
QA Technology's long plunger (-L) option in our 0.250 [6.35] stroke series offers a solution to help contact the shorter target, while maintaining the same spring force when the fixture is actuated at the recommended working stroke.



Long Stroke Probes for Dual-Level Testing

To perform a functional component test (FCT) and an in-circuit test (ICT) in the same fixture, use a longer stroke probe for the functional part of your test. QA Technology's 0.400 [10.16] long stroke probes are designed for this purpose. For dual-level testing, they are easily mixed with their standard stroke 0.250 [6.35] counterparts, available in a variety of sizes. This allows for the same set height when mounting sockets or termination pins for the same series.

Long stroke probes are 0.150 [3.81] longer than their neighboring standard stroke probes when the fixture is in the unactuated position. During an in-circuit test, the long stroke probes will be actuated to 0.317 [8.05], and the standard stroke probes will be actuated to 0.167 [4.24], the recommended working stroke position. In the functional test position, the long stroke probes are actuated to approximately 0.060 [1.52], leaving 0.090 [2.29] clearance to the standard stroke probes.

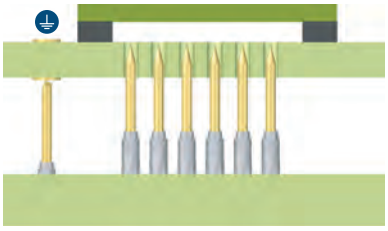


* Note: When installing the 050-25 sockets or X39-25 termination pins for the dual level testing, the 0.250 [6.35] stroke sockets terminations must be mounted 0.015 [0.38] higher to achieve the 0.150 tip height difference when the fixture is not actuated.

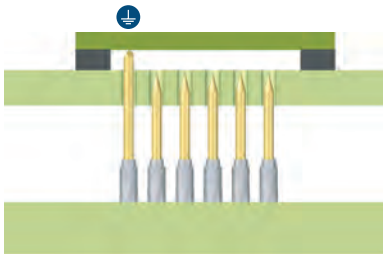
Extended Stroke Probe

QA Technology's Extended Stroke Probe is designed for applications where a longer plunger and more stroke is needed. The 100-50 series probe is a 0.500" (12.7mm) full stroke probe that fits into a standard 100-25 series socket.

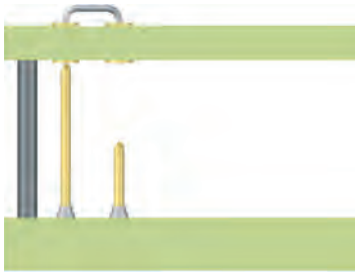
Suggested Uses:



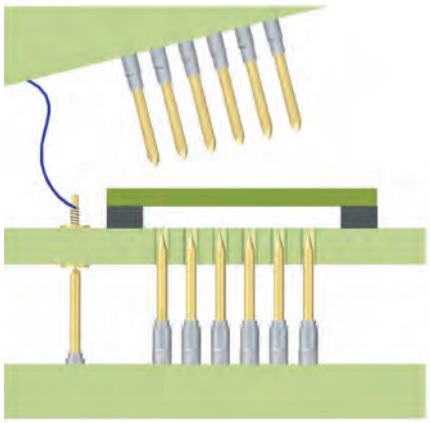
1. To continuously bleed off static charge from a support plate, use an extended stroke ESD ground probe in a probe plate to contact an ESD lug.



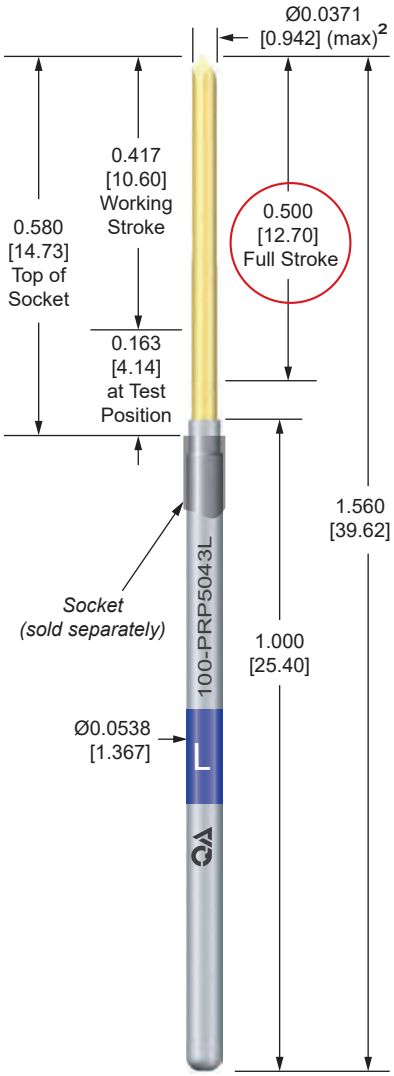
2. Use an extended stroke ESD ground probe to contact a ground point on the UUT to bleed off static before other probes contact a board.



3. Used with a shorter stroke probe, the extended reach probe contacts a conductive sensor on a gate or support plate to signal if a gate is open or closed.



4. Use an extended stroke probe when connecting to transfer points that are connected to topside probes or other signals for sensor plates used in an upper gate assembly. This allows electrical verification to be performed while the topside assembly is in the "open" position.



Notes

Cycle Life for Test Probes

Perhaps the most common question we hear from our customers is, “How long will my probes last?”. The best answer we can give is that it depends on many factors. While applications vary widely, extreme testing conditions may exist. Some test probes may be cycled once on clean contacts and maintained in the compressed position, while others on a high volume production assembly line may experience much higher cycles.

The published mechanical life and resistance data for a probe is based on both the fatigue life of the spring and the internal sliding contact surfaces when cycled in a controlled laboratory test environment. However, in an actual production environment, a test probe will typically encounter many conditions that will affect probe life.

Here are several important factors that should be considered:

Test Application – Measurement sensitivity is a critical factor when considering probe performance. For example, probe life may be much longer on a less sensitive measurement. Tests requiring high current need probes manufactured from materials that can carry high amperage. For targets with closer than average centers, this forces the use of smaller probes which are more fragile, have lower current ratings, and may have a shorter cycle life than larger probes.

Board Manufacturing Processes – There are a variety of board manufacturing processes that play a significant role in the ultimate cost of a test. It has become commonplace to use a no-clean process, which can leave everything from gummy residues to brittle contaminants affecting a probe’s contact reliability. Careful selection of tip styles and spring forces must be considered when contacting these difficult test targets.

Test Environment – Flux residues can range from very hard to wet and gummy depending on temperature and humidity levels. These flux residues can slowly build up on the tips of the test probes causing false failures resulting in no defects found (NDF). This effort to diagnose and retest boards with these false failures increases your company’s total cost of test. Testing in extreme high or low temperatures can reduce probe cycle life significantly. In cold temperatures, a probe’s lubrication may thicken, preventing the plunger from returning to full height. In extreme heat, the lubrication and/or the spring material may be compromised, causing premature probe failure.

Board Manufacturing Materials – The introduction of manufacturing processes which leave a difficult to probe coating or residues on the board can add complications for testing. Matching the best probe and tip style to the materials and finishes of the test targets is critical for a reliable test and for extending probe life.

For example, while organic solderability preservatives (OSP) can protect boards from oxidation, this protective layer can cause significant problems at test. Because reliable testing requires a good contact between the test probe and the test target, a combination of steel tip material, razor style tip design, and higher spring force will break through the coating, extending the probe’s life.

Applying pin testable solder paste to test targets is recommended to provide the most reliable, highest yielding contact surface.

Fixture Design – Fixture design and construction will greatly affect a probe’s performance. Probes that are out of alignment will quickly wear out.

- Producing fixture plates with accurate hole sizes, positions, and straightness will improve the installation, wiring, and accuracy of sockets and termination pins.
- When using a guide plate for small targets or close centers, proper alignment will minimize excess wear on the side of the plunger or damage to the probe tip.
- Socket/termination pin set height is also critical for probe performance and longevity. QA probes are designed to operate at a working stroke, typically at two third stroke. When set too low, the probe is under stroked, reducing the contact force and the ability to penetrate surface contaminants. When set too high, the probe is over stroked, which may result in spring failure and potential damage to the unit under test (UUT). Use QA indicator probes to measure the deflection amount and ensure probes are operating with the correct working stroke in your fixture.
- When designing a fixture, proper selection of spring force is important. Several factors such as total collective probe force, condition of the contact surface, contact density, board stops, and support pins all must be considered.
- Using the correct probe installation tool will avoid damage to the tip. A harder tool can cause the tips to deform or even break, directly impacting the probe’s effectiveness.

Probe Selection – QA offers a wide range of tube, spring, and tip options to ensure the best possible probe choice for a specific application, environment, manufacturing process, and test target.

- The tube material and plating are important factors that influence the resistance and current rating of a probe.
- QA springs are made of music wire or stainless steel and are designed to maximize cycle life for a given force.
- Selecting the right tip style, size, and material for the target is critical for reliable contact.
- There are significant differences between lubricated and non-lubricated probes. QA probes are lubricated to maximize cycle life and performance. Unlubricated probes are available options if required.
- An effective method for maximizing probe life is to select QA's socketless X Probe® design, delivering the same performance as conventional ICT probes while offering additional benefits. Using larger, more robust probes on smaller centers will generate better pointing accuracy, less sideloading, an increased spring force, and tip style selection.

Care and Maintenance – Improved test yields and reduced downtime are the rewards for keeping fixtures and probes in top condition.

- Good maintenance begins with careful storage. Leave probes in their original packaging to protect them from damage.
- Clean probe tips, remove lint, fibers, and other contaminants by gently brushing the probe tips with QA's natural fiber brush and vacuum away the dislodged particles. Never use cleaning solvents. They will wash away the internal lubrication and potentially cause debris to wash inside the probe, causing reduced performance or shorter life.
- Diagnosing contact problems as they arise and replacing test probes one at a time is more expensive than replacing probes on regular intervals. A preventive maintenance program for fixtures can reduce downtime and lower the overall cost of test.

Identifying When to Replace a Probe

Probe wear is inevitable. Knowing when to replace a probe at the right time makes testing more reliable while reducing the chance of false failures and lost rework expenses. Here are some common signs that a probe needs replacing:

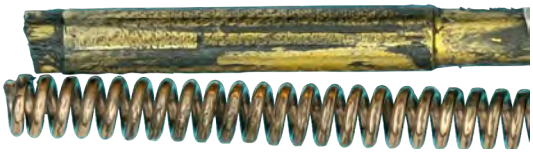
High Electrical Resistance

- Contamination buildup on the probe tips or the UUT can form an insulating layer and prevents reliable contact. This contamination comprises flux residue, solder oxides, and particulates from the contact surface. Also, fibrous contamination from clothing, gloves, or the recently sheared PCB material.

- Damage to the probe tip plating allows formation of oxides on the plunger base material. This effect is compounded in fixtures that sit idle for extended periods in humid environments.
- Damaged probe tips no longer create pressure high enough to make reliable contact. Tips are commonly damaged by improper installation, bottoming during use, or lateral motion between the tip and the UUT.

Internal Wear

- Plating wear on internal contact surfaces is caused by extended cycling or sideloading the plunger (contacting angled component leads with crowns, contacting misaligned open vias with chisels, etc.).
- Dirty plungers could potentially move contamination onto the critical internal contact areas.



Spring Failure

- Spring failure can occur when probes are used beyond their working stroke and rated cycle life. Indications of spring failure to look for are: plungers that no longer return to full height, reduced spring force, or broken spring coils that compromise the full stroke capability of a plunger which may cause damage to the UUT.
- Temperature relaxation happens when springs are exposed to temperatures greater than 120°C for music wire and 204°C for stainless steel for extended periods.

Current Carrying Capacity

This test report presents the data and describes the procedures for testing the current carrying capacity for QA Technology's test probes and their respective mounting sockets or termination pins. The current carrying ability of a probe is ultimately determined with respect to probe temperature. (Refer to the Applications Note titled *Working Temperature Ranges* for additional information.) QA's testing was performed at a nominal ambient temperature of 20°C. The final current carrying capacity of a probe will depend upon many additional factors specific to the actual application.

The maximum temperature that a probe can handle is determined primarily by the spring material and the lubricant used. Ratings for probes with music wire springs are limited to 120°C, while stainless steel springs can handle up to 204°C. Ratings at both temperatures are outlined in their respective product pages. Note that only certain products use a stainless spring.

Although our current and temperature ratings are based on our product materials, many fixture materials will not tolerate temperatures up to 204°C (some plastics will not even withstand 120°C). Many solders may become weak or even melt well below this temperature. Precaution is advised if operating probes at very high temperatures.

Test Procedure

QA Technology's current test system consists of a multichannel data acquisition system, programmable DC power supplies, a test fixture chamber shielded from room air currents and an industrial PC to provide test configuration, control and data recording. The test fixture chamber provides connection points for one or two test fixtures at a time, and it also has thermocouples installed for measuring the ambient air temperature during the test.

For our conventional probe series, FR4 test fixtures were built to mount eight probes at a time for testing. Standard 0.250 [6.35] stroke probes were stroked to 2/3 of their nominal full stroke. Long stroke 0.400 [10.16] probes were tested at 0.075 [1.91] stroke which is commonly used in dual-level fixturing. The probes were spaced 1.00 [2.54] apart to provide effective thermal isolation between individual probes. A circuit board was designed to allow all eight probes in one fixture to be connected in series. The surface of the circuit board was coated with solder to simulate typical contact conditions between the probe tip and a circuit board under test. The sockets were interconnected to complete the series current path. The wire gauge used for interconnecting the sockets was selected according to the expected test current.

Fine gauge type T thermocouples (Copper/Copper-Nickel) were soldered to the sockets just below the bottom surface of the socket mounting plate. The fine gauge thermocouple wire minimized heat transfer from the socket and decreased the thermal response time. The thermocouples were then connected to the multi-channel data acquisition system.

In the case of QA's X Probes®, the test thermocouples were attached directly to the probe tube wall just above the tube's interconnect receptacle. The X Probe termination pins were connected in the same fashion as the sockets for conventional probes.

For testing wireless sockets and termination pins, the test fixtures were designed so that both the test probe and wireless interface probe are part of the current path. The interface board was spaced so that the plungers were compressed to the recommended stroke and a flat gold pad was used for the contact point. The gold contacts on the interface board were wired to complete the series current path and a thermocouple was soldered to the wireless interface probe tube to monitor the temperature of the interface probe assembly. In general, the current carrying capacity of the wireless sockets and termination pins were less than a standard wired socket and termination pin assembly due to the additional interface probe.

A programmable DC power supply was used to provide a constant test current through the probes and sockets or termination pin being tested. The current was programmatically incremented and the assemblies were allowed to reach a stable temperature before the readings were recorded. This process was repeated until the required temperature rise was achieved across a majority of the probes under test.

The wire gauge used for interconnecting the sockets or termination pins of the probes under test varied depending on the final current requirements for the test. Indeed, the choice of interconnect wire gauge played a significant role in determining the temperature of a particular probe during testing. A heavier gauge wire ran cooler for any given current, with the copper conductor acting as a heat sink for the probe under test.

Three sets of tests were conducted and analyzed statistically to produce a temperature vs. current curve based upon a 3-sigma rise above the average data values. The final current carrying rating for the probe was derived from this curve. Using this 3-sigma standard, 99.7% of all probes will meet the current rating.

The M035-14, M08-89, and M100-75 probes' setup utilized fixtures designed around the typical applications for these probes and consisted of two plates with the probes captured between a top and bottom plate. A small cross-channel was machined in the plates to allow room for the thermocouple wires. Two circuit boards sandwiched the top and bottom plates to route the series test current through all eight probes.

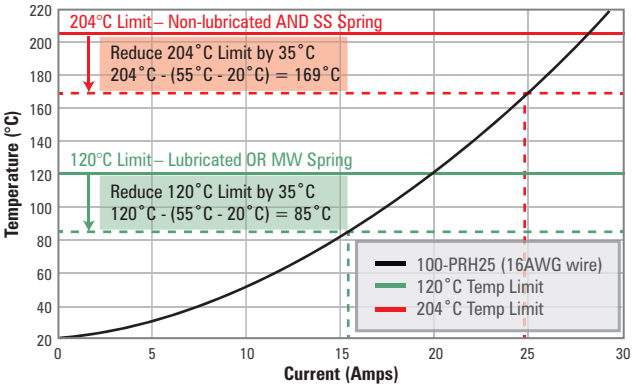
Application Notes

Probe Mounting Density – Higher probe mounting densities decrease the probe's current carrying ability. This is due to the combined heat generated by the probes and the decrease of air circulation via natural convection. Because each application is unique, it is recommended that appropriate tests be conducted before probes are put into service in applications with high currents, high probe densities, or limited airflow.

Probe Cooling – These temperature measurements were made in the absence of any forced convection. Providing airflow (by means of a fan, for example) around the sockets or termination pins will reduce the temperature for a given current. Also, tests have shown that the airflow present due to leaks in a typical vacuum fixture will reduce temperature.

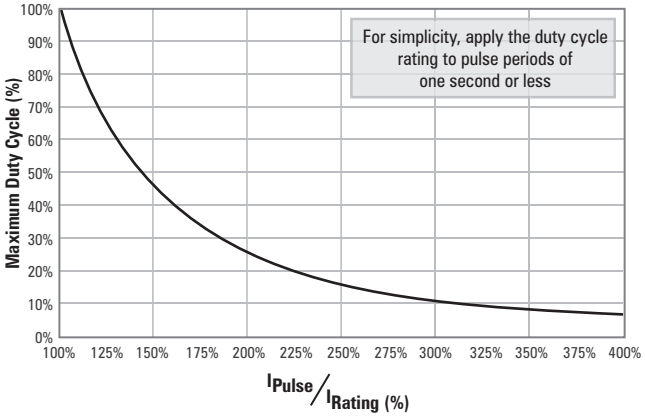
Elevated Ambient Temperatures – For conditions where the ambient temperature differs from the 20°C ambient of these tests, a simple graphical technique can be used to obtain a corrected current limit; shift the temperature limit line down by the same amount that the actual ambient temperature exceeds 20°C. For example, a 100-PRH25 series probe operating in an environment with an ambient temperature of 55°C will exceed 120°C at 15.4 amps and 204°C at 24.7 amps (instead of 19.8 amps and 28.3 amps respectively at 20°C ambient).

100-PRH25 Example Determining Current Limit at 55°C Ambient



Duty Cycle for Pulsed Currents – This data reflects performance at 100% duty cycle. Higher currents can be carried for pulses of short duration. For simplicity, apply higher currents for no longer than one second (longer pulses may be carried, but require that thermal inertia and rate of temperature gain be known). A probe's ultimate temperature is determined by the dissipated power [P=I2R], so duty cycle adjustments should be made according to the square of the current ratio. For example, a 100-PRH2509X in a 100-SDH250W is rated for 19.8 amps. If you want to run it at 35 amps, the duty cycle would need to be $(19.8 \div 35)^2 = 0.566^2 = 0.32 = 32\%$. So, to avoid overheating this probe at 35 amps, power must be applied for no more than 320 milliseconds (1 second x 32%). Similarly, the 187-25 Series of probes and sockets are designed for high current applications given the larger component diameters and greater internal contact surfaces areas when compared to the other series. A 187-PRS2509H probe in a 187-SDH250S socket carries a maximum continuous current of 59 amps. To carry 75 amps it would need to be run at a 62% duty cycle $(59 \div 75)^2 = 0.619 = 62\%$.

Duty Cycle for Pulsed Currents Exceeding the Continuous Current Rating



Reference Point – For comparison purposes, note that a 16 AWG, Ø 0.051 [1.30] solid copper wire close to the same diameter as a 100-25 series probe tube, Ø 0.054 [1.37] reaches 120°C at 31 amps.

CENTER SPACING	PROBE	SOCKET	WIRE SIZE	CURRENT CAPACITY @ 120°C (AMPS)[1]	CURRENT CAPACITY @ 204°C (AMPS)[2]
0.025 [0.63]	025-PRP1640S	025-SBH160C-3	30	2.7	3.7
0.039 [1.00]	039-PRP1644X-S	039-SDC165J	28	3.1	4.2
0.039 [1.00]	039-PRP2544H-S	039-SDC165J	28	3.1	4.3
0.039 [1.00]	039-PRP2544X-S	*039-SDC255DS3	28	3.8	5.3
0.039 [1.00]	039-PRP406RS-S	039-SDC165J	28	2.6	3.6
0.039 [1.00]	039-PRP406RS-S	*039-SDC255DS3	28	2.8	3.8
0.050 [1.27]	050-PLP0543S	050-SBB050C6530	26	3.7	5.2
0.050 [1.27]	050-PLP1609H	050-SBN160S	26	4.9	7.4
0.050 [1.27]	050-PLP1609H	*050-SBB162DS3	22	4.2	5.8
0.050 [1.27]	050-PTP2509Y	050-STB255C6530	26	4.5	6.2
0.050 [1.27]	050-PTP2509Y	*050-STB255DS3	22	4.5	6.5
0.050 [1.27]	050-PRP2509X	050-SRB255C6530	26	3.9	5.4
0.050 [1.27]	050-PTP4046U	050-STB255C6530	26	4.3	5.9
0.050 [1.27]	050-PTP4046U	*050-STB255DS3	22	4.4	6.4
0.050 [1.27]	050-PRP4046S	050-SRB255C6530	22	3.7	5.0
0.075 [1.91]	075-PRP2509X 075-PRG2509X 075-PRN2509X	075-SDN250S	20	7.7 7.7 6.1	10.4 11.1 8.5
0.075 [1.91]	075-PRP2509X	*075-SDN250DS3	20	5.4	7.6
0.075 [1.91]	075-PRP4009U 075-PRG4009U 075-PRN4009U	075-SDN250S	20	7.3 7.2 6.1	10.0 9.0 9.9
0.075 [1.91]	075-PRP4009U	*075-SDN250DS3	20	4.9	7.1
0.100 [2.54]	100-PLP0502H 100-PLN0502H	100-SDN050S	18	13.2 12.0	18.1 18.5
0.100 [2.54]	100-PLP1609U 100-PLG1609U 100-PLN1609U	100-SDN160S	16	14.0 12.0 10.0	21.0 16.5 15.5
0.100 [2.54]	100-PRP2509X 100-PRV2509X 100-PRG2509X 100-PRN2509X 100-PRH2509X	100-SDN250S 100-SDN250S 100-SDN250S 100-SDN250S 100-SDH250W	16	11.8 12.7 12.3 10.2 19.8	16.2 17.4 17.3 15.3 28.3
0.100 [2.54]	100-PRP2509X	*100-SDN250DS3	16	5.9	8.5
0.100 [2.54]	100-PRP4009U 100-PRV4009U 100-PRG4009U 100-PRN4009U 100-PRH4009U	100-SDN250S 100-SDN250S 100-SDN250S 100-SDN250S 100-SDH250W	16	10.2 12.7 12.2 8.8 15.9	14.3 17.5 17.5 13.2 22.0
0.100 [2.54]	100-PRP4009U	*100-SDN250DS3	16	6.2	9.0
0.100 [2.54]	100-PRP5043L	100-SDN250S	16	10.0	13.7

* Wireless

[1] 120°C temperature limit for MW springs **or** lubricated probes

[2] 204°C temperature limit for SS springs **and** non-lubricated probes

CENTER SPACING	PROBE	SOCKET	WIRE SIZE	CURRENT CAPACITY @ 120°C (AMPS)[1]	CURRENT CAPACITY @ 204°C (AMPS)[2]
0.125 [3.18]	125-PRG2509H 125-PRH2509H 125-PRN2509H 125-PRS2509H	125-SDN250S 125-SDH250S 125-SDN250S 125-SDH250S	12	16.9 30.0 13.7 32.8	23.0 41.0 18.8 48.0
0.156 [3.96]	156-PRH2509H 156-PRN2509H 156-PRS2509H	156-SDH250S	12	31 16 34	43 22 47
0.187 [4.75]	187-PRH2509H 187-PRN2509H 187-PRS2509H	187-SDH250S	10	39 24 48	55 32 59
0.031 [0.80]	X31-PRP16S44HS	X31-TR-2G	30	3.4	4.7
0.031 [0.80]	X31-PRP16S43PS	*X31-TDS3-00	30	3.7	5.1
0.031 [0.80]	X31-PRP2544H-S	X31-TG-3G	30	2.6	3.6
0.031 [0.80]	X31-PRP2544X-S	*X31-TDS3-02	30	3.2	4.4
0.031 [0.80]	X31-PRP406RS-S	X31-TG-3G	30	2.5	3.6
0.031 [0.80]	X31-PRP406RX-S	*X31-TDS3-02	30	2.9	4.0
0.039 [1.00]	X39-PRP16S44HS	X39-TR-2G	28	4.5	6.2
0.039 [1.00]	X39-PRP16B39HH	*X39-TDS3-00	28	5.5	7.6
0.039 [1.00]	X39-PRP2509Y	X39-TJ-3G	28	3.4	4.7
0.039 [1.00]	X39-PRP2509Y	*X39-TDS3-10	28	2.6	3.6
0.039 [1.00]	X39-PRP4044U	X39-TJ-3G	28	3.3	4.5
0.039 [1.00]	X39-PRP4044U	*X39-TDS3-10	28	4.2	5.9
0.050 [1.27]	X50-PRP16S44HS	X50-TR-2G	22	5.7	7.8
0.050 [1.27]	X50-PRP16B39HS	*XTDS3-00	22	7.1	9.7
0.050 [1.27]	X50-PRP2509X	X50-TJ-3G	28	5.6	7.8
0.050 [1.27]	X50-PRP2509X	*XTDS3-14	22	6.0	8.2
0.050 [1.27]	X50-PRP4009U	X50-TJ-3G	28	5.3	7.8
0.050 [1.27]	X50-PRP4009U	*XTDS3-14	22	5.9	8.2
0.075 [1.91]	X75-PRP16S44HS	X75-TR-2G	20	6.9	9.5
0.075 [1.91]	X75-PRP16B09HS	*XTDS3-00	20	7.3	10.0
0.075 [1.91]	X75-PRP2509X	X75-TWA-5G	20	8.4	12.0
0.075 [1.91]	X75-PRP2509X	*XTDS3-14	20	7.3	10.1
0.075 [1.91]	X75-PRP4009U	X75-TWA-5G	20	7.9	11.3
0.075 [1.91]	X75-PRP4009U	*XTDS3-14	20	7.3	10.2
0.35mm	M035PRH1440S-S	n/a	20	1.6	2.2
0.8mm	M08-PRG8944H	n/a	20	4.4	6.1
1.0mm	M100-DRP7563AS3	n/a	20	3.4	4.7

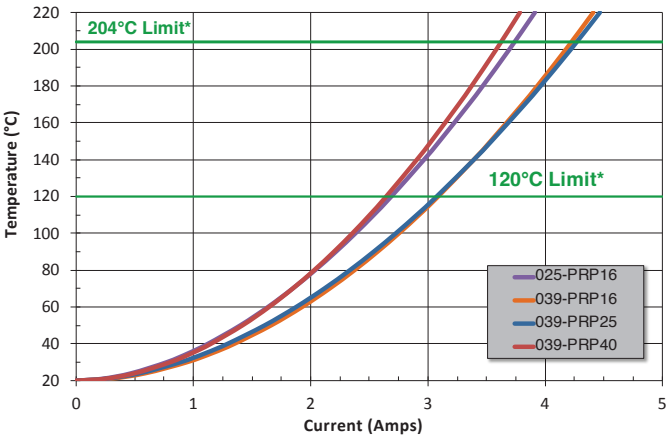
* Wireless

[1] 120°C temperature limit for MW springs **or** lubricated probes

[2] 204°C temperature limit for SS springs **and** non-lubricated probes

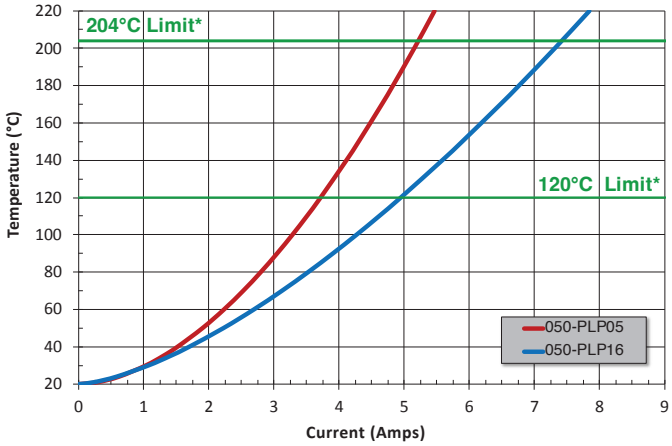
025-16 | 039-16 | 039-25 | 039-40 SERIES

Temperature vs. Current at 20°C Ambient



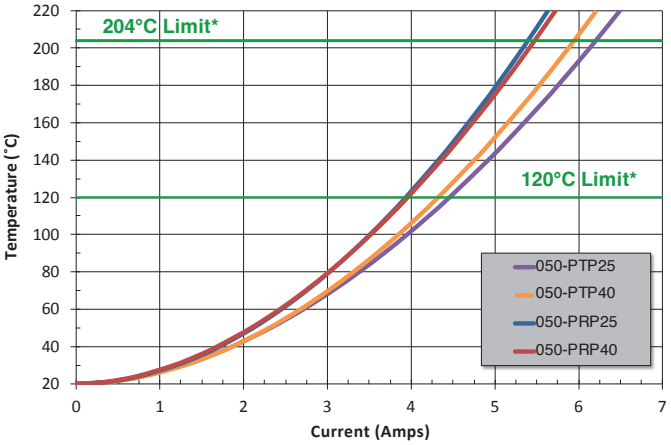
050-05 | 050-16 SERIES

Temperature vs. Current at 20°C Ambient



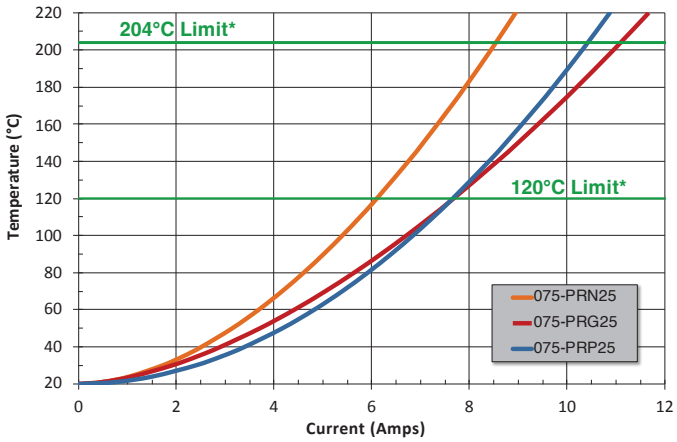
050-T25 | 050-T40 | 050-R25 | 050-T40 SERIES

Temperature vs. Current at 20°C Ambient



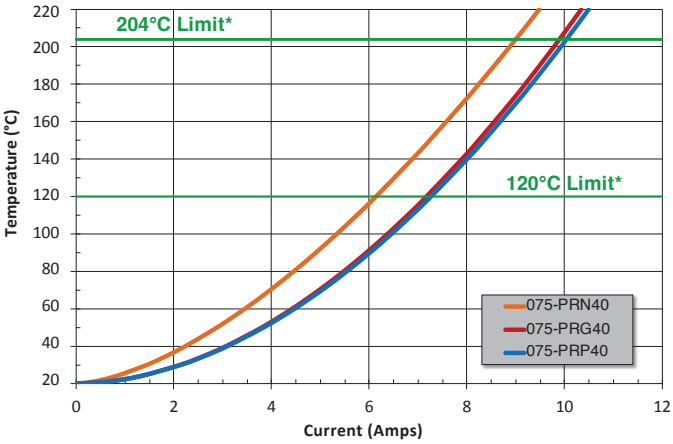
075-25 SERIES

Temperature vs. Current at 20°C Ambient



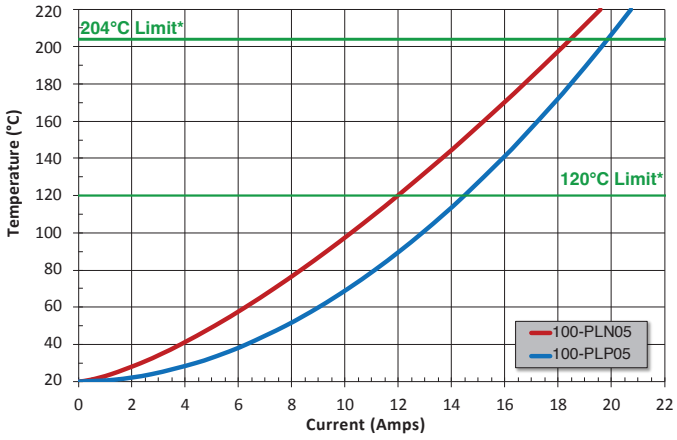
075-40 SERIES

Temperature vs. Current at 20°C Ambient



100-05 SERIES

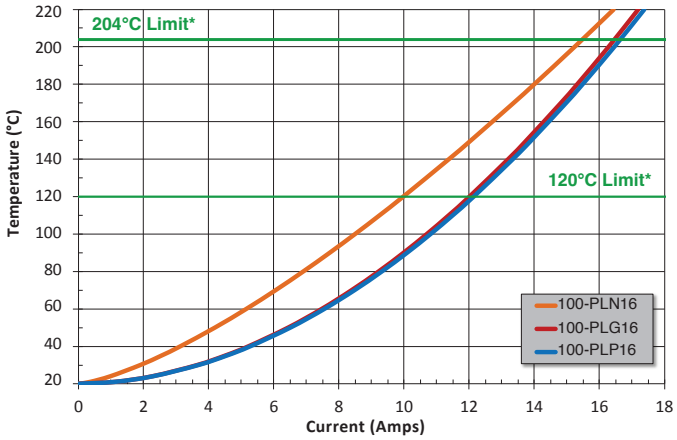
Temperature vs. Current at 20°C Ambient



*Check product specification for temperature limitations

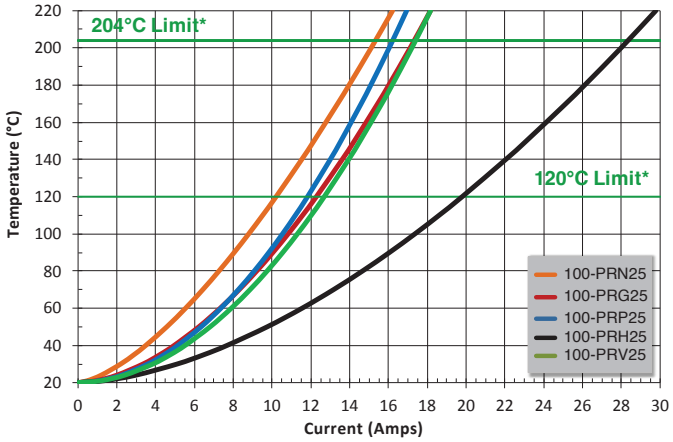
100-16 SERIES

Temperature vs. Current at 20°C Ambient



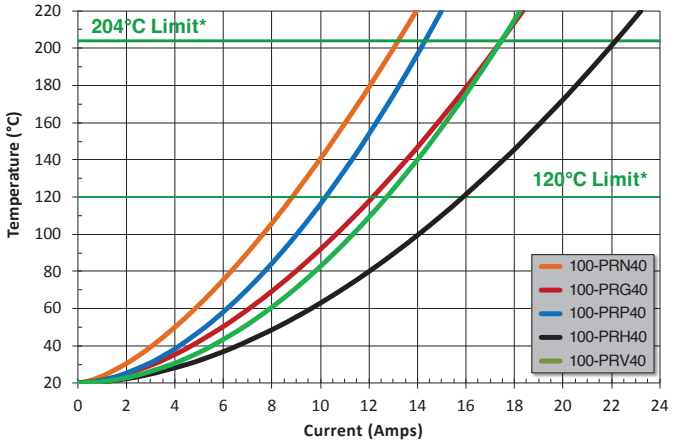
100-25 SERIES

Temperature vs. Current at 20°C Ambient



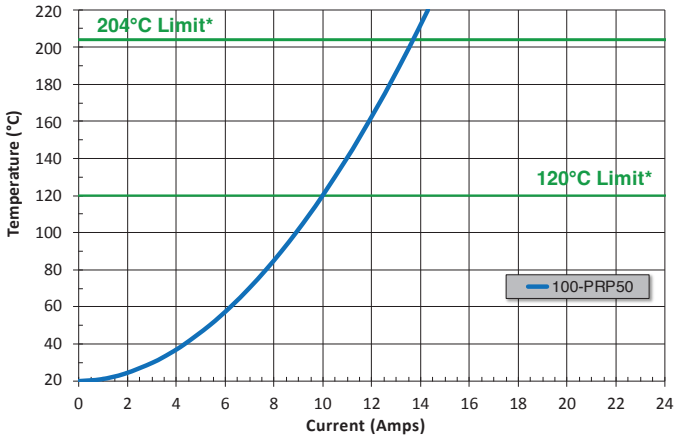
100-40 SERIES

Temperature vs. Current at 20°C Ambient



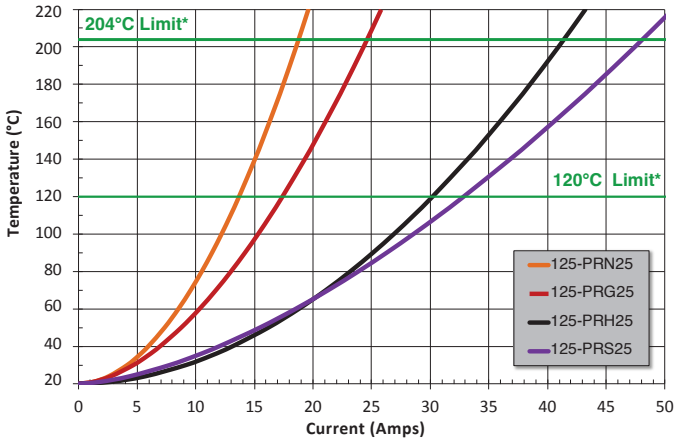
100-50 SERIES

Temperature vs. Current at 20°C Ambient



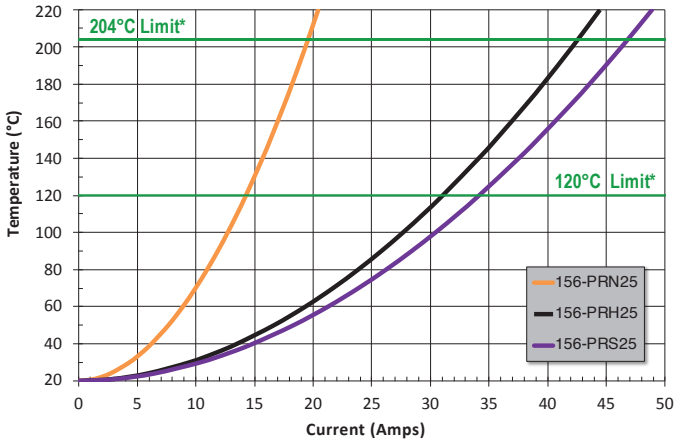
125-25 SERIES

Temperature vs. Current at 20°C Ambient



156-25 SERIES

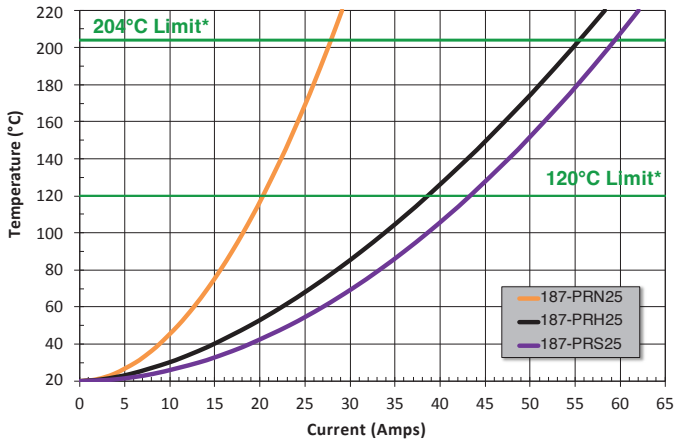
Temperature vs. Current at 20°C Ambient



*Check product specification for temperature limitations

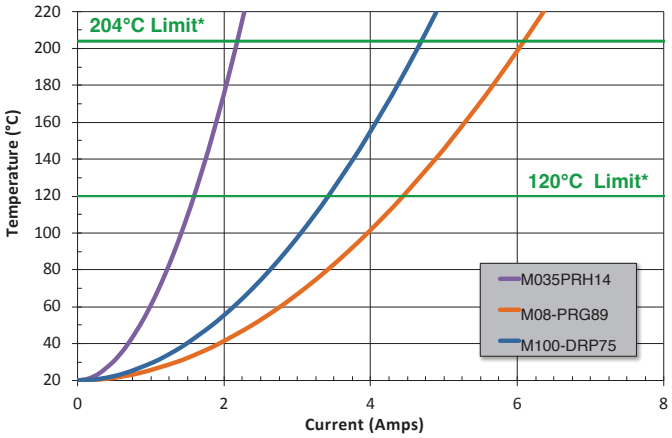
187-25 SERIES

Temperature vs. Current at 20°C Ambient



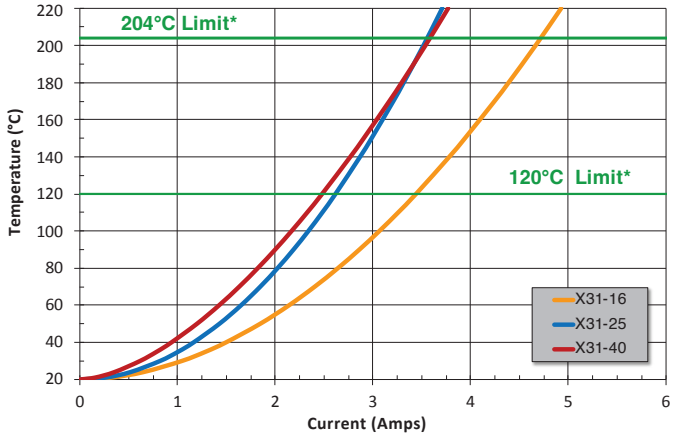
DOUBLE ENDED PROBES

Temperature vs. Current at 20°C Ambient



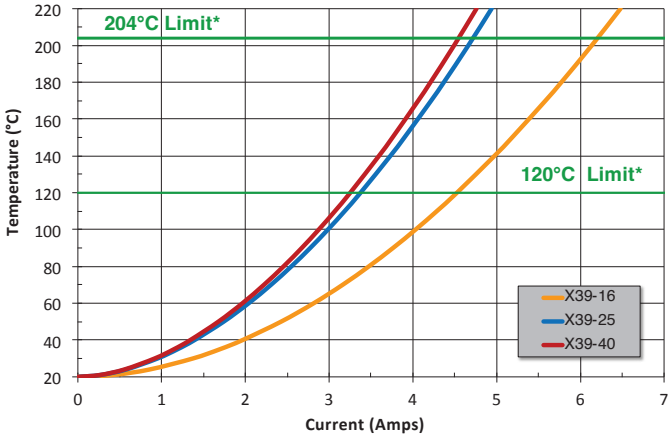
X31-16 | X31-25 | X31-40 SERIES

Temperature vs. Current at 20°C Ambient



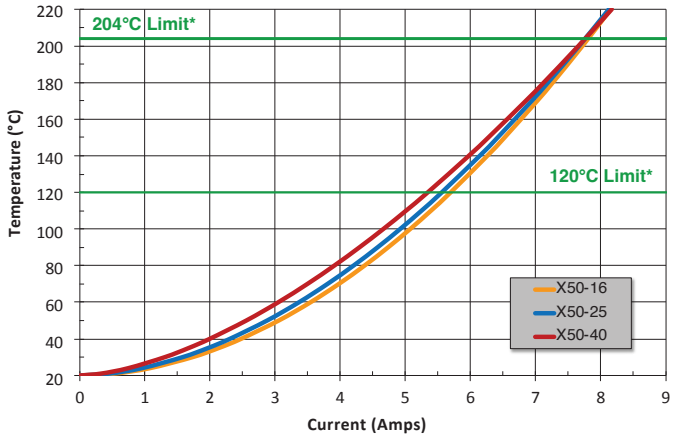
X39-16 | X39-25 | X39-40 SERIES

Temperature vs. Current at 20°C Ambient



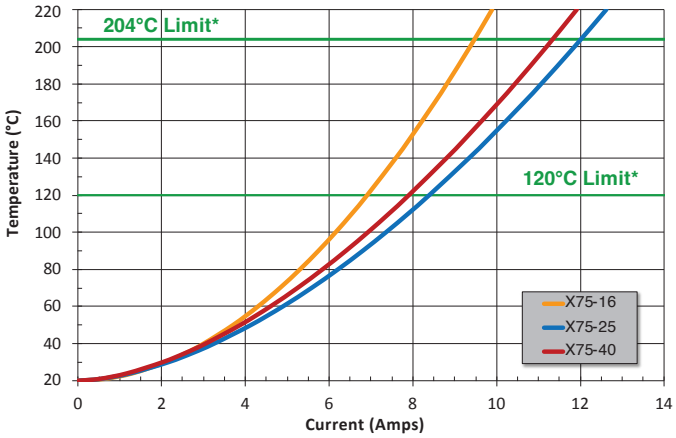
X50-16 | X50-25 | X50-40 SERIES

Temperature vs. Current at 20°C Ambient



X75-16 | X75-25 | X75-40 SERIES

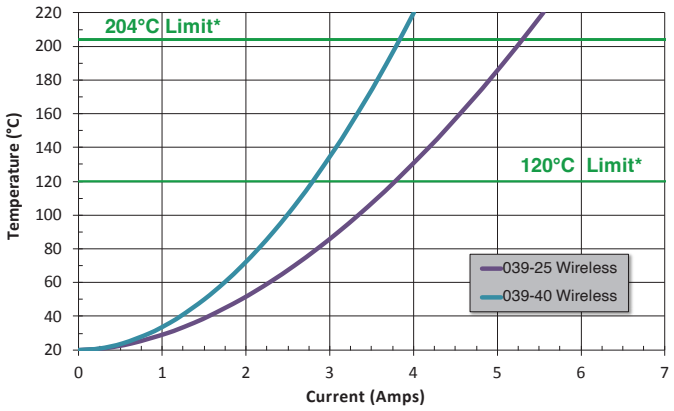
Temperature vs. Current at 20°C Ambient



*Check product specification for temperature limitations

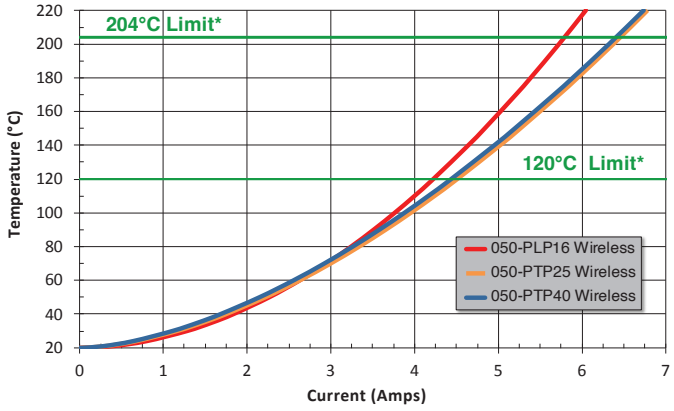
039-25 | 039-40 SERIES WIRELESS

Temperature vs. Current at 20°C Ambient



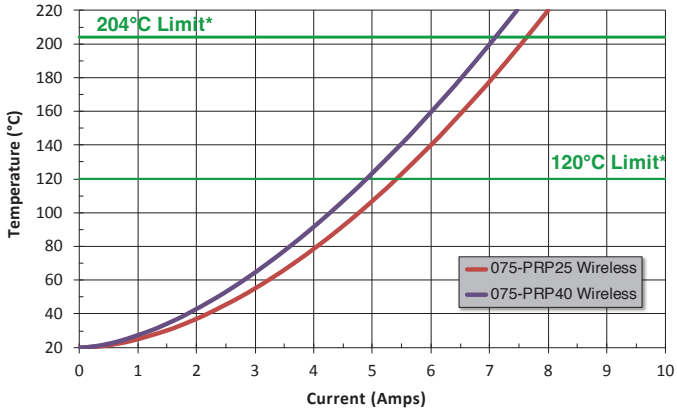
050-16 | 050-25 | 050-40 SERIES WIRELESS

Temperature vs. Current at 20°C Ambient



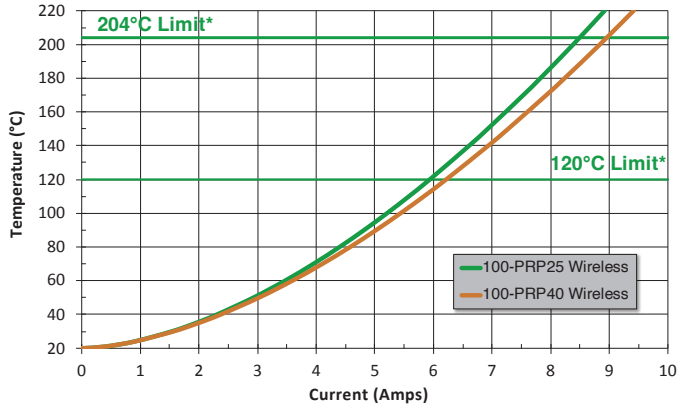
075-25 | 075-40 SERIES WIRELESS

Temperature vs. Current at 20°C Ambient



100-25 | 100-40 SERIES WIRELESS

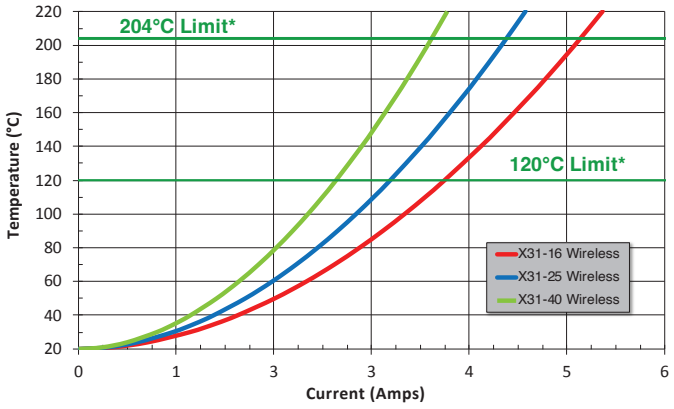
Temperature vs. Current at 20°C Ambient



*Check product specification for temperature limitations

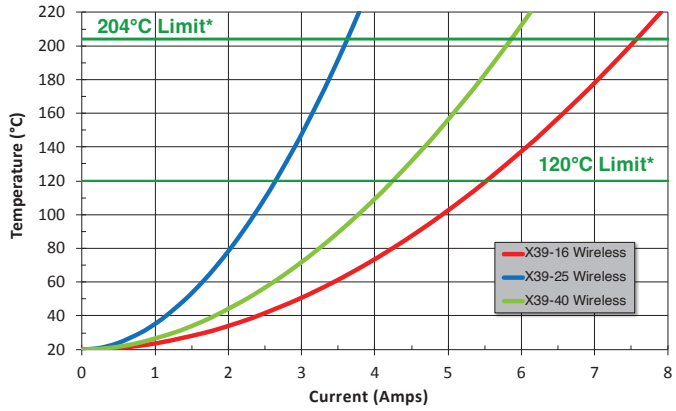
X31-16 | X31-25 | X31-40 SERIES WIRELESS

Temperature vs. Current at 20°C Ambient



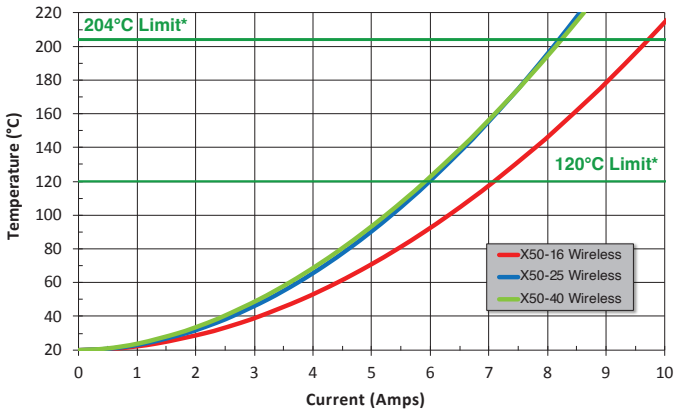
X39-16 | X39-25 | X39-40 SERIES WIRELESS

Temperature vs. Current at 20°C Ambient



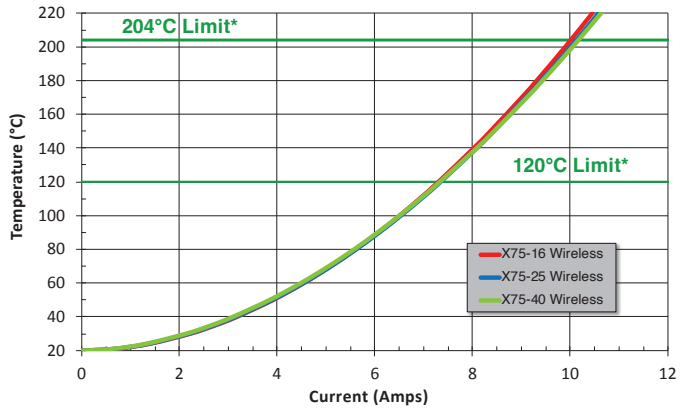
X50-16 | X50-25 | X50-40 SERIES WIRELESS

Temperature vs. Current at 20°C Ambient



X75-16 | X75-25 | X75-40 SERIES WIRELESS

Temperature vs. Current at 20°C Ambient



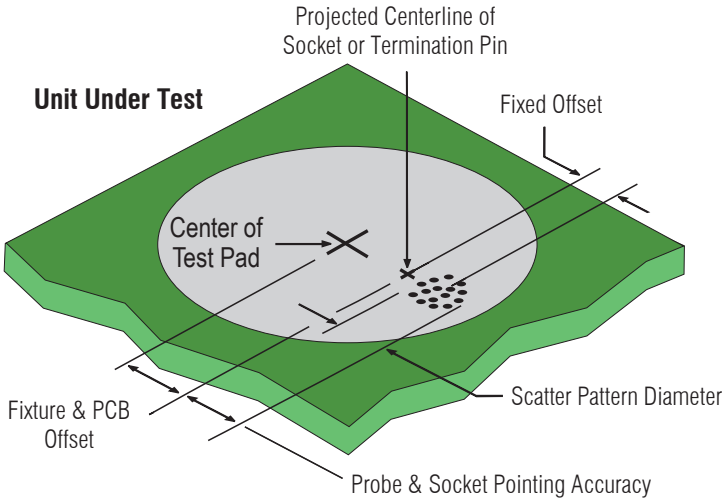
*Check product specification for temperature limitations

Pointing Accuracy

As space on printed circuit boards (PCBs) becomes increasingly limited, reliable contact of smaller test targets becomes a requirement. By improving manufacturing and assembly methods and designing for testability, false test failures can be greatly reduced.

During the electrical testing of PCBs, spring test probes contact the test targets on the Unit Under Test (UUT). These targets include but are not limited to pads, vias, leads, posts, components, and connectors. In an ideal situation, the probe tip will contact the test target every time. Unfortunately, the manufacturing tolerance stack-up which includes the board, fixture, and probes may cause the probe to miss the target.

The following information is meant to explain the variables, defines the tests, and most importantly, provides engineers and designers with the needed accuracy specifications for probe products made by QA Technology. This can be used in conjunction with tolerances from the test fixture and PCB to properly size test pads for reliable contact.



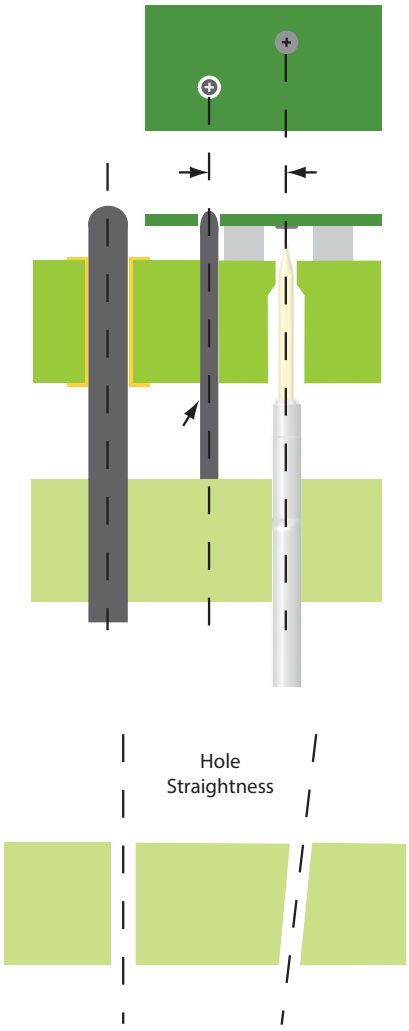
Definitions

When discussing the ability of a probe to contact its intended target, the effects of standard groups of tolerances must be classified. The tolerances which affect a probe's ability to contact its target on the UUT can be broadly divided into the following groups:

Fixture and PCB Offset: This group of tolerances is controlled by the fixture builder and by the PCB manufacturer.

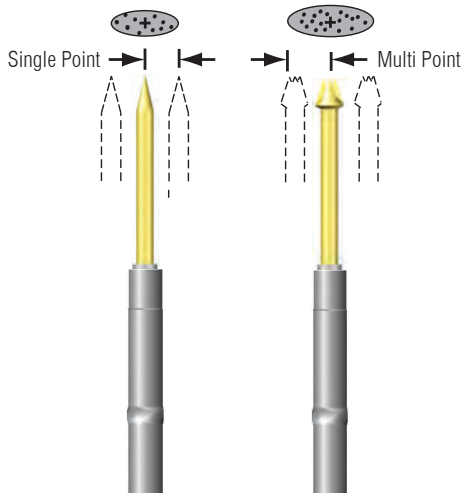
It includes:

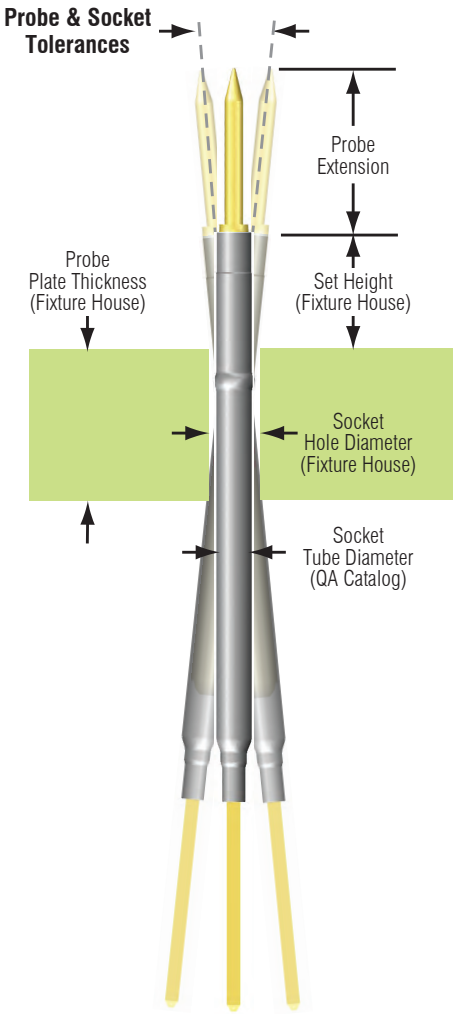
- Registration of UUT to the Fixture
- Artwork registration
- Guide plate clearance to the UUT
- Tooling pin location and straightness Socket or termination pin mounting hole tolerances (or actual position) of the drilled socket mounting holes relative to where they should be
- Tilting of the socket or termination pin in its hole – the angle of the drilled socket mounting hole in the Probe Plate



Probe and Socket Tolerances: This is a roughly circular scatter pattern where the probe tip contacts the UUT.

- Fixed Offsets
  - *Socket Straightness*
  - *Probe to Socket Concentricity*
- Scatter Pattern Diameter
  - *Probe Tube Straightness*
  - *Plunger Straightness*
  - *Single vs. Multi-point Tip Style*
  - *Clearances within the Probe Assembly*



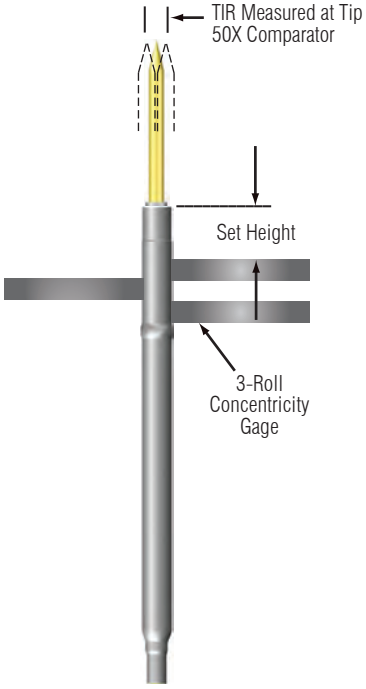


Probe and Socket Pointing Accuracy: The combined effects of the "Fixed Offsets" and one half (½) of the "Scatter Pattern Diameter". This is measured directly by rotating a probe and socket assembly around the socket's centerline and measuring the Total Indicator Reading (TIR) at the probes tip. Pointing Accuracy = ½ TIR.

Test Procedure

Fifty spear point probes from each series were inserted in their appropriate sockets. Each probe and socket assembly was then mounted in a three-roll concentricity gage at a given set-height, then rotated around its axis to record the TIR.

The set height was determined by the location of the socket's press ring so that it did not interfere with the rolls on the concentricity gage during the test. The total deviation of the tip was measured with a 50X comparator to calculate the Minimum, Maximum, Average, and Standard Deviations. Note: The measurements for the X Probe® Series do not include a socket.



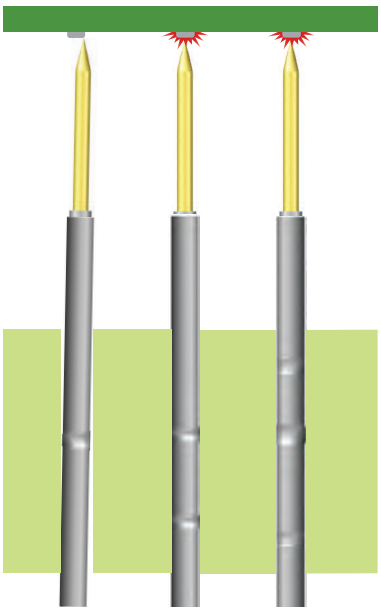
PROBE SERIES	SET HEIGHT	MINIMUM	MAXIMUM	AVERAGE	+/- 2 σ [95.44%]	+/- 3 σ [99.74%]
025-16	0.035 [0.89]	0.0003 [0.008]	0.0035 [0.089]	**0.0018 [0.046]**	0.0035 [0.088]	0.0043 [0.110]
039-16	0.085 [2.16]	0.0006 [0.015]	0.0037 [0.093]	**0.0017 [0.043]**	0.0033 [0.084]	0.0041 [0.105]
039-25	0.085 [2.16]	0.0000 [0.000]	0.0052 [0.132]	**0.0019 [0.048]**	0.0044 [0.112]	0.0057 [0.144]
039-40	0.085 [2.16]	0.0010 [0.024]	0.0093 [0.235]	**0.0055 [0.140]**	0.0095 [0.242]	0.0116 [0.293]
050-05	0.000 [0.00]	0.0001 [0.003]	0.0020 [0.051]	**0.0007 [0.018]**	0.0014 [0.035]	0.0017 [0.044]
050-16	0.085 [2.16]	0.0003 [0.006]	0.0022 [0.056]	**0.0013 [0.033]**	0.0022 [0.056]	0.0027 [0.068]
050-T25	0.085 [2.16]	0.0001 [0.003]	0.0026 [0.066]	**0.0011 [0.028]**	0.0024 [0.060]	0.0030 [0.076]
050-T40	0.085 [2.16]	0.0004 [0.010]	0.0068 [0.173]	**0.0031 [0.079]**	0.0058 [0.146]	0.0071 [0.180]
050-R25	0.085 [2.16]	0.0001 [0.003]	0.0038 [0.097]	**0.0016 [0.041]**	0.0034 [0.086]	0.0043 [0.108]
050-R40	0.085 [2.16]	0.0011 [0.028]	0.0074 [0.188]	**0.0034 [0.086]**	0.0062 [0.158]	0.0077 [0.195]
075-25	0.085 [2.16]	0.0004 [0.010]	0.0050 [0.127]	**0.0023 [0.058]**	0.0046 [0.118]	0.0058 [0.147]
075-40	0.085 [2.16]	0.0004 [0.010]	0.0077 [0.196]	**0.0034 [0.086]**	0.0069 [0.176]	0.0087 [0.221]
100-16	0.065 [1.65]	0.0001 [0.003]	0.0036 [0.091]	**0.0014 [0.036]**	0.0031 [0.079]	0.0039 [0.100]
100-24	0.085 [2.16]	0.0001 [0.003]	0.0035 [0.089]	**0.0020 [0.051]**	0.0039 [0.099]	0.0049 [0.123]
100-25	0.085 [2.16]	0.0002 [0.005]	0.0055 [0.140]	**0.0023 [0.058]**	0.0045 [0.114]	0.0056 [0.143]
100-40	0.085 [2.16]	0.0001 [0.003]	0.0076 [0.193]	**0.0029 [0.074]**	0.0065 [0.165]	0.0083 [0.211]
125-25	0.085 [2.16]	0.0004 [0.010]	0.0057 [0.145]	**0.0031 [0.079]**	0.0059 [0.149]	0.0073 [0.185]
156-25	0.100 [2.54]	0.0010 [0.025]	0.0056 [0.142]	**0.0034 [0.086]**	0.0059 [0.149]	0.0071 [0.180]
187-25	0.100 [2.54]	0.0014 [0.036]	0.0068 [0.173]	**0.0043 [0.109]**	0.0067 [0.171]	0.0080 [0.202]
X31-16	0.215 [5.46]	0.0007 [0.018]	0.0037 [0.094]	**0.0020 [0.051]**	0.0021 [0.052]	0.0027 [0.069]
X31-25	0.085 [2.16]	0.0007 [0.018]	0.0034 [0.085]	**0.0018 [0.046]**	0.0032 [0.081]	0.0039 [0.098]
X31-40	0.085 [2.16]	0.0010 [0.025]	0.0075 [0.189]	**0.0036 [0.090]**	0.0066 [0.167]	0.0081 [0.206]
X39-16	0.215 [5.46]	0.0001 [0.003]	0.0037 [0.094]	**0.0017 [0.043]**	0.0016 [0.042]	0.0024 [0.062]
X39-25	0.085 [2.16]	0.0001 [0.003]	0.0027 [0.069]	**0.0012 [0.030]**	0.0023 [0.059]	0.0029 [0.074]
X39-40	0.085 [2.16]	0.0002 [0.006]	0.0052 [0.133]	**0.0024 [0.061]**	0.0047 [0.119]	0.0058 [0.148]
X50-16	0.215 [5.46]	0.0001 [0.003]	0.0033 [0.084]	**0.0014 [0.036]**	0.0016 [0.041]	0.0024 [0.060]
X50-25	0.085 [2.16]	0.0001 [0.003]	0.0033 [0.084]	**0.0015 [0.038]**	0.0031 [0.078]	0.0039 [0.098]
X50-40	0.085 [2.16]	0.0001 [0.003]	0.0059 [0.150]	**0.0031 [0.079]**	0.0059 [0.150]	0.0073 [0.186]
X75-16	0.215 [5.46]	0.0003 [0.008]	0.0022 [0.056]	**0.0012 [0.030]**	0.0013 [0.033]	0.0018 [0.046]
X75-25	0.085 [2.16]	0.0001 [0.003]	0.0040 [0.102]	**0.0019 [0.048]**	0.0038 [0.098]	0.0048 [0.122]
X75-40	0.085 [2.16]	0.0003 [0.008]	0.0059 [0.149]	**0.0024 [0.061]**	0.0053 [0.134]	0.0067 [0.170]

All dimensions in inches [mm]

The table summarizes the overall pointing accuracy for each series. The X Probe® series will have better pointing accuracy as it does not utilize a socket. To get a better statistical representation of the data, the standard deviation can be added to the average or mean to show how a population of probes from the same series will respond. These numbers are a more useful average. They give designers a higher confidence level that they will be able to meet design for test (DFT) objectives.

The probe accuracy specifications listed above can be used together with fixture and PCB tolerances to accurately size the smallest test pad necessary for reliable contact.

To improve a probe's TIR in a fixture, use multiple press ring sockets. This feature is offered in our smaller sizes to reduce tilting in the mounting hole. Triple press ring sockets are an exclusive from QA to meet the increased pointing accuracy demands of the ATE industry.



Consequences of Improper Alignment

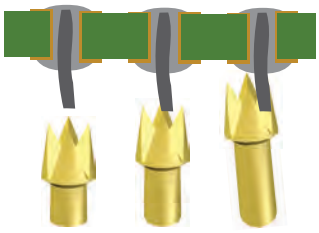
The goal for the end user is a fixture/PCB that delivers high first pass yields. Ensuring that the fixture is aligned, and the sockets and probes are selected and installed properly, will lead to a longer life because of the reduction of sideloading in the finished assembly.

All of the above characteristics of pointing accuracy should be considered when designing and building a fixture to achieve optimal probe performance and cycle life. Otherwise, probe tips may miss the intended target or contact off center causing sideloading which increases probe wear.

Examples that cause extreme sideloading:

- Improper socket installation in a straight hole
- Hole not drilled straight
- Mis-aligned guide plate
- Improper tip selection to the target

Extreme contact angles create higher internal friction. In the case of a crown point contacting a straight component lead, the lead can fit in the downward sloping valley between the points of the crown and create large sideloads. The plunger will deflect sideways, sometimes to the point where the lead will glance off the side of the head. But before the plunger is pushed sideways enough to break, “test point on” the PCB contacts the probe tip and the plunger is compressed. The compressing of the plunger in this state causes an increase in friction between the sliding surfaces of the probe tube and plunger resulting in the increase of wear in the probe assembly. While a probe in this condition may operate as designed for the life of the test fixture, high cycle production test environments may experience shorter probe life requiring an increase in fixture maintenance.



Summary

Addressing the factors in the early stages of design will lead to the best possible fixture and probe performance.

The use of Printed Circuit Boards is an important part of our daily lives that is often taken for granted. Designers and manufacturers of PCB’s understand the importance of ensuring that the PCB design, manufacturing, and assembly of these boards meets the highest standards to guarantee a long life and reliable operation. While the factors discussed are only a small part of the overall success of a PCB test system, taking them into consideration and utilizing the design data for the construction of test fixtures will provide long term dividends for our customers. QA’s recommendations for initial board design and for subsequent test procedure will enable appropriate adherence to best practice probe accuracy specifications while increasing cost efficiency, manufacturing quality, performance, accuracy, and testing of PCB products.

Frequency Response of Wireless Probing

Getting a clean and accurate signal from the tester electronics to the board under test is critical for high-speed testing. Fixture wiring can be a major contributor of distortion and noise in the signal transmission path. To better understand the possibilities of wireless fixturing, QA Technology examined the high frequency performance of wireless socket and termination pins and probes.

QA used a network analyzer to measure the frequency response characteristics of a wide variety of probe configurations. Initial testing of the wireless sockets utilized an RF network analyzer covering the frequency range of 300 KHz to 3 GHz. Subsequent testing using a microwave network analyzer covered the frequency

range of 50 MHz to 20 GHz. For consistency, graphs of the more recent tests extrapolate data below 50 MHz and omit data above 10 GHz. QA used a TDR oscilloscope to look at the impedance of the signal path through the test fixture and obtained time domain impedance information by use of the time domain transform option of the microwave network analyzer.

Test Procedure

Test fixtures were constructed for 100, 75, 50, and 39mil wireless socket products. These fixtures comprised a 0.250 [6.35] G10 socket mounting plate, a 0.062 [1.57] G10 socket spacer plate, and two electrical interface boards attached to the socket mounting plate with non-conducting standoffs. Test fixtures for the X75, X50, X39, and X31wireless termination pins were built up from multiple G10 plates totaling 1.562 [39.67] and sandwiched between two electrical interface boards. In all the fixtures, the electrical interface boards provided the SMA connectors for the test equipment and copper traces to contact the various probe/socket configurations. Configurations comprised different center spacing for the ground and signal probes, multiple ground probes, and arrangements to measure cross-talk where one pair of probes was “driven” and the “pick up” on an adjacent pair measured.

Results

The following graphs study the performance of the X75 probes. Comparable data for all other wireless assemblies follow.

Figure 1 shows the frequency response of two X75 probes on 1.00 [25.4] centers. This might be representative of the signal probe to ground probe separation for an IC package. Note the bandwidth roll-off below 100 MHz. This response is dominated by the separation between the signal and ground probe. Plots for the other wireless probe families tested on 1.00 [25.4] centers have very similar performance. In Figure 2, the probes are on their nominal 0.075 [1.91] centers. On these closer centers, a –1dB frequency response to over 400 MHz is achieved. This improvement is the result of the more closely-spaced probes providing a better match to the impedance of the 50 Ohm test environment.

The TDR option of the microwave network analyzer allows measurement of the impedance of a transmission line at any point along its length. Figure 3 shows the impedance of two wireless 0.075 [1.91] QA X Probes® on 0.075 [1.91] centers. In this TDR graph, the transmitted signal has an effective rise time of 50 picoseconds, which equates to a 7 GHz test frequency. The impedance extremes are exaggerated by the high

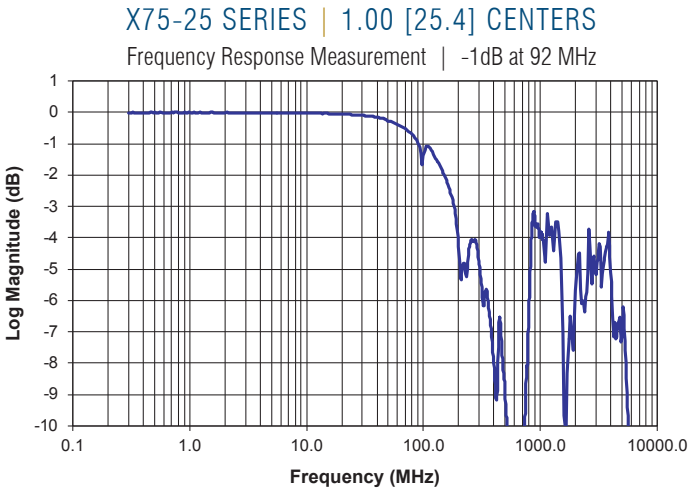


Figure 1: *Frequency response of two 0.075 [1.91] wireless X Probes (signal and ground) on 1.00 [25.4] centers.*

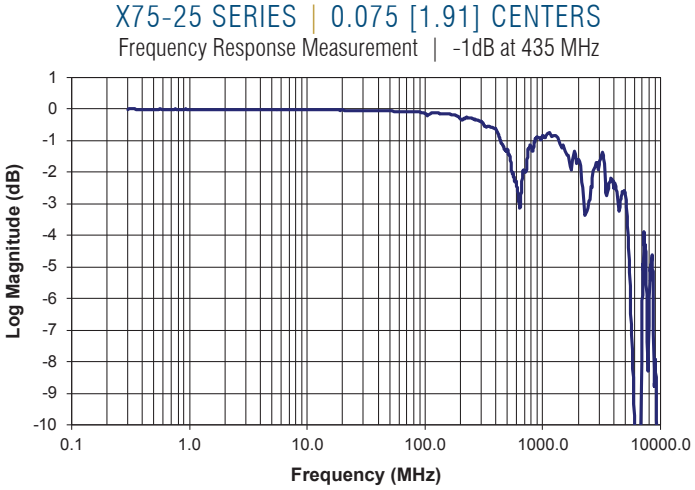


Figure 2: *Frequency response of two 0.075 [1.91] wireless X Probes (signal and ground) on 0.075 [1.91] centers.*

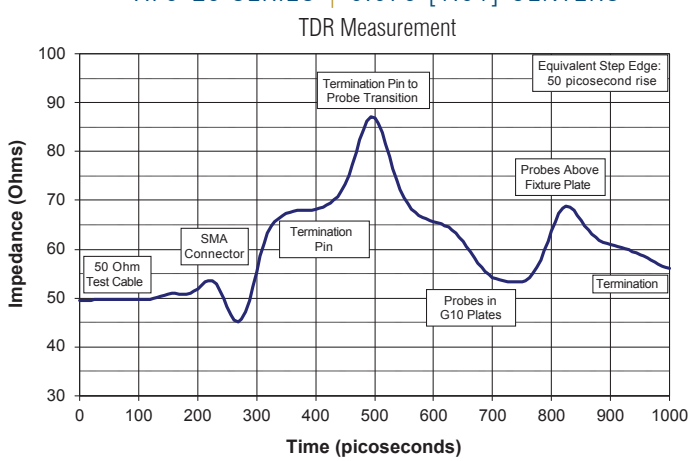


Figure 3: *Impedance of the transmission line created by two 0.075 [1.91] wireless X Probes (signal and ground) on 0.075 [1.91] centers. Note: the 50 picosecond equivalent rise time equates to an effective test frequency of 7 GHz.*

bandwidth of the measurement; at lower frequencies the impedance differences would be less apparent. These high frequency measurements show three distinct physical regions: the termination pin, the transition from the termination pin to the X Probe, and the X Probe itself. These changes of impedance are caused by the differing diameters of the termination pins and probes as well as the drilled clearances surrounding them. The nature of the dielectric material separating the probes also plays a critical role in determining the characteristic impedance of the transmission line.

Figure 4 shows the performance of a three-probe in-line configuration on 0.075 [1.91] centers with the signal probe placed between two grounds. Although this configuration may not always be practical, its –1dB performance to greater than 1400 MHz is excellent. Figure 5 shows the corresponding TDR plot for the same three-probe configuration.

Crosstalk in a conventional fixture is a complex function of many variables: the characteristics of the test signals, the length and type of wiring used, how the wiring is (or isn't) dressed, and the relative locations of the probes themselves.

Wiring problems are the reason for the existence of wireless probing solutions. Replacing fixture wiring with a translator board provides a more repeatable and controllable environment for routing test signals between the unit under test (UUT) and the test electronics.

The test signals and probe locations are driven by the needs of the UUT. For reference purposes, a plot of the crosstalk between two pairs of 0.075 [1.91] wireless X Probes on 0.075 [1.91] centers is shown in Figure 6.

Conclusions

A wireless probing solution can deliver excellent high frequency performance. Signal-to-ground probe spacing and the dielectric material separating the probes both play a major role in determining the impedance and the bandwidth of the transmission path. In general, a more constant probe diameter and consistent dielectric material separating the probes makes for fewer impedance changes in the signal path and better overall high frequency performance.

Replacing fixture wiring with a translator board allows the test engineer greater control of length and impedance characteristics of the signal path to the unit under test. This produces cleaner, distortion-free test signals and higher performance testing.

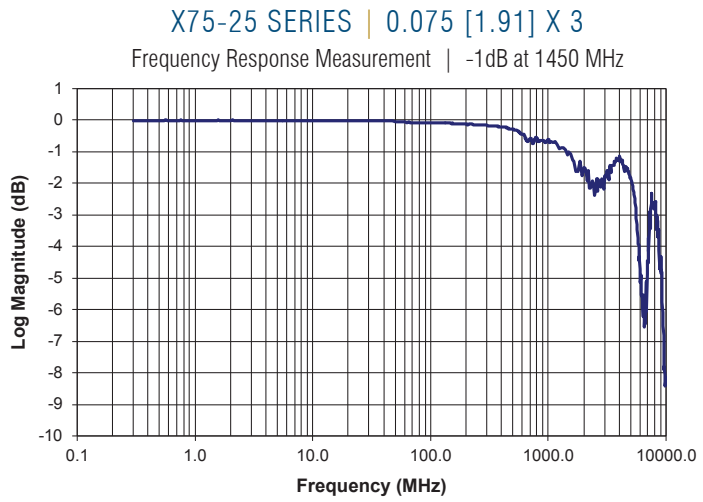


Figure 4: *For a three-probe configuration (signal between two grounds) excellent performance to more than 1400MHz was achieved.*

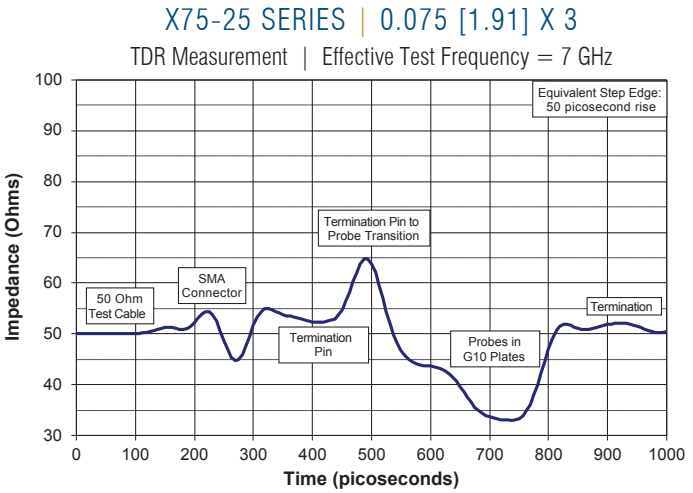


Figure 5: *The TDR plot for the three-probe configuration shows a better match to the 50 Ohm test environment. This results in a higher bandwidth frequency response.*

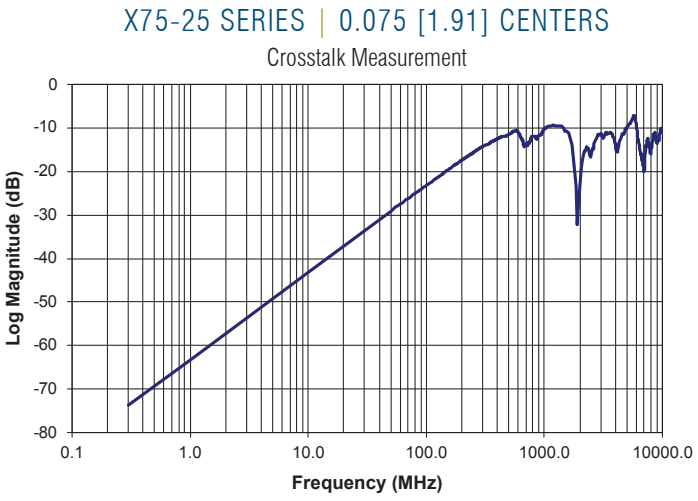
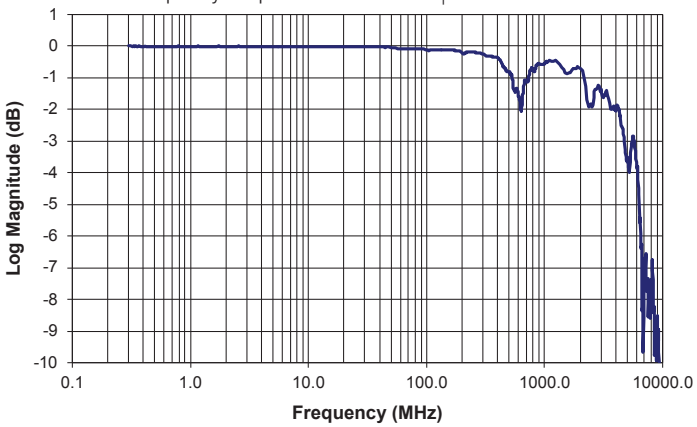


Figure 6: *Crosstalk between two pairs of X75 probes on a 0.075 [1.91] grid.*

X50-25 Series Wireless

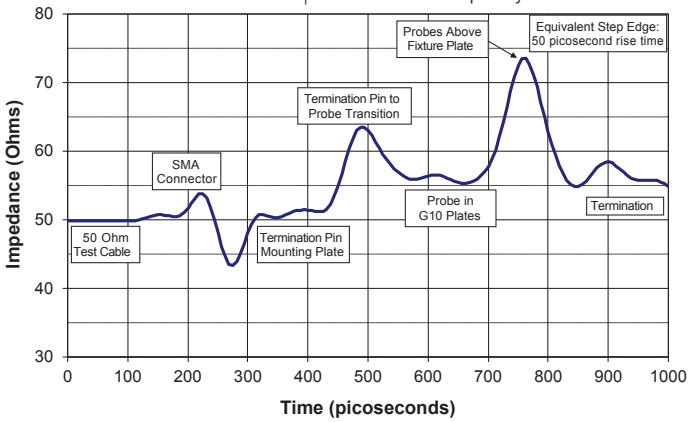
X50-25 SERIES | 0.050 [1.27] CENTERS

Frequency Response Measurement | -1dB at 530 MHz



X50-25 SERIES | 050 [1.27] CENTERS

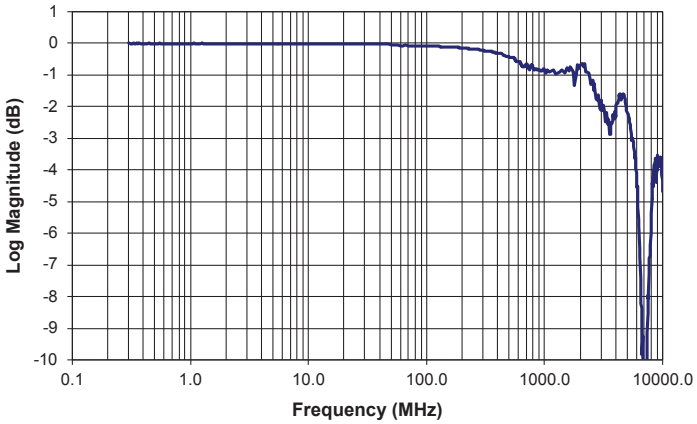
TDR Measurement | Effective Test Frequency = 7GHz



Two X50 wireless probes (signal and ground) on 0.050 [1.27] centers.

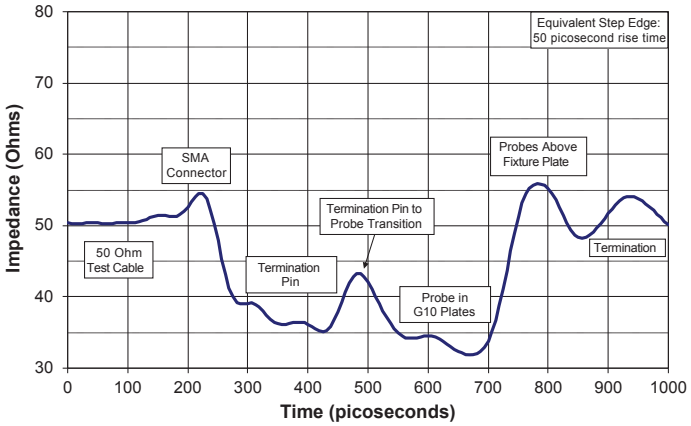
X50-25 SERIES | 0.050 [1.27] X3

Frequency Response Measurement | -1dB at 1800 MHz



X50-25 SERIES | 0.050 [1.27] X3

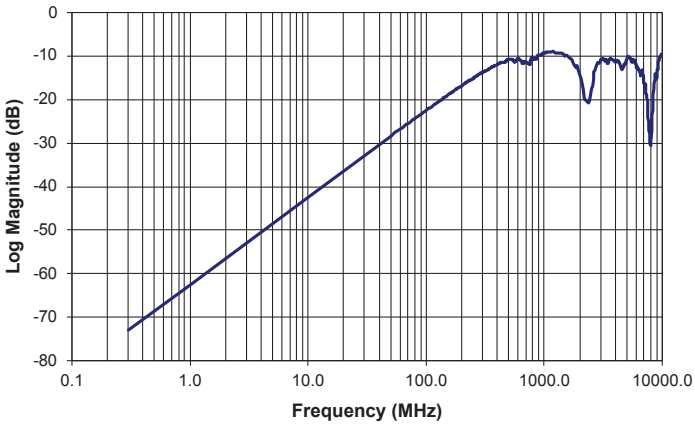
TDR Measurement | Effective Test Frequency = 7GHz



Three X50 wireless probes (ground-signal-ground) on 0.050 [1.27] centers.

X50-25 SERIES | 0.050 [1.27] CENTERS

Crosstalk Measurement

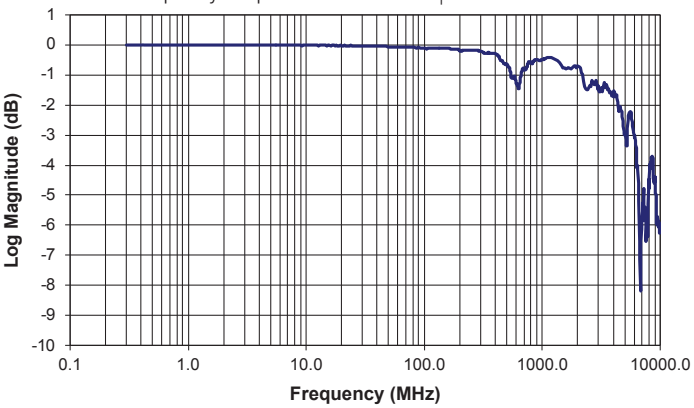


Cross talk for two pairs of X50 wireless probes on a 0.050 [1.27] grid.

X39-25 Series Wireless

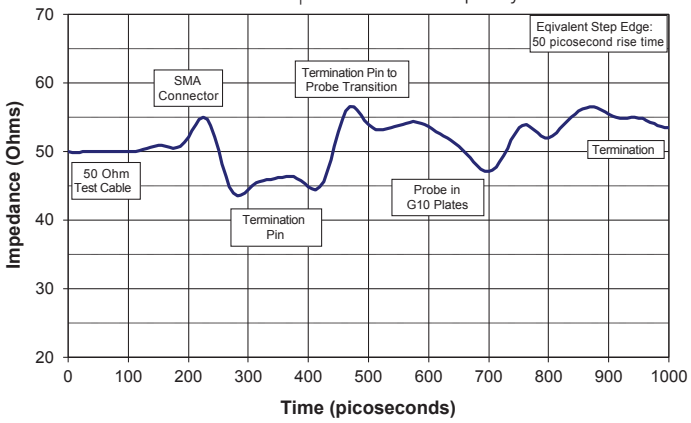
X39-25 SERIES | 0.039 [1.00] CENTERS

Frequency Response Measurement | -1dB at 540 MHz



X39-25 SERIES | 0.039 [1.00] CENTERS

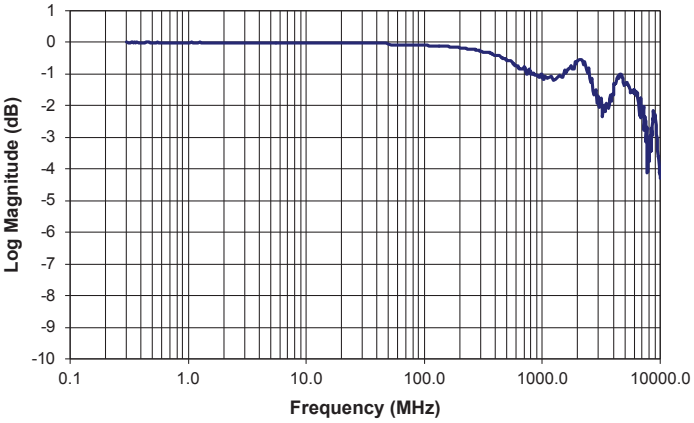
TDR Measurement | Effective Test Frequency = 7GHz



Two X39 wireless probes (signal and ground) on 0.039 [1.00] centers.

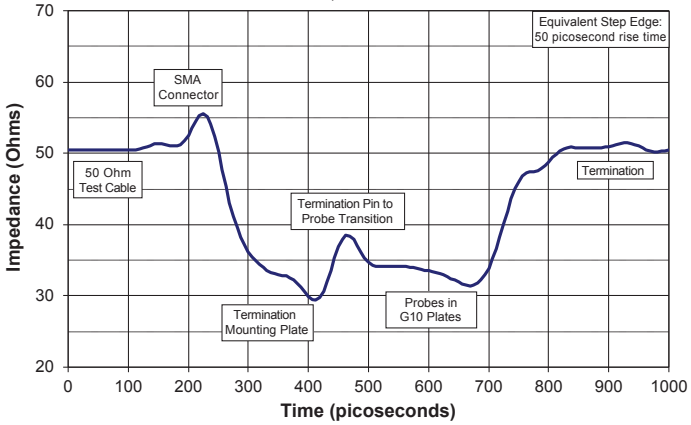
X39-25 SERIES | 0.039 [1.00] X3

Frequency Response Measurement | -1dB at 740 MHz



X39-25 SERIES | 0.039 [1.00] X3

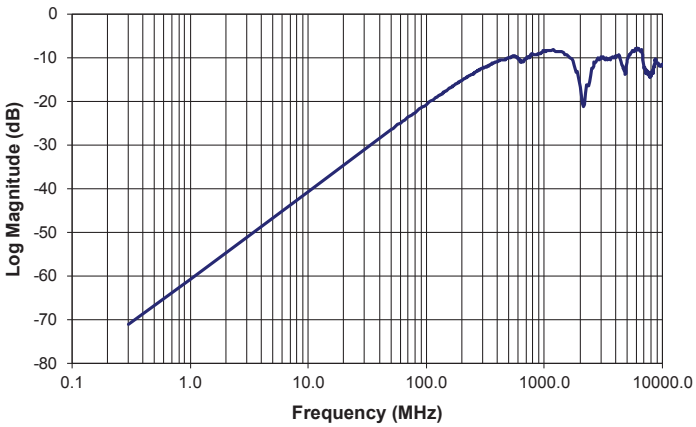
TDR Measurement | Effective Test Frequency = 7GHz



Three X39 wireless probes (ground-signal-ground) on 0.039 [1.00] centers.

X39-25 SERIES | 0.039 [1.00] CENTERS

Crosstalk Measurement

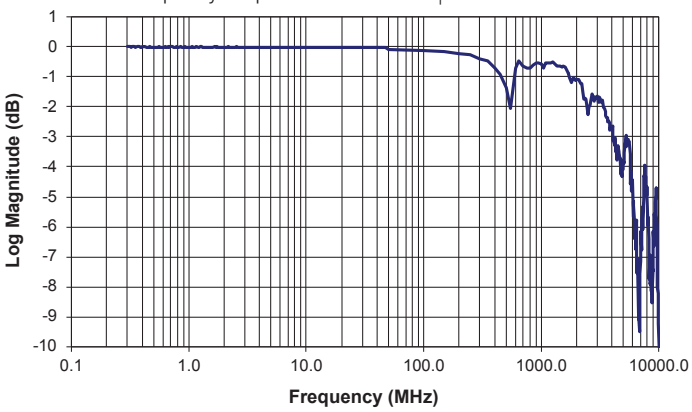


Crosstalk for two pairs of X39 wireless probes on a 0.039 [1.00] grid.

X31-25 Series Wireless

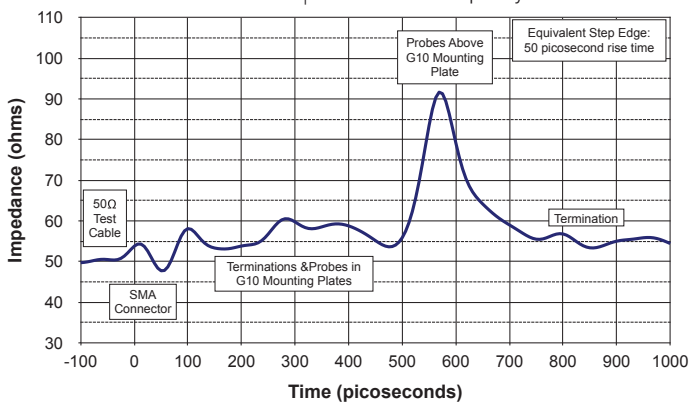
X31-25 SERIES | 0.031 [0.80] CENTERS

Frequency Response Measurement | -1dB at 500 MHz



X31-25 SERIES | 0.031 [0.80] CENTERS

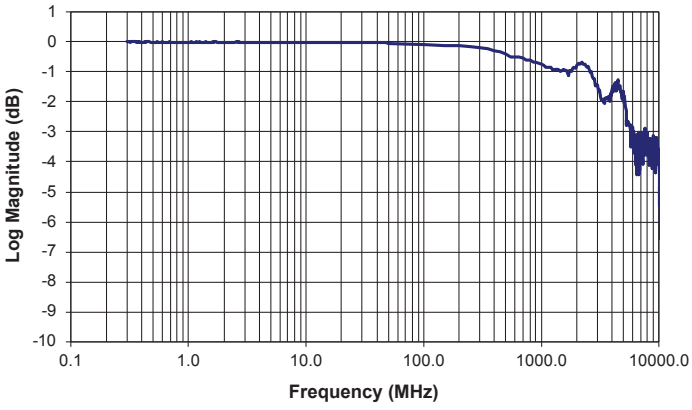
TDR Measurement | Effective Test Frequency = 7GHz



Two X31 wireless probes (signal and ground) on 0.031 [0.80] centers.

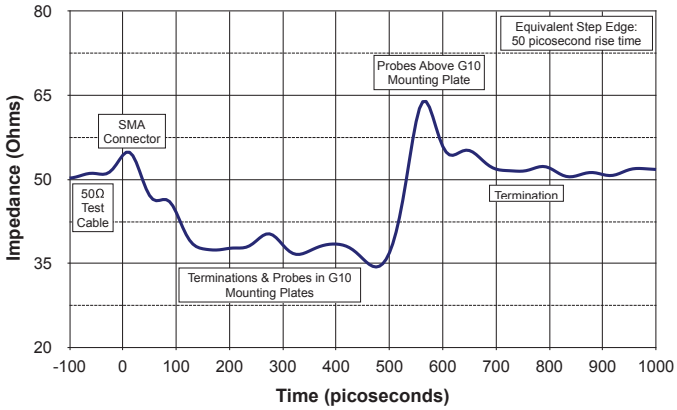
X31-25 SERIES | 0.031 [0.80] X3

Frequency Response Measurement | -1dB at 1700 MHz



X31-25 SERIES | 0.031 [0.80] X3

TDR Measurement | Effective Test Frequency = 7GHz

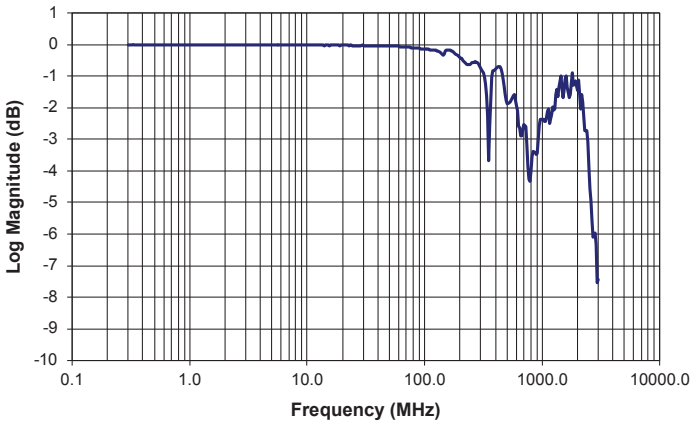


Three X31 wireless probes (ground-signal-ground) on 0.031 [0.80] centers.

100-25 Series Wireless

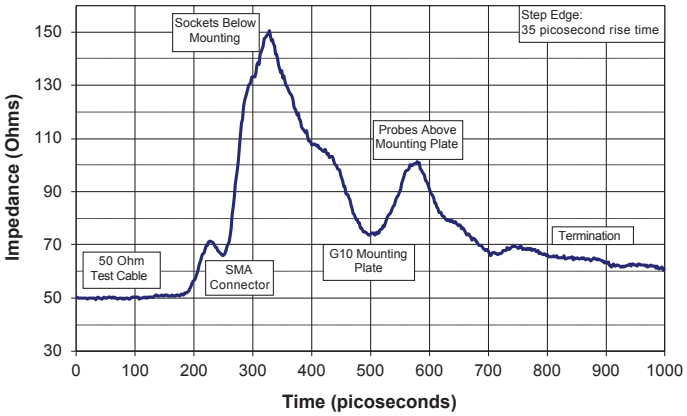
100-25 SERIES | 0.100 [2.54]

Frequency Response Measurement | -1dB at 320 MHz



100-25 SERIES | 0.100 [2.54]

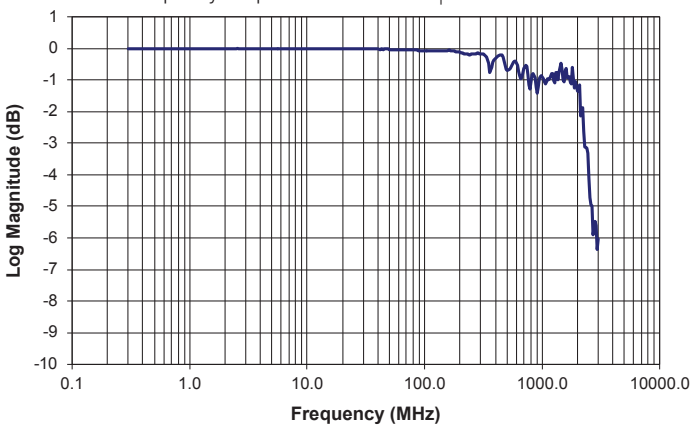
TDR Measurement | Effective Test Frequency = 10GHz



Two 100-25 Series wireless socket assemblies (signal and ground) on 0.100 [2.54] centers.

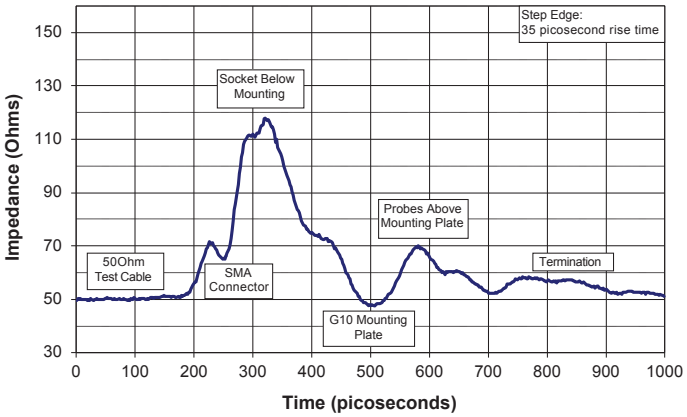
100-25 SERIES | 0.100 [2.54] X3

Frequency Response Measurement | -1dB at 770 MHz



100-25 SERIES | 0.100 [2.54] X3

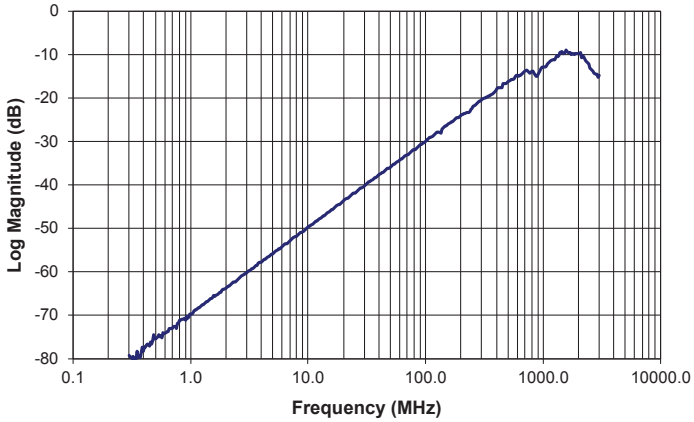
TDR Measurement | Effective Test Frequency = 7GHz



Three 100-25 Series wireless socket assemblies (ground-signal-ground) on 0.100 [2.54] centers.

100-25 SERIES | 0.100 [2.54] CENTERS

Crosstalk Measurement

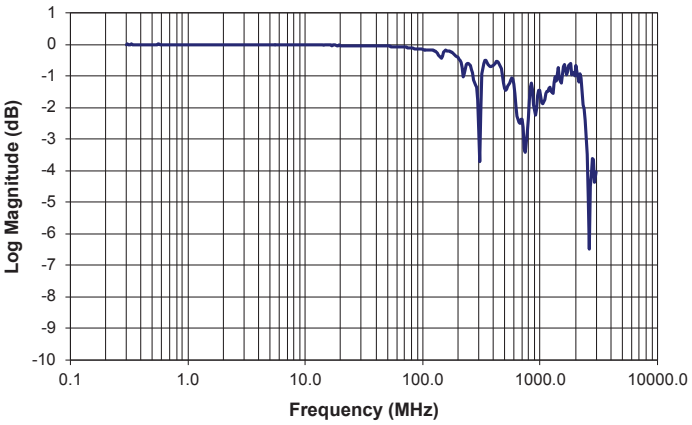


Crosstalk for two pairs of 100-25 Series wireless socket assemblies on a 0.100 [2.54] grid.

075-25 Series Wireless

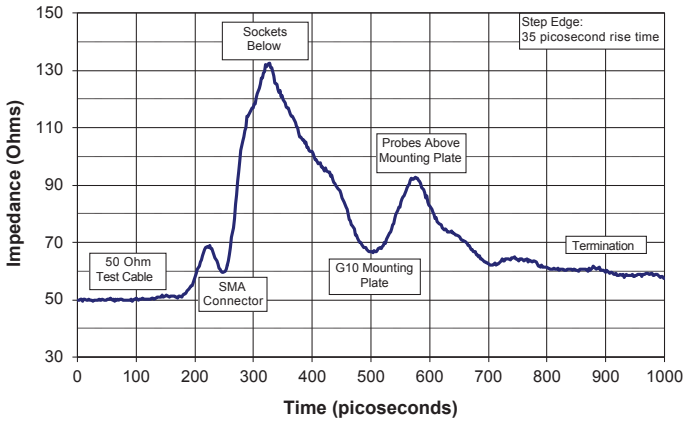
075-25 SERIES | 0.075 [1.91] CENTERS

Frequency Response Measurement | -1dB at 220 MHz



075-25 SERIES | 0.075 [1.91] CENTERS

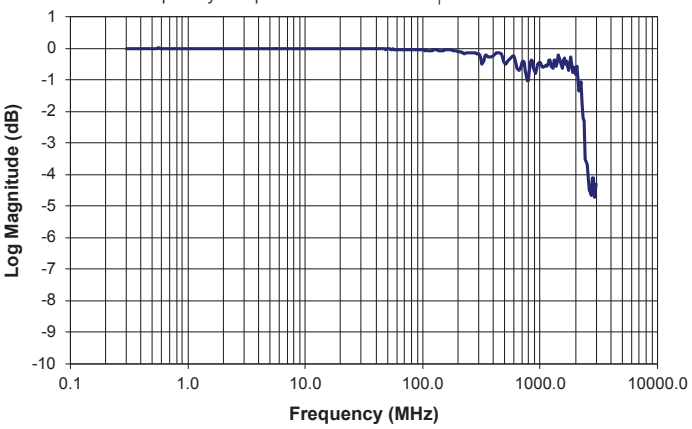
TDR Measurement | Effective Test Frequency = 10GHz



Two 075-25 Series wireless socket assemblies (signal and ground) on 0.075 [1.91] centers.

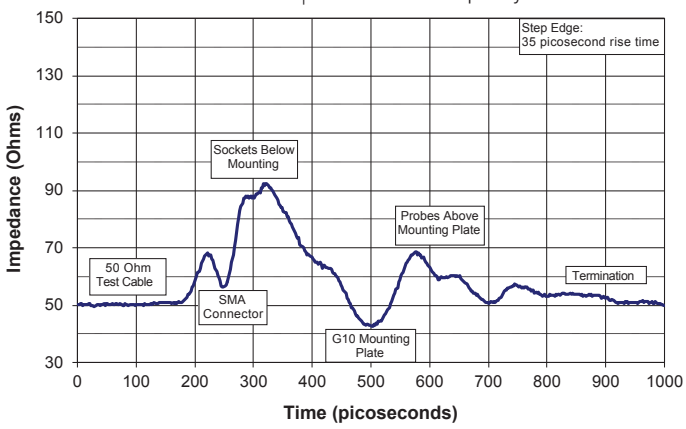
075-25 SERIES | 0.075 [1.91] X3

Frequency Response Measurement | -1dB at 770 MHz



075-25 SERIES | 0.075 [1.91] X3

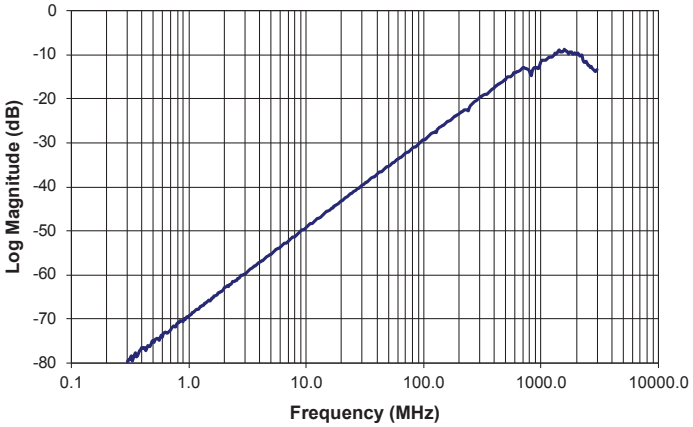
TDR Measurement | Effective Test Frequency = 7GHz



Three 075-25 Series wireless socket assemblies (ground-signal-ground) on 0.075 [1.91] centers.

075-25 SERIES | 0.075 [1.91] CENTERS

Crosstalk Measurement

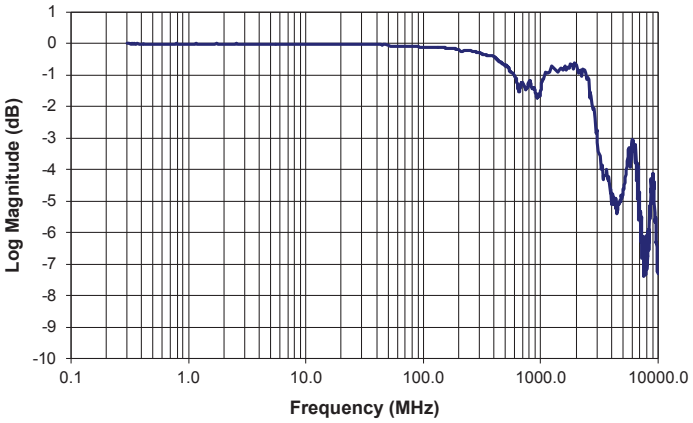


Crosstalk for two pairs of 075-25 Series wireless socket assemblies on a 0.075 [1.91] grid.

050-25 Series Wireless

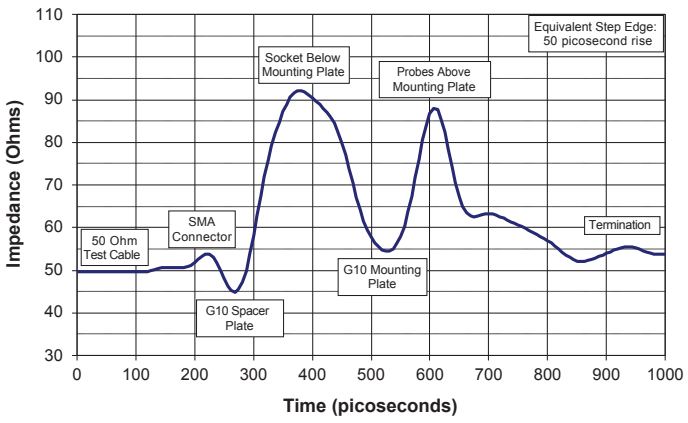
050-25 SERIES | 0.050 [1.27] CENTERS

Frequency Response Measurement | -1dB at 585 MHz



050-25 SERIES | 0.050 [1.27] CENTERS

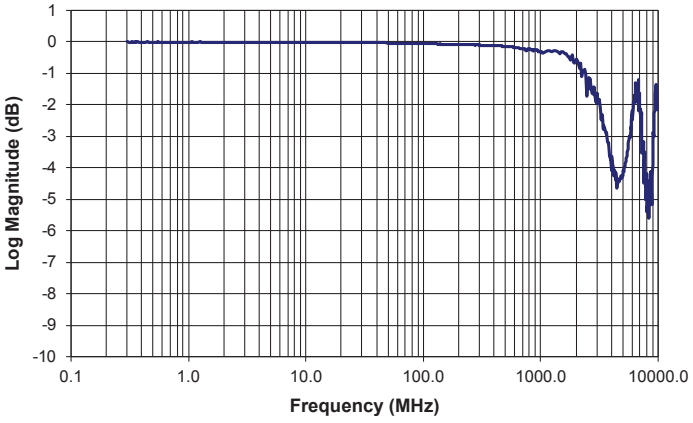
TDR Measurement | Effective Test Frequency = 7GHz



Two 050-25 Series wireless socket assemblies (signal and ground) on 0.050 [1.27] centers.

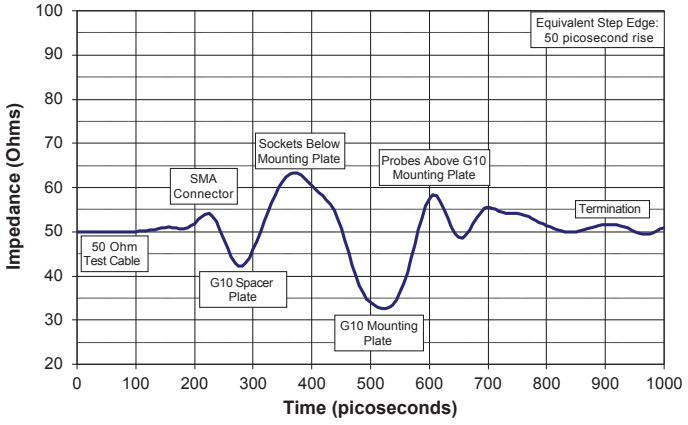
050-25 SERIES | 0.050 [1.27] X3

Frequency Response Measurement | -1dB at 2250 MHz



050-25 SERIES | 0.050 [1.27] X3

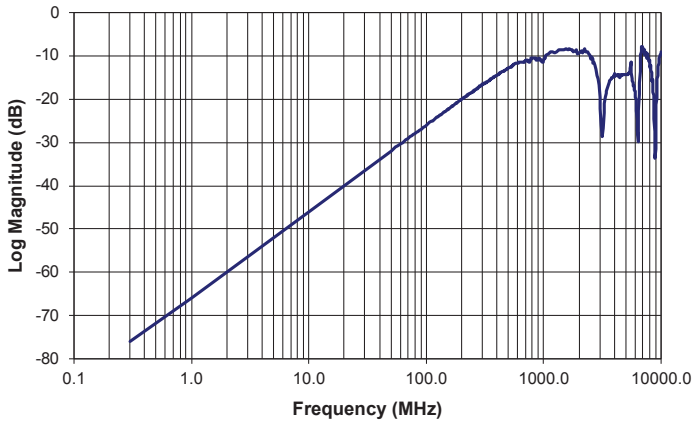
TDR Measurement | Effective Test Frequency = 7GHz



Three 050-25 wireless socket assemblies (ground-signal-ground) on 0.050 [1.27] centers.

050-25 SERIES | 0.050 [1.27] CENTERS

Crosstalk Measurement

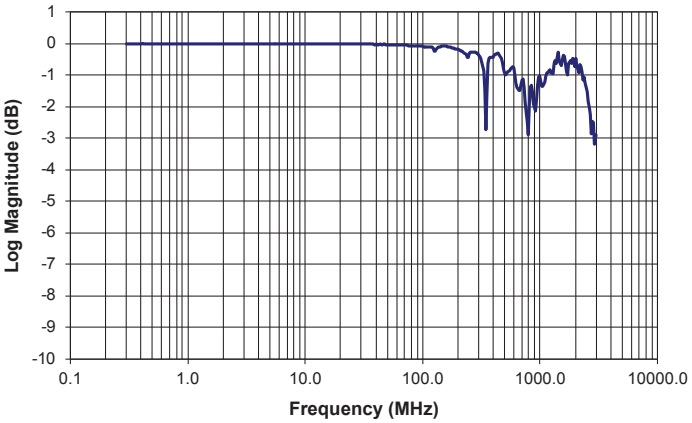


Crosstalk for two pairs of 050-25 wireless socket assemblies on a 0.050 [1.27] grid.

050-16 Series Wireless

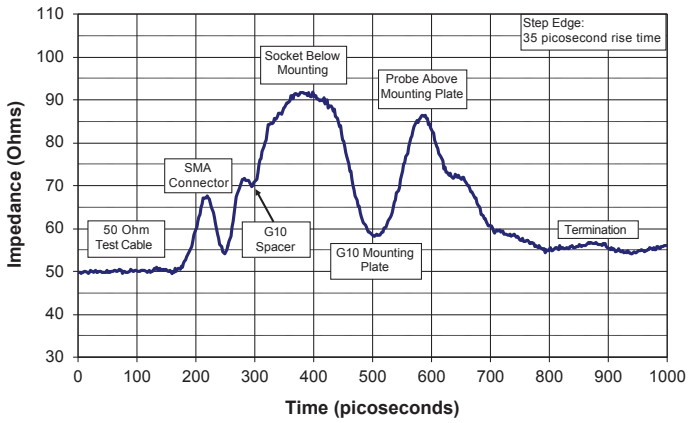
050-16 SERIES | 0.050 [1.27] CENTERS

Frequency Response Measurement | -1dB at 336 MHz



050-16 SERIES | 0.050 [1.27] CENTERS

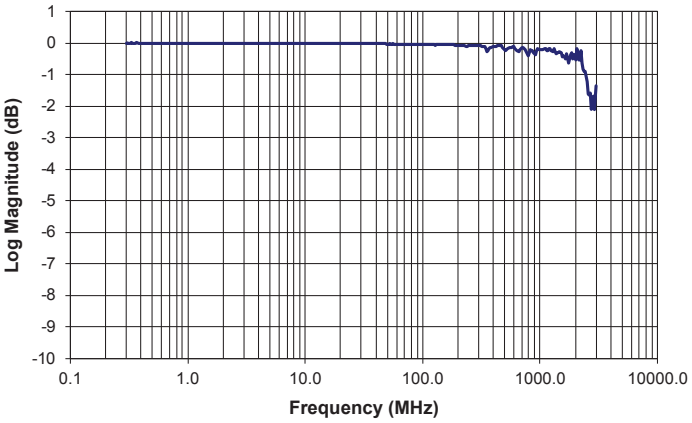
TDR Measurement | Effective Test Frequency = 10GHz



Two 050-16 wireless socket assemblies (signal and ground) on 0.050 [1.27] centers.

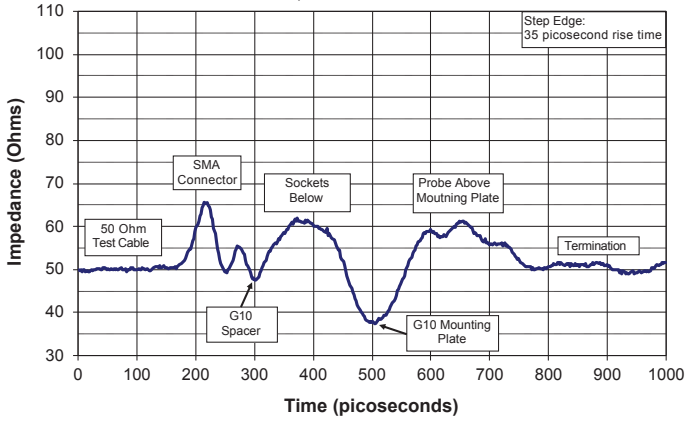
050-16 SERIES | 0.050 [1.27] X3

Frequency Response Measurement | -1dB at 2495 MHz



050-16 SERIES | 0.050 [1.27] X3

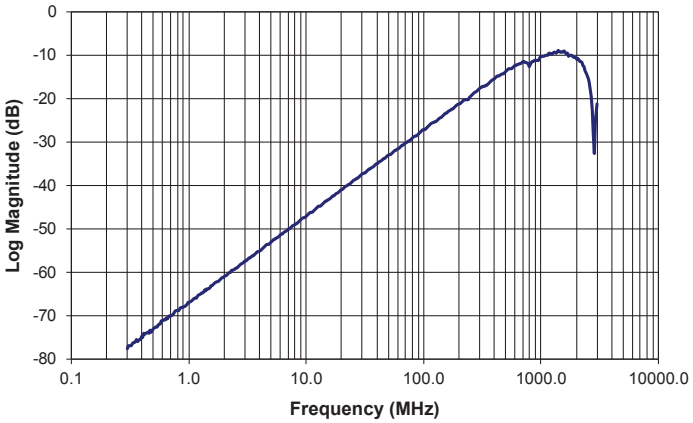
TDR Measurement | Effective Test Frequency = 10GHz



Three 050-16 wireless socket assemblies (ground-signal-ground) on 0.050 [1.27] centers.

050-16 SERIES | 0.050 [1.27] CENTERS

Crosstalk Measurement

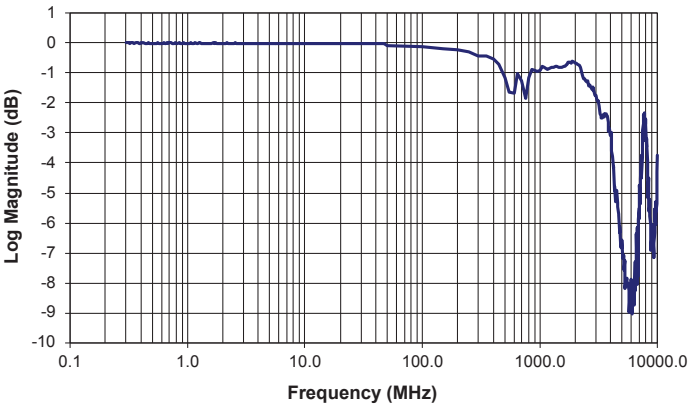


Crosstalk for two pairs of 050-16 wireless socket assemblies on a 0.050 [1.27] grid.

039-25 Series Wireless

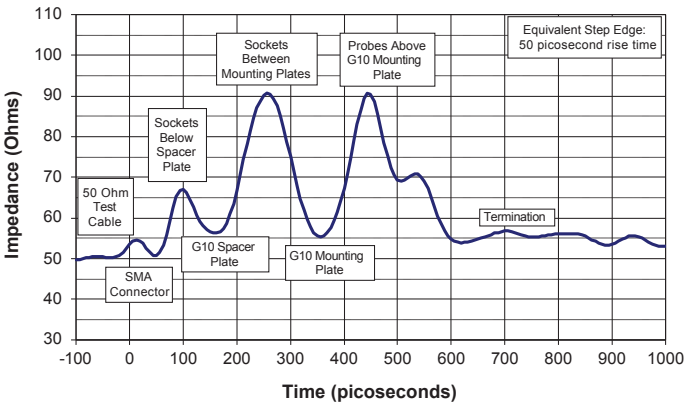
039-25 SERIES | 0.039 [1.00] CENTERS

Frequency Response Measurement | -1dB at 500 MHz



039-25 SERIES | 0.039 [1.00] CENTERS

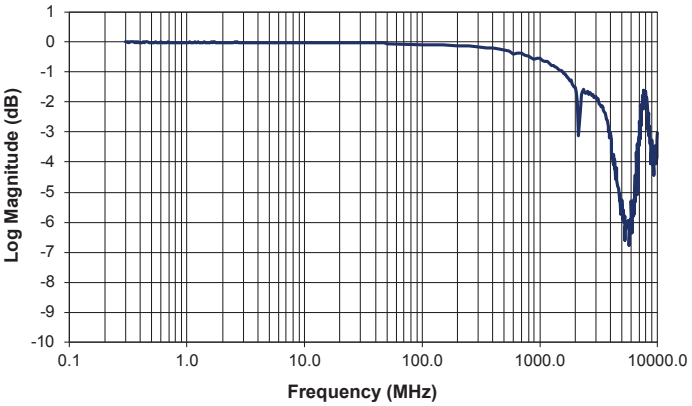
TDR Measurement | Effective Test Frequency = 7GHz



Two 039-25 wireless socket assemblies (signal and ground) on 0.039 [1.00] centers.

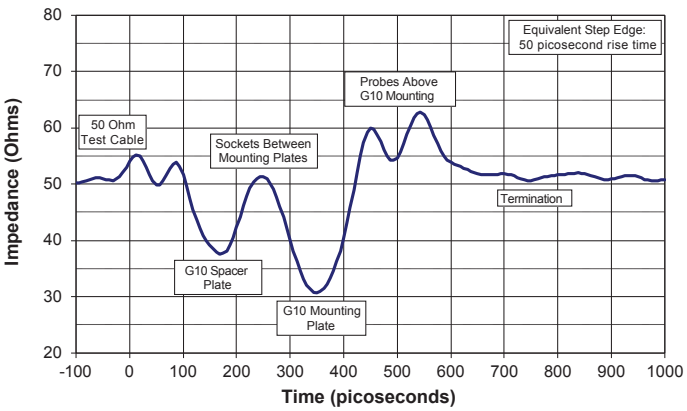
039-25 SERIES | 0.039 [1.00] X3

Frequency Response Measurement | -1dB at 1600 MHz



039-25 SERIES | 0.039 [1.00] X3

TDR Measurement | Effective Test Frequency = 7GHz



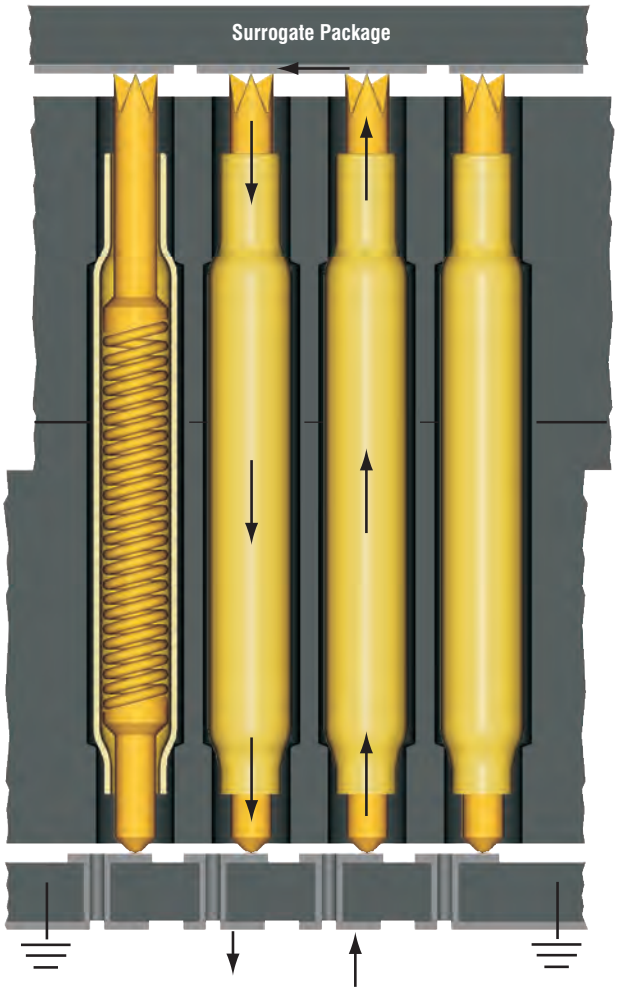
Three 039-25 wireless socket assemblies (ground-signal-ground) on 0.039 [1.00] centers.

High Frequency Performance for M08-89 Series

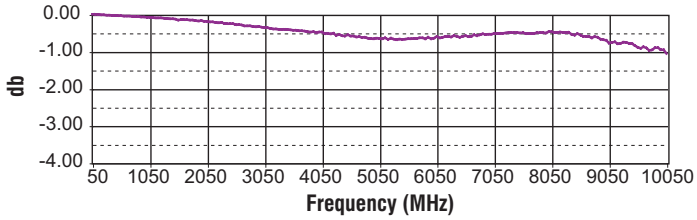
The high frequency performance of an IC test contactor is very important in high-speed test applications. QA Technology has conducted high frequency measurements on a surrogate IC test contactor populated with our M08-PRG89 probes. QA used a microwave network analyzer and custom test fixturing to test the contactor in numerous configurations.

For the loop-thru measurement, the test signal travels through the test board via and the first probe to the surrogate package. The isolated trace on the surrogate package couples the signal to the adjacent probe where it is returned back through the second test board via. All the probes surrounding the two signal carrying probes are grounded.

The loop-thru signal path described achieved a -1 db bandwidth of 10GHz, as seen in the Insertion Loss graphs.



INSERTION LOSS – S_{21} LOOP-THRU



Bandwidth: -1 db @ 10.0 GHz
Self Inductance: 1.13 nH

Mounting Hole Specifications and Suggestions

Hole Specifications

QA Technology recommends hole sizes as shown in the charts below. Suggested drill sizes are for reference only and were derived using AT7000 epoxy glass fixture plate material. Factors such as material, drill tolerances, wear, and machining parameters will affect the final hole size. Each combination should be tested and verified for the application. Use QA pin gauge tools to verify proper hole sizes. Undersized holes could damage sockets, terminations, and installation tools. Oversized holes could result in loose sockets and terminations that would allow the part to move in the mounting plate during testing.

CONVENTIONAL

SERIES	FIXTURE PLATES	SUGGESTED HOLE SIZES	SUGGESTED DRILL SIZE	PIN GAUGE TOOL P/N
025-16	Probe Plate	0.0205/0.0215 [0.521/0.546]	#75 or 0.55 mm	PG25
039-16 039-25 039-40		0.0307/0.0317 [0.780/0.805]	0.8 mm or #67	PG39
050-05 050-16		0.0368/0.0378 [0.935/0.960]	0.95 mm or #62	PG050-05/16
050-T25 050-T40 050-R25 050-R40		0.0380/0.0390 [0.965/0.991]	1.00 mm	PG050-25
075-25 075-40		0.0530/0.0550 [1.346/1.397]	#54 or 1.40 mm	PG75
100-05 100-16 100-25 100-40 100-50		0.0670/0.0690 [1.702/1.753]	1.75 mm	PG100
125-25		0.0940/0.0960 [2.390/2.440]	2.40 mm or #41	PG125
156-25		0.108/0.110 [2.74/2.79]	7/64" or 2.80 mm	PG156
187-25		0.141/0.143 [3.58/3.63]	3.60 mm	PG187

X PROBE® SOCKETLESS

SERIES	FIXTURE PLATES	SUGGESTED HOLE SIZES	SUGGESTED DRILL SIZE	PIN GAUGE TOOL P/N
X31-16 X31-25 X31-40	Probe Plate	0.0250/0.0260 [0.635/0.660]	#71 or 0.65 mm	PG-X31-P
	Optional Spacer Plate	0.027 [0.686] min	0.70 mm or #70	
	Back Plate	0.0217/0.0225 [0.551/0.572]	#74 or 0.58 mm	PG-X31-T
X39-16 X39-25 X39-40	Probe Plate	0.0315/0.0325 [0.800/0.826]	#66 or 0.84 mm	PG-X39
	Optional Spacer Plate	0.034 [0.860] min	#65 or 0.90 mm	
	Back Plate	0.0315/0.0325 [0.800/0.826]	#66 or 0.84 mm	PG-X39
X50-16 X50-25 X50-40	Probe Plate	0.0415/0.0430 [1.054/1.092]	#57 or 1.10 mm	PG-X50-P
	Optional Spacer Plate	0.045 [1.14] min	1.15 mm or #56	
	Back Plate	0.038/0.039 [0.965/0.990]	#61 or 1.00 mm	PG-X50-T
X75-16 X75-25 X75-40	Probe Plate	0.0545/0.0560 [1.384/1.422]	#54 or 1.40 mm	PG-X75A-P
	Optional Spacer Plate	0.0625 [1.59] min	1/16 or 1.60 mm	
	Wired Back Plate	0.0515/0.0525 [1.308/1.333]	#55 or 1.35 mm	PG-X75A-T
	Wireless Back Plate	0.0380/0.039 [0.965/0.990]	#61 or 1.00 mm	PG-X50-T

Minimum Center Spacing

The following charts detail the minimum recommended center-to-center spacing for QA's conventional sockets and X Probe termination pins.

Note: headed probes may require larger spacing depending on their diameter.

CONVENTIONAL

CENTERS	0.039 [1.00]	0.050 [1.27]	0.075 [1.91]	0.100 [2.54]	0.125 [3.18]	0.156 [3.96]	0.187 [4.75]
0.039 [1.00]	0.039 [1.00]	0.043 [1.09]	0.052 [1.32]	0.060 [1.53]	0.071 [1.80]	0.078 [1.98]	0.095 [2.41]
0.050 [1.27]	0.043 [1.09]	0.048 [1.22]	0.057 [1.45]	0.064 [1.63]	0.077 [1.96]	0.084 [2.13]	0.101 [2.57]
0.075 [1.91]	0.052 [1.32]	0.057 [1.45]	0.068 [1.73]	0.075 [1.91]	0.087 [2.21]	0.094 [2.39]	0.111 [2.82]
0.100 [2.54]	0.060 [1.53]	0.064 [1.63]	0.075 [1.91]	0.085 [2.16]	0.098 [2.49]	0.105 [2.67]	0.122 [3.10]
0.125 [3.18]	0.071 [1.80]	0.077 [1.96]	0.087 [2.21]	0.098 [2.49]	0.111 [2.82]	0.118 [3.00]	0.135 [3.43]
0.156 [3.96]	0.078 [1.98]	0.084 [2.13]	0.094 [2.39]	0.105 [2.67]	0.118 [3.00]	0.133 [3.38]	0.150 [3.81]
0.187 [4.75]	0.095 [2.41]	0.101 [2.57]	0.111 [2.82]	0.122 [3.10]	0.135 [3.43]	0.150 [3.81]	0.166 [4.21]

X PROBE SOCKETLESS

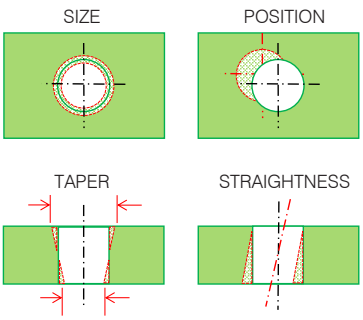
CENTERS	X31 [0.80]	X39 [1.00]	X50 [1.27]	X75 [1.91]
X31 [0.80]	0.030 [0.76]	0.035 [0.89]	0.040 [1.02]	0.046 [1.17]
X39 [1.00]	0.035 [0.89]	0.038 [0.97]	0.043 [1.09]	0.052 [1.32]
X50 [1.27]	0.040 [1.02]	0.043 [1.09]	0.048 [1.22]	0.057 [1.45]
X75 [1.91]	0.046 [1.17]	0.052 [1.32]	0.057 [1.45]	0.068 [1.73]

Drilling Suggestions

Producing fixture plates with accurate hole sizes, positions, and straightness will improve the installation, wiring, and accuracy of sockets and termination pins.

QA recommends several drill bit types to achieve optimal holes.

- Center or spot drill
- Carbide circuit board drill
- Extended flute carbide drill
- High speed steel drill



STEP 1

Use a short, rigid center or spot drill to locate the center of the hole, to break through the plate surface, and to leave a small divot starting a point for subsequent drilling operations.

STEP 2

Use a standard carbide circuit board drill to finish the hole. Use an extended flute drill for thicker plates. For small holes, peck drilling achieves straighter more accurate hole diameters.

STEP 3 (WHEN REQUIRED)

Use a conventional high-speed steel drill bit to finish the hole for engineering change orders (ECOs) or when plates cannot be taken apart after steps 1 and 2. This drill type has a long flute length to accommodate a thicker stack up of plates.



STEP 4

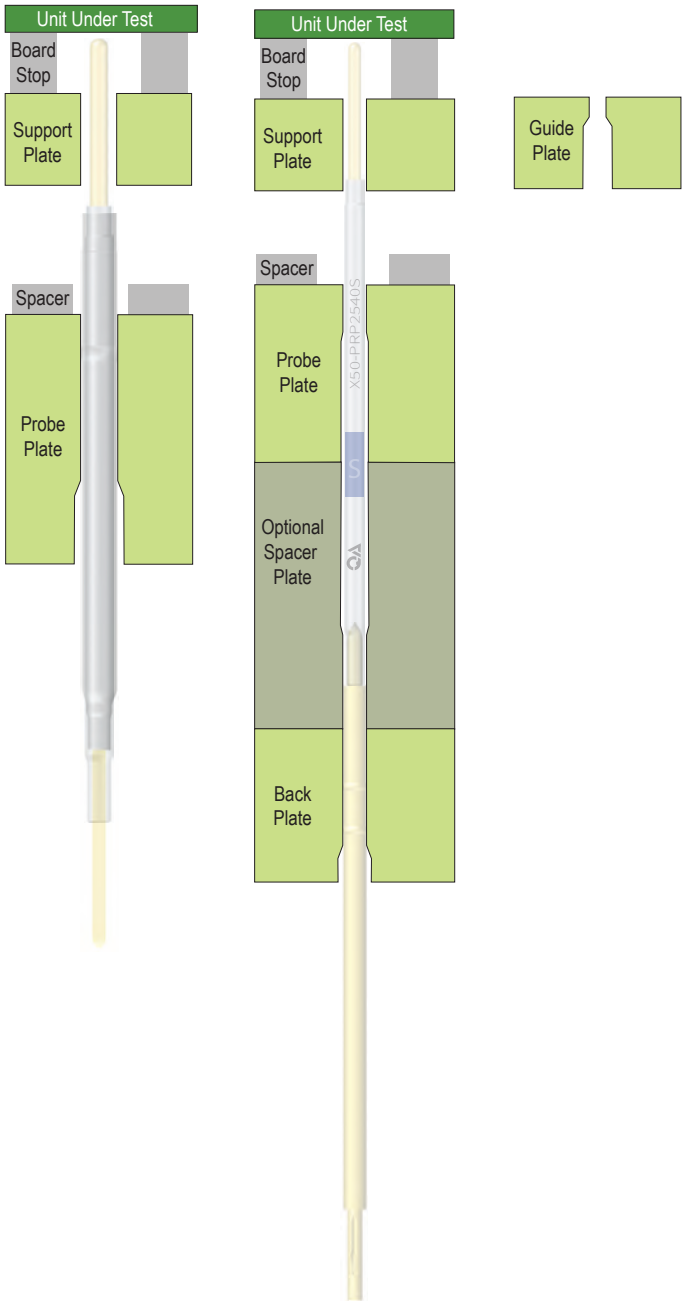
Test to determine if the hole is sized correctly by using a pin gauge tool or GO/NO-GO gauges. Verify hole sizes with both sides of the gauge to ensure the hole falls within the correct tolerance. The GO (green) end of the gauge should go into the hole. If it does not, the hole is undersized and must be resized. The NO-GO (red) end of the gauge should not enter the hole. If it enters, the hole is oversized, and the plate may need to be re-drilled.

ADDITIONAL CONSIDERATIONS

With thick mounting plates, drill optional stepped holes or use multiple thinner plates to improve hole straightness. Position the properly sized hole on the critical surface and a larger clearance hole on the non-critical surface.

With X Probe fixtures, the bottom of the spacer plate is critical. It helps guide the end of the probe tube/interconnect housing onto the termination pin during installation and replacement.

When using guide plates, it is necessary to back drill the bottom to make it easier to align the probe tips during installation. This provides added clearance for the probe and socket tubes when the guide plate is actuated.

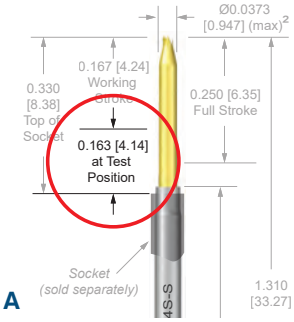


Calculating Socket Set Heights

The socket set height is the distance from the top of the probe plate to the top of the socket. Probe performance and longevity are maximized when sockets are installed to the correct set height. When set too low, the probe is under-stroked, reducing the contact force and the probe's ability to penetrate surface contaminants. When set too high, the probe is over-stroked, which may cause reduced spring life, risk damage to the unit under test (UUT) or incur tip damage due to bottoming. To calculate proper set height, follow these steps:

STEP 1

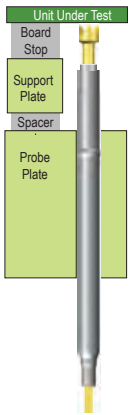
Retrieve dimension **(A)** "at Test Position" from the product series page from our catalog or website. This is simply the distance from the tip of the probe of an unactuated plunger to the top of the socket, minus the working/test stroke. It is important to note that these dimensions may vary from series to series so a separate calculation must be made for each probe series used in the fixture.



Step 1

STEP 2

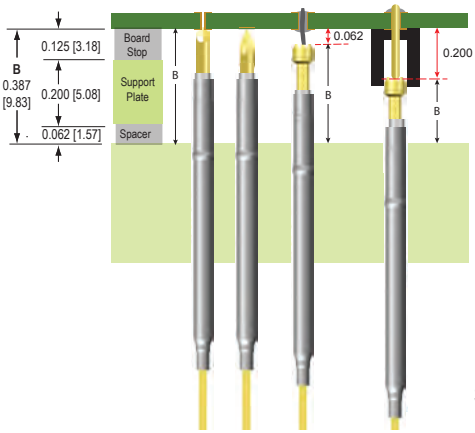
Make a cross-sectional sketch of your fixture in the actuated/test position, including board stops, support plates, spacers, etc. This sketch illustrates one example of a typical fixture.



Step 2

STEP 3

Add the thickness of the items that stack up between the top surface of the probe plate and the contact surface of the UUT to get dimension **(B)**. If contacting leads, posts, or components, subtract the average length of these to adjust dimension **(B)**.



Step 3

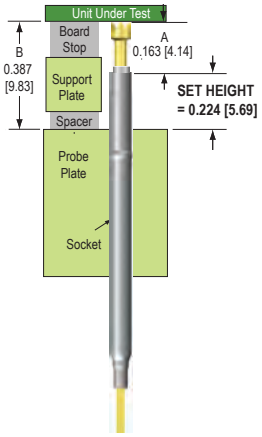
STEP 4

Subtract the at test position dimension **(A)** from total stack up dimension **(B)**.

Example for 100-25 Series:

0.387 [9.83] ***(B)*** *- 0.163 [4.14]* ***(A)***

= 0.224 [5.08] set height

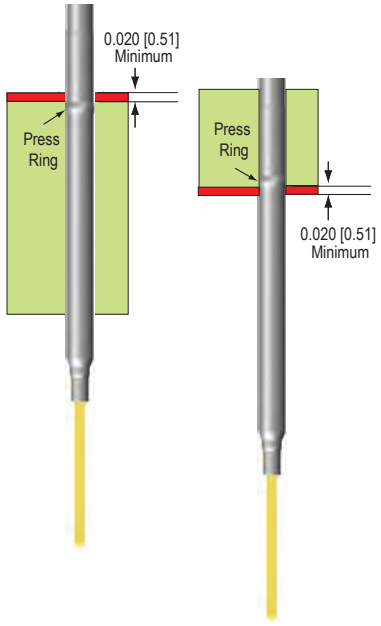


Step 4

You can now use this set height dimension to install your sockets with our ATR adjustable or ITR preset installation tools.

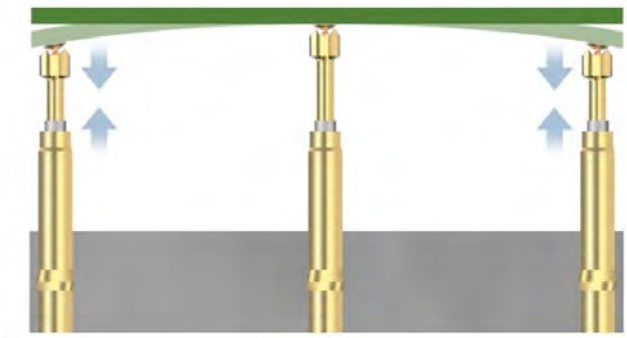
ADDITIONAL CONSIDERATIONS

To account for irregularities in the mounting hole, QA recommends a margin of at least 0.020 [0.51] between the press ring and the closest plate surface.



100-05, 050-05, and 025-16 series sockets are all mounted flush (set height is zero).

Users should consider board flexing and bowing as they calculate socket set heights. Be sure that all probes are stroked to at least their working stroke.



Notes

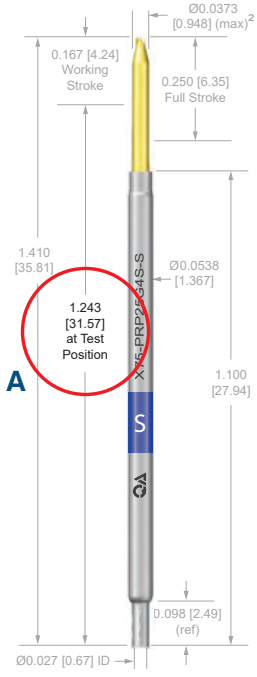
- When the 050-25 and 050-40 Series are used in dual level testing applications, the 050-25 Series socket must be set 0.015 [0.38] higher to achieve the probe's designed 0.150 [3.81] tip height difference when the fixture is in the unactuated state.
- Some tip styles will require an adjusted "at Test Position" dimension. If your chosen tip style has stroke limitations, a new "at Test Position" dimension should be determined before proceeding with a set height calculation.

Calculating QA X Probe® Termination Set Heights

For QA's X Probe® fixtures, the termination pin set height is the distance from the top of the back plate to the shoulder of the termination pin. Probe performance and longevity are maximized when the termination pins are installed to the correct set height. When set too low, the probe is under-stroked, reducing the contact force and the probe's ability to penetrate surface contaminants. When set too high, the probe is over-stroked, which may cause reduced spring life, risk damage to the unit under test (UUT) or incur tip damage due to bottoming. To calculate the proper set height, follow these steps:

STEP 1

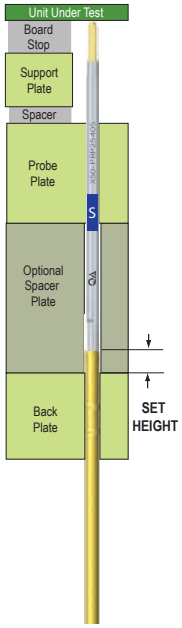
Retrieve dimension **(A)**, the "at Test position" from the product series page of our catalog or website. This is simply the difference between the overall length of the X Probe and the working stroke. It is important to note that these dimensions may vary from series to series, so a separate calculation must be made for each probe series used in the fixture.



Step 1

STEP 2

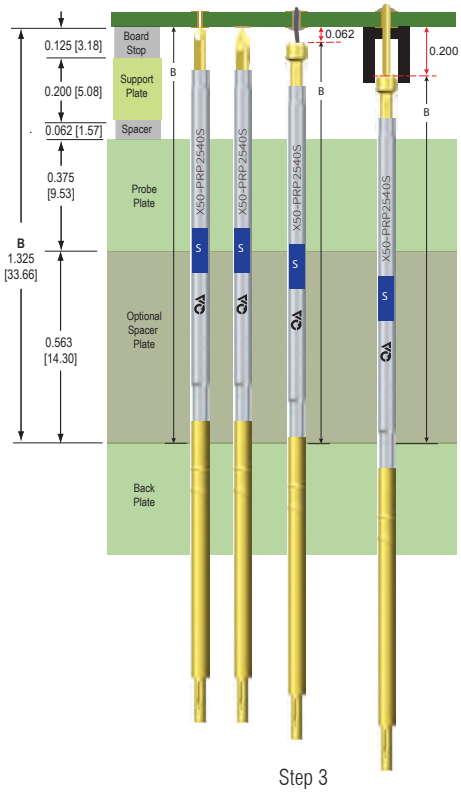
Make a cross-sectional sketch of your fixture to calculate the total thickness of all fixture items that stack up between the top surface of the back plate and the UUT when the fixture is in the actuated position. This includes the probe plate, spacer plate, spacers, support plate, and board stops. This diagram is one example of a typical fixture.



Step 2

STEP 3

Add the thickness of the items that stack up on the top surface of the back plate to the contact surface of the UUT to get dimension **(B)**. If contacting leads, posts, or components, subtract the average length of these to adjust dimension **(B)**.



Step 3

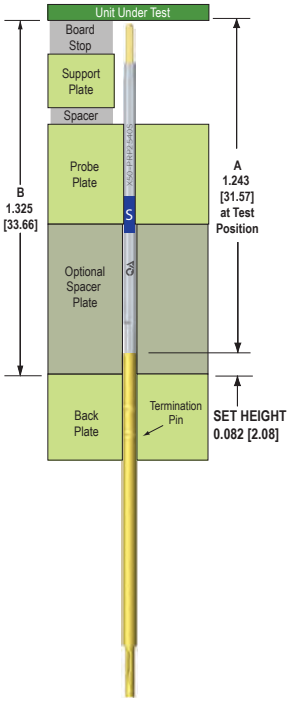
STEP 4

Subtract the at test position dimension **(A)** from total stack-up dimension **(B)**.

Example X50-25:

1.325 [33.66] ***(B)***
*- 1.243 [31.57] (**A**)*
= 0.082 [2.08] Set Height

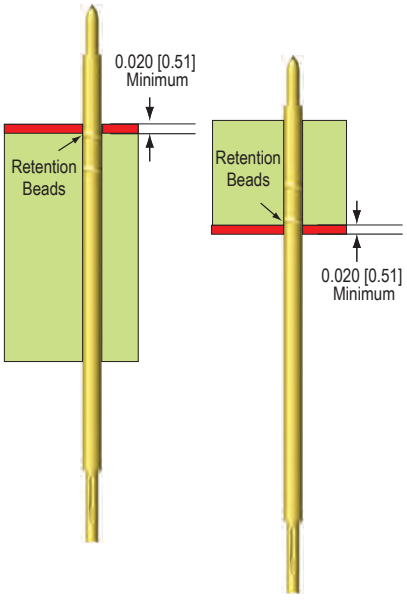
You can now use this set height dimension to install your termination pins with our ITR preset installation tools.



Step 4

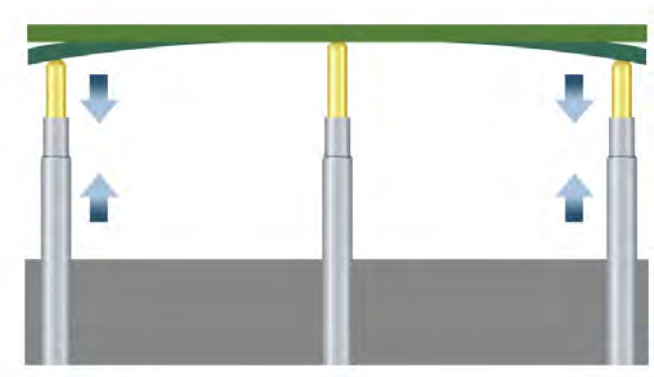
ADDITIONAL CONSIDERATIONS

To account for irregularities in the hole mounting, a margin of at least 0.020 [0.51] is recommended between the retention beads and the closest plate surface.



Instructions

Consider board flexing and bowing. Be sure that all probes are stroked to at least their working stroke.



Notes

- Some calculations may result in a negative set height, which will require setting the termination pin below flush [0.00].
- Some tip styles will require an adjusted “at Test Position” dimension. If your chosen tip style has stroke limitations, a new “at Test Position” dimension should be determined before proceeding with a set height calculation.

Probe and Socket Installation and Extraction

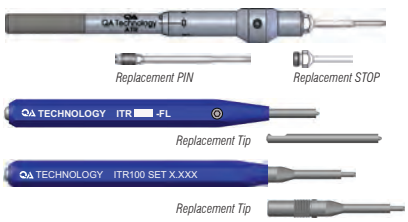
Ensuring that you install sockets and probes correctly provides the best pointing accuracy, retention force, and overall performance. Be sure to select the appropriately sized tool for the product you are using.

Socket Installation

YOU WILL NEED

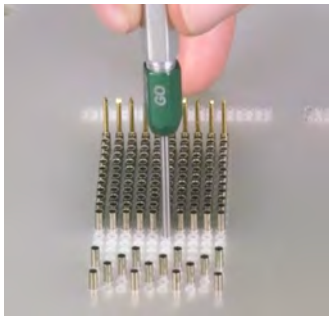
- Sockets
- Pin Gauge (PGxxx-xx)

- Socket Insertion Tool (ITRxxx or ATRxxx)



- Hammer (THM-1)

STEP 1



Check that the mounting hole is sized correctly with the proper pin gauge (PG) tool. The RED NO-GO side should not enter the hole, while the GREEN GO side should slide into the hole confirming that the hole size is correct and ready for the socket.

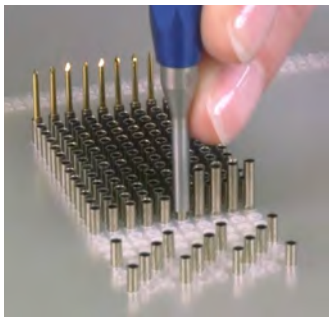
When drilling laminates such as AT7000 and G10/FR4, there is usually a difference between the drill diameter and the actual measured diameter of the finished hole. Drill feed, spindle speed, and material affect choice of the proper diameter drill. QA Technology recommends solid carbide, printed circuit board drills with 1/8” shanks. For 025-16 series sockets, homogeneous plate materials such as Lucite®, Nylon, or Delrin are recommended options.

STEP 2

Insert the socket in the mounting hole with the termination side down. The socket should slide easily into the hole until the press ring contacts the top surface of the mounting plate.

If you are using 025-16 sockets with pre-attached wire in multi-plate fixtures, slide the socket threading (ST25) tool, reduced end first, into the plates until it is flush with the top plate. Then feed the 1.0 [25.40] long stripped end of the wire into the tool until it protrudes from the reduced end. Pull the wire through with the tool and slide the socket into the mounting hole.

STEP 3



Insert the nose of the socket installation tool (ITR or ATR) over the top end of the socket and lightly tap it with a small hammer (THM-1) until the nose of the tool contacts the mounting plate. Take care not to damage the mounting plate. Sockets installed with several light taps will have at least double the pushout force of sockets installed with a single blow.

For 025-16 sockets, push them flush with a small press or other controlled method such as a hard, flat pusher and apply force perpendicular to the mounting plate.

Probe Installation

It is important to use our probe installation (PT) tool to prevent damage to the sharpest of tip styles. Do not use a metal object as a pusher because it will damage the tip and plating on the plunger.

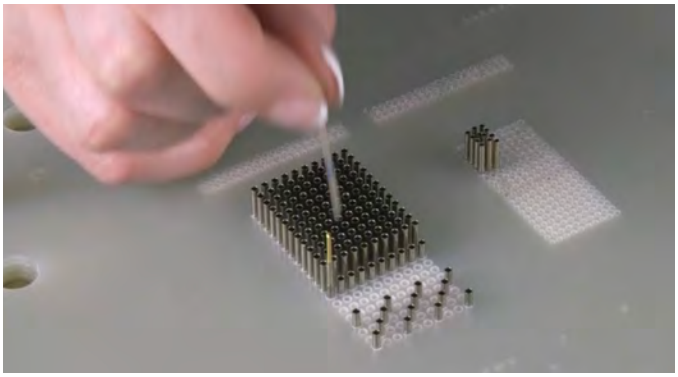
YOU WILL NEED

- Probes
- Probe Installation Tool (PT Tool)

- Tweezers

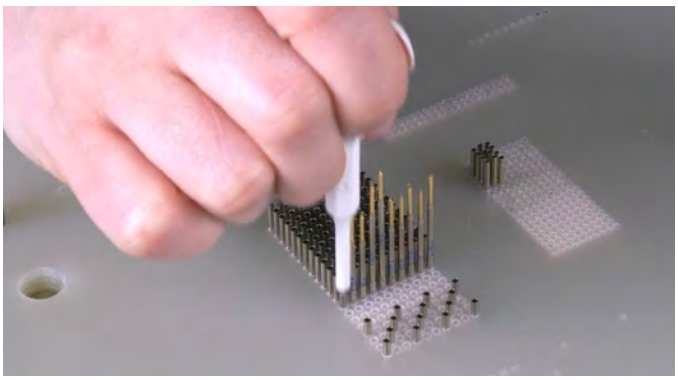
STEP 1

Place the probe into the socket by hand or with tweezers, avoiding the mouth area at the top of the probe tube.



STEP 2

Push straight down with our probe installation tool (PT) until the probe is seated in socket. You will feel resistance as the probe slides past the retention indents of the socket.



Probe Extraction

There are times when you will need to replace a worn or damaged probe. Here a few simple steps for this process.

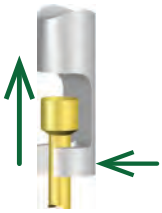
The most effective methods are:

YOU WILL NEED

- Probe Extraction Tool (PERX) or needle-nose pliers

STEP 1

For headed probes, slide the hook of the probe extraction tool (PERX) under the head and pull straight up to remove the probe. For headless probes, use needle-nose pliers.



If a plunger comes out or if it is broken off and leaves the probe tube and spring behind in a socket, you can remove it without damaging the socket. Always remove the remaining components such as the plunger or spring with needle-nose pliers to begin with any of the following options:

Option 1

YOU WILL NEED

- Tube Extraction Tool (TERX)
- Needle-nose pliers

STEP 1

Use needle-nose pliers to remove any of the remaining components, such as the plunger or spring, from the broken probe.

STEP 2

Insert the tube extraction tool (TERX) into the broken or damaged probe tube. If the probe tube has become deformed, you can also use this tool to reform the tube. Push firmly into the probe tube, taking care not to push so hard that the socket will move, then pull the broken tube out.

If this tool is not available, we recommended a few other options:

Option 2: Solder a piece of buss wire on the broken plunger.

STEP 1

Insert a plunger, point end first, or insert a buss wire into the damaged probe.

STEP 2

Solder the plunger or buss wire into the broken off probe tube. Be careful not to solder the probe tube into the socket. In some cases where the tube does not allow you to install a plunger, use a pointed awl or needle to reform the tube.

STEP 3

Pull the damaged tube from the socket with needle-nose pliers.

Option 3: Pin Vise and Drill Bit

STEP 1

Using a small pin vise and the proper size drill bit*, insert the drill bit straight down into the broken probe tube and twist it.

** Drill Bit Sizes:*

039/X31 = Method #3 is not recommended as standard drill bits are not readily available
050/X39 = #70 Drill bit (.0280) [0.71]
075/X50 = #66 Drill bit (.0330) [0.84]
100/X75 = #57 Drill bit (.0430) [1.09]

STEP 2

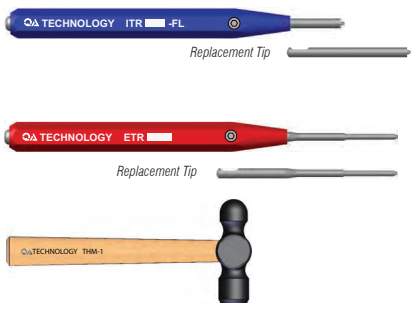
After a few rotations with the pin vise and drill bit, pull straight up. The drill bit will grab the ID of the damaged tube so that you can pull it straight out of its socket.

Socket Extraction

Extracting sockets on closely-spaced grids is a delicate process. Take care not to damage neighboring probes and not to enlarge the mounting hole. It may be necessary to remove probes from adjacent sockets to allow clearance for the tool.

YOU WILL NEED

- Socket Installation Tool set FLUSH (ITRxxx-FL)
- Socket Extraction Tool (ETR)
- Hammer (THM-1)



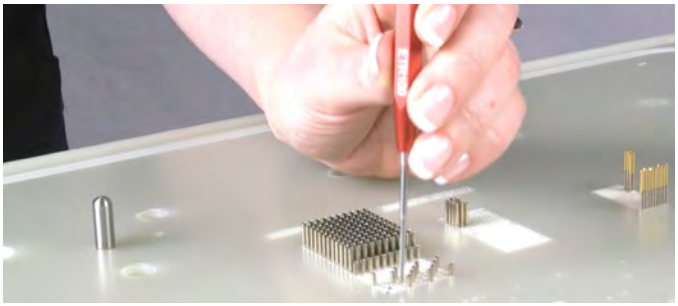
STEP 1

Identify the socket from the bottom and move adjacent wires and components.

STEP 2

We recommend that you set the socket flush to avoid further damage or having it become wedged into the hole. Insert the nose of the flush installation (ITR-FL) tool into the socket and lightly tap until the nose of the tool sits flush with your mounting plate.

For 025-16 series sockets mounted in acrylic or similar plastics, you can remove the socket through the mounting plate by gently pulling on the pre-attached wire or body of the socket with needle nose pliers. It is often better to leave the probe in the socket if you are pulling on the socket with needle nose pliers because the probe helps the socket to resist crushing. If the wire is missing, you can push straight down on the back of the socket with a flat pusher, forcing the socket up through the mounting plate. You can also use a 0.021 [0.53] diameter gauge pin. Place it on top of the socket and gently push or tap the socket out.



STEP 3

Insert the nose of the socket extraction (ETR) tool, tapping it lightly several times until the damaged socket drops out the back side of the mounting plate.

There are situations where it is not possible to remove the socket by driving it through the mounting plate with our extraction tools, such as in a wireless fixture, in limited access areas, or when the socket is damaged.

Option 1

You can also remove from the top by using the buss wire soldering technique described previously for damaged probes. If the socket is not set flush, use the vise technique.

Option 2

Remove sockets from the bottom by pulling carefully with needle-nose pliers. The socket tube will be crushed, but it will retain enough strength to allow it to be pulled out. Headless probes need not be removed first. Doing so will make the job easier since the spring inside reduces crushing of the socket tube and it will come through with the socket. Probes that are headed must first be removed from the top.

QA sockets with soldered tailpins may be pulled out by the tailpin since the joint between the socket tube and the tailpin is stronger than the tube itself.

Option 3

You can also remove sockets from the top by soldering a piece of buss wire along the outside of the socket, then pulling on the wire to remove the socket. Special soldering fluxes are available for soldering to the Stainless Steel sockets.

Option 4

You can push sockets out from the bottom by snipping off the tailpin and driving the socket out with a hammer (THM-1) and small metal pin. A small countersink on the end of the pin makes it easier to keep it aligned.

Socketless Termination and X Probe® Installation and Extraction

Ensuring that you install termination pins and QA Technology X Probes® correctly provides the best pointing accuracy, retention force, and overall performance. Be sure to select the appropriately sized tool for the product you are using.

Termination pins are installed in the back plate of a fixture and are used to adjust the set height of the probe. They provide the electrical connection from the probe to the fixture wiring.

Termination Pin Installation

YOU WILL NEED

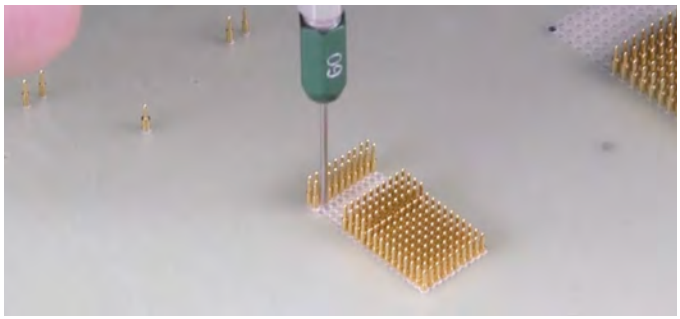
- Termination Pins
- Pin Gauge (PGxxx-xx)

- Termination Pin Insertion Tool (ITRxxx)

- Hammer (THM-1)

STEP 1

Check that the mounting hole is sized correctly with the proper pin gauge (PG) tool. The RED NO-GO side should not enter the hole, while the GREEN GO side confirms the hole size is correct and ready for the termination pin.



When drilling laminates such as AT7000 and G10/FR4, there is usually a difference between the drill diameter and the actual measured diameter of the finished hole. Drill feed, spindle speed, and material affect choice of the proper diameter drill. QA Technology recommends solid carbide, printed circuit board drills with 1/8" shanks.

STEP 2

Insert the termination pin into the correctly gauged mounting hole, tail end first. The bottom retention bead should sit on top of the back plate. When termination pins have a pre-attached wire, thread the wire through the mounting hole and gently pull on the wire until the first retention bead contacts the back plate. Do not try to pull the retention beads through the plate by the attached wire as the wire could pull apart from the body of the termination pin.

STEP 3

Place the nose of the termination pin installation (ITRX) tool over the interconnect pin and tap lightly with a small hammer (THM-1) until the nose of the tool contacts the mounting plate. Because of the delicate nature of the ITRX31 and ITRX39 tools, take extra care so as not to damage the tool.

CONSIDERATIONS

Inaccurate hole sizes and excessive hammering can cause damage to the termination pins or fixture plates.

Sheared off retention beads leave metal shavings that could cause electrical shorts.

Mounting plate material may be displaced due to excessive hammering.

Damage to the shoulder of the termination pin and inconsistent set heights can occur with undersized holes or excessive hammering.

Probe Installation

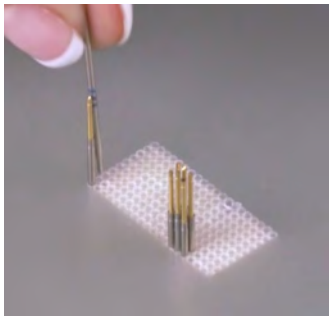
It is important to use our probe installation (PT) tool to prevent damage to the sharpest of tip styles. Do not use a metal pusher because it can damage the tip and plating on the plunger.

YOU WILL NEED

- X Probes®
- Probe Installation Tool (PT Tool)
- Tweezers

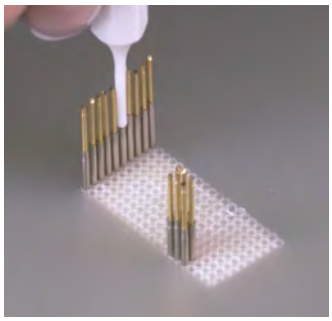
STEP 1

After the probe and optional spacer plates are installed, install the probe into the hole onto the termination pin by hand or with tweezers, avoiding the mouth area the probe tube.



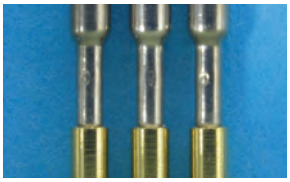
STEP 2

Using the probe installation (PT) tool, push on the probe tip guiding it onto the termination pin. Continue pushing until you feel a positive click.



CONSIDERATIONS

Properly sized holes and installation is key. The following are some things to check if poor electrical contact or shorts are experienced:



Proper X Probe installation, bottom of probe tube is sitting on shoulder of Termination pin.

The X Probe may have missed the termination pin and is not making the connection. Remove the X Probe, verify plate alignment and re-install.

If the X Probe is sitting too high, it may not be seated properly. Continue pushing down until the connection is complete.

Probe Extraction

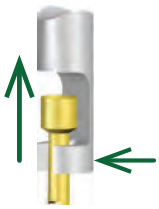
To replace a worn or damaged probe, the following methods can be used.

YOU WILL NEED

- Probe Extraction Tool (PERX) or needle-nose pliers

STEP 1

For headed probes, slide the hook of the probe extraction tool (PERX) under the head and pull straight up to remove the probe. For headless probes, use needle-nose pliers.



You can also remove a broken probe by using one of the following optional methods. Always remove the remaining components, such as the plunger or spring, with needle-nose pliers to begin.

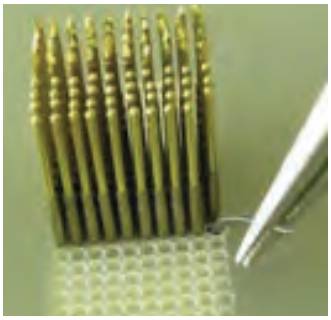
Option 1: Tube extraction tool

YOU WILL NEED

- Tube Extraction Tool (TERX)
- Needle-nose pliers

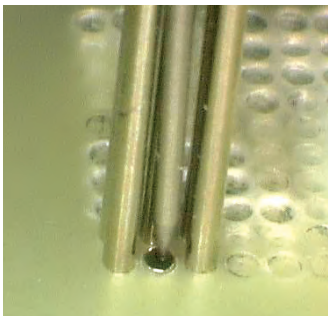
STEP 1

Insert the tube extraction tool (TERX) into the damaged probe tube. If the tube has become deformed, you can also use this tool to reform the tube. Push firmly into the probe tube, taking care not to push so hard that the termination pin will move.



STEP 2

Pull the broken tube out.



Option 2: Solder a piece of buss wire on the broken plunger

STEP 1

Insert a plunger, point end first, or insert a buss wire into the damaged probe.

STEP 2

Solder the plunger or buss wire into the broken off probe tube. Be careful not to solder the probe tube into the mounting hole. In some cases where the tube does not allow you to install a plunger, use a pointed awl to reform the tube. Pull the damaged tube from the socket with needle-nose pliers.

STEP 3

Pull the damaged tube from the mounting hole with needle-nose pliers.

Option 3: Pin Vise and Drill Bit

STEP 1

Using a small pin vise and the proper size drill bit*, insert the drill bit straight down into the broken probe tube and twist it.

** Drill Bit Sizes:*

039/X31 = Method #3 is not recommended as standard drill bits are not readily available
050/X39 = #70 Drill bit (.0280) [0.71]
075/X50 = #66 Drill bit (.0330) [0.84]
100/X75 = #57 Drill bit (.0430) [1.09]

STEP 2

After a few rotations with the pin vise and drill bit, pull straight up. The drill bit will grab the ID of the damaged tube so that you can pull it straight from its mounting hole.

Termination Pin Extraction

Damaged termination pins can be removed with or without the probe and optional spacer plates installed.

YOU WILL NEED

- Termination Installation Tool set FLUSH (ITRXxx-FL)

- Extraction Tool (ETRX)

- Hammer (THM-1)

With the Probe and Spacer Plates Removed:

Following these instructions will ensure that the back plate will not be damaged when replacing a termination pin.

STEP 1

We recommend the termination pin first be set to 0.000 or flush with an insertion (ITRX-FL) tool prior to extraction. (For termination pins set below 0.000, this step is not required).

STEP 2

Place the nose of extraction (ETRX) tool onto the termination's interconnect pin and lightly tap with a small hammer (THM-1) until it's driven out. With care, the tool will also remove the termination pins with broken interconnect pins.

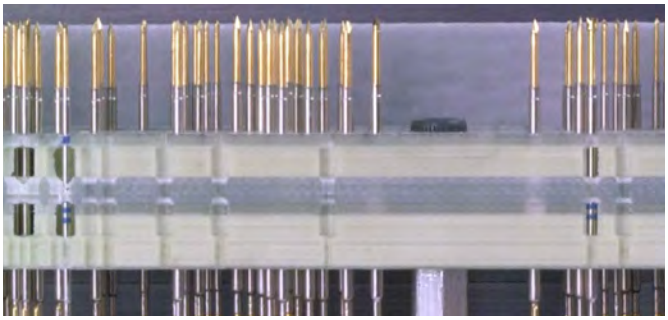
With the Probe and Spacer Plates Installed:

YOU WILL NEED

- Extended Extraction Tool (ETRX-E)

- Hammer (THM-1)

At times, it is not practical to remove all of the probes and disassemble the fixture in the field. Use our extended extraction (ETRX-E) tools to remove and re-install terminations pins in fixtures where the probe and spacer plates are installed.



STEP 1

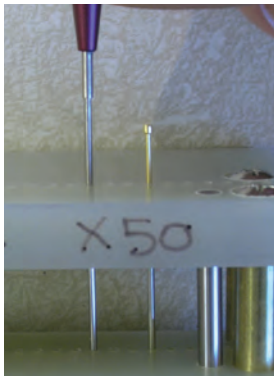
Remove the X Probe from the probe plate (see previous instructions).

STEP 2

To help prevent damage to nearby contacts during extraction, identify the termination pin from the bottom side of the back plate and move adjacent wires and components.

STEP 3

Guide the nose of the extended extraction (ETRX-E) tool into the mounting hole in the probe plate until the nose of the tool contacts the termination's interconnect pin.



Proper use of extraction tool with spacer & probe plates installed

Incorrect use of tool. ETRX-E tool may buckle.

STEP 4

With a pencil or fine line marker, make a small mark on the shank of the tool located at the top of the probe plate. When installing the replacement termination pin, this mark is used to gauge the set height.

STEP 5

Lightly tap on the extraction tool with a small hammer (THM-1) until the termination pin is driven out.

Re-installing the Termination Pin with the Probe and Spacer Plates Installed:

YOU WILL NEED

- Extended Extraction Tool (ETRX-E)

- Hammer (THM-1)

- Probe Installation Tool (PT Tool)

STEP 1

Check the mounting hole to make sure nothing is obstructing it. The extraction (ETRX-E) tool can be inserted into the hole to check this.

STEP 2

Drop the replacement termination pin into the hole, tail first. If the termination pin hangs up in the hole, use the extraction (ETRX-E) tool to push it to its starting position on the top of the back plate.

STEP 3

Lightly tap with a small hammer (THM-1) only to the point where the mark (made previously) on the tool shank aligns with the top of the probe plate. This ensures that it is set at the same height as the previously removed termination pin.

STEP 4

Reinstall the proper X Probe with appropriate probe installation (PT) tool or other plastic pusher.

STEP 5

Reconnect fixture wiring to the termination pin.

Notes

If termination pins require more than a light tap of the hammer to seat on the back plate, verify the hole size and make modifications if required.

Replacement termination pins can be installed from the bottom side of the back plate without removing the probes or probe and optional spacer plates. A custom tool would have to be fabricated by the user to support the termination pin during installation and provide positioning to be set at the proper set height. On high-density fixtures, the congested wiring on the bottom side of the back plate could make this method particularly challenging.

The tools are designed to remove and install termination pins in back plates up to 0.625 [15.88] in thickness when the fixture is designed around QA's Fixture Layout Examples.

The wireless XTDS termination pins are used with both the X50 and X75 Probes. In cases where an X75 Probe is connected with an XTDS termination, the ETRX50-E tool would be used, not the ETRX75A-E tool.

Because of the delicate nature of the X31 and X39 tools, take extra care to avoid bending or damage.

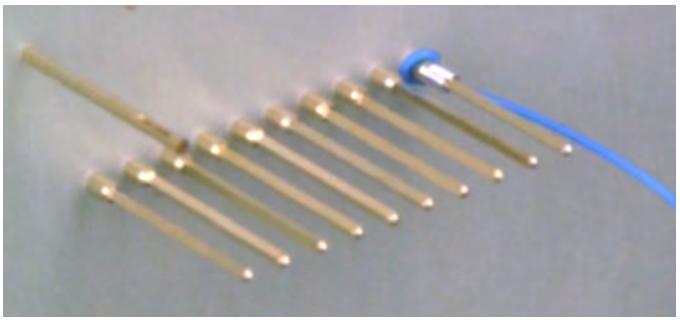
Wire Connection Methods

There are many wiring options for your fixture. QA Technology offers several different methods to ensure that you make a reliable connection for successful testing. These include wire wrapping, soldering, and crimping, as well as wire grip sleeves, wire plugs, and wire jacks for smaller sizes.

Wire Wrap Type

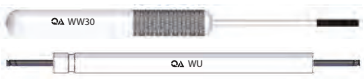
Wire wrapping is the most common wiring method for QA sockets and termination pins. For 75mil and larger centers, use 28AWG solid wire. For 50mil and smaller centers, use 30AWG solid wire to prevent crowding between adjacent sockets. Modified wraps are not recommended on 50mil centers. On all wire wrap pins longer than 0.250 [6.35], multiple wire wraps can be used.

For 50mil centers or smaller QA recommends insulating every other connection to prevent adjacent sockets from shorting. Our heat-shrinkable tubing (INS046-6) is stiffer than other types making installation easier. It is colored to help identify progress during the wrapping process.



YOU WILL NEED

- "W" termination type socket or termination pin
- Wire wrapping tool
- Unwrapping tool

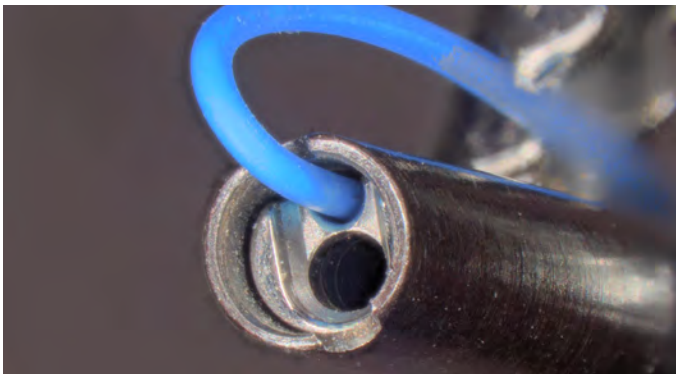


- Solid Kynar® insulated copper wire
- INS046 Insulated tubing (for 50mil and smaller)
- Needle-nosed pliers or tweezers

Instructions

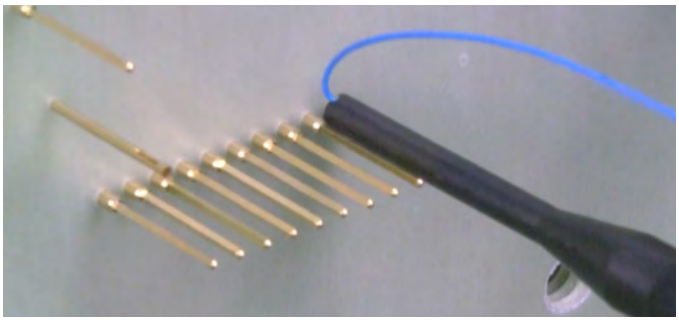
STEP 1

Cut and strip one end of the wire. A minimum strip length of 0.625 [16] will achieve the recommended six to seven regular wire wrap turns. For 50mil centers or smaller see further insulating instructions.



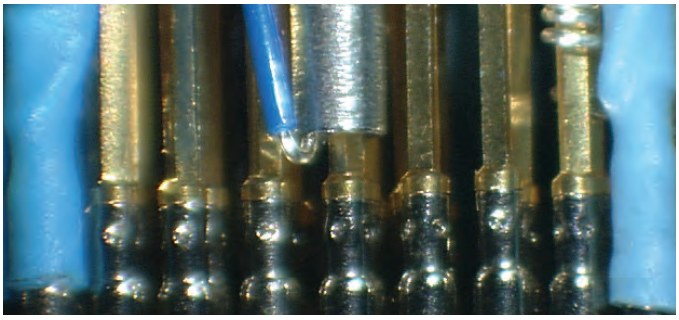
STEP 2

Insert the wire into the smaller of the two holes until the wire insulation contacts the face of the tool as shown.



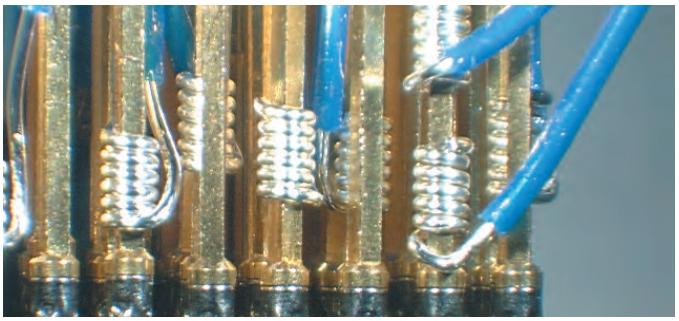
STEP 3

Align the larger center hole with the pin and slide the tool down to the desired wrap location. The nose of the tool will determine the starting point of the wrap.



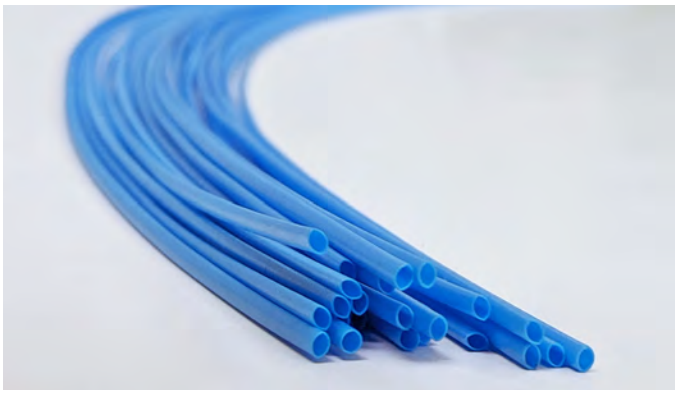
STEP 4

Holding the insulated end of the wire firmly, apply gentle pressure downward and rotate the (WW) wire wrap tool. Do not pull the tool backwards or push with excessive force. Keep the tool on the pin until the wrap is completed.



Insulating Heat-Shrinkable Tubing

(for 50mil and smaller)



Instructions

STEP 1

Cut lengths of 0.500 [13] will completely cover the wire wrap post in most applications.

STEP 2

Slide the tubing on every other wire BEFORE wrapping.

STEP 3

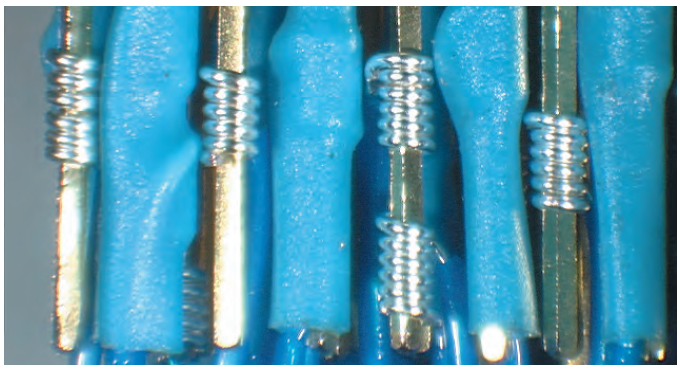
Wire wrap all pins.

STEP 4

Slide the tubing to cover the wire wrap.

STEP 5 (OPTIONAL)

Heat the tubing with a heat gun to make it shrink around the wire and hold it in place.



Removal

STEP 1

If shrink tubing is present, slit it lengthwise with a penknife and pull it off with needle-nose pliers, taking care to avoid damage to the surrounding wires.

STEP 2

Place the (WU) unwrapping tool on the post, use moderate forward pressure, and rotate it in a direction opposite to the wrap until the coil has loosened enough to be removed by hand. The WU tool is double-ended for both clockwise (CW) and counterclockwise (CCW) wraps.

Soldering Type

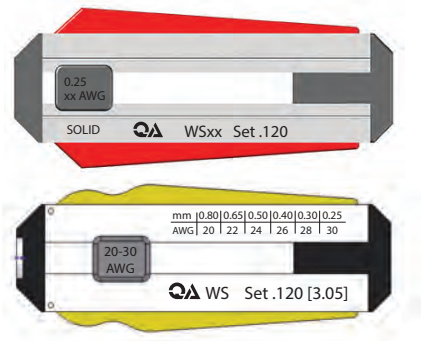
A solder connection is another common method to secure an electrical bond. QA offers a solder cup termination option for 75mil sockets and larger. QA suggests using lead-free solder. If choosing stranded wire, you may need the next smaller gauge. The accompanying chart indicates the maximum solid wire sizes that are suggested for the various solder cup sockets we offer.

SOLDER CUP TYPE SOCKET PART NUMBER	WIRE DIAMETER IN [MM]	WIRE GAUGE (AWG)
075-SDN250S	0.026 [0.660]	22
100-SDN250S	0.036 [0.914]	20 or 18
125-SD_250S	0.042 [1.067]	18
156-SD_250S	0.058 [1.473]	16 or 14
187-SD_250S	0.072 [1.829]	14 or 12

For 125, 156, and 187mil sizes, 12AWG and 10AWG wire can be used for high current testing. However, be sure that the wires are secured, as heavier wires can bend the sockets if not supported and adjacent sockets could touch or short.

Termination Types for Small Center Spacing

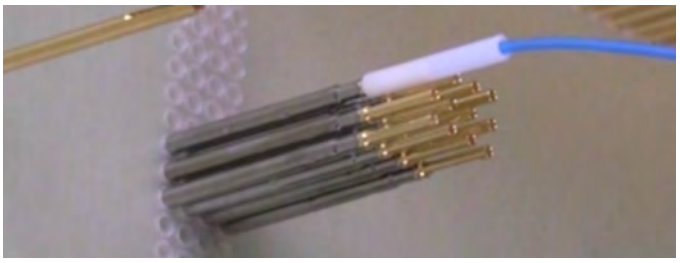
Wire connections on small centers can be challenging. QA has wire grips, wire jacks, and wire plugs that are great wiring options. Refer to our catalog or website for connection style availability.



For wire grip, wire plug, or wire jack installation, use a solid Kynar insulated copper wire stripped to 0.120 [3.05] (multi-stranded wire is not recommended). QA offers wire strippers preset to this length for this purpose.

Wire Grip Sleeve Installation

Wire grip sleeve connection is used with our “G” type termination socket or termination pin.



YOU WILL NEED

- “G” termination type socket or termination pin
- Wire grip sleeve
- Solid Kynar insulated copper wire (28AWG or 30AWG)
- Needle-nosed pliers or tweezers
- GTR installation tool

Replacement Tip

Instructions

STEP 1

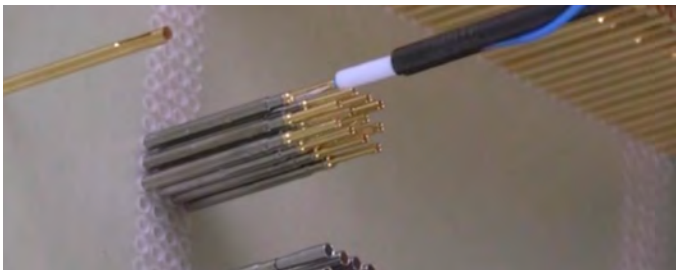
Slide the sleeve onto stripped wire.

STEP 2

Lay the wire and sleeve into the channel of the wire grip installation tool (GTR) and slide it until the sleeve bottoms on the inner shoulder of the tool.

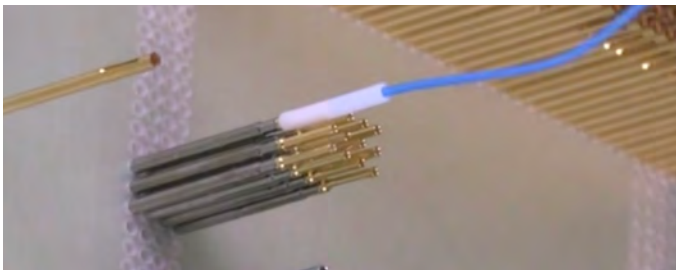
STEP 3

While holding the wire firmly, push the wire until the insulation bottoms on the “G” type termination. The stripped wire will be exposed through the slot of the termination.



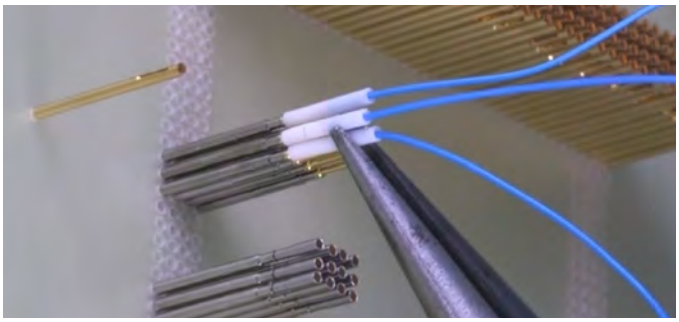
STEP 4

Continue sliding the sleeve until the stripped wire stops on the shoulder of the socket or termination pin and the exposed wire is completely encased.



Removal

Use needle-nose pliers to slide the sleeve off the wire, pulling straight back while wiggling the wire back and forth until the wire is freed. Remove any broken pieces to prevent possible shorting in the fixture.



Wire Plug Installation

Wire plugs connect into any “P” type termination sockets.

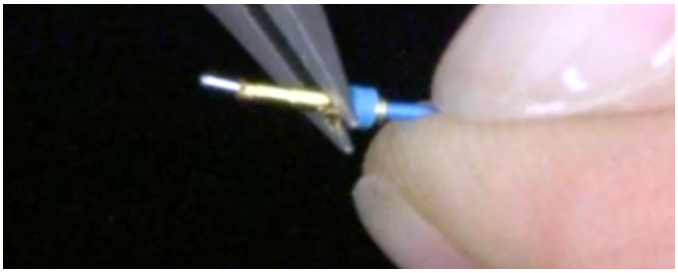
YOU WILL NEED

- “P” termination type socket
- Wire plug connection (28AWG or 30AWG)
- Solid Kynar insulated copper wire (28AWG or 30AWG)
- Needle-nosed pliers or tweezers
- WTR installation tool

Instructions

STEP 1

Insert the wire into the wire plug until the insulation stops against the internal shoulder and bare wire protrudes through the end of the wire plug.

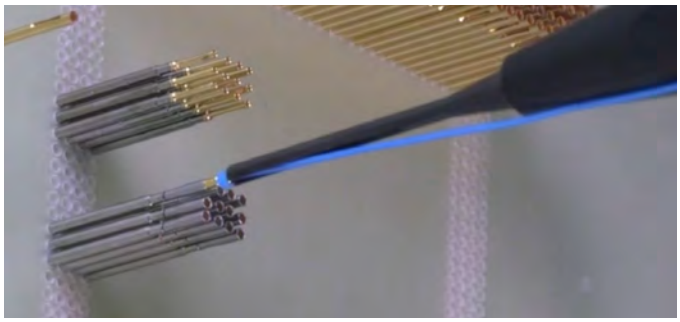


STEP 2

Lay the wire into the channel of the wire plug installation tool (WTR) and slide it until the wire plug sits at the tip of the tool.

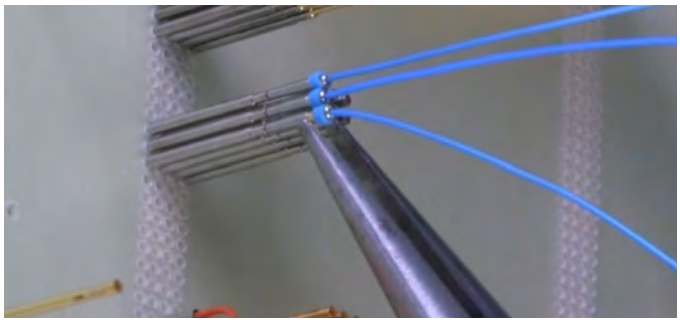
STEP 3

Push the wire plug assembly into the back of the “P” type socket. You will feel a positive “click” when the assembly is complete.



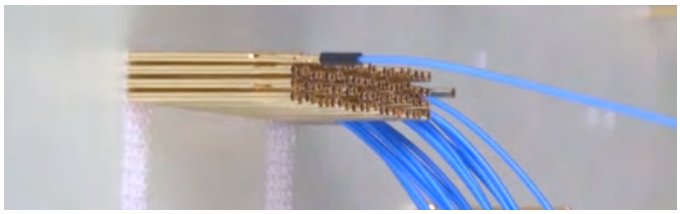
Removal

Wire plugs are reusable and may be removed by pulling straight back on the wire plug as shown. The wire plug will remain attached to the wire.



Wire Jack Installation

The wire jacks accepts 28AWG or 30AWG wire sizes and is available with or without pre-crimped wire. Wire jacks connect to “J” type sockets and termination pins.



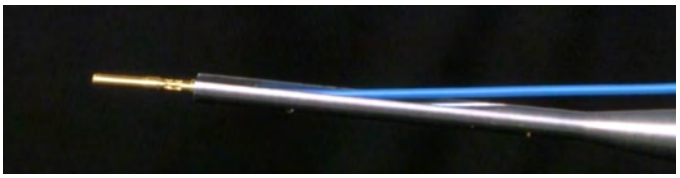
YOU WILL NEED

- “J” termination type socket or termination pin
- Wire jack connector and Solid Kynar insulated copper wire (28AWG or 30AWG) (use QA’s CR2830 wire jack crimping tool or order wire jacks with precrimped wires)
- Needle-nosed pliers or tweezers
- JTR installation tool

Instructions

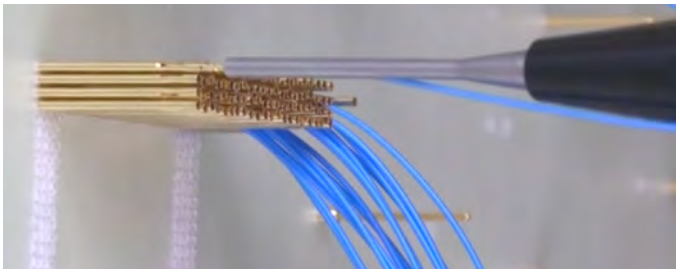
STEP 1

Place the wire jack assembly into the wire jack installation tool (JTR) seat the wire jack insulator into the tip of the tool.



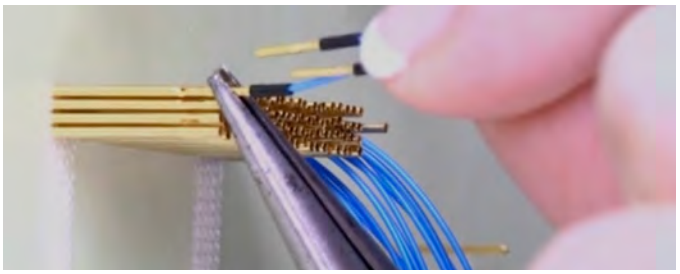
STEP 2

Push the wire jack assembly into the back of the “J” type socket or termination pin. You will feel a positive “click” when the assembly is complete.



Removal

Wire jacks are reusable and can be removed by pulling the wire jack straight back. The wire jack will remain attached to the wire.



Notes

- *If wire installation or retention force is noticeably reduced, the wire conductor or insulation could be worn or damaged. Simply cut and re-strip the wire to restore original forces.*
- *In high probe count or high-density applications where unsupported sockets/termination pins could flex because of wire tension, it may be necessary to add additional insulation to keep adjacent contacts from shorting. Use our INS046-6 heat shrinkable tubing for this purpose.*
- *Wire wrap tools can be obtained directly from JDV Products www.jdvproducts.com or other electronics tool distributor.*

How to Verify Probe Stroke

YOU WILL NEED

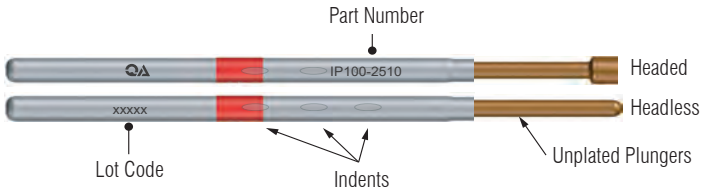
- Indicator Probes
- Hand-held calipers

Test probes are designed to be used at their working stroke, typically two thirds of their full stroke capability when testing. Test fixtures should be designed and built so that sockets or QA X Probe® termination pins are set at the correct height for probes to stroke at the working stroke when actuated by the unit under test (UUT).

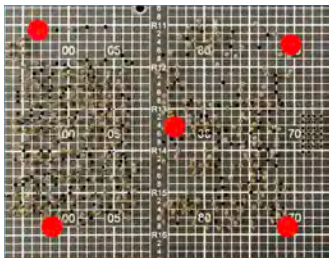
When set too low, the spring force may be insufficient for a reliable electrical contact with the UUT. When set too high, the plunger will be over-stroked, causing early spring fatigue, tip damage, or other premature failures. Setting probes at the proper working stroke will achieve the highest first pass yields, maximize probe life, and reduce overall maintenance costs.

You can easily measure how much a probe is actuated during test by using QA’s indicator probes. Indicator probes must not be used as electrical contacts as they remain compressed at the test position when actuated.

Indicator Probe Features

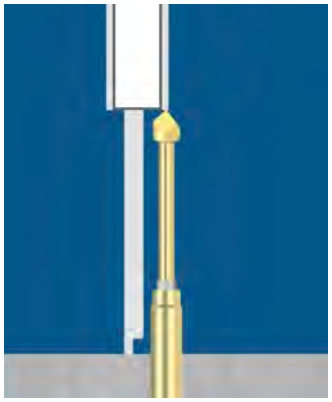


- Indents in the probe tube interfere with the free motion of the plunger and keep it in its deflected position.
- Plungers are un-plated to make it easy for you to identify them.
- Available in both headed and headless tip style versions. Always use a headless style when the fixture support plate has a built-in guided probe feature which uses a small plunger clearance hole.



Before installing indicator probes, remove the support plate and select a location to measure the current stroke of the probes. To get a good indication of the overall probe stroke in a fixture, it is common to measure at each corner of the probe field, and once in the center.

STEP 1



Measure from the top of the probe plate surface to the tip of the standard, unactuated probe at each location where the indicator probes will be used. This will be used as "Dimension A" in the calculation. Hand-held calipers are perfect for this.

STEP 2

Replace the standard probes at each of the five locations with indicator probes. Pressing down as far as they will go, the plungers will stick down.

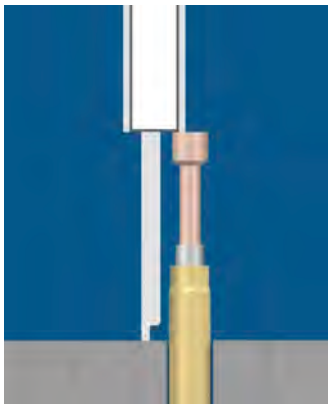
STEP 3

Using tweezers or needle nose pliers, pull up on each of the indicator probe plungers, bringing them back up to their original position. Be careful not to pull the probe out of the socket or termination pin.

STEP 4

Reassemble the fixture and cycle one time only. The indicator probe plungers will remain in the deflected position, showing their position when the fixture is actuated.

STEP 5



Measure from the probe plate surface to the actuated indicator probe tip. This will be "Dimension B" in the calculation. Repeat at each indicator probe location to ensure that all are stroked a similar amount across the entire field.

The height difference between the original test probe and the indicator probe is the amount of plunger stroke that occurs when the fixture is actuated in production.

Example:

0.580	Dimension A (height of the existing probes in the fixture)
– 0.413	Dimension B (height of indicator probe from the top of probe plate)
= 0.167	Amount of probe stroke when the fixture is actuated in production

STEP 6

Compare the actual plunger stroke findings to the "working stroke" rating for each probe series listed in our catalog/probe guide or website. Sockets or termination pins should be lowered if probes are being over-stroked. If they are being under-stroked, sockets or termination pins must be replaced at a higher set height to achieve the proper stroke.

STEP 7

Remove the indicator probes and make any necessary modifications to the set height of the socket or termination pins.

STEP 8

Re-install the original probes and reassemble the support plate back onto the fixture. Now you are ready to use the fixture.

Notes

Select a headless probe in the location that will measure the stroke of probes hitting vias or test pads. Use a headed probe for a location that will test a lead or post.

Replace an indicator probe after a few actuations as it will lose its ability to remain in the deflected position.

Probe Maintenance

Keeping your test probes in good working condition is key to making a reliable test and keeping probes at their optimum performance. Over time, in high volume production environments or even in low volume applications where the fixtures may be stored for months at a time, contaminants and debris can build up and cause false failures, yet you may not find any defects. To help reduce these contact problems, save time and money, QA Technology recommends the following:

Maintenance Program

A practical maintenance program can save considerable time and money. This creates a more reliable test, reducing the chance of false failures and lost rework expense. Use cycle counters on test fixtures to help establish a routine maintenance program, whether it be cleaning the probe tips or replacing the probes after a predetermined number of cycles.

Developing a program requires some tracking to determine the average life of the probes in your application. Certain environments call for probe replacement as often as every few thousand cycles, while in clean applications probes can last far longer. Increased test yields and reduced downtime are the rewards for keeping probes in top condition.

Probe Cleaning

To clean the contaminants that build up on the probes, gently brush the probe tips with QA's natural fiber brush (TBR-1) and vacuum away the dislodged particles. QA does not recommend the use of metallic bristles because they may damage the probe plating.

QA uses a small amount of lubricant to minimize wear caused by the internal sliding contact surfaces of our probes. Never use cleaning solvents on your probes as it may wash particles down into the critical internal surfaces. This could affect the performance and shorten the life of your probes.

Good Housekeeping Suggestions

Here are recommendations to help keep test probes clean and maximize cycle life:

Probe Storage – Good maintenance begins with careful storage. Before populating your fixture, leave probes in their original packaging to protect them from damage and to keep them labeled and organized.

Test Environment – Minimize airborne contamination such as dust, clothing fibers, or particles from nearby wave-solder machines and other manufacturing processes that create airborne particulates.

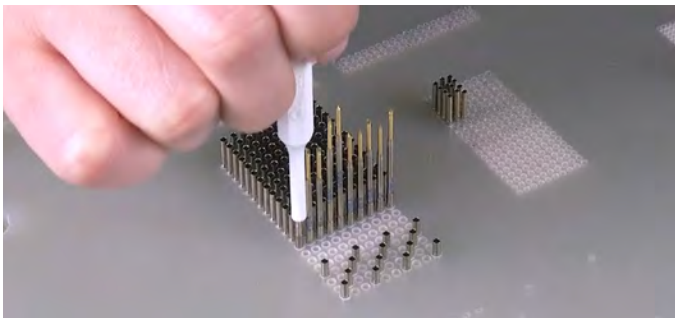
Circuit Boards – Printed circuit boards should be as clean as possible. If you are testing boards coated with no-clean flux, choose low-solids fluxes and fine-tune process controls to minimize the amount of flux applied to the board. Testing contaminated boards will not only cause poor contact on new probes, but also will leave residues behind on the probe tips and thus impede the next test.

Dust Covers – Use dust covers over idle fixtures or receiver bays to prevent airborne contaminants from settling on the probe tips. In the case of vacuum fixtures, dust that settles on the board test area is drawn directly onto the test probes when you first put the fixture into use.

Air Filters – When a vacuum fixture is released, room air rushes into the fixture around the test probes. Protect the probes from airborne contamination by installing an air filter in the release port.

Probe Replacement

Eventually, you will need to replace probes. Do so when cleaning is no longer effective or when you record a decrease in performance. Due to their small sizes and features, worn, blunt or damaged tips may not be readily visible while spring fatigue will often show up as a plunger that does not extend to its full height after being compressed.

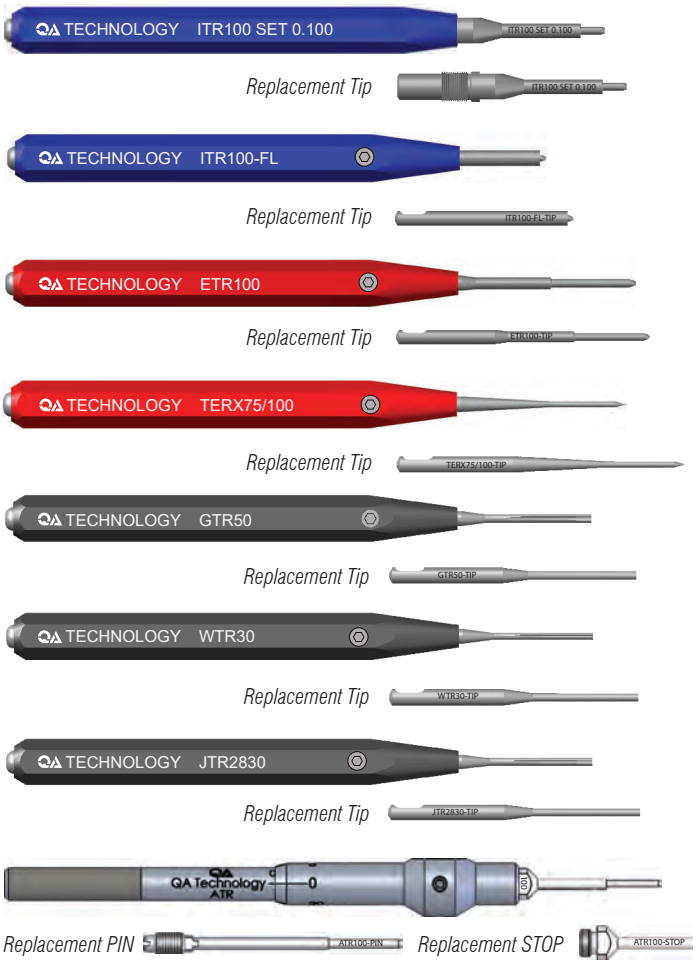


Diagnosing contact problems as they arise and replacing individual probes may work in the short term but as probes reach the end of their life, the added maintenance time is more expensive compared to a full maintenance schedule.

Tool Tip Replacement Instructions

QA Technology tools are designed to allow for easy replacement of a damaged or worn-out tip without having to return the tool for repair. We offer several different replacement methods for various tool products. Please see our catalog or website for individual replacement part numbers. The following are instructions for the different tools we offer.

Tool Variations



SPECIAL NOTES BEFORE YOU BEGIN:

- Since the handles and TIPS are engraved with the specific tool part number, it is important to match the one being replaced to avoid an improper set height or damage to an associated component.

- Applying low heat to the threaded area with a torch will help to loosen threads when Loctite has been applied.
- Clean the internal threads and smooth bore with compressed air or a cotton swab. If needed use a mild solvent to help dissolve contaminants and to dry the part.
- All threaded assemblies are right hand threads.

Replacement Instructions

STEP 1

Clamp the handle in a vise to remove damaged/worn/broken tip assembly. Use soft jaws to prevent damage to the handle.

STEP 2

Remove the tip from the handle.

Style: ITR-SET

Using the 4.5mm open ended wrench, unscrew the ITR-TIP from the handle.

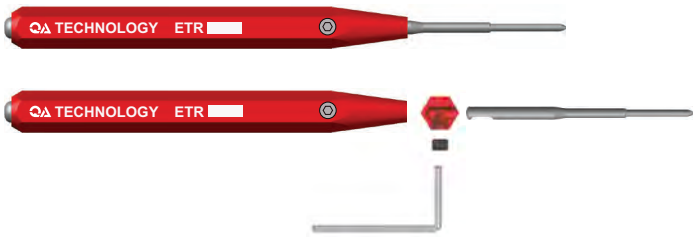
STEP 3

Thread the replacement tip until it is tightened by using the 4.5mm wrench. Be sure that the tip is tightened securely. Your tool is now ready for use.

OR

Style: ITR-FL, ETR, WTR, JTR, GTR AND TERX

Using the 1.5mm hex key, loosen the set screw from the handle and pull out the tip.



STEP 3

Insert the replacement tip into the bottom of the bore while keeping the flat side on the set screw side.

STEP 4

Tighten the set screw with the 1.5mm hex key. Your tool is now ready for use.

Style: ATR

STEP 1

Loosen the two 3mm thimble locking hex screws with the 1.5mm hex wrench key.

STEP 2

Remove the thimble from the handle by unscrewing the two assemblies.

STEP 3

Using the 4.5mm wrench, unscrew the stop tube from the thimble.

STEP 4

Using the 1/16" wrench, unscrew the drive pin from the handle.

STEP 5

Screw the drive pin with 5-40 thread onto handle, tighten with a 1/16" wrench.

STEP 6

Screw the stop tube with 10-32 thread onto the thimble and tighten it with 4.5mm wrench.

STEP 7

Thread the thimble onto the handle.

STEP 8

Set the tool to the desired set height and tighten the 3mm set screws to maintain the setting.

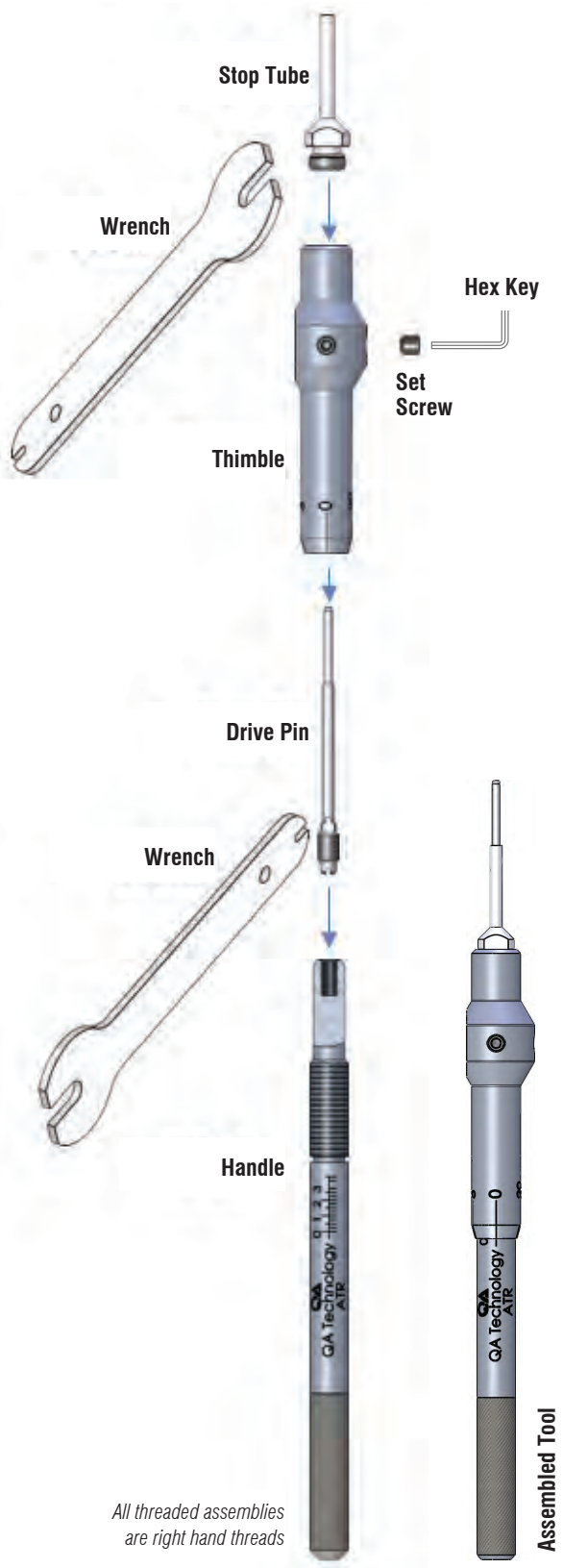
Socket Plugs

QA Technology's socket plugs are a quick and easy solution to plug a conventional socket where a test point is no longer needed. They eliminate the possibility of re-installing a probe that could cause a test error.

The top of the socket plugs will not contact the UUT when the test probes in the fixture are actuated to the recommended working stroke. For applications where the probes are being over-stroked, it is important to verify that the socket plugs will not contact the UUT when the fixture is actuated.

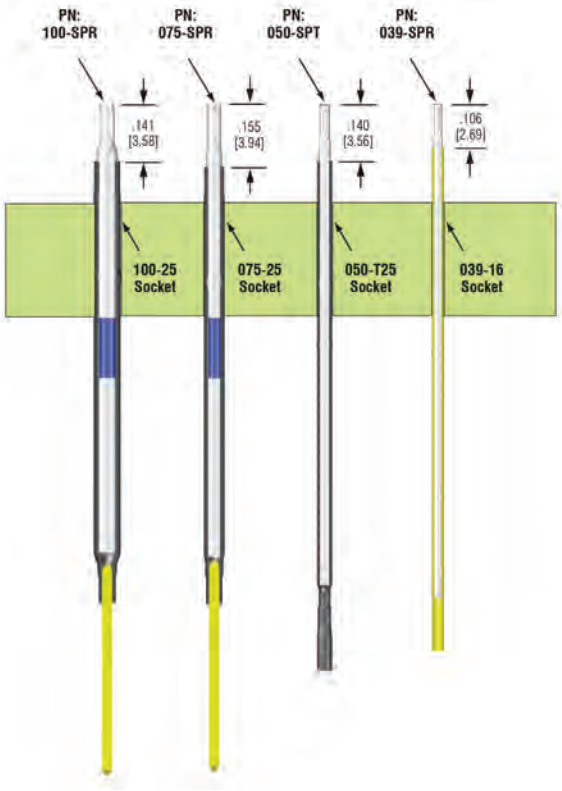
Socket plugs are available for use the following sockets:

SOCKET SERIES	PART NUMBER
100-25	100-SPR
100-40	
075-25	075-SPR
075-40	
050-T25	050-SPT
050-T40	
039-25	039-SPR
039-40	



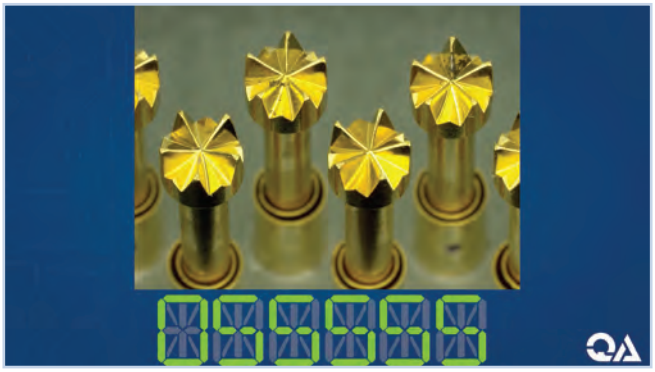
Instructions

- Insert the applicable socket plug into a conventional socket with the smaller diameter end facing up into a conventional socket until it bottoms.
- If the test point is to be used again, simply remove the socket plug and re-install the proper probe.

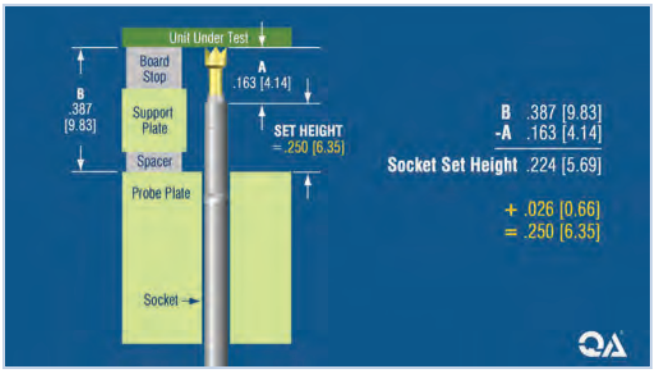


Videos

All videos can be found at: https://www.qatech.com/en/resources-videos/resources-videos.html



7 Factors that Affect Probe Life

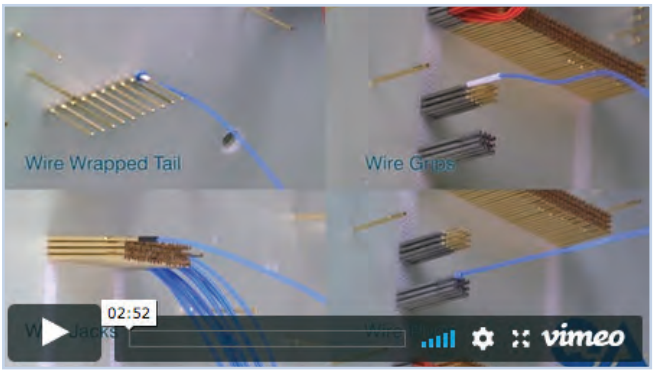


How to Calculate Socket Set Heights

How to Calculate X Probe Termination Pins Set Heights

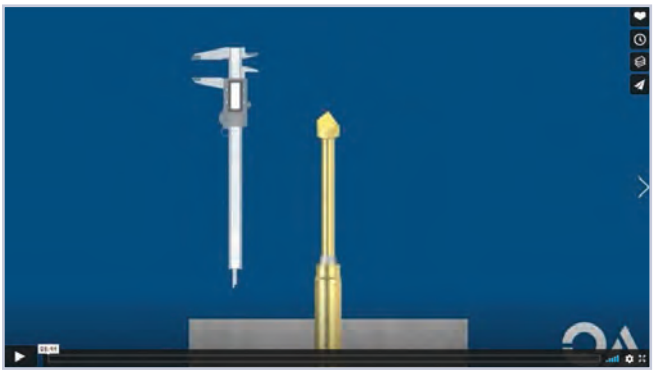
Probe and Socket Installation and Extraction

X Probe Socketless Installation and Extraction



Wire Connection Methods

Tool Tip Replacement



How to Measure Probe Stroke

FAQs

Q **Do probe extraction tools (PERX) remove all probes in all series?**

A No. They are designed to remove headed probes only. These tools are ideal in cases where many headed probes must be removed quickly without damaging the probe. For headless probes and probes on closer centers, QA recommends miniature precision long nose pliers. Users must be careful when removing probes that are to be reused because pliers can damage the plating and/or bend the plunger.

Q **Can the probe tube be soldered directly to the termination/fixture?**

A Probe tubes are typically made from nickel silver and this material is easily soldered to. Take precautions to prevent the solder from flowing into the probe tube ID. Solder in the probe tube ID could cause the plunger to stick or prevent the plunger from fully compressing. This application is common when installing probes directly into PCBs.

Q **What is the difference between the 050-R25 and 050-T25 Series?**

A The main difference is that the 050-R25 Series has a longer probe tube compared to the 050-T25 Series. The increased length of the 050-R25 probe tube allows more space for higher force springs to be used. The 050-T25 series is compatible to mix mount with other sized wireless applications.

Q **What material is recommended for mounting the sockets and termination pins into?**

A In general, any nonconductive material is suitable with the most popular socket mounting plate made from an epoxy fiberglass AT7000, G10, or FR4. This is the same material used in the manufacturing of printed circuit boards. Other suitable materials include but are not limited to Acrylic, polycarbonate, PVC, and Delrin. The socket retention forces will vary between materials and must be considered in fixture design. For our X Probe® termination pins, we recommend using epoxy fiberglass laminates (G10/FR4, etc.) for the back plate due to the retention requirements of the termination pins. Our published suggested mounting hole sizes are designed for epoxy fiberglass laminates.

Q **What is the maximum voltage that test probes and sockets can carry?**

A There is no maximum recommended voltage limits for test probes and sockets/termination pins. However, the spacing between the probes and the dielectric properties of the probe plate must be taken into consideration. Avoid probe plate materials that have hygroscopic tendencies. The test voltage to the fixture/DUT must be applied only after the fixture is activated and the probes are compressed and contacting the DUT. Voltage applied prior to the probe's tips making contact will cause electrical arcing which will damage or melt the tips.

Q When and where is the -B option (curved probe tube) used?

A The –B option is designed for use with the old-style Pylon brand sockets that do not incorporate a probe retention indent. The bend in the probe tube acts as the retention feature to hold the probe in the socket. As a rule, we do not recommend that the –B option be used with QA sockets as our sockets incorporate probe retention indents. For older sockets where the probe retention indent has been damaged, or if the probes are loose or are being pulled out during test, using the –B option is a suitable solution until a replacement of the socket can be made.

Q Can QA Probes be used for Hipot testing

A Yes. Hipot testing is an abbreviation for High Potential Testing and is also called Dielectric Withstanding Voltage (DWV) test. This test applies an over voltage condition to the device and is used to verify that the electrical insulation in the device does not break down and is sufficient to protect the operator from electrical shock in PCBs, transformers, electric motors, finished appliances, cables, or other wired and wireless assemblies.

When test probes are used as the interface between the Hipot Tester and UUT, we recommend the following:

- The probes must contact the terminals on the UUT and must be compressed before you run the test.
- Do not retract probes from the UUT until the test is complete and the voltage has been cut off.
- Any contaminants between the tips of the probes and UUT will act as insulation that will cause high resistance at this junction. In turn, the higher resistance will cause loca-lized heating and possible arcing at the tip.
- Maintain sufficient distance and/or insulation between the conductors to prevent the electricity from arcing between the bare plungers.
- Over time, the sliding plated surfaces will degrade faster compared to low voltage applications and may require increased maintenance.
- Use the largest probe you can with the highest spring forces.

Q How many times can the same X Probe be reinstalled on a termination pin?

A An X Probe can be reinstalled on the same termination pin a maximum of five times. After this, the probe retention is reduced to the point where the probe is loose on the termination pin. The probe retention indents are the mechanical features that hold the probe to the termination pin. Because of the tolerance variability of the mating parts, a probe that is installed onto a different termination pin on which it was originally installed may have lower or higher forces. In the case of low forces, the probe should be replaced with a new one. The probe is designed to be the “wear point” in the system. By replacing the probe, you will restore the retention force.

Q Will termination pins wear or degrade over time?

A The termination pin is designed to last the life of the fixture under normal operating conditions.

Q Can the QA X Probe be used on existing test platforms?

A Yes. The X Probe is compatible with Keysight, Genrad, Teradyne, and others. Fixture designs must be able to accommodate the additional plates. In general, the height of the fixture is increased and in the case of Keysight compatible fixtures, wider rails (up to one inch, depending on the set height) are required to maintain the depth of the wiring area to accommodate the personality pins and alignment plate. The X-16 series does not require an increase in the fixture height and can be used on existing test platforms with minimal fixture modifications.

Q Can the X Probe be used with pneumatic, mechanical, and vacuum fixtures?

A Yes. The X Probe design does not limit the type of fixtures that they can be used on.

Q **Can standard test probes and sockets be mixed mounted with the X Probe Series?**

A Yes. With design considerations standard test probes can be mixed mounted with the X Probe Series. A standard socket would mount in the probe plate and clearance holes would have to be drilled in the spacer and back plates. In a vacuum fixture, a method would have to be designed to maintain the integrity of the vacuum. The best approach is to cut out areas in the plates where the sockets will be mounted and design inserts with gaskets to accommodate them.

Q **Is a spacer plate necessary?**

A No. The spacer plate is an optional intermediate support plate that, when fixed to the back plate, provides additional strength, and helps with the alignment of the probe to the termination pin during probe installation. On small to medium sized fixtures this can be replaced with fixture standoffs or flanges.

Q **How are additional X Probes and termination pins added to a completed fixture?**

A Because the X Probe system relies on accurately drilled and aligned holes, the recommended approach is to remove all the probes and plates. The new hole locations must be accurately registered from the original reference points so that the X Probe and termination pin will align during assembly.

Q **How much weight will be added to a fixture designed around the X Probe?**

A 20lbs [9.1Kg] for an average sized fixture. An X Probe fixture requires a top (support) plate, a probe plate, a spacer plate, and a back plate while the conventional fixture has a top plate and a probe (socket mounting) plate.

Q **When comparing the prices of two identical test fixtures, one built with standard probes and the other with QA X Probes, how do their costs compare?**

A It depends. The purpose of a socketless probe is to put a larger probe on closer centers. Meaning, X Probe socketless technology was developed for fixtures requiring larger quantities of 75mm, 50mm, and 39mm center probes than 100mm center probes.

Please keep in mind that QA does not build fixtures. QA manufactures test probes in service and support of the in-circuit test industry. Only a fixture house can determine actual fixture costs and pricing. The following is a guideline to determine if X Probe technology should be considered for your fixture.

A best guesstimate comparing conventional probe costs to QA X Probe costs would be:

- If a fixture is predominately 100mm centers, the cost of using X Probe socketless technology would be greater than a conventional 100mm center probe fixture.
- If a fixture requires predominately 75mm centers, the cost of using X Probe socketless technology could be equal to or less than a 75mm center conventional probe fixture.
- If a fixture requires predominately 50mm centers, the cost of using X Probe socketless technology could be equal to or less than a conventional 50mm center probe and socket fixture.
- If a fixture requires predominately 39mm and smaller centers, the cost of using X Probe socketless technology should be less than a conventional 39mm center probe and socket fixture.

When my father, Thomas Coe, founded QA Technology in 1981, he committed to build a company that would provide the best quality product and service that our customers demanded and deliver it to them in a timely manner. He knew that to do it he would have to build a team that was similarly committed to that goal and would work together to achieve it. In his own words, QA's guiding principles are:

QUALITY ALWAYS COMES FIRST – The quality of our products and services is our number one priority, along with the customer satisfaction and continuous improvement to the excellence of our products and services.

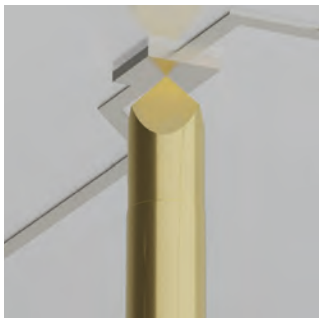
PEOPLE – Our people are the source of our strength. They determine our reputation and vitality. Teamwork and involvement are our core human values. We trust and respect each other.

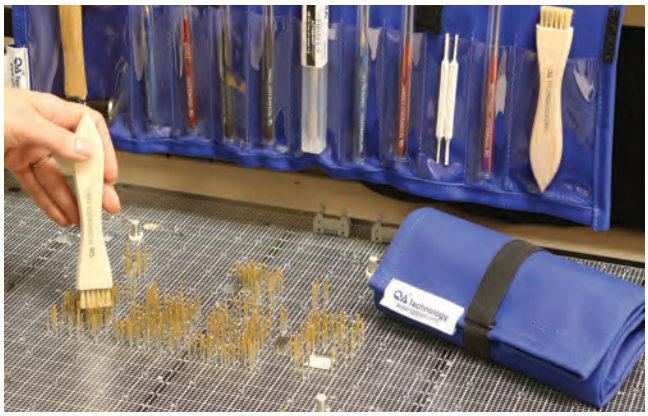
SERVICE – We strive to give the best possible service to our customers, who are the focus of what we do. As our service is viewed, so are we viewed.

Sadly, Tom Coe passed away in 2009, just a few days short of his 80th birthday, but happily he saw his vision successfully grow and manifest itself in the globally recognized company that QA is today. All of the people that continue to make up the QA 'team' remain steadfastly committed to his original vision. Please tell us how we can help you solve your probing or interconnect problems.

Sincerely,

David S. Coe
President
QA Technology Company, Inc.





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