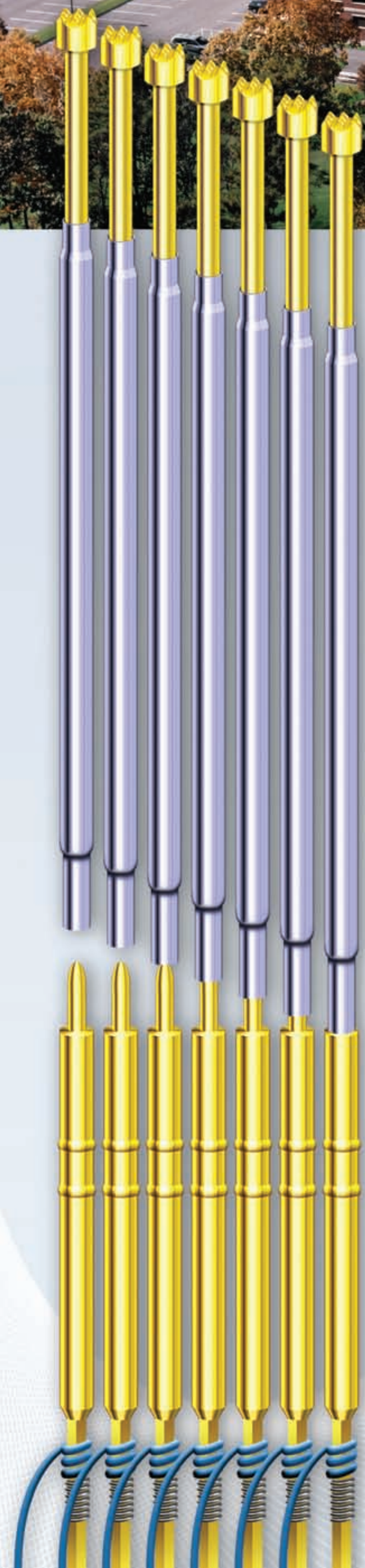
WORLD-CLASS
TESTING PRODUCTS

QA Technology Company, Inc.

ISO 9001:2008 Certified



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

TABLE OF CONTENTS

ALI A ANCE &
C ME E ICE

QUALITY ASSURANCE

QA Technology Company's philosophy embraces the concepts of Total Customer Satisfaction, Continual Improvement, and Teamwork as the vehicles for achieving our goals of providing the best products and services to our Customers. Our registration to ISO 9001:2008 demonstrates our commitment to Quality and the effectiveness of our Quality System. Although our Quality Assurance efforts encompass all aspects of our operations, the strict and comprehensive monitoring of our processes and products is the cornerstone of our Quality System and is an attribute which distinguishes us from our competition.

Product/Process Quality

QA Technology's reputation for superior quality rests on a two-part foundation:

1. Our ability to develop innovative processes and fully-automatic assembly machines which incorporate sensors for 100% inspection.
2. Our commitment to assuring that all processes and equipment are proven capable of consistently producing a quality product.

Another key factor to assuring product quality is the skill of our employees and their commitment to Total Customer Satisfaction. Our production operators are thoroughly trained on the process including inspection and accept responsibility for monitoring process and product quality. Our Quality Department monitors the consistency of all processes and products through inspections and tests ensuring that we are maintaining our goals.

PRODUCT TESTING

In order to ensure QA has the best products and the capability to provide technical support to Customers on application problems, it is critical that we have state of the art test facilities. Our computer controlled probe life cycle testers, extensive metalographic lab, and Scanning Electron Microscope are examples of the equipment in place to support our product testing/failure analysis activities.

State-of-the-art inspection equipment assists in the quality assurance process for all of our products.

CUSTOMER SERVICE

QA takes pride in the level of support we give to each and every one of our customers across the globe. We are here to assist you in all aspects of product support including design, quality, applications and orders.

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

Carl Marcucci
General Manager

Jeff Smith
North American Sales Manager

John Hansen
Sales Manager

Steve Doth
Sales Manager

Deb Bragdon
Customer Service Lead

Kara Mathews
Customer Service Coordinator

Wendy Wing
Marketing Specialist

Kurt Smith
Engineering Manager

Matt Parker
Product Engineer

Chris Smith
Quality Engineer

Bob Lascelles
Manager, integraMate

Jeff Brown
Product Engineer, integraMate

DELIVERY & SHIPPING

QA utilizes a bar code and order verification system which enables us to ship our products quickly and accurately.

These are the rules we ship by. 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® and UPS® shipments. Packages can be shipped using any of the available services including, but not limited to, FedEx®, UPS®, DHL, Emery, or any other carrier you choose. These and other systems insure that 90% of customer orders ship the same day.

All of our products are double packaged for safe delivery. We are also capable of meeting certain customer packaging specifications. Call Customer Service for more information.

Typical shipping weights for cost comparison:

Probes	Weight
1,000 pcs.	less than 1.0 lb.
3,000 pcs.	less than 2.0 lb.
5,000 pcs.	less than 5.0 lb.
10,000 pcs.	less than 10 lb.
Sockets	**Weight**
3,000 pcs.	less than 2.0 lb.
10,000 pcs.	less than 10 lb.

Payment methods

integraMate®

INTRODUCTION

Contact Us for Detailed Product Information

QA Technology IntegraMate® Contacts are high quality, high reliability hyberboloid contacts intended for use in a wide range of applications. Our patented design provides lower insertion force, closer connector pin spacing, and better protection from damage than competitive designs. In addition, our automated manufacturing equipment typically allows us to ship within 24–48 hours of order.

Applications

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

Hyperboloid Socket Construction Details

The core of QA's design is the socket sub-assembly. The photo below shows an end-view of the contact entrance, as well as cross-sections of the two crimp joints.

HYPERBOLOID CONTACTS

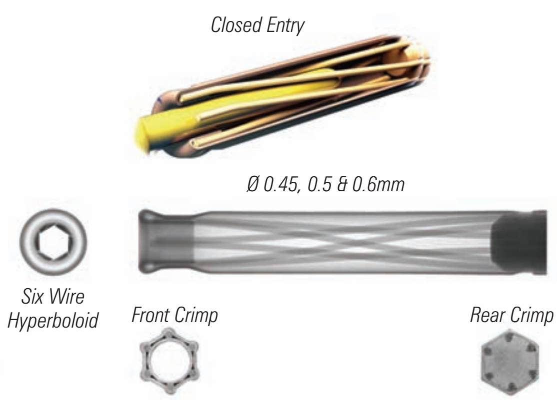
Competitive Advantages

The integraMate® Hyperboloid Contact System has three clear advantages over existing hyperboloid contacts:

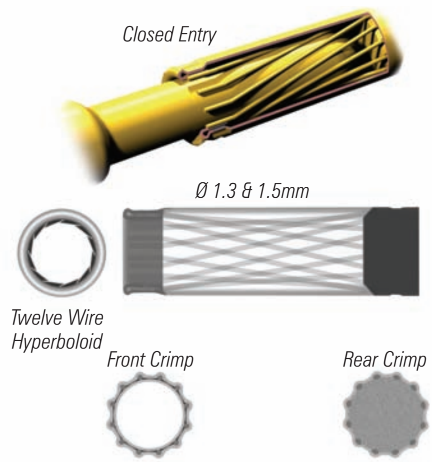
- Lower and more uniform insertion and extraction force
- Smaller contact diameter allows closer spacing and higher connector density
- Better protection of the hyperbolic wire cage from accidental damage, since the cage lies behind a strong tubular entrance

Features and Benefits

- Low insertion/extraction force
- Low electrical resistance
- Long cycle life
- Immune to shock and vibration
- Positive wiping action
- Easy contact removal using available extraction tool
- Intermates with other hyperboloid contacts known in the industry



0.45, 0.5 & 0.6mm Signal Contacts



1.3 & 1.5mm Power Contacts

D-SERIES CIRCULAR CONNECTORS

QA Technology integraMate® D-Series Connectors are high quality, plastic circular connectors featuring the reliability of integraMate® hyperboloid contacts. They are designed to be used in applications where low mating force, resistance to vibration and reliability over a high number of mating cycles is essential. Featuring a low profile, easy to actuate latch mechanism and ergonomic shell design, they are perfect for a wide range of instrumentation applications. Made of impact resistant polycarbonate, they are able to survive rough handling. The latch mechanism provides an audible click when locked, and is resistant to accidental disconnection. D-Series connectors use easily installed and removable solder cup or crimp contacts. D-Series plugs have robust cable clamping systems and offer optional bend reliefs that make fabricating custom cable assemblies a snap.

Competitive Advantages

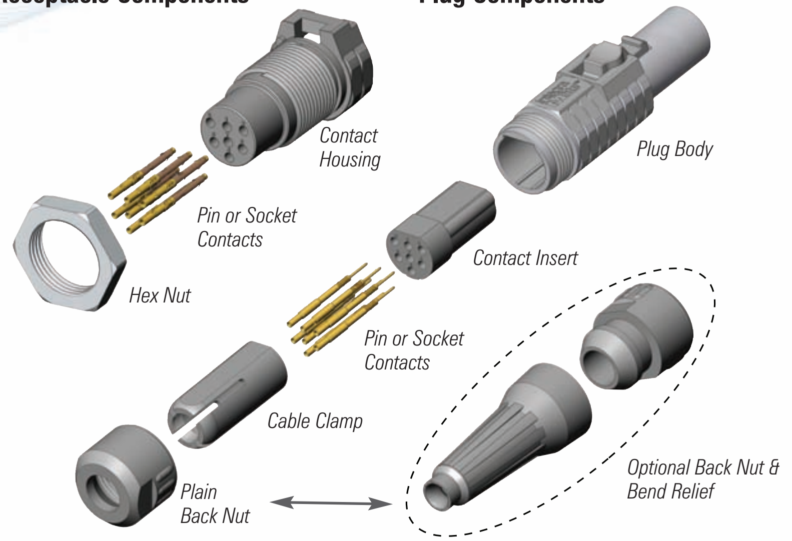
integraMate® D-Series Connectors provide clear advantages over competing hyperboloid contact, circular connectors:

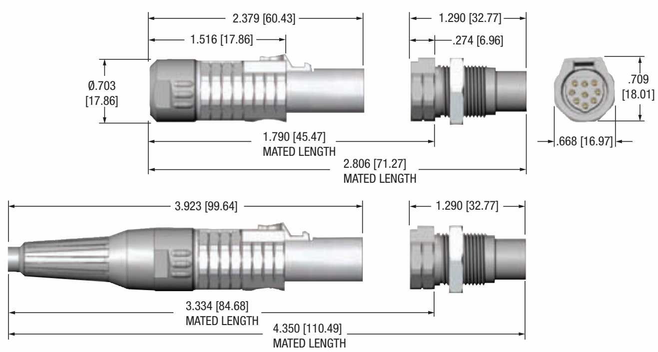
- Attractive design with improved ergonomics
- Improved latching system
- Robust cable clamping and strain relief
- Easily removable contacts cut down on waste during assembly
- Higher density contact patterns

Features

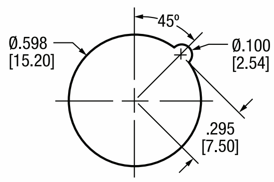
- All the benefits of integraMate® IC Series hyperboloid contacts
- Multiple contact configurations available
- Removable contacts feature solder cup or crimp termination options
- The pin and socket contacts are interchangeable within the plug and receptacle assemblies
- High-strength polycarbonate shell & polyethersulfone (PES) cable clamp
- Low mating/de-mating force
- Resistant to shock & vibration
- Long cycle life, over 10,000 connector mating cycles
- Robust cable clamp system and bend relief option for 5.0 mm to 8.0 mm diameter cables

Receptacle Components **Plug Components**

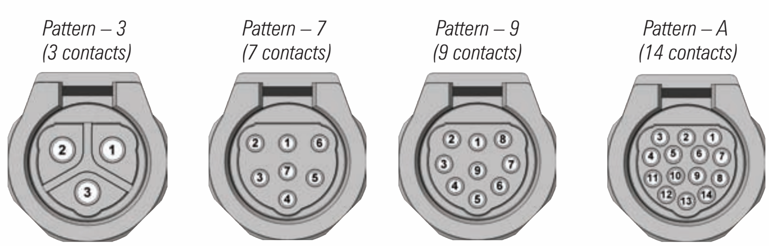




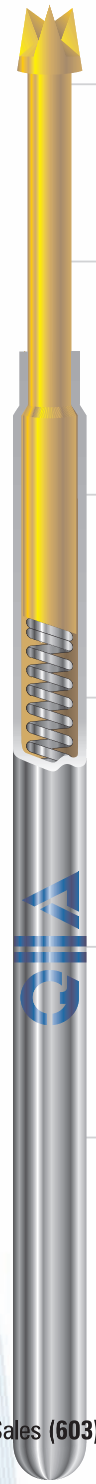
Receptacle Mounting Hole in Panel



Connector Contact Patterns



CONVENTIONAL TEST PROBE & SOCKET PRODUCT DESIGN



We offer a wide variety of point styles to suit virtually any test requirement.

Plungers are manufactured from beryllium copper or steel, then heat treated, gold plated over nickel.

Our patented probe design features an angled plunger tail for improved biasing that ensures consistent contact with the probe tube.

Springs are constructed of high-strength music wire or stainless steel for long life.

"QA" stands for Quality Assurance in every test probe and socket we manufacture.

Probe tubes are deep-drawn from a variety of alloys with some featuring hardened precious metal cladding for high performance.

DESIGN, ASSEMBLY AND TESTING OF QA'S PATENTED PROBES

QA's patented rolled design probes attribute their increased accuracy and performance to our fully automatic assembly and test machines. Our machines are designed and built in-house, from the micro-processor controllers to the assembly mechanisms themselves.

The machines that assemble our 050-R25, 050-T25, 050-40, 075-25, 075-40, 100-25, 100-40, X39-25, X39-40, X50-25, X50-40, X75-25, X75-40 and M08-PRH89 probes automatically test the probes for spring force, sliding friction, plunger stroke and lubrication.

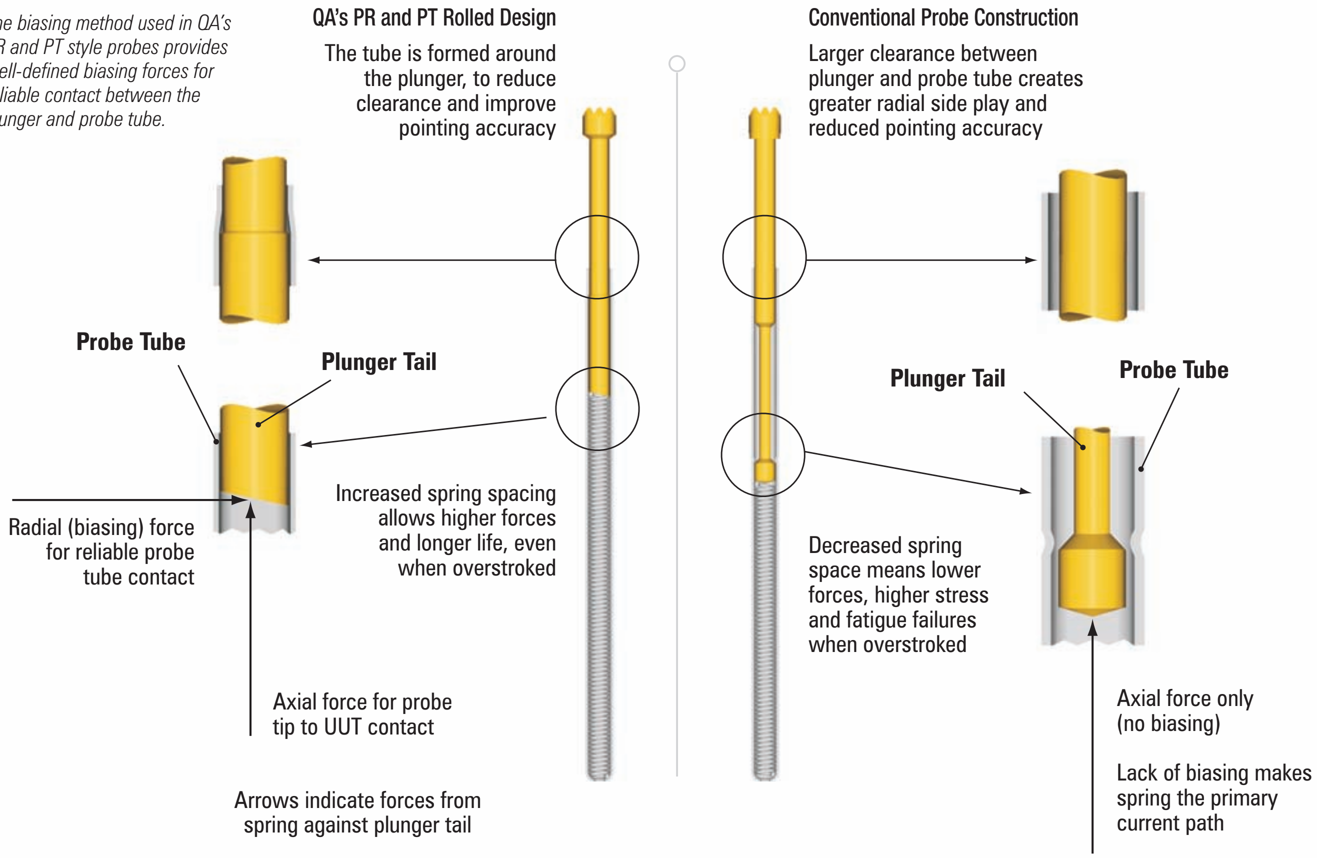
Our 025-16, 039-16, 039-25, 100-24, 125-25, and X31-25 series also share a unique patented design offering several major advantages:

- The first is a probe tube and plunger design that reduces radial plunger play at the probe tube opening. The clearance between the tube and the plunger has been reduced by forming the tube around the plunger itself. This feature reduces play from side to side and significantly improves pointing accuracy (see page 87 for pointing accuracy information).
- These probes also feature a patented biasing system for the tail end of the plunger. Biasing is the name given to the intentional loading of the plunger against the inside surface of the probe tube.

An angled surface machined on the plunger tail mates with the spring and allows it to exert a small radial force on the tube. This biasing force causes a well-defined wiping action between the plunger and the inner surface of the probe tube to provide improved electrical contact.

Comparison of Biasing Methods

The biasing method used in QA's PR and PT style probes provides well-defined biasing forces for reliable contact between the plunger and probe tube.



PROBE CONSTRUCTION

Materials and methods used in the manufacture and assembly of all QA Technology test probes meet only the highest standards. Each component is designed, manufactured, assembled and inspected for optimum performance. This assures superior quality in every product.

Probe Tubes

Probe tubes are deep drawn from a variety of alloy and clad materials. In the drawing process, precision flat stock is formed into tubes through a sequence of progressive dies. Standard nickel silver alloys and custom designed clad materials are used in the tube manufacturing process. Deep drawing gold clad stock (with the gold on the inside diameter) hardens the precious metal layer, producing tubes with a uniform layer of gold on the inside surface. This is a critical surface, for it makes sliding contact with the probe plunger. QA is an industry leader in the use of gold clad materials for probe construction. The various probe tube materials offered by QA give the needed options for testing in any test environment.

For in-circuit and loaded board testing where low and consistent resistances are critical, the P and F tube materials (gold lined inside diameters) offer superior performance.

For bare board test applications, tubes made from nickel silver, a highly conductive copper alloy, provide satisfactory performance. Gold plated nickel silver tubes (G tube material) are also suitable for this application.

Note that the unprotected inside surfaces of N tubes are susceptible to the formation of oxides. Although oxides may cause the initial probe resistance to be high, the wiping action of the plunger will clear the oxide layer and restore the probe's performance.

Unique to QA Technology is our proprietary, high conductivity alloy with gold plating on the inside and outside surfaces (H tube material). These probes are used in high current applications or where extremely low electrical resistance is required.

For ease of selection and to help identify the proper replacement probe, the 075-25, 075-40, 100-12, 100-15, 100-16, 100-24, 100-25, 100-40, 125-PRH25, X50-25, X50-40, X75-25 and X75-40 series probes are color-coded to show which alloy and cladding combinations are used for the probe tube.

- **P** (Precious metal clad)
- **N** (No finish)
- **G** (Gold plated)
- **H** (High conductivity)
- **F** (Factron replacement)

Springs

QA Technology probes are available in a wide range of spring forces allowing the Test Engineer or Fixture Fabricator to custom-tune test probe applications.

Spring design is a critical factor in probe life, internal resistance and contact integrity. QA springs are force and cycle tested and to insure consistent performance and reliability,

Low force springs are typically used in highly populated sections of vacuum fixtures for proper pull down. Standard force springs are ideal for most vacuum and mechanical fixtures. High force springs are useful in penetrating contaminated contact surfaces in low-density areas. Elevated, Extra-high and Ultra-high force springs are used in cases of extreme contamination or heavy flux residues.

Increased available space for the spring in our patented probes allows QA to offer the only .100 [2.54] centers, .250 [6.35] stroke probe that can be used at full stroke without risk of fatigue failure. This extra space also allows us to offer the 050-40, 075-40, 100-40, X39-40, X50-40 and X75-40 series, which fit in the same sockets/termination pins as their .250 [6.35] stroke counterparts.

For ease of selection and to help identify the proper replacement probe, the probe tubes on our 075-25, 100-12, 100-15, 100-16, 100-24, 100-25, 100-40 and 125-PRH25 series probes as well as our X50-25, X50-40, X75-25 and X75-40 socketless series are marked with spring force designations on their outer surface.

Conventional Springs Force Identification

<table>
<tr><th colspan="2">125 PRH25 Series</th></tr>
<tr><td>|</td><td>(L) Light</td></tr>
<tr><td>| |</td><td>(S) Standard</td></tr>
<tr><td>| | |</td><td>(H) High</td></tr>
<tr><td>| | | | |</td><td>(Y) Elevated</td></tr>
</table>

BeCu	100 Series	Steel
	(L) Low	
	(S) Standard	
	(H) High	
	(Y) Elevated	
	(E) High Preload	
	(X) Extra High	
	(U) Ultra High	

BeCu	075 25 Series	Steel
QAL	(L) Low	QALS
QAS	(S) Standard	QASS
QAH	(H) High	QAHS
QAE	(E) High Preload	QAES
QAX	(X) Extra High	QAXS

X Probe Socketless Series Spring Force Identification

<table>
<tr><th colspan="2">X50 & X75 Series</th></tr>
<tr><td>|</td><td>(L) Light</td></tr>
<tr><td>| |</td><td>(S) Standard</td></tr>
<tr><td>| | |</td><td>(H) High</td></tr>
<tr><td>| | | |</td><td>(E) High Preload</td></tr>
<tr><td>| | | | |</td><td>(Y) Elevated</td></tr>
<tr><td>| | | | | |</td><td>(X) Extra High</td></tr>
<tr><td>| | | | | | |</td><td>(U) Ultra</td></tr>
</table>

Probe Lubrication

While direct component contact is important to conductivity, sliding metallic contact will induce wear and degrade performance. QA Technology probes use a thin film of strategically placed lubricant on moving parts to minimize wear and extend probe life without any increase in contact resistance. Removing the lubricant will significantly reduce probe life and should only be used in applications outside of the probe operating temperature specifications.

Cleaning probes with a solvent is not recommended because it dissolves the lubricant on the internal parts. The use of solvents is also likely to wash tip contamination into the critical internal contact areas of the probe. For more information about probe maintenance, refer to page 92.

Plungers

QA Technology plungers are manufactured from beryllium copper and steel. They are heat treated for durability and plated with hard gold to eliminate surface oxides and to lower electrical resistance. We offer a wide range of standard point styles to cover a variety of testing applications.

Please refer to page 10 and 11 for specific tip style recommendation for your application.

POINT STYLE SELECTION & AVAILABILITY

QA Technology offers a wide range of point styles to support the various applications and test targets known in the industry. The following Point Style Selection chart provides a general guideline of probe recommendations typically used in these applications along with the availability in each probe size we offer. For more details, please feel free to contact our applications department at (603) 926-1193.

Point Style — Material Availability: • = BeCu (B) • = Steel (S)

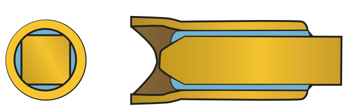
Solder Bump/Dome	Pads	Filled Holes/Vias	Unfilled Vias	Leads	Terminals/Posts	Connectors	Self-Cleaning	OSP	No Clean/Pb Free	Point Style	025-16	039-16	039-25	050-05	050-16	050-T25	050-R25	050-40	075-25	075-40	100-05	100-16	100-25	100-40	125-25	X31-25	X39-25	X39-40	X50-25	X50-40	X75-25	X75-40	M08-89
	•		•				•			01 - Spear									B			B	B		B				B		B		
				•	•					02 - Cup											B												
	•			•	•					02 - Cup												B											
	•	•	•				•			03 - Chisel					B	B, S	B, S		B, S	B	B	B	B, S	B	B		B, S		B, S	B	B, S	B	
				•	•					04 - Crown													B	B							B	B	
	•			•			•			05 - Torch									B			B	B	B					B		B	B	
	•	•	•				•			06 - Star									B	B		B	B	B					B	B	B	B	
				•						07 - Tulip									B				B	B					B		B	B	
	•			•			•	•	•	08 - Triad									B, S	B		B	B, S	B					B, S	B	B, S	B	
	•			•	•					09 - Serrated					B	B, S	B, S		B, S	B		B	B, S	B	B		B, S		B, S	B	B, S	B	
•	•			•	•					10 - Flat						B	B		B			B	B	B	B		B		B		B	B	
	•	•	•				•	•	•	11 - Spear												B											
	•	•	•				•			13 - Chisel				B	B	S	S		S	S	B	B		S			S		S	S		S	
				•	•					14 - Crown													B	B							B	B	
	•			•	•				•	14 - Crown		S			B, S	B, S	B, S										B, S						
•							•		•	16 - Flat Star						B	B		B				B				B		B		B		
	•			•	•		•	•	•	17 - Tulip									S				B, S						S		B, S		
	•	•	•				•		•	18 - Chisel Triad									B, S				B, S	B					B, S		B, S	B	
				•	•					19 - Serrated													B	B							B	B	
•	•									20 - Flat						B	B		B	B			B	B			B		B	B	B	B	
	•			•	•					22 - Cup						B	B		B				B	B	B		B		B		B	B	
	•	•	•				•			23 - Chisel											B												
	•	•	•				•			23 - Chisel													B	B							B	B	
				•	•		•	•	•	24 - Crown									B, S	B		B	B, S	B	B				B, S	B	B, S	B	
•							•		•	26 - Center Point Star						B	B		B				B				B		B		B		
	•			•			•	•	•	28 - Triad										S										S			
				•	•					29 - Serrated													B								B		
	•									30 - Spherical											B	B	B	B							B	B	
	•						•	•	•	31 - Spear													S								S		
				•	•					32 - Cup									B				B						B		B		
	•	•	•							33 - Chisel											B												

Point Style

Material Availability
• = BeCu • = Steel

Point Style	Solder Bump/Dome	Pads	Filled Holes/Vias	Unfilled Vias	Leads	Terminals/Posts	Connectors	Self-Cleaning	OSP	No Clean/Pb Free
34 - Crown					•	•		•	•	•
39 - Serrated					•	•				
40 - Spherical		•					•	•		
41 - Spear		•	•	•			•	•	•	•
42 - Cup					•	•				
43 - Chisel		•	•	•				•		•
44 - Crown					•	•		•	•	•
46 - Flat Star	•							•		•
49 - Serrated					•	•				
51 - Blade		•	•	•				•	•	•
53 - Chisel		•	•					•	•	•
53 - Chisel		•	•	•						
54 - Crown		•			•			•		•
55 - Crown					•	•		•	•	•
56 - Crown					•	•		•	•	•
58 - Crown					•	•		•	•	•
59 - Serrated	•	•			•	•				•
6R - Razor		•	•	•				•	•	•
61 - Blade		•	•	•				•	•	•
62 - Slotted							•			
63 - Chisel		•	•					•	•	•
63 - Chisel		•	•	•				•	•	•
64 - Crown					•	•				
70 - Connector							•			
71 - Blade		•	•	•				•	•	•
74 - Crown		•								
76 - Center Point Star	•							•		•
79 - Serrated	•	•			•	•				•
8R - Razor		•	•	•				•	•	•
84 - Crown		•			•	•		•	•	•
89 - Insulator					•	•				
9R - Razor		•	•	•				•	•	•
94 - Crown					•	•		•	•	•
99 - Insulator					•	•				

Point Style	025-16	039-16	039-25	050-05	050-16	050-T25	050-R25	050-40	075-25	075-40	100-05	100-16	100-25	100-40	125-25	X31-25	X39-25	X39-40	X50-25	X50-40	X75-25	X75-40	M08-89
34 - Crown									B/S	B			B/S	B					B/S	B	B/S	B	
39 - Serrated									S										S				
40 - Spherical	B			B	B	B	B		B		B		B	B	B		B		B		B	B	
41 - Spear	B	S		B	B/S	B/S	B/S		B/S	B		B	B/S	B	B		B/S		B/S	B	B/S	B	B
42 - Cup					B	B	B					B					B						
43 - Chisel		S	S	B		B/S	B/S		B/S	B			B/S	B		S	B/S		B/S	B	B/S	B	
44 - Crown		S	S		B/S	B/S	B/S		B/S	B			B/S	B		S	B/S		B/S	B	B/S	B	B
46 - Flat Star						B	B	B	B	B			B	B			B	B	B	B	B	B	
49 - Serrated													B	B							B	B	
51 - Blade						S	S		S				B/S				S		S		B/S		
53 - Chisel						B/S	B/S		B/S	S			B/S	B/S			B/S		B/S	S	B/S	B/S	
53 - Chisel											B												
54 - Crown									B				B	B					B		B	B	
55 - Crown									B/S				B/S		B				B/S		B/S		
56 - Crown													B		B						B		
58 - Crown						B	B		B				B				B		B		B		
59 - Serrated						B	B		B				B				B		B		B		
6R - Razor			S			S	S	S	S	S			S	S		S	S	S	S	S	S	S	
61 - Blade						B/S	B/S		S	S			S	S			B/S		S	S	S	S	
62 - Slotted												B	B								B		
63 - Chisel					B	S	S		S				B/S				S		S		B/S		
63 - Chisel											B												
64 - Crown												B	B								B		
70 - Connector												B	B	B							B	B	
71 - Blade									S	S				S					S	S		S	
74 - Crown									S				B/S						S		B/S		
76 - Center Point Star						B	B	B	B	B			B	B			B	B	B	B	B	B	
79 - Serrated									B	B			B	B					B	B	B	B	
8R - Razor		S	S			S	S	S	S	S			S	S		S	S	S	S	S	S	S	
84 - Crown									S				S						S		S		
89 - Insulator													B								B		
9R - Razor						S	S		S				S				S		S		S		
94 - Crown										S				S						S		S	
99 - Insulator									B				B						B		B		



Cross-sections of the soldered socket joint show the interference fit of the tailpin in the tube, and the complete filling of all gaps with lead-free solder.

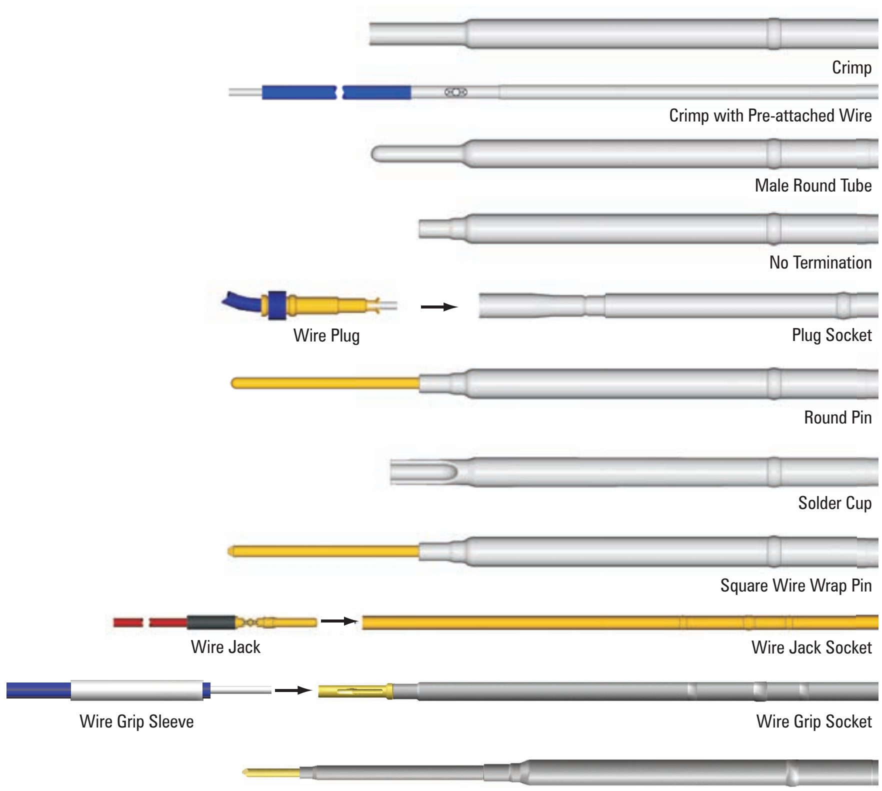
SOCKET CONSTRUCTION

The design and construction of the socket is as critical to the test process as the probe itself.

QA Technology offers sockets deep-drawn from nickel silver, beryllium copper, stainless steel or our proprietary high-conductivity alloy.

They may also be gold plated depending upon the application requirements. The sockets come in a variety of termination styles, for specific details on termination types, see page 81.

Our .100 and .075 inch centers sockets are made by automatically soldering the round or square tail pins to the socket tube. This generation of sockets sets new standards in straightness, leak tightness, and strength in both tension and torsion.



Triple Press Ring Sockets

Triple press rings are a worldwide exclusive from QA to meet the increased pointing accuracy demands of the ATE industry.

Triple press ring sockets are available in our 039-16, 039-25, 050-T25, 050-R25 and 050-40 series product lines.

Triple press rings offer the following:

- **Pointing Accuracy:** Like double press ring sockets, triple press ring sockets offer true alignment with the socket mounting hole. Keeping at least two press rings in the mounting hole eliminates the possibility of the socket tilting which may occur with single press ring sockets. This is critical for applications which require tight pointing accuracy. (Figure A)

- **Reduces Inventory:** Because the triple press rings cover the entire range of set heights, it is not necessary to calculate specific set heights before placing your order. This feature enables you to reduce your inventory levels by carrying a single socket for all your requirements. (Figure B)
- **Very Wide Set Height Range:** Covering the common range of set heights with double press rings requires multiple sockets with the rings in different locations. Triple press rings allow set heights from flush up to .270 [6.86] in plates as thin as 5⁄16" with just a single socket. (Figure C)

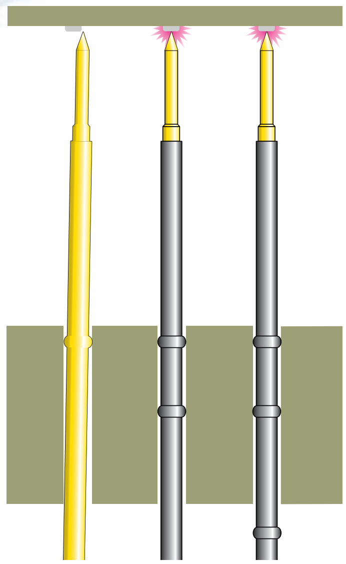


Figure A

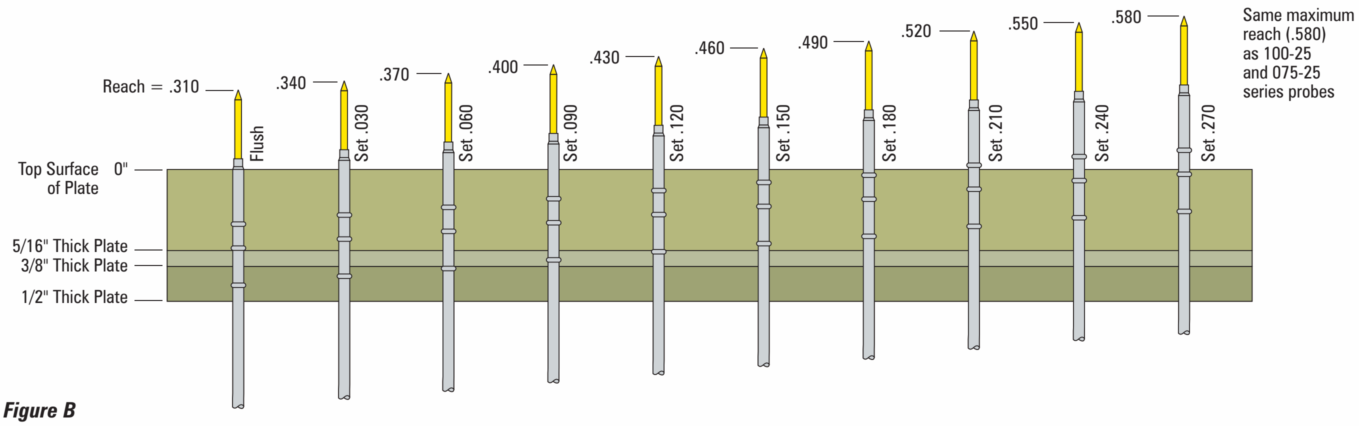


Figure B

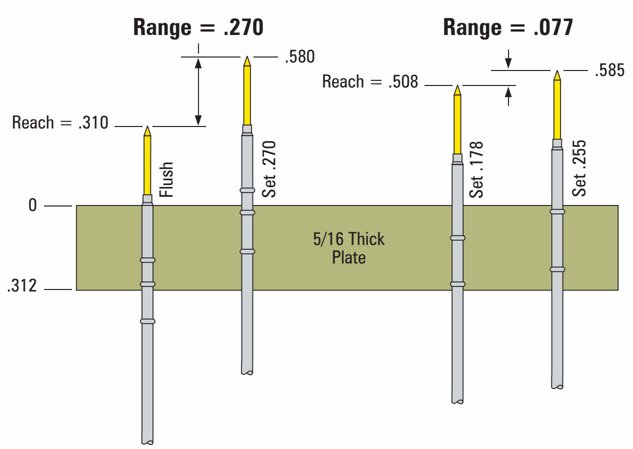


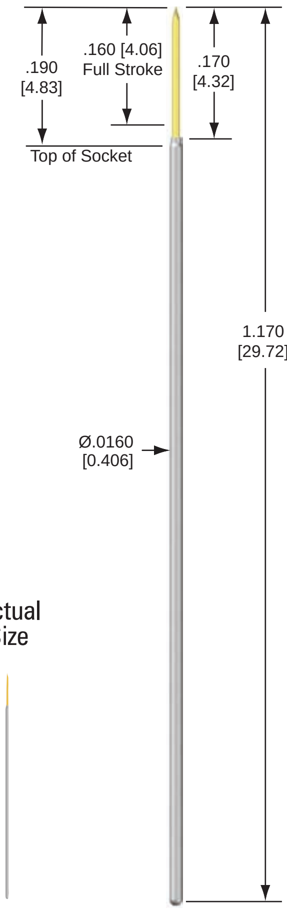
Figure C

025-16 Series

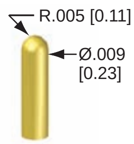
.025 [0.63] Centers | .160 [4.06] Stroke

Designed for bare and loaded board testing.

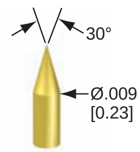
Probe



Actual
Size



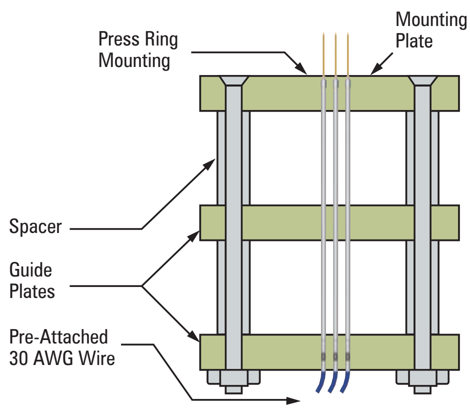
40 - Spherical



41 - Spear

Suggested Fixture Arrangement for 025-16 Series

See 025-16 Series Installation Notes (page 97) for more information.



PROBES

PROBE P/N: 025-PRP16 S-

example: 025-PRP1641S

TUBE	**Letter**	**Material/Finish**			**Average Resistance**	
	P	Nickel silver/ID precious metal clad			< 100 milliohms	
POINT	**Digits**	**Material/Finish**				
	See Points	Heat treated BeCu/plated gold over nickel				
SPRING	**Letter**	**Spring Force**	**Preload**	**@ 2/3 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
	S	Standard	0.5 [14]	1.6 [45]	Music wire	1M min @ .107 [2.72] max
OPTION	**Letter**	**Description**				
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				

Probe Specifications

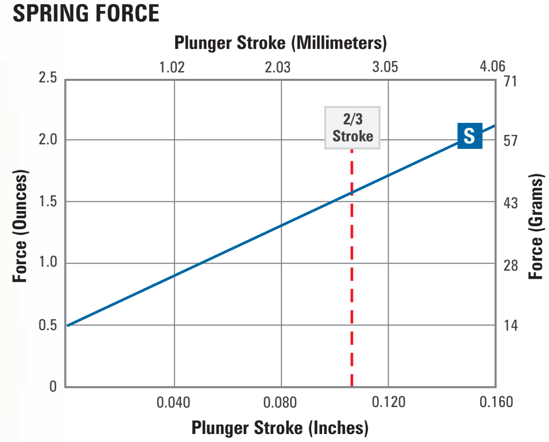
Full stroke: .160 [4.06]

Working stroke: up to .107 [2.72]

Operating temp.: 40°F to 250°F [5°C to 120°C]

Current rating: 2.5 Amps (see page 83)

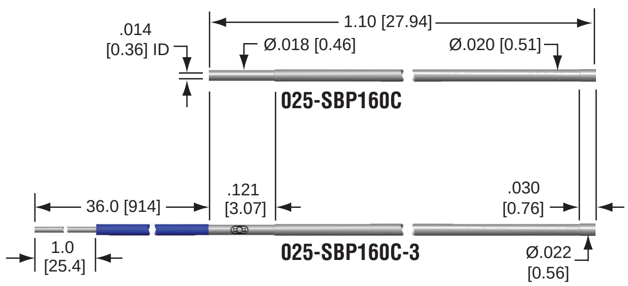
SPRING FORCE



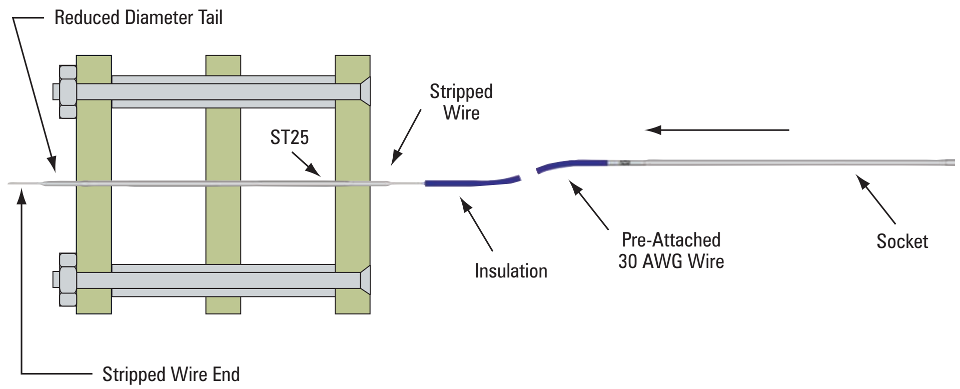
Direct Sales **(603) 926-0348** • Support (603) 926-1193 • Fax (603) 926-8701 • Email: sales@qatech.com • **www.qatech.com**

Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .0205/.0215 [0.52/0.55], suggested drill size #75.



ST25 Socket Threading Tool



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG25

Socket Threading Tool: ST25 (designed to be set FLUSH) (see pages 98 for more information)

SOCKETS

SOCKET P/N: 025-SBP160C-

example: 025-SBP160C-3

	Letter	Material/Finish
TUBE	P	Nickel silver/ID precious metal clad
	Digits	**Material/Finish**
TERM.	C	Crimp
	Letter	**Spring Force**
OPTION	3	Socket with 30 AWG Kynar insulated solid wire 36 [914] pre-attached. Blue insulation 1.0 [25.4] strip length
	(Blank)	No option required

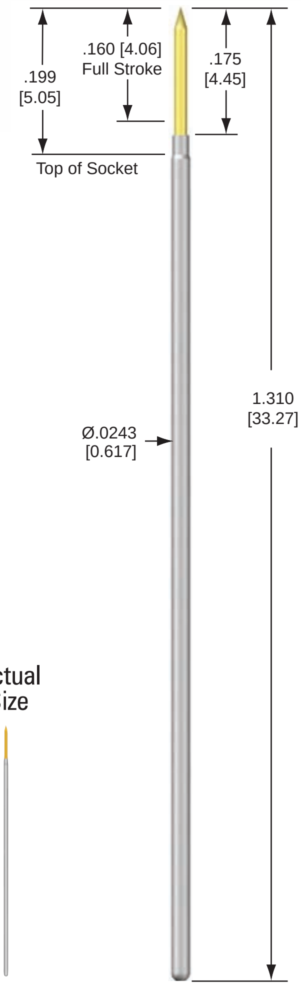
US Patent No. 4,885,533

039-16 Series

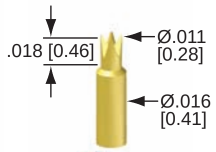
.039 [1.00] Centers | .160 [4.06] Stroke

Designed for loaded board testing.

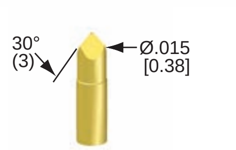
Probe



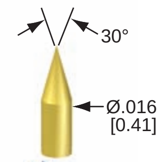
Actual Size



14 -S - Crown



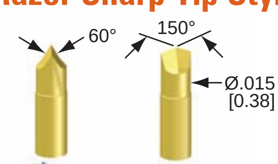
43 -S - Chisel



41 -S - Spear

44 -S - Crown

Razor Sharp Tip Styles (See page 72 for more details)



8R -S - Razor

PROBES

PROBE P/N: 039-PRP16 ☐☐☐-☐

example: 039-PRP1643X-S

TUBE

Letter	Material/Finish	Average Resistance
P	Nickel silver/ID precious metal clad	< 165 milliohms

POINT

Digits	Material/Finish
See Points	Heat treated steel/plated gold over nickel

SPRING

Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
S	Standard	1.5 [42]	3.6 [102]	Music wire	1M min @ .107 [2.72] max
X	Extra	2.2 [62]	5.4 [153]	Music wire	75K min @ .107 [2.72] max
	High Preload Spring – *Available in 43-S, 44-S & 8R-S point styles.*				
E	High Preload	3.8 [108]	5.4 [153]	Music wire	100K min @ .107 [2.72] max

OPTION

Letter	Description
N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
S	Heat treated steel/plated gold over nickel

Probe Specifications

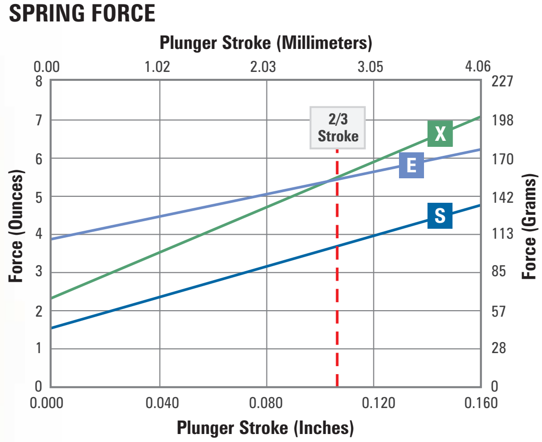
Full stroke: .160 [4.06]

Working stroke: up to .107 [2.72]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

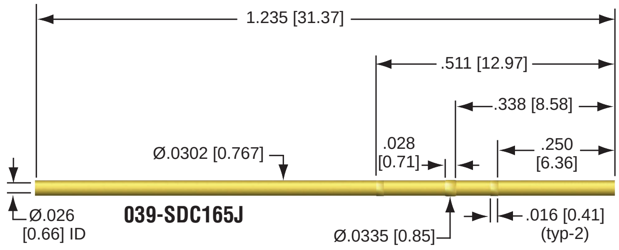
Current rating: 7.0 Amps (see page 83)

SPRING FORCE



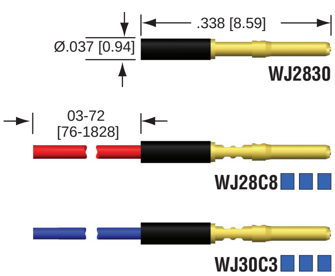
Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .0307/.0317 [0.78/0.81], suggested drill sizes 1/32" or .80mm.



Wire Jacks

For use with J termination sockets



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG39

Socket Installation Tool: ITR039-FL or ITR039 SET .001 to .320 [0.03 to 8.13]

Socket Extraction Tool: ETR039-KIT (includes ITR039-FL and ETR039 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT50/39

Damaged Probe Tube Extraction Tool: TERX31/039

Wire Jack Installation Tool: JTR2830

SOCKETS

SOCKET P/N: 039 - SDC165J

TUBE	**Letter**	**Material/Finish**
	C	Heat treated BeCu/gold plated over nickel
TERM.	**Digits**	**Description**
	J	Wire Jack termination, accepts wire jacks

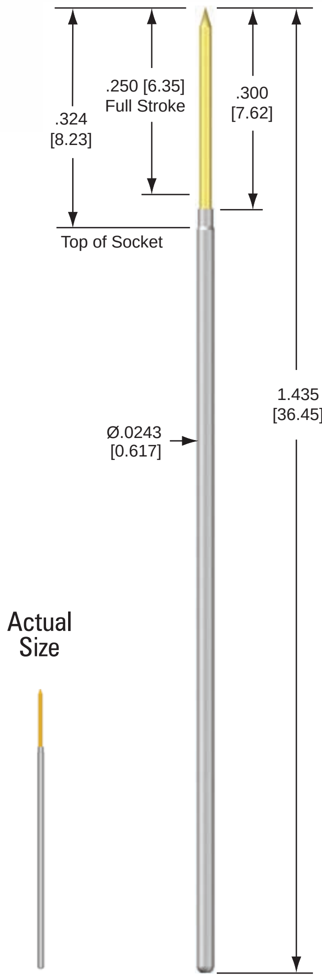
WIRE JACK P/N: WJ

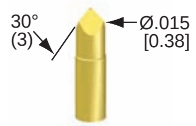
example: WJ28C8230

JACK	**Letter**	**Material/Finish**										
	WJ	Brass/gold plated with nylon insulator										
SIZE	**Digits**	**Description**										
	2830	Wire Jack only (customer to crimp wire)										
	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	Grey		
	1	Brown	3	Orange	5	Green	7	Violet	9	White		
	Wire Length Available for 28C & 30C Termination											
		Specify Length: 03 – 72 [76-1828]										
OPTION	**Letter**	**Description**										
	S	Strip Length 0.000/0.669 [0.00/16.99]; Customer to specify strip length										

US Patent No. 4,885,533

Probe

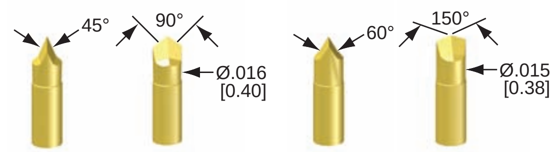




43 -S - Chisel

44 -S - Crown

Razor Sharp Tip Styles (See page 72 for more details)



6R -S - Razor

8R -S - Razor

PROBES

PROBE P/N: 039-PRP25 ☐☐☐-☐
example: 039-PRP2544X-S

	Letter	Material/Finish				Average Resistance
TUBE	P	Nickel silver/ID precious metal clad				< 65 milliohms
	Digits	**Material/Finish**				
POINT	See Points	Heat treated steel/plated gold over nickel				
	Letter	**Spring Force**	**Preload**	**@ 2/3 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
SPRING	S	Standard	1.49 [42]	3.6 [102]	Music Wire	1M min @ .167 [4.24] max
SPRING	X	Extra	2.22 [63]	5.4 [153]	Stainless Steel	50K min @ .167 [4.24] max
	Letter	**Description**				
OPTION	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				
OPTION	S	Heat treated steel/plated gold over nickel				

Probe Specifications

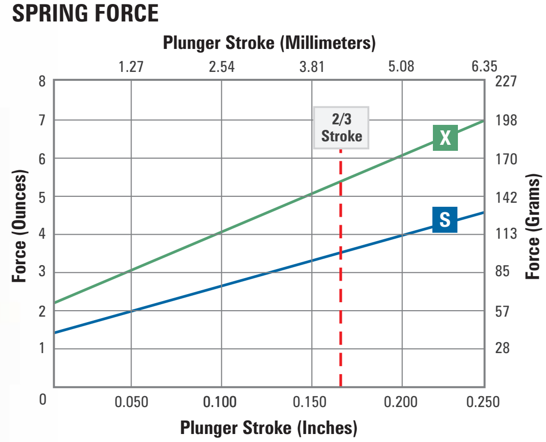
Full stroke: .250 [6.35]

Working stroke: up to .167 [4.24]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

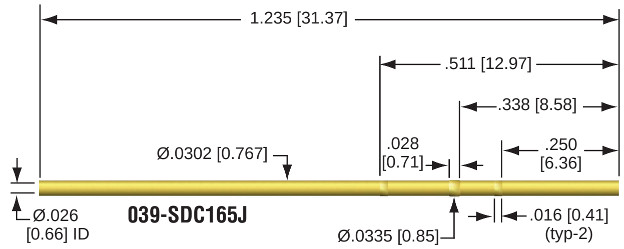
Current rating: 7.0 Amps (see page 83)

SPRING FORCE



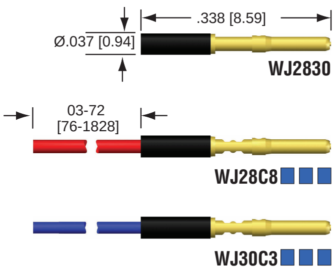
Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .0307/.0317 [0.78/0.81], suggested drill sizes 1/32" or .80mm.



Wire Jacks

For use with J termination sockets



SOCKETS

SOCKET P/N: 039 - SDC165J

	Letter	Material/Finish
TUBE	C	Heat treated BeCu/gold plated over nickel
	Digits	**Description**
TERM.	J	Wire Jack termination, accepts wire jacks

WIRE JACK P/N: WJ■■■■■■■-■

example: WJ28C8230

	Letter	Material/Finish					
JACK	WJ	Brass/gold plated with nylon insulator					
SIZE	**Digits**	**Description**					
SIZE	2830	Wire Jack only (customer to crimp wire)					
SIZE	28C8	28 AWG Kynar insulated solid wire, pre-attached, specify color and length					
SIZE	30C3	30 AWG Kynar insulated solid wire, pre-attached, specify color and length					
WIRE	**Colors Available for 28C & 30C Termination**						
WIRE	0	Black	2	Red	4	Yellow	6 Blue / 8 Grey
WIRE	1	Brown	3	Orange	5	Green	7 Violet / 9 White
WIRE	**Wire Length Available for 28C & 30C Termination**						
WIRE		Specify Length: 03 – 72 [76-1828]					
OPTION	**Letter**	**Description**					
OPTION	S	Strip Length 0.000/0.669 [0.00/16.99]; Customer to specify strip length					

US Patent No. 4,885,533

Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG39

Socket Installation Tool: ITR039-FL or ITR039 SET .001 to .320 [0.03 to 8.13]

Socket Extraction Tool: ETR039-KIT (includes ITR039-FL & ETR039 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT50/39

Damaged Probe Tube Extraction Tool: TERX31/039

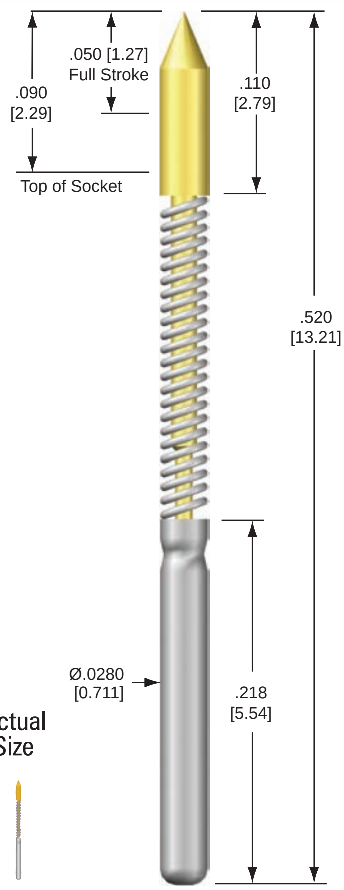
Wire Jack Installation Tool: JTR2830

Socket Plugs: 039-SPR

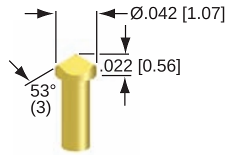
050-05 Series

.050 [1.27] Centers | .050 [1.27] Stroke

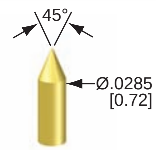
Probe



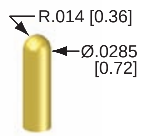
Actual Size



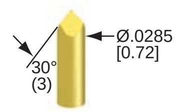
13 - Chisel



41 - Spear



40 - Spherical



43 - Chisel

PROBES

PROBE P/N: 050-PLP05 ☐☐S-☐

example: 050-PLP0513S

TUBE	Letter	Material/Finish	Average Resistance
	P	Nickel silver/ID precious metal clad	< 25 milliohms

POINT	Digits	Material/Finish
	See Points	Heat treated BeCu/plated gold over nickel

SPRING	Letter	Spring Force	Preload	@ Full Stroke	Material	Mechanical Life (Cycles @ Stroke)
	S	Standard	1.3 [37]	4.6 [130]	Music wire	1M min @ .050 [1.27] max

OPTION	Letter	Description
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.

Probe Specifications

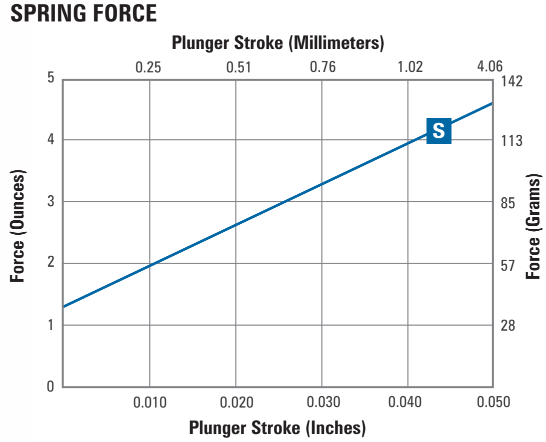
Full stroke: .050 [1.27]

Working stroke: up to .050 [1.27]

Operating temp.: 40°F to 250°F [5°C to 120°C]

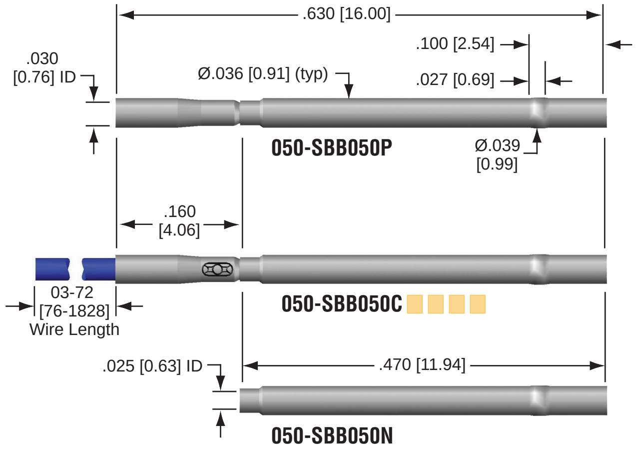
Current rating: 5.0 Amps (see page 83)

SPRING FORCE



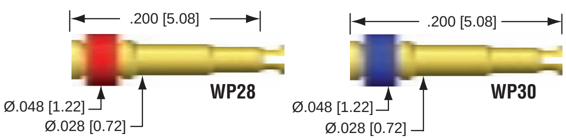
Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .0368/.0378 [.935/.960], suggested drill sizes #63 or .95mm.



Wire Plugs

For use with P termination sockets



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG050-05/16

Socket Installation Tool: ITR050-FL

Socket Extraction Tool: ETR050-05

Probe Installation Tool: PT50/39

Wire Plug Installation Tool: WTR30 or WTR28

Wire Strippers preset to .120 [3.05]: WS30 or WS28

WIRE PLUG P/N: WP■■

example: WP30

	Letter	Material/Finish
PLUG	WP	Brass/plated gold over nickel with insulating sleeve
	Digits	**Description**
PLUG SIZE	28	Plug (identified with red insulating sleeve) to accept 28 AWG Kynar solid wire (not included)
	30	Plug (identified with blue insulating sleeve) to accept 30 AWG Kynar solid wire (not included)

SOCKETS

SOCKET P/N: 050-SBB050■■■■■

example: 050-SBB050C3630

	Letter	Material/Finish
TUBE	B	Heat treated BeCu/Nickel clad ID/OD
	Letter	**Description**
TERMINATION	P	Plug housing Stainless Steel/ID precious metal clad. Accepts wire plugs
	C	Crimp (specify wire size, color and length option)
	N	No termination
OPTION	**Digit**	**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 [76-1828]

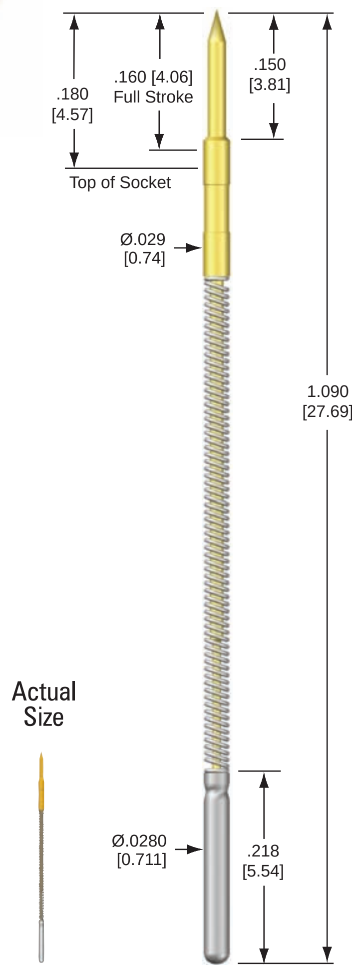
US Patent No. 4,659,987 & 4,597,662

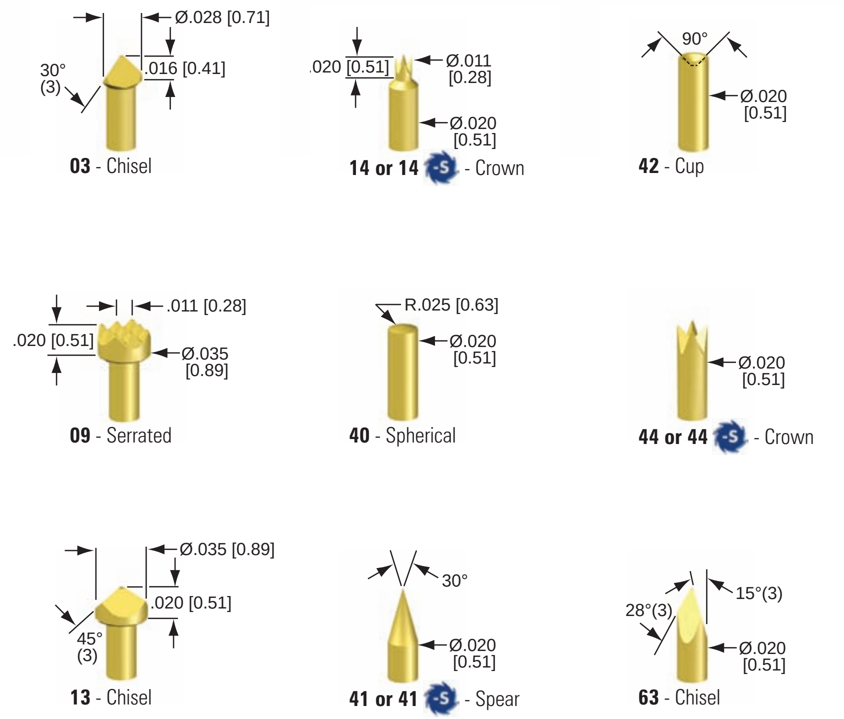
050-16 Series

.050 [1.27] Centers | .160 [4.06] Stroke

Designed for loaded board testing.

Probe





PROBES

PROBE P/N: 050-PLP16 ☐☐☐-☐

example: 050-PLP1603H

TUBE

Letter	Material/Finish	Average Resistance
P	Nickel silver/ID precious metal clad	< 20 milliohms

POINT

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

SPRING

Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
S	Standard	2.0 [57]	4.0 [113]	Music wire	1M min @ .107 [2.72] max
H	High	2.7 [77]	6.1 [173]	Music wire	1M min @ .107 [2.72] max

OPTION

Letter	Description
N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
S	Heat treated steel/plated gold over nickel (see points for availability)
(blank)	No option required

Probe Specifications

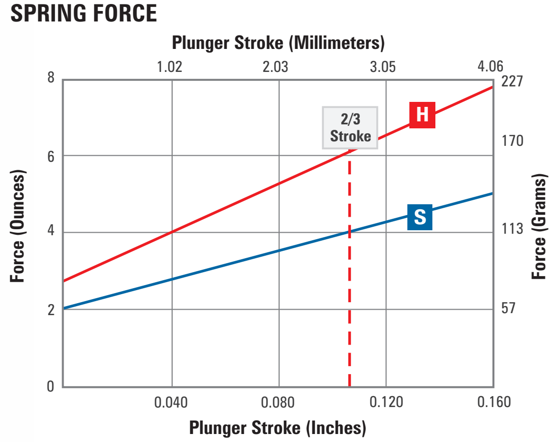
Full stroke: .160 [4.06]

Working stroke: up to .107 [2.72]

Operating temp.: 40°F to 250°F [5°C to 120°C]

Current rating: 8.5 Amps (see page 83)

SPRING FORCE



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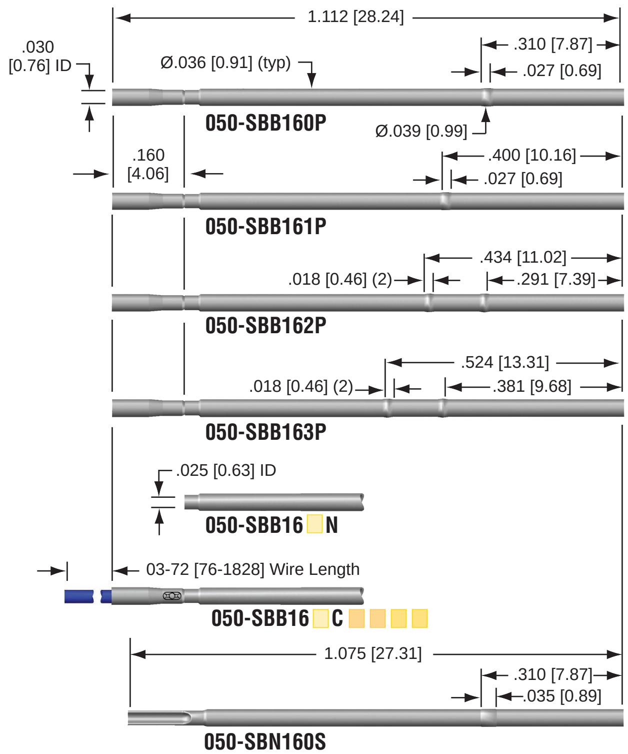
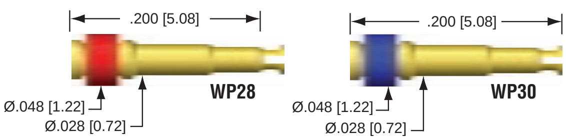
Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .0368/.0378 [.935/.960], suggested drill sizes #63 or .95mm.



Wire Plugs

For use with P termination sockets



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG050-05/16

Socket Installation Tool Adjustable: AT50-KIT or AT50M-KIT

Socket Installation Tool Preset: ITR050-FL or ITR050-16 SET .001 to .360 [0.03 to 9.14]

Socket Extraction Tool: ETR050-16-KIT (includes ITR050-FL & ETR050-16 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT50/39

Wire Plug Installation Tool: WTR30 or WTR28

Wire Strippers preset to .120 [3.05]: WS30 or WS28

WIRE PLUG P/N: WP

example: WP30

	Letter	Material/Finish
PLUG	WP	Brass/plated gold over nickel with insulating sleeve
	Digits	**Description**
PLUG SIZE	28	Plug (identified with red insulating sleeve) to accept 28 AWG Kynar solid wire (not included)
	30	Plug (identified with blue insulating sleeve) to accept 30 AWG Kynar solid wire (not included)

SOCKETS

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
	Letter	**Description**
PRESS RING	0	Single press ring located at .310 [7.87]
	1	Single press ring located at .400 [10.16]
	2	Double press ring located at .434 [11.02]
	3	Double press ring located at .524 [13.31]
	Letter	**Description**
TERMINATION	P	Plug housing Stainless Steel/ID precious metal clad. Accepts wire plugs
	C	Crimp (specify wire size, color and length option)
	N	No termination
	S	Solder cup ①
	Digit	**Wire Size Available for C Termination**
OPTION	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 [76-1828]

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

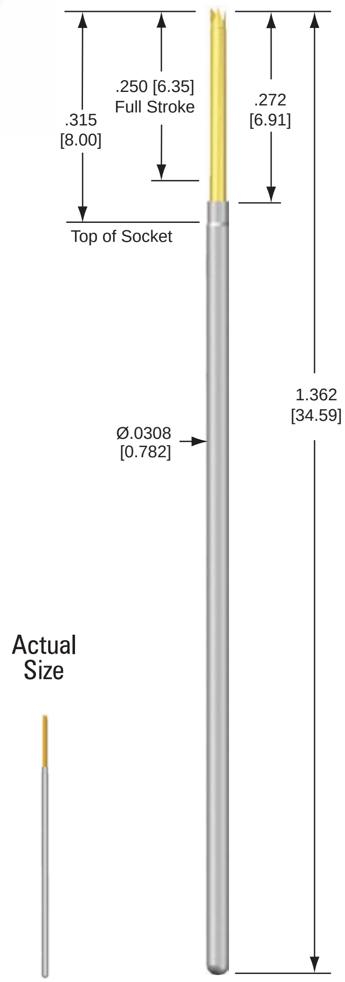
US Patent No. 4,659,987 & 4,597,662

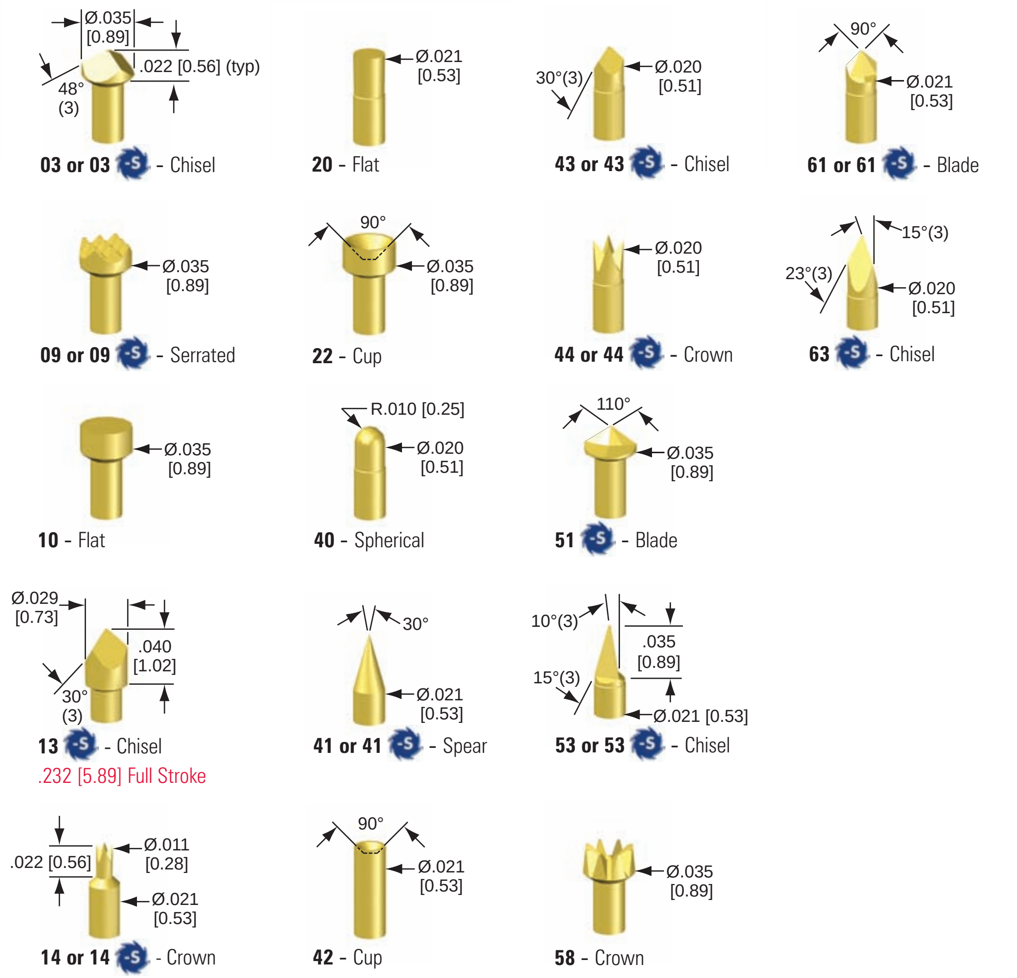
050-T25 Series

.050 [1.27] Centers | .250 [6.35] Stroke

Designed for loaded board testing.

Probe





PROBES

PROBE P/N: 050-PTP25 ☐☐☐-☐

example: 050-PTP2503L-S

	Letter	Material/Finish	Average Resistance
TUBE	P	Nickel silver/ID precious metal clad	< 30 milliohms

	Digits	Material/Finish
POINT	See Points	Standard material is Heat treated BeCu/plated gold over nickel (see S option for steel plungers)

	Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ stroke)
SPRING	L	Low	1.2 [34]	3.0 [85]	Music wire	1M min @ .167 [4.24] max
	S	Standard	1.1 [31]	4.3 [122]	Music wire	1M min @ .167 [4.24] max
	H	High	2.4 [68]	5.6 [159]	Music wire	1M min @ .167 [4.24] max
	Y	Elevated	3.2 [91]	8.0 [227]	Stainless Steel	25K min @ .167 [4.24] max
		High Preload Spring – *Available in 43-S, 44-S, 6R-S, 61-S, 63-S, 8R-S & 9R-S point styles.*				
	E	High Preload	4.2 [119]	8.0 [227]	Stainless Steel	10K min @ .167 [4.24] max

	Letter	Description
OPTION	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
	S	Heat treated steel/plated gold over nickel (see points for availability)
	(blank)	No option required

Probe Specifications

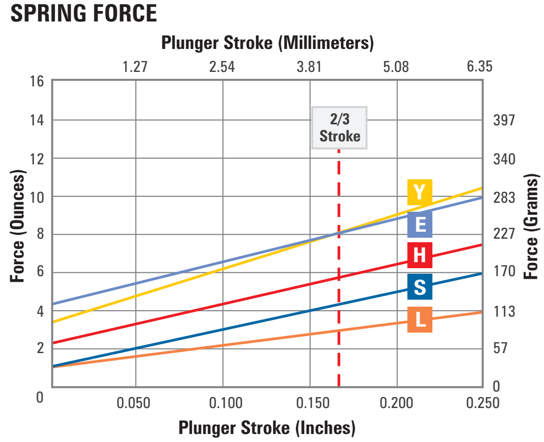
Full stroke: .250 [6.35]

Working stroke: up to .167 [4.24]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 7.5 Amps (see page 83)

SPRING FORCE



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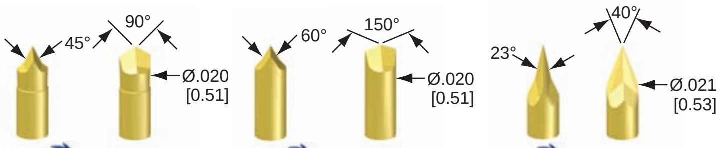
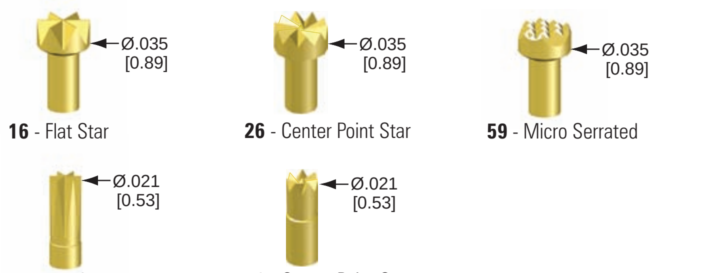
Razor Sharp Tip Styles (See page 72 for more details)



6R -S - Razor **8R** -S - Razor **9R** -S - Razor

Solder Bump/Dome Tip Styles (see page 78 for more details)

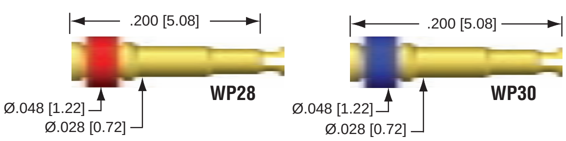


16 - Flat Star **26** - Center Point Star **59** - Micro Serrated

46 - Flat Star **76** - Center Point Star

Wire Plugs

For use with P termination sockets



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG050-25

Socket Installation Tool Adjustable: AT50-KIT or AT50M-KIT

Socket Installation Tool Preset: ITR050-FL or ITR050-25 SET .001 to .270 [0.03 to 6.86]

Socket Extraction Tool: ETR050-25-KIT (includes ITR050-FL & ETR050-25 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT50/39

Damaged Probe Tube Extraction Tool: TERX39/050

Wire Plug Installation Tool: WTR30 or WTR28

Wire Grip Installation Tool: GTR50

Wire Strippers preset to .120 [3.05]: WS30 or WS28

Indicator Probes: IP050-T2510 or IP050-T2540

Socket Plugs: 050-SPT

WIRE PLUG P/N: WP■■

example: WP30

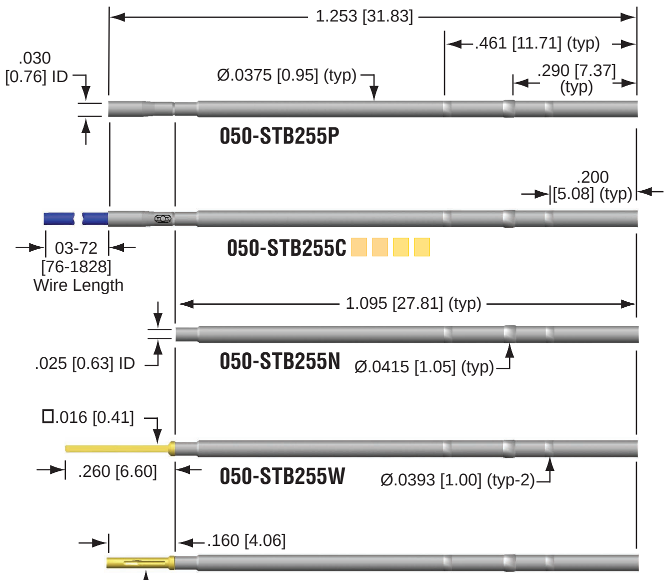
	Letter	Material/Finish
PLUG	WP	Brass/plated gold over nickel with insulating sleeve
PLUG SIZE	**Digits**	**Description**
	28	Plug (identified with red insulating sleeve) to accept 28 AWG Kynar solid wire (not included)
	30	Plug (identified with blue insulating sleeve) to accept 30 AWG Kynar solid wire (not included)

WIRE GRIP SLEEVE P/N: WG50

	Letter	Material
SLEEVE	WG	Nylon sleeve, white
SIZE	**Digits**	**Description**
	50	.300 [7.62] long, to accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at .120 [3.05]

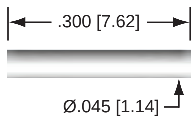
Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .038/.039 [.97/.99], suggested drill size #61 or 1mm.



Wire Grip Sleeve

For use with G termination sockets



WG50

SOCKETS

SOCKET P/N: 050-STB255■■■■■

example: 050-STB255C3630

	Letter	Material/Finish							
TUBE	B	Heat treated BeCu/Nickel plated							
TERMINATION	**Letter**	**Description**							
	P	Plug housing Stainless Steel/ID precious metal clad. Accepts wire plugs							
	C	Crimp (specify wire size, color and length option)							
	N	No termination							
	W	Square wire wrap pin; Phosphor bronze/gold plated over nickel							
	G	Wire grip termination; BeCu/gold plated over nickel. Accepts wire grip sleeve							
OPTION	**Digit**	**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							
	Wire Size Available for C 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							
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length							
	(Blank)	No option required							
	Wire Colors 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 [76-1828]							

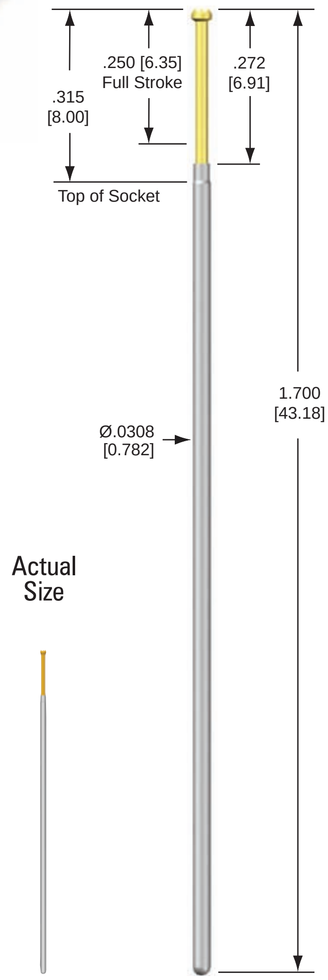
US Patent No. 4,885,533 & 4,597,622

050-R25 Series

.050 [1.27] Centers | .400 [6.35] Stroke

Designed for loaded board testing.

Probe



PROBES

PROBE P/N: 050-PRP25 ▢▢▢-▢

example: 050-PRP2503L-S

	Letter	Material/Finish				Average Resistance
TUBE	P	Nickel silver/ID precious metal clad				< 35 milliohms
POINT	**Digits**	**Material/Finish**				
	See Points	Standard material is Heat treated BeCu/plated gold over nickel (see S option for steel plungers)				
SPRING	**Letter**	**Spring Force**	**Preload**	**@ 2/3 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
	L	Low	1.5 [43]	3.6 [102]	Music wire	1M min @ .167 [4.24] max
	S	Standard	1.9 [54]	5.5 [156]	Music wire	1M min @ .167 [4.24] max
	H	High	2.4 [68]	7.0 [198]	Music wire	1M min @ .167 [4.24] max
	X	Extra	3.0 [85]	10.1 [286]	Music wire	50K min @ .167 [4.24] max
		High Preload Spring – *Available in 43-S, 44-S, 6R-S, 61-S, 63-S & 8R-S point styles.*				
	E	High Preload	5.5 [156]	8.0 [227]	Stainless Steel	50K min @ .167 [4.24] max
OPTION	**Letter**	**Description**				
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				
	S	Heat treated steel/plated gold over nickel (see points for availability)				
	(blank)	No option required				

Probe Specifications

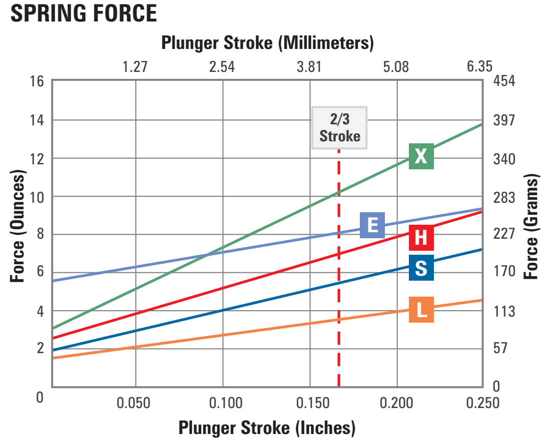
Full stroke: .250 [6.35]

Working stroke: up to .167 [4.24]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 8.5 Amps (see page 83)

SPRING FORCE



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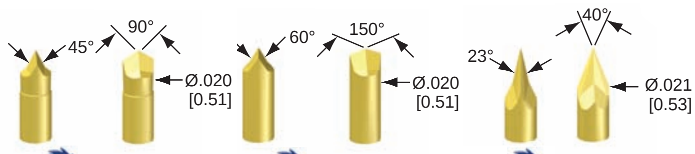
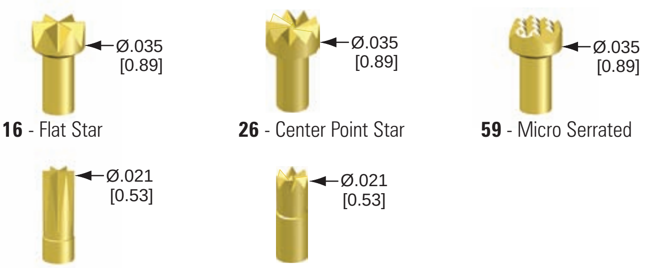
Razor Sharp Tip Styles (See page 72 for more details)



6R - Razor　**8R** - Razor　**9R** - Razor

Solder Bump/Dome Tip Styles (see page 78 for more details)

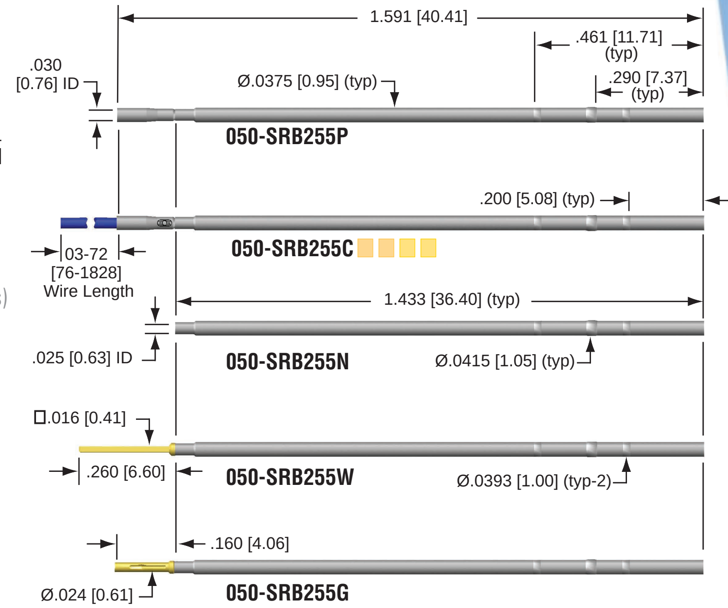


16 - Flat Star　**26** - Center Point Star　**59** - Micro Serrated

46 - Flat Star　**76** - Center Point Star

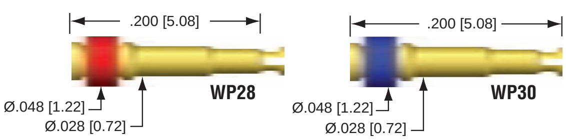
Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .038/.039 [.97/.99], suggested drill size #61 or 1mm.



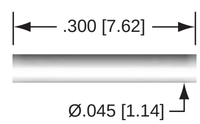
Wire Plugs

For use with P termination sockets



Wire Grip Sleeve

For use with G termination sockets



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG050-25

Socket Installation Tool Adjustable: AT50-KIT or AT50M-KIT

Socket Installation Tool Preset: ITR050-FL or ITR050-25 SET .001 to .270 [0.03 to 6.86]

Socket Extraction Tool: ETR050-25-KIT (includes ITR050-FL & ETR050-25 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT50/39

Damaged Probe Tube Extraction Tool: TERX39/050

Wire Plug Installation Tool: WTR30 or WTR28

Wire Grip Installation Tool: GTR50

Wire Strippers preset to .120 [3.05]: WS30 or WS28

Indicator Probes: IP050-R2510 or IP050-R2540

WIRE PLUG P/N: WP▢▢

example: WP30

	Letter	Material/Finish
PLUG	WP	Brass/plated gold over nickel with insulating sleeve
	Digits	**Description**
PLUG SIZE	28	Plug (identified with red insulating sleeve) to accept 28 AWG Kynar solid wire (not included)
	30	Plug (identified with blue insulating sleeve) to accept 30 AWG Kynar solid wire (not included)

WIRE GRIP SLEEVE P/N: WG50

	Letter	Material
SLEEVE	WG	Nylon sleeve, white
	Digits	**Description**
SIZE	50	.300 [7.62] long, to accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at .120 [3.05]

SOCKETS

SOCKET P/N: 050-SRB255▢▢▢▢▢

example: 050-SRB255C3630

	Letter	Material/Finish								
TUBE	B	Heat treated BeCu/Nickel plated								
	Letter	**Description**								
TERMINATION	P	Plug housing Stainless Steel/ID precious metal clad. Accepts wire plugs								
	C	Crimp (specify wire size, color and length option)								
	N	No termination								
	W	Square wire wrap pin; Phosphor bronze/gold plated over nickel								
	G	Wire grip termination; BeCu/gold plated over nickel. Accepts wire grip sleeve								
	Digit	**Description**								
OPTION	**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								
	Wire Size Available for C 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								
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length								
	(Blank)	No option required								
	Wire Colors 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 [76-1828]								

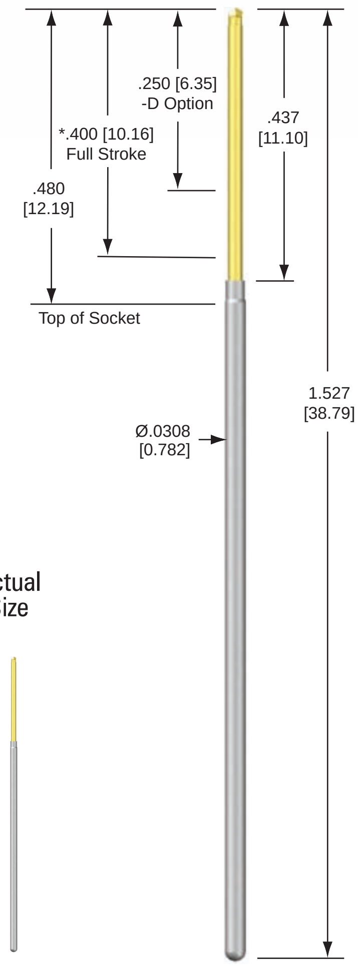
US Patent No. 4,885,533 & 4,597,622

050-40 Series

.050 [1.27] Centers | .400 [10.16] Stroke

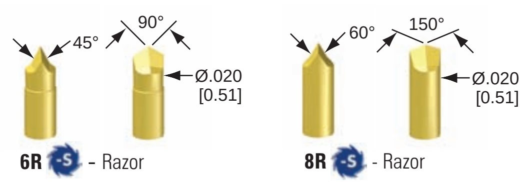
Designed for mixed height, loaded board testing.

Probe

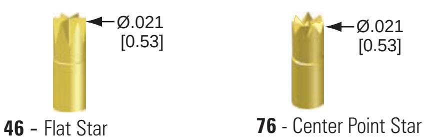


Actual Size

Razor Sharp Tip Styles (See page 72 for more details)



Solder Bump/Dome Tip Styles (see page 78 for more details)



PROBES

PROBE P/N: 050 - PTP40 ▢ ▢ ▢ - ▢

example: 050-PTP406RX-S

TUBE	**Letter**	**Material/Finish**				**Average Resistance**	
	P	Nickel silver/ID precious metal clad				< 35 milliohms	
POINT	**Digits**	**Material/Finish**					
	See Points	Heat treated steel/plated gold over nickel (see S option for steel plungers)					
SPRING	**Letter**	**Spring Force**	**Preload**	**@ .317 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**	
	X	Extra	1.2 [34]	4.75 [135]	Stainless Steel	10K min @ .317 [8.05] max	
	U*	Ultra	1.3 [37]	7.5 [213]	Stainless Steel	10K min @ .317 [8.05] max	
OPTION	**Letter**	**Description**					
	D	Decreased stroke is .250 [6.35]. Must select from 050-T25 series spring forces with this option					
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should be only used in applications outside of the probe operating temperature specifications.					
	S	Heat treated steel/plated gold over nickel					

*0.350 [8.89] max stroke for U spring.

Probe Specifications

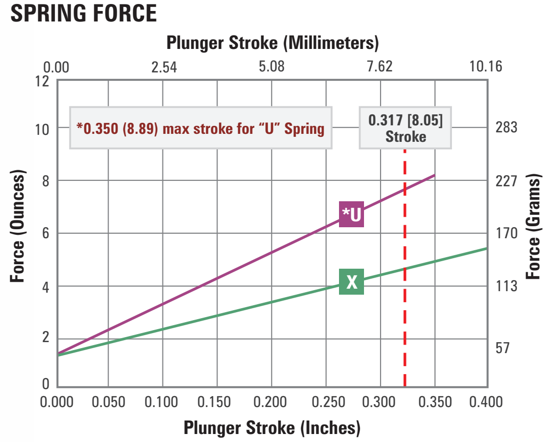
Full stroke: *.400 [10.16]

Working stroke: up to .317 [8.05]

Operating temp.: -50° to 250°F [-45° to 120°C]

Current rating: 10.0 Amps (see page 83)

SPRING FORCE



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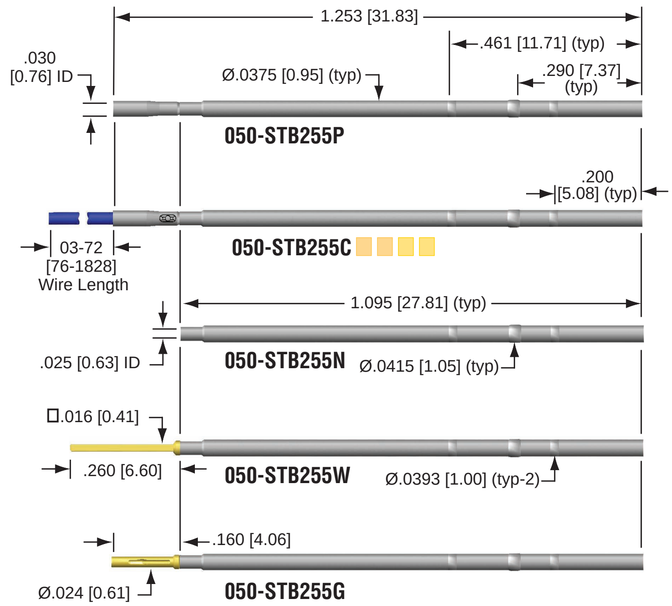
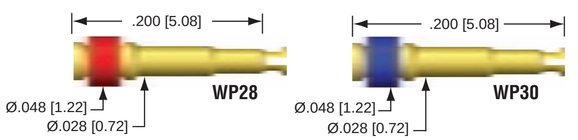
Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .038/.039 [.97/.99], suggested drill size #61 or 1mm.



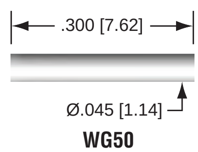
Wire Plugs

For use with P termination sockets



Wire Grip Sleeve

For use with G termination sockets



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG050-25

Socket Installation Tool Adjustable: AT50-KIT or AT50M-KIT

Socket Installation Tool Preset: ITR050-FL or ITR050-25 SET .001 to .270 [0.03 to 6.86]

Socket Extraction Tool: ETR050-25-KIT (includes ITR050-FL & ETR050-25 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT50/39

Damaged Probe Tube Extraction Tool: TERX39/050

Wire Plug Installation Tool: WTR30 or WTR28

Wire Grip Installation Tool: GTR50

Wire Strippers preset to .120 [3.05]: WS30 or WS28

Socket Plugs: 050-SPT

WIRE PLUG P/N: WP

example: WP30

	Letter	Material/Finish
PLUG	WP	Brass/plated gold over nickel with insulating sleeve
	Digits	**Description**
PLUG SIZE	28	Plug (identified with red insulating sleeve) to accept 28 AWG Kynar solid wire (not included)
	30	Plug (identified with blue insulating sleeve) to accept 30 AWG Kynar solid wire (not included)

WIRE GRIP SLEEVE P/N: WG50

	Letter	Material
SLEEVE	WG	Nylon sleeve, white
	Digits	**Description**
SIZE	50	.300 [7.62] long, to accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at .120 [3.05]

SOCKETS

SOCKET P/N: 050-STB255

example: 050-STB255C3630

	Letter	Material/Finish
TUBE	B	Heat treated BeCu/Nickel plated
	Letter	**Description**
TERMINATION	P	Plug housing Stainless Steel/ID precious metal clad. Accepts wire plugs
	C	Crimp (specify wire size, color and length option)
	N	No termination
	W	Square wire wrap pin; Phosphor bronze/gold plated over nickel
	G	Wire grip termination; BeCu/gold plated over nickel. Accepts wire grip sleeve
	Digit	**Description**
OPTION	**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
	Wire Size Available for C 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
	6	26 AWG Kynar insulated solid wire, pre-attached, specify color and length
	(Blank)	No option required
	Wire Colors Available for C Termination	
	Wire Length Available for C Termination	
		Specify Length in inches: 03 – 72 [76-1828]

Wire Colors Available for C Termination:

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

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

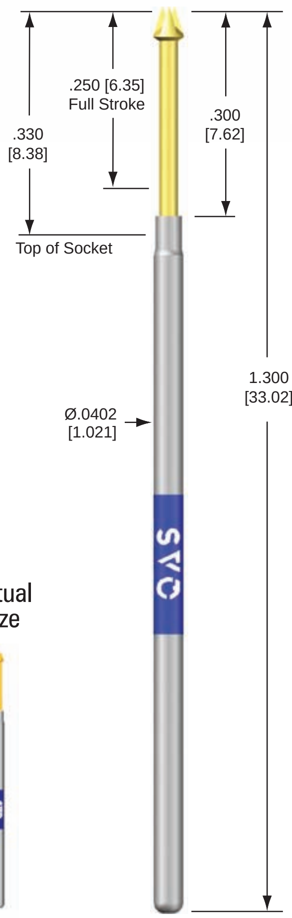
All specifications subject to change without notice. All dimensions are in inches [mm]. All spring forces in ounces [gms].

075-25 Series

.075 [1.91] Centers | .250 [6.35] Stroke

Designed for loaded board testing.

Probe



Actual Size

PROBES

PROBE P/N: 075 - PR ■ 25 ■ ■ ■ - ■

example: 075-PRP2503H-S

TUBE

Letter	Material/Finish	Average Resistance
P	Nickel silver/ID precious metal clad	< 20 milliohms
G	Nickel silver OD gold plated	< 20 milliohms
N	Nickel silver/no finish	< 155 milliohms

POINT

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

SPRING

Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
L	Low	1.5 [43]	3.1 [88]	Music wire	1M min @ .167 [4.24] max
S	Standard	2.7 [77]	5.5 [156]	Music wire	1M min @ .167 [4.24] max
H	High	2.8 [79]	7.0 [198]	Music wire	1M min @ .167 [4.24] max
X	Extra	2.7 [77]	10.1 [286]	Music wire	100K min @ .167 [4.24] max
	High Preload Spring – *Available in 43-S, 44-S, 6R-S, 61-S, 63-S, 8R-S & 9R-S point styles and PRP tube material only.*				
E	High Preload	5.0 [142]	8.0 [227]	Stainless Steel	50K min @ .167 [4.24] max

OPTION

Letter	Description
B	Curved tube (pylon replacement)
N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
S	Heat treated steel/plated gold over nickel (see points for availability)
(blank)	No option required

Probe Specifications

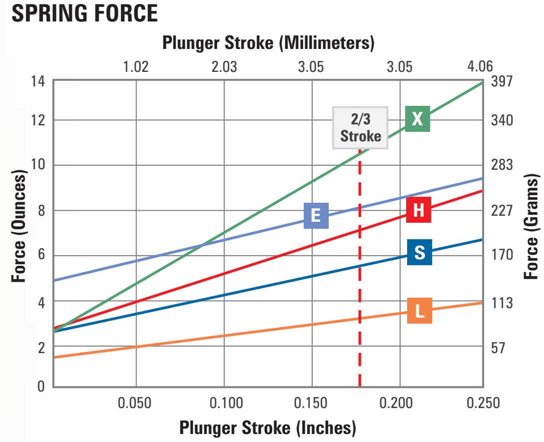
Full stroke: .250 [6.35]

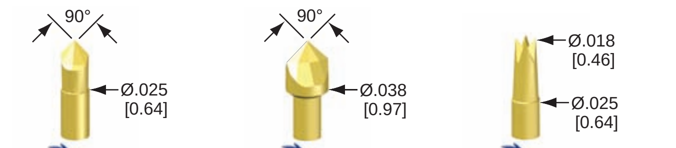
Working stroke: up to .167 [4.24]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

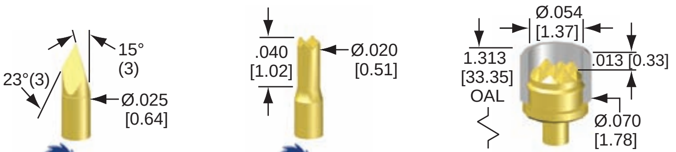
Current rating: 9.5 Amps (see page 83)

SPRING FORCE



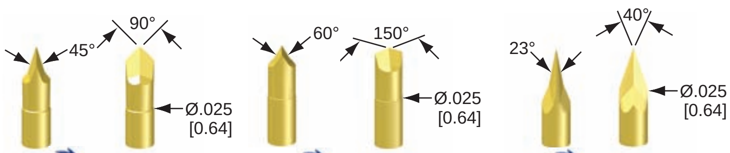


61 - Blade **71** - Blade **84** - Crown



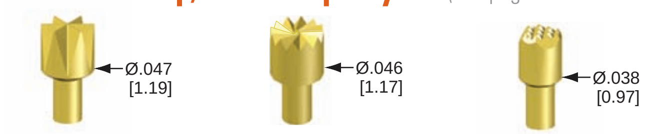
63 - Chisel **74** - Crown **99** - Insulator

Razor Sharp Tip Styles (See page 72 for more details)



6R - Razor **8R** - Razor **9R** - Razor

Solder Bump/Dome Tip Styles (see page 78 for more details)



16 - Flat Star **26** - Center Point Star **59** - Micro Serrated

46 - Flat Star **76** - Center Point Star **79** - Micro Serrated

Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG75

Socket Installation Tool: AT75-KIT or AT75M-KIT

Socket Installation Tool Preset: ITR075-FL or ITR075 SET .001 to .345 [0.03 to 8.75]

Socket Extraction Tool: ETR075-KIT (includes ITR075-FL & ETR075 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT100/75

Probe Extraction Tool: PE75 (not for use with headless point styles)

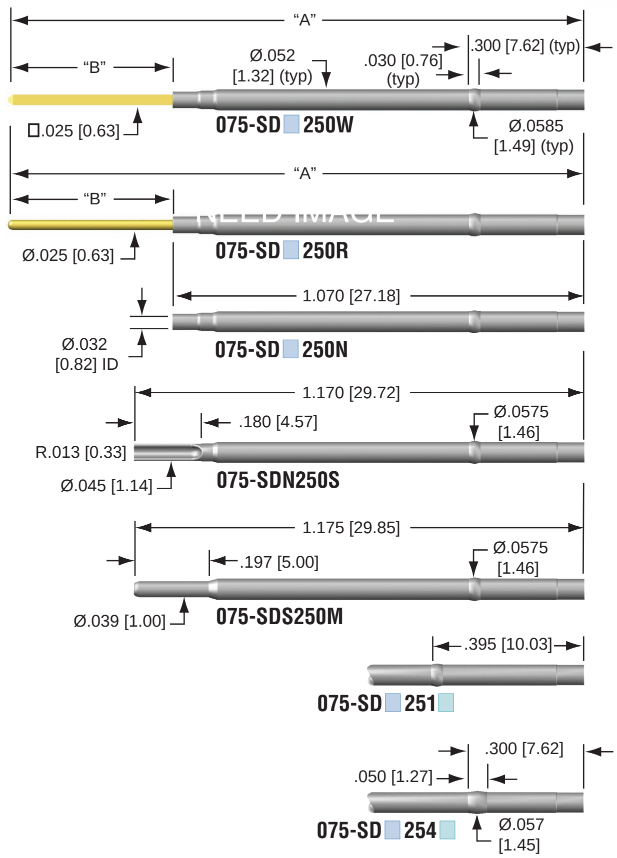
Damaged Probe Tube Extraction Tool: TERX50/075

Indicator Probes: IP075-2510 or IP075-2540

Socket Plugs: 075-SPR

Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .053/.055 [1.35/1.40], suggested drill sizes 1.35mm or #54.



SOCKETS

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 .300 [7.62]		
	1	Single press ring located at .395 [10.03] ④		
	4	Single extra long press ring ④		
	Letter	**Description**	**A in (mm)**	**B in (mm)**
TERMINATION	M	Male round tube ①⑤		
	N	No termination		
	S	Solder cup ①②③		
	R*	Round pin ③	1.480 [37.59]	.410 [10.41]
	R1*	Round pin ③	1.617 [41.07]	.547 [13.89]
	R3*	Round pin ③	1.286 [32.66]	.216 [5.49]
	R5*	Round pin ③	2.017 [51.23]	.947 [24.05]
	W*	Square wire wrap pin ③	1.499 [38.08]	.429 [10.90]
	W1*	Square wire wrap pin ②③	1.764 [44.81]	.694 [17.63]
	W2*	Square wire wrap pin ②③	2.114 [53.70]	1.044 [26.52]

* Pin material: Phosphor bronze/gold plated over nickel

Notes:
① Not available in 1 or 4 press ring
② Not available in G tube material
③ Not available in S tube material/finish
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

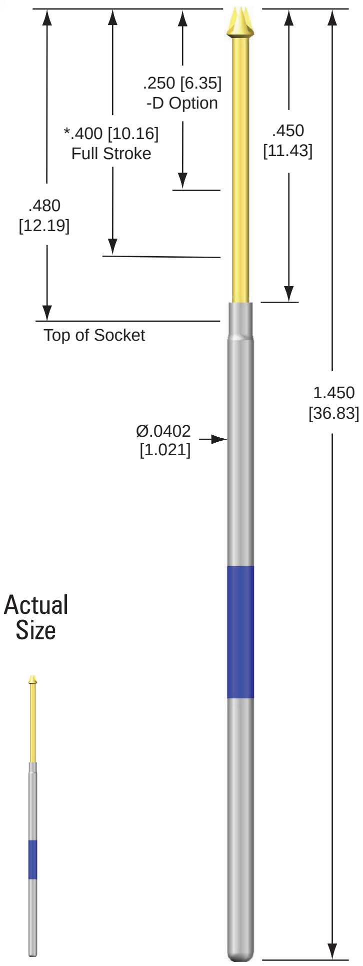
US Patent No. 4,885,539

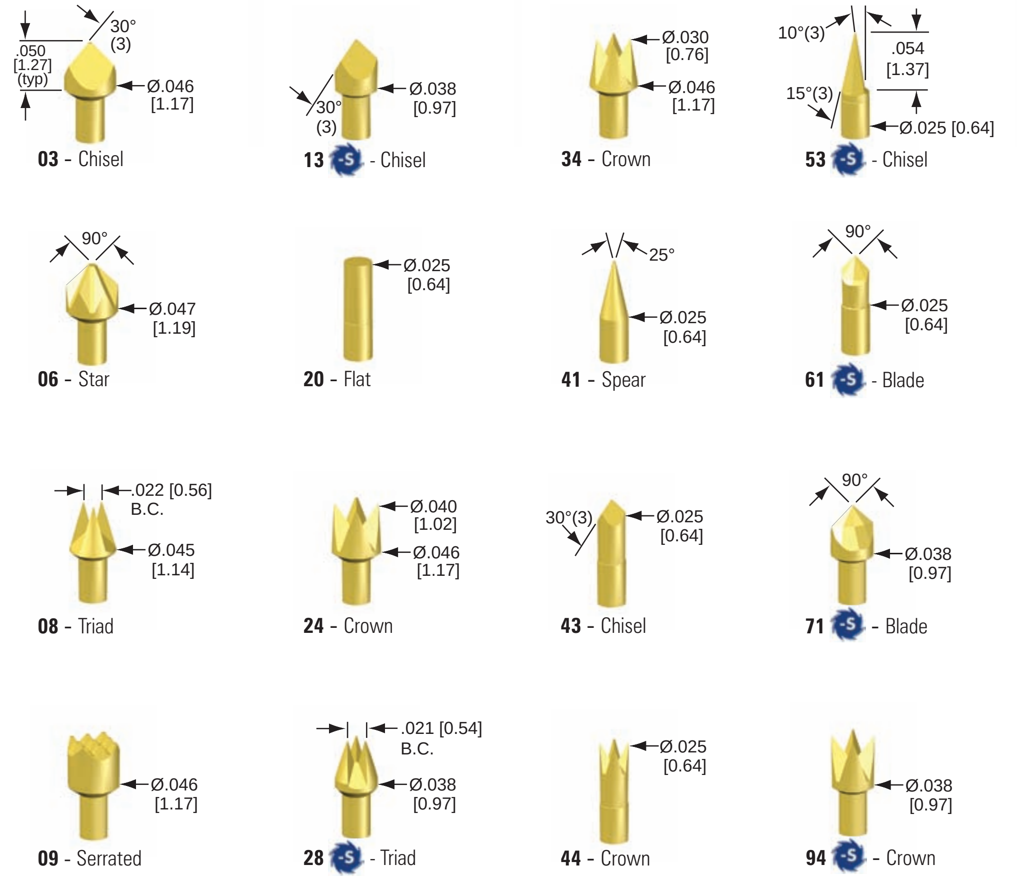
075-40 Series

.075 [1.91] Centers | .400 [10.16] Stroke

Designed for mixed height, loaded board testing.

Probe





PROBES

PROBE P/N: 075 - PR ▢ 40 ▢ ▢ ▢ - ▢

example: 075-PRP4003X

	Letter	Material/Finish	Average Resistance
TUBE	P	Nickel silver/ID precious metal clad	< 20 milliohms
	G	Nickel silver OD gold plated	< 25 milliohms
	N	Nickel silver/no finish	< 210 milliohms

	Digits	Material/Finish
POINT	See Points	Standard material is Heat treated BeCu/plated gold over nickel (see S option for steel plungers)

	Letter	Spring Force	Preload	@ .317 Stroke	Material	Mechanical Life (Cycles @ Stroke)
SPRING	X	Extra	1.2 [34]	4.3 [122]	Stainless Steel	500K min @ .317 [8.05] max
	U*	Ultra	4.1 [116]	9.3 [264]	Music wire	10K min @ .317 [8.05] max

	Letter	Description
OPTION	B	Curved tube (pylon replacement)
	D	Decreased stroke is .250 [6.35]. Must select from 075-25 series spring forces with this option.
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
	S	Heat treated steel/plated gold over nickel (see points for availability)
	(blank)	No option required

*0.350 [8.89] max stroke for U spring.

Probe Specifications

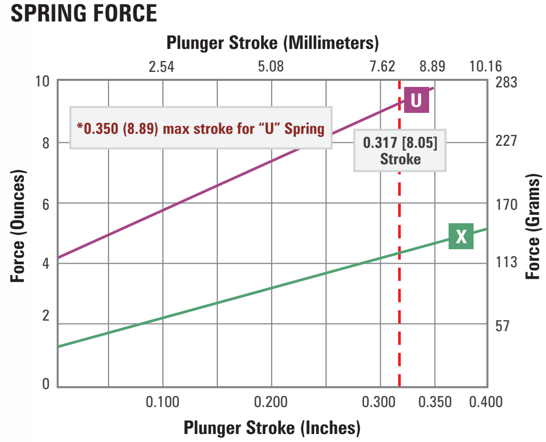
Full stroke: *.400 [10.16]

Working stroke: up to .317 [8.05]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 11.0 Amps (see page 83)

SPRING FORCE



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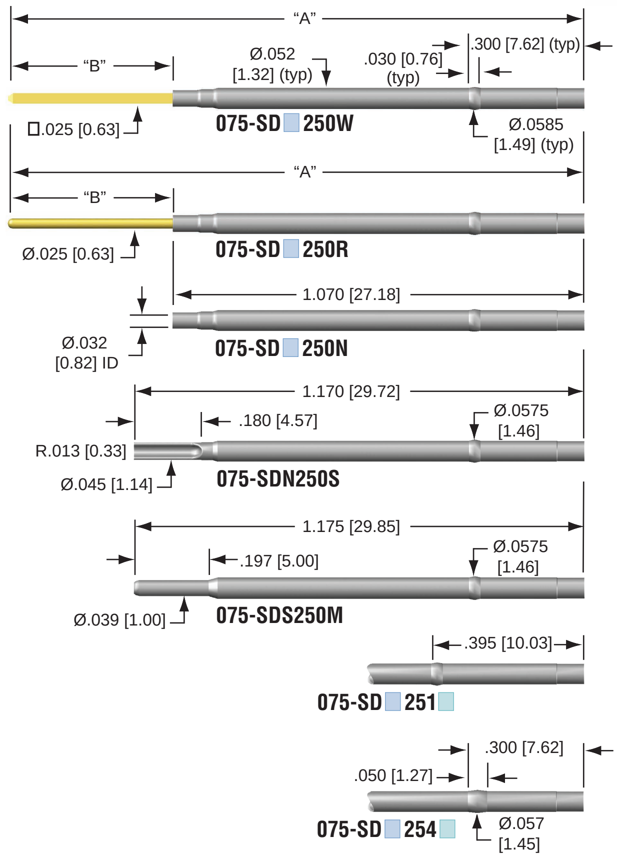
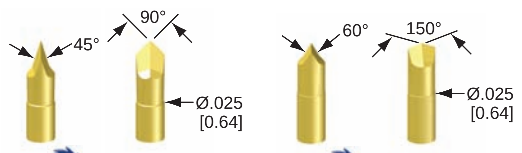
Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .053/.055 [1.35/1.40], suggested drill sizes 1.35mm or #54.



Razor Sharp Tip Styles (See page 72 for more details)



6R -S - Razor **8R** -S - Razor

Solder Bump/Dome Tip Styles (see page 78 for more details)

46 - Flat Star **76** - Center Point Star **79** - Micro Serrated

Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG75

Socket Installation Tool Adjustable: AT75-KIT or AT75M-KIT

Socket Installation Tool Preset: ITR075-FL or ITR075 SET .001 to .345 [0.03 to 8.76]

Socket Extraction Tool: ETR075-KIT (includes ITR075-FL & ETR075 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT100/75

Probe Extraction Tool: PE75 (not for use with headless point styles)

Damage Probe Tube Extraction Tool: TERX50/075

Socket Plug: 075-SPR

SOCKETS

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 .300 [7.62]		
	1	Single press ring located at .395 [10.03] ④		
	4	Single extra long press ring ④		
	Letter	**Description**	**A in (mm)**	**B in (mm)**
TERMINATION	M	Male round tube ①⑤		
	N	No termination		
	S	Solder cup ①②③		
	R*	Round pin ③	1.480 [37.59]	.410 [10.41]
	R1*	Round pin ③	1.617 [41.07]	.547 [13.89]
	R3*	Round pin ③	1.286 [32.66]	.216 [5.49]
	R5*	Round pin ③	2.017 [51.23]	.947 [24.05]
	W*	Square wire wrap pin ③	1.499 [38.08]	.429 [10.90]
	W1*	Square wire wrap pin ②③	1.764 [44.81]	.694 [17.63]
	W2*	Square wire wrap pin ②③	2.114 [53.70]	1.044 [26.52]

* Pin material: Phosphor bronze/gold plated over nickel

Notes:
① Not available in 1 or 4 press ring
② Not available in G tube material
③ Not available in S tube material/finish
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

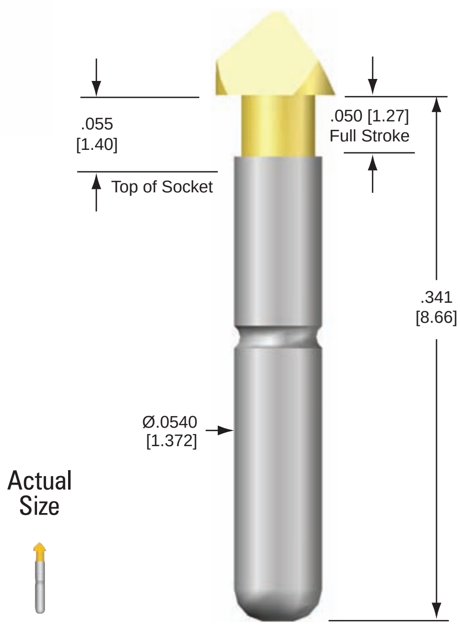
US Patent No. 4,885,533 & 4,597,622

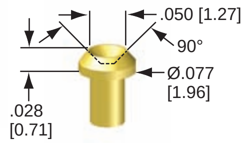
100-05 Series

.100 [2.54] Centers | .050 [1.27] Stroke

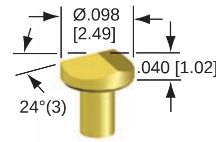
Designed for bare board testing.

Probe

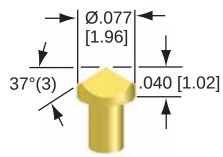




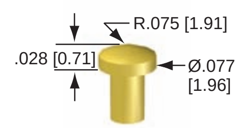
02 - Cup



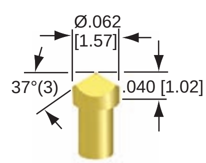
23 - Chisel
.120 [3.05] Min. Mounting Centers



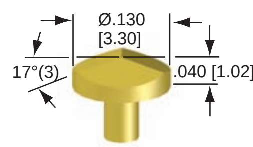
03 - Chisel



30 - Spherical



13 - Chisel



33 - Chisel
.150 [3.81] Min. Mounting Centers

PROBES

PROBE P/N: 100 - PL ■ 05 ■ ■ ■

example: 100-PLP0503L

	Letter	Material/Finish				Average Resistance
TUBE	P*	Nickel silver/ID precious metal clad				< 45 milliohms
	N	Nickel silver/no finish				< 65 milliohms
POINT	**Digits**	**Material/Finish**				
	See Points	Heat treated BeCu/plated gold over nickel				
SPRING	**Letter**	**Spring Force**	**Preload**	**Full Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
	L	Low	0.7 [20]	2.0 [57]	Stainless Steel	1M min @ .050 [1.27] max
	S	Standard	1.3 [37]	4.5 [128]	Music wire	1M min @ .050 [1.27] max
	H	High	2.7 [77]	6.5 [184]	Stainless Steel	1M min @ .050 [1.27] max

* P tube has Ø.016 [0.41] hole in end for identification only.

Probe Specifications

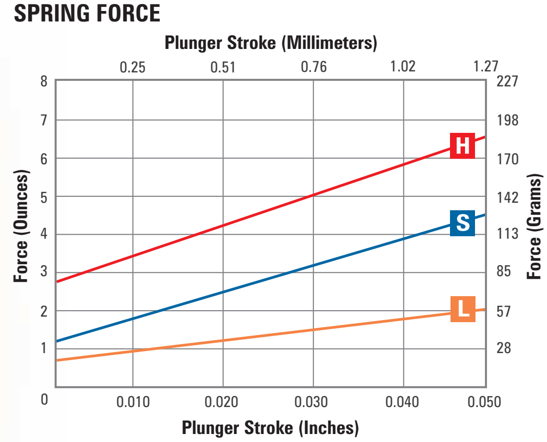
Full stroke: .050 [1.27]

Working stroke: Up to .050 [1.27]

Operating temp.: Up to 250°F [120°C];
Up to 400°F [204°C] for (L&H) Stainless Steel Springs

Current rating: 13.5 Amps (see page 83)

SPRING FORCE



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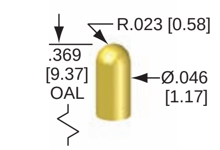
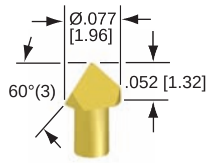
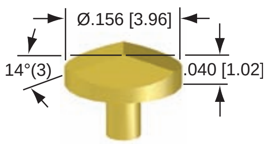


40 - Spherical



63 - Chisel

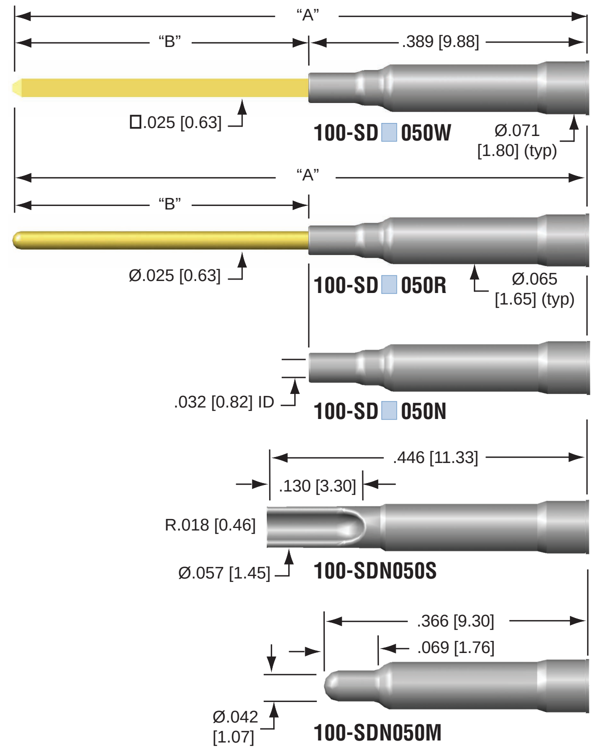


53 - Chisel
.175 [4.45] Min. Mounting Centers

Tip Style	Head Length	Overall Probe Length
02	.028 [0.71]	.369 [9.37]
03	.040 [1.02]	.381 [9.68]
13	.040 [1.02]	.381 [9.68]
23	.040 [1.02]	.381 [9.68]
30	.028 [0.71]	.369 [9.37]
33	.040 [1.02]	.381 [9.68]
40	–	.369 [9.37]
53	.040 [1.02]	.381 [9.68]
63	.052 [1.32]	.393 [9.98]

Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .067/.069 [1.70/1.75], suggested drill sizes #51 or 1.75mm.



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG100
Socket Installation Tool: ITR100-FL
Socket Extraction Tool: ETR100
Probe Installation Tool: PT100/75

SOCKETS

SOCKET P/N: 100 - SD□050□
example: 100-SDN050S

	Letter	Material/Finish		
TUBE	G	Nickel silver/OD gold plated		
TUBE	N	Nickel silver/no finish		
	Letter	**Description**	**A in (mm)**	**B in (mm)**
TERMINATION	M	Male round tube ①		
TERMINATION	N	No termination		
TERMINATION	S	Solder cup ①		
TERMINATION	R*	Round pin	.799 [20.29]	.410 [10.41]
TERMINATION	R1*	Round pin	.936 [23.77]	.547 [13.89]
TERMINATION	R3*	Round pin	.605 [15.37]	.216 [5.49]
TERMINATION	R5*	Round pin	1.336 [33.93]	.947 [24.05]
TERMINATION	W*	Square wire wrap pin	.818 [20.78]	.429 [10.90]
TERMINATION	W1*	Square wire wrap pin ①	1.083 [27.51]	.694 [17.63]
TERMINATION	W2*	Square wire wrap pin ①	1.433 [36.40]	1.044 [26.52]
TERMINATION	W5*	Square wire wrap pin ①	.889 [22.58]	.500 [12.70]

* Pin material: Phosphor bronze/gold plated over nickel

Notes: ① Not available in G tube material

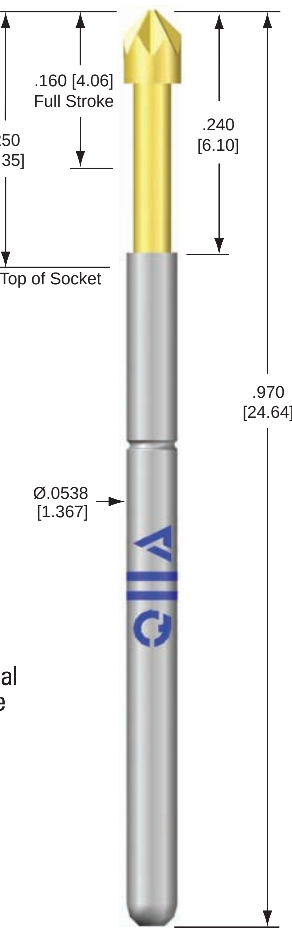
US Patent No. 4,885,533

100-16 Series

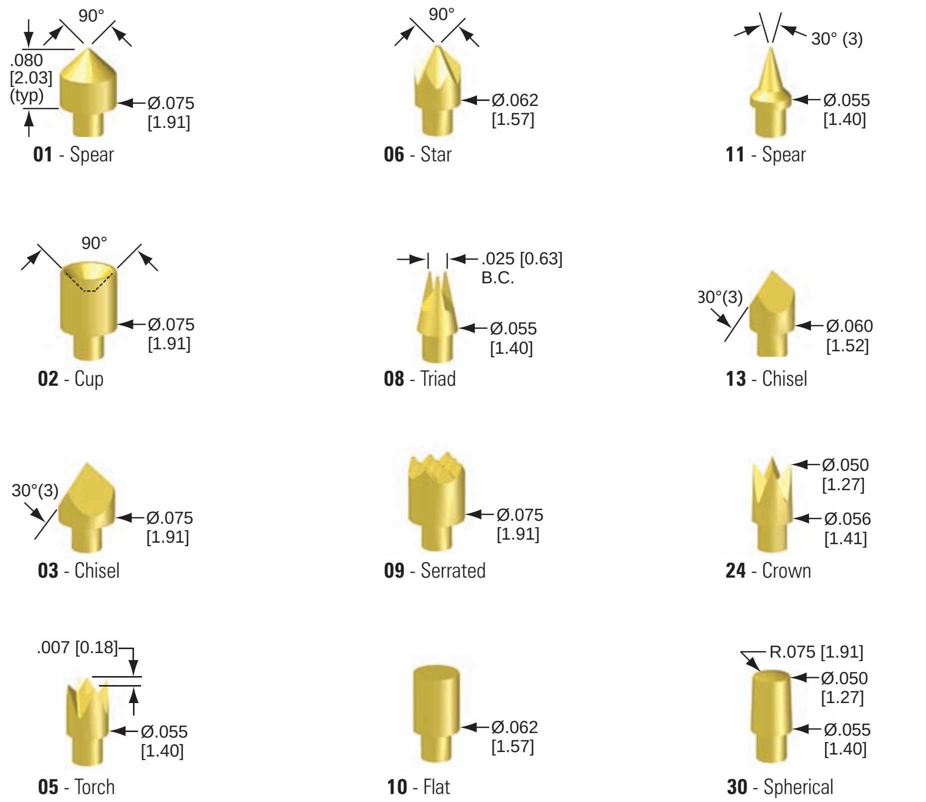
.100 [2.54] Centers | .160 [4.06] Stroke

Designed for bare and loaded board testing.

Probe



Actual Size



PROBES

PROBE P/N: 100 - PL ▢ 16 ▢ ▢ ▢ - ▢

example: 100-PLP1603L-B

	Letter	Material/Finish				Average Resistance
TUBE	P	Nickel silver/ID precious metal clad				< 20 milliohms
	G	Nickel silver/OD gold plated				< 25 milliohms
	N	Nickel silver/no finish				< 45 milliohms
	Digits	**Material/Finish**				
POINT	See Points	Heat treated BeCu/plated gold over nickel				
	Letter	**Spring Force**	**Preload**	**@ 2/3 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
SPRING	L	Low	0.7 [20]	1.5 [43]	Music wire	1M min @ .107 [2.72] max
	S	Standard	1.4 [40]	3.5 [99]	Music wire	1M min @ .107 [2.72] max
	H	High	2.2 [62]	5.5 [156]	Music wire	1M min @ .107 [2.72] max
	X	Extra	3.0 [85]	8.0 [227]	Music wire	1M min @ .107 [2.72] max
	U	Ultra	4.5 [127]	10.0 [283]	Music wire	250K min @ .107 [2.72] max
	Letter	**Description**				
OPTION	B	Curved tube (pylon replacement)				
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				
	(blank)	No option required				

Probe Specifications

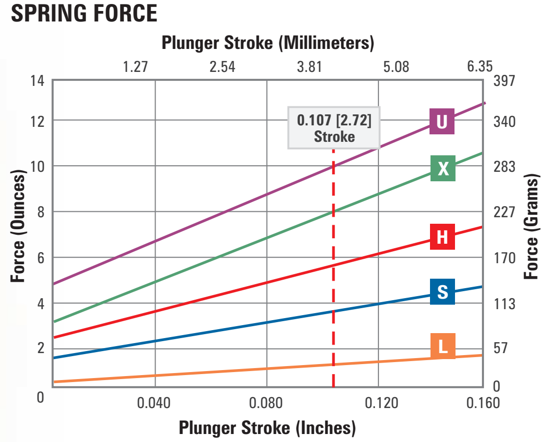
Full stroke: .160 [4.06]

Working stroke: up to .107 [2.72]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 12.0 Amps (see page 83)

SPRING FORCE



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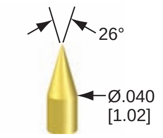
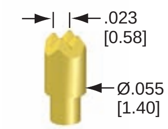
Sockets

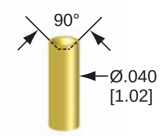
Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .067/.069 [1.70/1.75], suggested drill sizes #51 or 1.75mm.



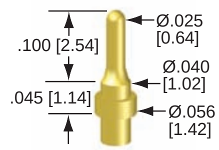
41 - Spear



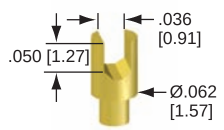
64 - Crown



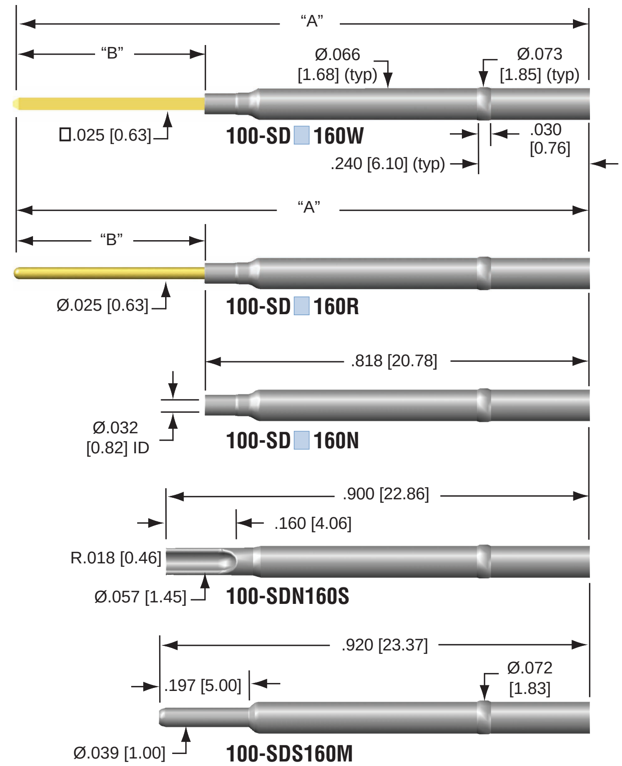
42 - Cup



70 - Connector
.095 [2.41] Full Stroke



62 - Slotted



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG100

Socket Installation Tool Adjustable: AT100-KIT or AT100M-KIT

Socket Installation Tool Preset: ITR100-FL or ITR100 SET
.001 to .190 [0.03 to 4.83]

Socket Extraction Tool: ETR100-KIT (includes ITR100-FL & ETR100 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT100/75

Probe Extraction Tool: PE100 (not for use with headless point styles)

Damaged Probe Tube Extraction Tool: TERX75/100

SOCKETS

SOCKET P/N: 100 - SD□160□

example: 100-SDG160R

	Letter	Material/Finish		
TUBE	G	Nickel silver/OD gold plated ⑤		
TUBE	N	Nickel silver/no finish		
TUBE	S	Stainless Steel/no finish ③		
	Letter	**Description**	**A in (mm)**	**B in (mm)**
TERMINATION	M	Male round tube ④		
TERMINATION	N	No termination ②		
TERMINATION	S	Solder cup ①②		
TERMINATION	R*	Round pin ②	1.228 [31.19]	.410 [10.41]
TERMINATION	R1*	Round pin ②	1.365 [34.67]	.547 [13.89]
TERMINATION	R3*	Round pin ②	1.034 [26.26]	.216 [5.49]
TERMINATION	R5*	Round pin ②	1.765 [44.83]	.947 [24.05]
TERMINATION	W*	Square wire wrap pin ②	1.247 [31.67]	.429 [10.90]
TERMINATION	W1*	Square wire wrap pin ①②	1.512 [38.40]	.694 [17.63]
TERMINATION	W2*	Square wire wrap pin ①②	1.862 [47.29]	1.044 [26.52]

* Pin material: Phosphor bronze/gold plated over nickel

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

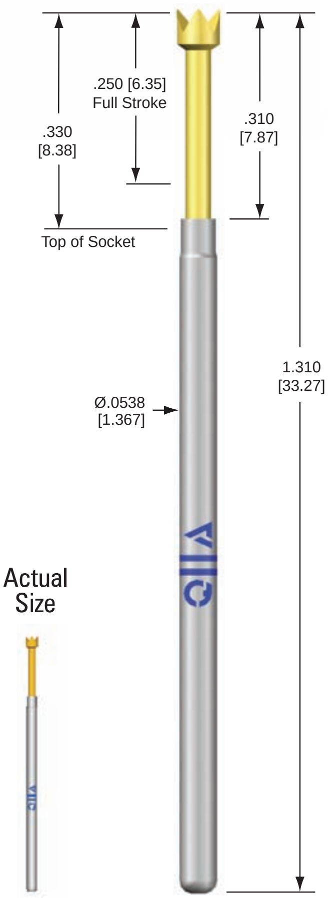
US Patent No. 4,885,533

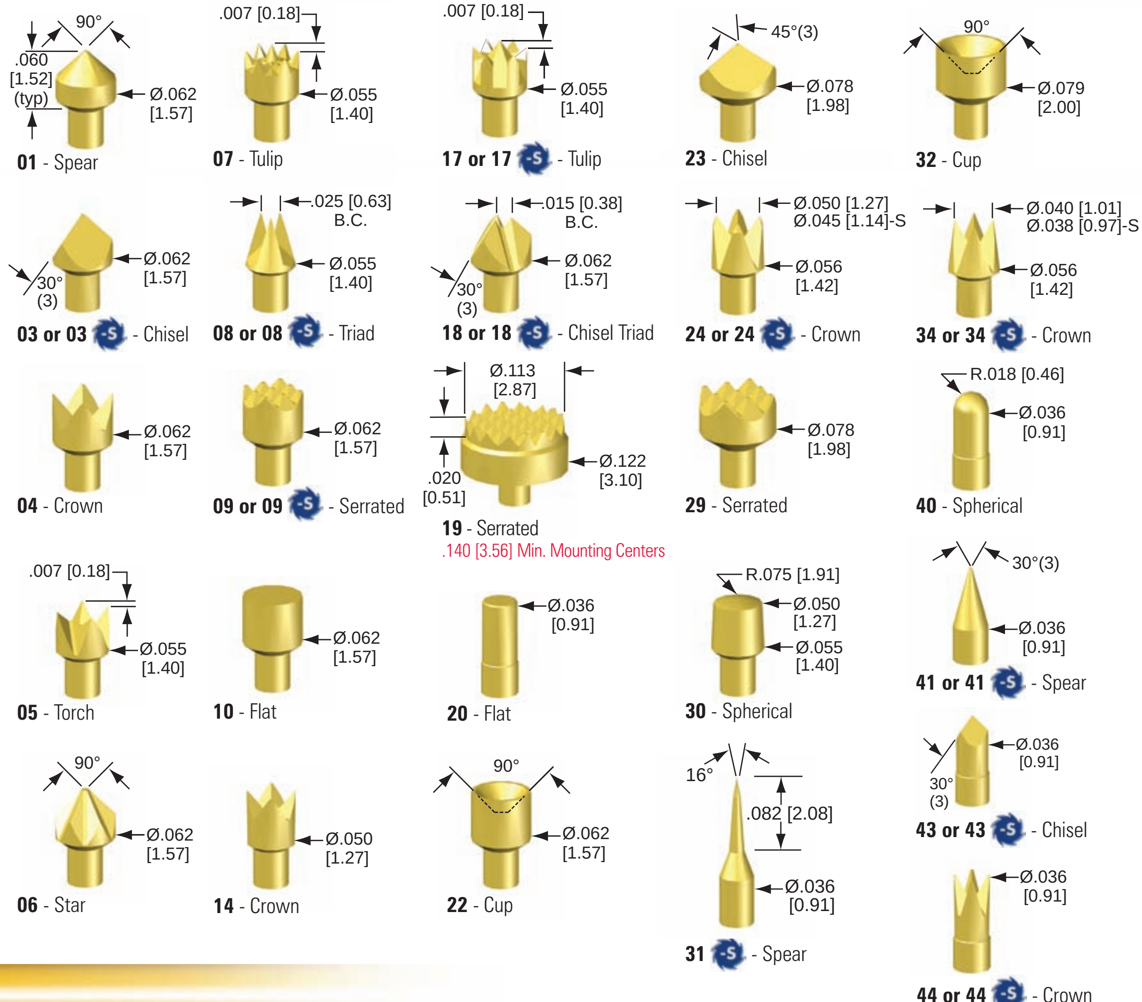
100-25 Series

.100 [2.54] Centers | .250 [6.35] Stroke

Designed for loaded board testing.

Probe





PROBES

PROBE P/N: 100 - PR ▢ 25 ▢ ▢ ▢ - ▢

example: 100-PRH2509S

TUBE

Letter	Material/Finish	Average Resistance
P	Nickel silver/ID precious metal clad	< 15 milliohms
G	Nickel silver OD gold plated	< 15 milliohms
N	Nickel silver/no finish	< 165 milliohms
H	High conductivity proprietary alloy/gold plated	< 10 milliohms
F	Nickel silver/ID precious metal clad. Oversized tube .0542 [1.377] OD (Factron Replacement)	< 20 milliohms

POINT

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

SPRING

Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
L	Low	1.3 [37]	3.5 [99]	Stainless Steel	1M min @ .167 [4.24] max
S	Standard	1.6 [45]	5.5 [156]	Music wire	1M min @ .167 [4.24] max
H	High	2.6 [74]	6.5 [184]	Music wire	1M min @ .167 [4.24] max
Y	Elevated	2.3 [65]	8.1 [230]	Music wire	1M min @ .167 [4.24] max
X	Extra	3.6 [102]	10.8 [306]	Music wire	1M min @ .167 [4.24] max
U	Ultra	3.3 [94]	17.1 [485]	Music wire	100K min @ .167 [4.24] max
	High Preload Spring — *Available in 43-S, 44-S, 61-S, 63-S, 6R-S. 8R-S & 9R-S point styles and PRP tube material only.*				
E	High Preload	6.0 [170]	8.0 [227]	Stainless Steel	1M min @ .167 [4.24] max

OPTION

Letter	Description
B	Curved tube (pylon replacement)
N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
S	S Heat treated steel/plated gold over nickel (see points for availability)
(blank)	No option required

Probe Specifications

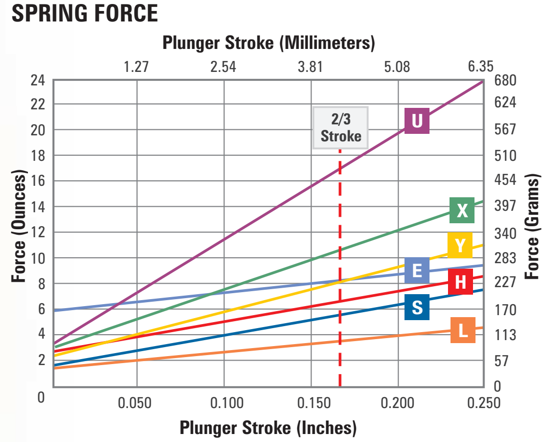
Full stroke: .250 [6.35]

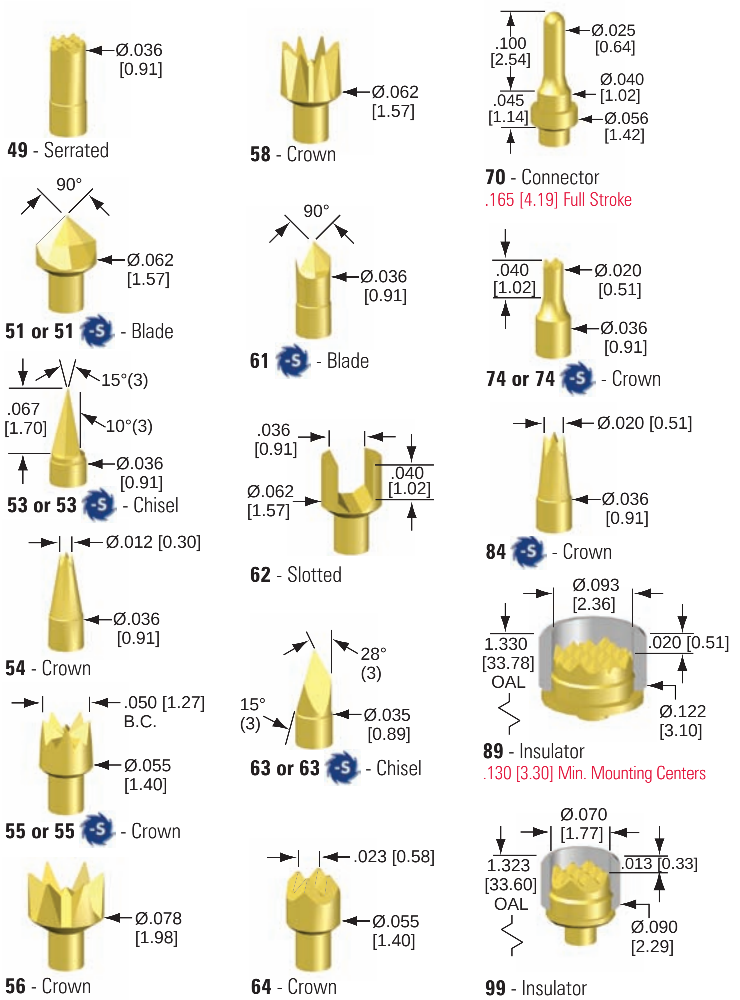
Working stroke: up to .167 [4.24]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 12.0 Amps (For H tube, 20.0 Amps) (see page 83)

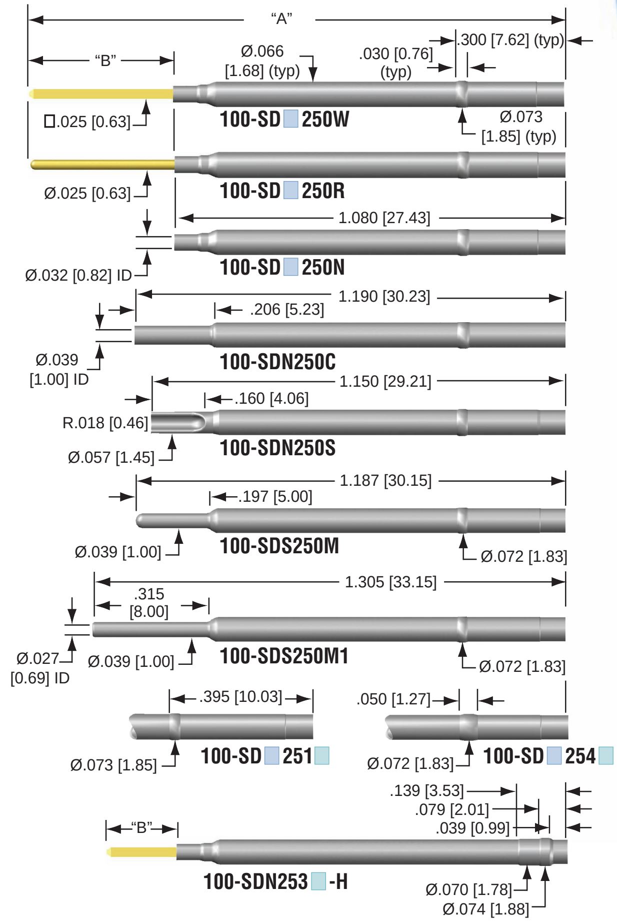
SPRING FORCE



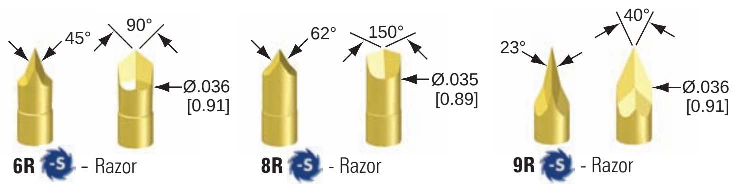


Sockets

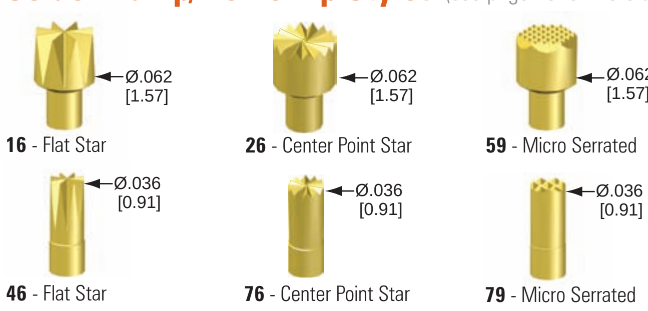
Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .067/.069 [1.70/1.75], suggested drill sizes #51 or 1.75mm.



Razor Sharp Tip Styles (See page 72 for more details)



Solder Bump/Dome Tip Styles (see page 78 for more details)



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG100 • **Socket Installation Tool Adjustable:** AT100-KIT or AT100M-KIT

Socket Installation Tool Preset: ITR100-FL or ITR100 SET .001 to .345 [0.03 to 8.76]

Socket Extraction Tool: ETR100-KIT (includes ITR100-FL & ETR100 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT100/75

Probe Extraction Tool: PE100 (not for use with headless point styles)

Damaged Probe Tube Extraction Tool: TERX75/100

Indicator Probes: IP100-2510 or IP100-2540 • **Socket Plugs:** 100-SPR

SOCKETS

SOCKET P/N: 100-SD▢25▢▢-▢

example: 100-SDN250W

	Letter	Material/Finish		
TUBE	G	Nickel silver/OD gold plated ⑦⑨		
	H	High conductivity alloy/ID & OD precious metal clad ④⑤⑦		
	N	Nickel silver/no finish		
	S	Stainless Steel/no finish ①④⑦		
PRESS RING	**Digit**	**Description**		
	0	Single press ring located at .300 [7.62]		
	1	Single press ring located at .395 [10.03] ⑤⑦⑧		
	3	Single press ring located at .139 [3.53] ⑤⑪		
	4	Single extra long press ring ⑤⑦⑧		
TERMINATION	**Letter**	**Description**	**A in (mm)**	**B in (mm)**
	C	Crimp ②④⑦⑧		
	M	Male round tube ③④⑦		
	M1	Male round tube ③④⑦		
	N	No termination ②		
	S	Solder cup ④⑥⑦⑧⑩		
	R*	Round pin	1.490 [37.85]	.410 [10.41]
	R1*	Round pin	1.627 [41.33]	.547 [13.89]
	R3*	Round pin	1.296 [32.92]	.216 [5.49]
	R5*	Round pin	2.027 [51.49]	.947 [24.05]
	W*	Square wire wrap pin	1.509 [38.33]	.429 [10.90]
	W1*	Square wire wrap pin ⑥	1.774 [45.06]	.694 [17.63]
	W2*	Square wire wrap pin ⑥	2.124 [53.95]	1.044 [26.52]
	W3*	Square wire wrap pin	1.244 [31.60]	.164 [4.17]
OPTION	**Letter**	**Description**		
	H	High force probe indent ④⑤⑥⑧		
	(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

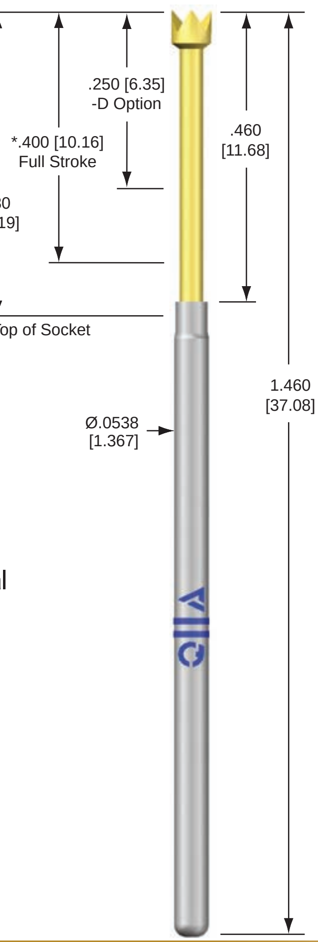
US Patent No. 4,885,533

100-40 Series

.100 [2.54] Centers | .400 [10.16] Stroke

Designed for mixed height, loaded board testing.

Probe



Actual Size

PROBES

PROBE P/N: 100 - PR ▢ 40 ▢ ▢ ▢ - ▢

example: 100-PRP4003L - B

	Letter	Material/Finish	Average Resistance
TUBE	P	Nickel silver/ID precious metal clad	< 20 milliohms
	G	Nickel silver OD gold plated	< 20 milliohms
	N	Nickel silver/no finish	< 375 milliohms
	H	High conductivity proprietary alloy/gold plated	< 15 milliohms
	F	Nickel silver/ID precious metal clad. Oversized tube .0542 [1.377] OD (factron replacement)	< 20 milliohms

	Digits	Material/Finish
POINT	See Points	Heat treated BeCu/plated gold over nickel (see S option for steel plungers)

	Letter	Spring Force	Preload	@ .317 Stroke	Material	Mechanical Life (Cycles @ Stroke)
SPRING	L	Low	0.8 [23]	3.0 [85]	Music wire	1M min @ .317 [8.05] max
	X	Extra	1.5 [43]	5.7 [162]	Stainless Steel	500K min @ .317 [8.05] max
	U*	Ultra	4.5 [128]	8.1 [230]	Music wire	10K min @ .317 [8.05] max

	Letter	Description
OPTION	B	Curved tube (pylon replacement)
	D	Decreased stroke is .250 [6.35]. Must select from 100-25 series spring forces with this option.
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
	S	Heat treated steel/plated gold over nickel (see points for availability)
	(blank)	No option required

*0.350 [8.89] max stroke for U spring.

Probe Specifications

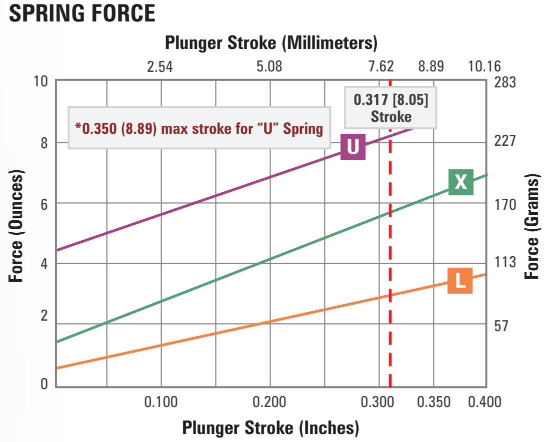
Full stroke: *.400 [10.16]

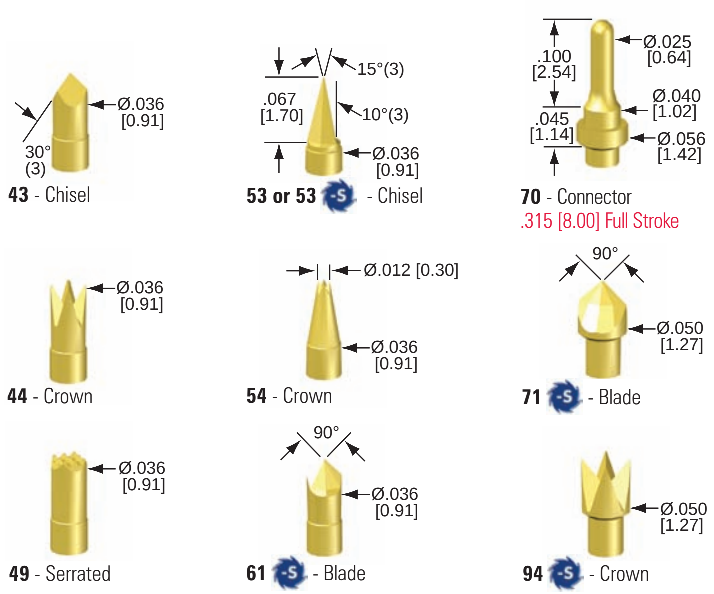
Working stroke: up to .317 [8.05]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

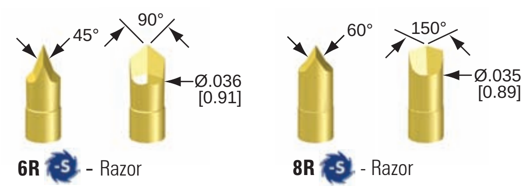
Current rating: 12.0 Amps (For H tube, 21.0 Amps) (see page 83)

SPRING FORCE





Razor Sharp Tip Styles (See page 72 for more details)



Solder Bump/Dome Tip Styles (see page 78 for more details)

Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG100

Socket Installation Tool Adjustable: AT100-KIT or AT100M-KIT

Socket Installation Tool Preset: ITR100-FL or ITR100 SET .001 to .345 [0.03 to 8.76]

Socket Extraction Tool: ETR100-KIT (includes ITR100-FL & ETR100 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT100/75

Probe Extraction Tool: PE100 (not for use with headless point styles)

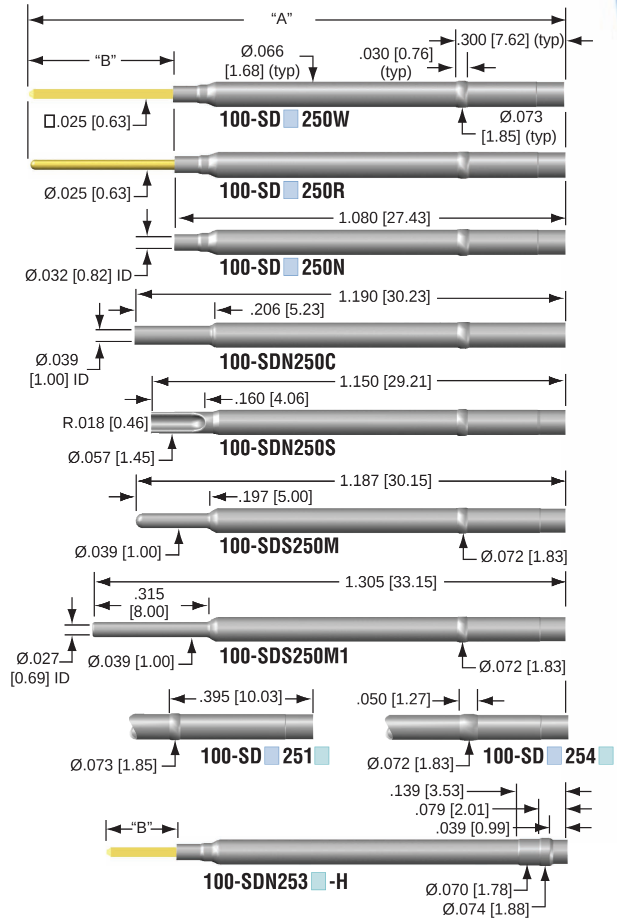
Damaged Probe Tube Extraction Tool: TERX75/100

Indicator Probes: IP100-4010 or IP100-4040

Socket Plugs: 100-SPR

Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .067/.069 [1.70/1.75], suggested drill sizes #51 or 1.75mm.



SOCKETS

SOCKET P/N: 100-SD 25 -

example: 100-SDN250W

	Letter	Material/Finish		
TUBE	G	Nickel silver/OD gold plated ⑦⑨		
	H	High conductivity alloy/ID & OD precious metal clad ④⑤⑦		
	N	Nickel silver/no finish		
	S	Stainless Steel/no finish ①④⑦		
PRESS RING	**Digit**	**Description**		
	0	Single press ring located at .300 [7.62]		
	1	Single press ring located at .395 [10.03] ⑤⑦⑧		
	3	Single press ring located at .139 [3.53] ⑤⑪		
	4	Single extra long press ring ⑤⑦⑧		
TERMINATION	**Letter**	**Description**	**A in (mm)**	**B in (mm)**
	C	Crimp ②④⑦⑧		
	M	Male round tube ③④⑦		
	M1	Male round tube ③④⑦		
	N	No termination ②		
	S	Solder cup ④⑥⑦⑧⑩		
	R*	Round pin	1.490 [37.85]	.410 [10.41]
	R1*	Round pin	1.627 [41.33]	.547 [13.89]
	R3*	Round pin	1.296 [32.92]	.216 [5.49]
	R5*	Round pin	2.027 [51.49]	.947 [24.05]
	W*	Square wire wrap pin	1.509 [38.33]	.429 [10.90]
	W1*	Square wire wrap pin ⑥	1.774 [45.06]	.694 [17.63]
	W2*	Square wire wrap pin ⑥	2.124 [53.95]	1.044 [26.52]
	W3*	Square wire wrap pin	1.244 [31.60]	.164 [4.17]
OPTION	**Letter**	**Description**		
	H	High force probe indent ④⑤⑥⑧		
	(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

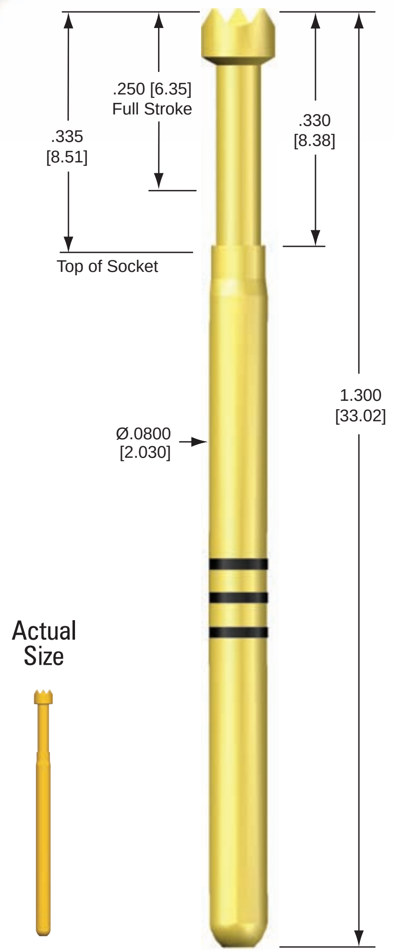
US Patent No. 4,885,533

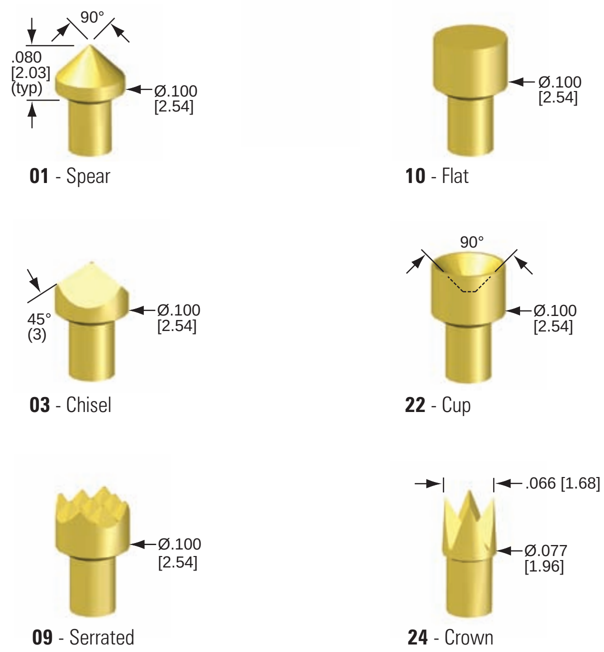
125-25 Series

.125 [3.17] Centers | .250 [6.35] Stroke

Designed for loaded board testing.

Probe





PROBES

PROBE P/N: 125 - PR▢25▢▢▢-▢

example: 125-PRH2509S

	Letter	Material/Finish				Average Resistance
TUBE	G	Nickel silver/OD gold plated				< 15 milliohms
	H	High conductivity proprietary alloy/gold plated				< 10 milliohms
POINT	**Digits**	**Material/Finish**				
	See Points	Heat treated BeCu/plated gold over nickel (see S option for steel plungers)				
SPRING	**Letter**	**Spring Force**	**Preload**	**@ 2/3 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
	L	Low	1.9 [54]	4.5 [128]	Stainless Steel	1M min @ .167 [4.24] max
	S	Standard	2.2 [62]	7.0 [198]	Stainless Steel	1M min @ .167 [4.24] max
	H	High	3.7 [105]	12.0 [340]	Stainless Steel	1M min @ .167 [4.24] max
	Y	Elevated	4.4 [125]	18.0 [510]	Stainless Steel	100K min @ .167 [4.24] max
OPTION	**Letter**	**Description**				
	B	Curved tube (pylon replacement)				
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				
	(blank)	No option required				

Probe Specifications

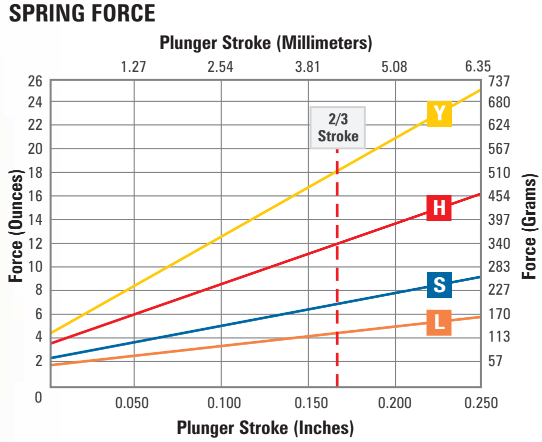
Full stroke: .250 [6.35]

Working stroke: up to .167 [4.24]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 17.0 Amps (For H tube, 20.0 Amps) (see page 83)

SPRING FORCE



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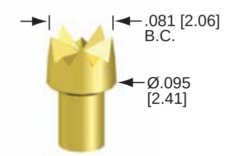
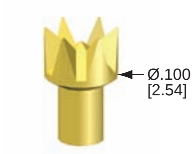
40 - Spherical



55 - Crown

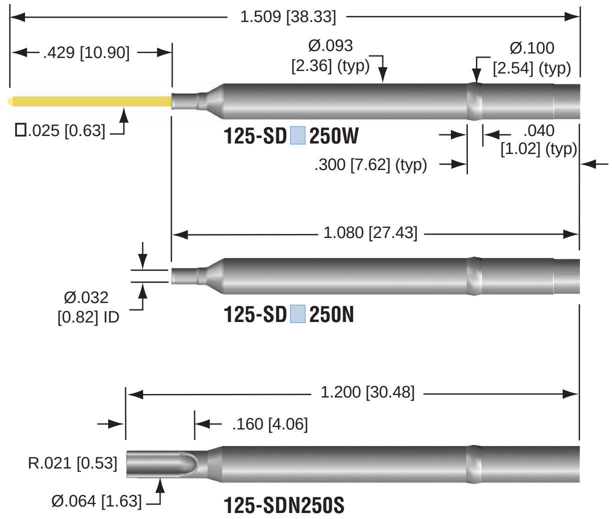
41 - Spear



56 - Crown

Sockets

Mounting holes in AT7000, G10/FR4 or similar materials should be gauged at .094/.096 [2.39/2.44], suggested drill sizes 2.4mm or #41.



Tools & Accessories (see pages 66 & 67)

Socket Installation Tool: ITR125-FL or ITR125 SET .001 to .250 [0.03 to 6.35]

Socket Extraction Tool: ETR125-KIT (includes ITR125-FL & ETR125 – sockets must be FLUSH before extraction)

Probe Installation Tool: PT100/75

SOCKETS

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
	Letter	**Description**
TERMINATION	N	No termination
	S	Solder cup ①
	W*	Square wire wrap pin

Notes: ① Not available in G tube material
② Not available in S termination
* Pin material: Phosphor bronze/gold plated over nickel

US Patent No. 4,659,987 & 4,597,662

Double-Ended Sockets

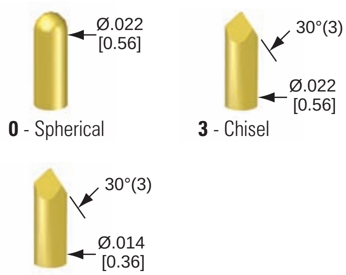
Designed for mixed height, loaded board testing.

Sockets

Double-ended sockets are comprised of a standard socket with a special interface probe permanently attached to the tail of the socket. Double-ended 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 double-ended sockets and should be ordered separately (see applicable product series).

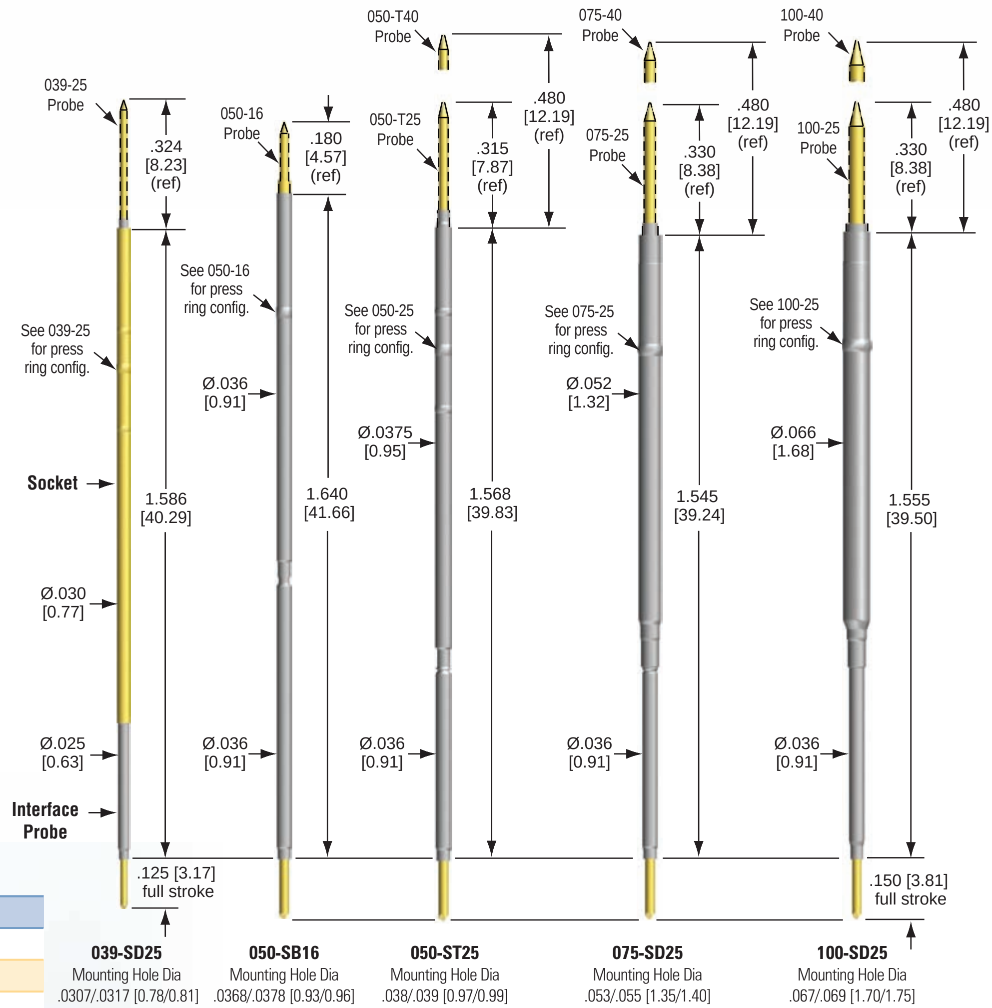
Interface Probe Point Styles



0 - Spherical

3 - Chisel

3 - Chisel (for 039-SDC255DS3 only)



SOCKETS

PART NUMBER: 039-SDC255DS3

	Letter	Material/Finish
TUBE	C	Heat treated BeCu/gold plated over nickel
TIP STYLE	**Digits**	**Material/Finish**
	3	Chisel. Heat treated BeCu/gold plated over nickel

050-SBB16 DS

example: 050-SBB160DS3

	Letter	Material/Finish
TUBE	B	Heat treated BeCu/nickel clad ID/OD
PRESS RING	**Digits**	**Press Ring**
	0	Single press ring located at .310 [7.87]
	1	Single press ring located at .400 [10.16]
	2	Double press ring located at .434 [11.02]
	3	Double press ring located at .524 [13.31]
STYLE	**Digits**	**Material/Finish**
	0	Spherical. Heat treated BeCu/gold plated over nickel
	3	Chisel. Heat treated BeCu/gold plated over nickel

050-STB255DS

example: 050-STB255DS3

	Letter	Material/Finish
TUBE	B	Heat treated BeCu/nickel plated
STYLE	**Digits**	**Material/Finish**
	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

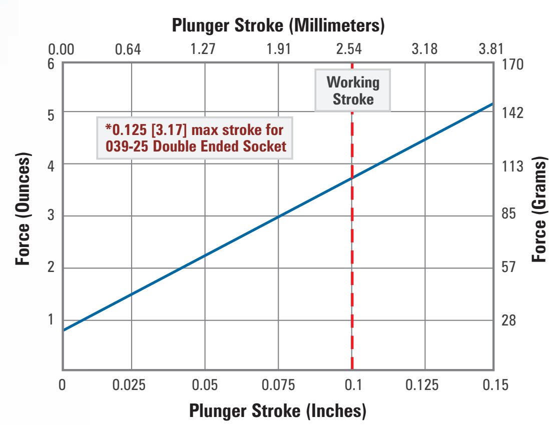
Full stroke: .125 [3.18] for 039-25 • .150 [3.81] for all others

Working stroke: Up to .100 [2.54]

Operating temp.: Up to 250°F [120°C] for 039-25 • Up to 400°F [204°C] for all others

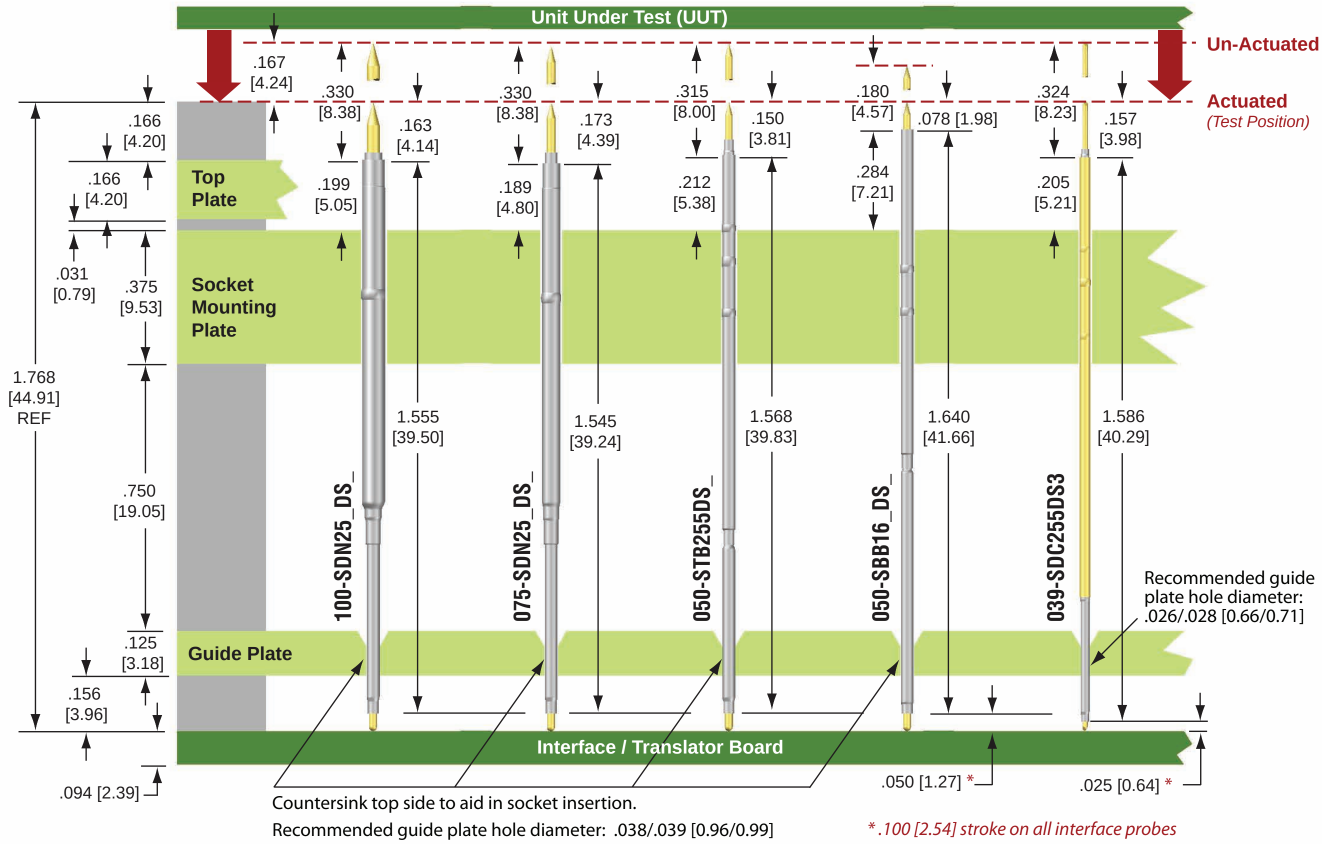
SPRING FORCE

	Preload	Full stroke	Working Stroke	Material	Mechanical Life (Cycles @ stroke)
039-25	0.75 [21]	4.5 [125]	3.85 [109]	Music wire/gold plated	10K min @ .100 [25.4] max
All Others	0.82 [23]	5.22 [147]	3.75 [106]	Stainless Steel/gold plated	100K min @ .100 [25.4] max



Direct Sales **(603) 926-0348** • Support (603) 926-1193 • Fax (603) 926-8701 • Email: sales@qatech.com • **www.qatech.com**

Suggested Mix Mounting Fixture (see page 103 for more details)



Tools & Accessories (see pages 66 & 67)

100-25 Socket

Installation Tool: AT100-KIT or AT100M-KIT adjustable tools or preset ITR100-FL or ITR100 SET .001 to .345 [0.03 to 8.76]

Extraction Tool: ETR100-KIT (includes ITR100-FL & ETR100 – sockets must be FLUSH before extraction)

075-25 Socket

Installation Tool: AT75-KIT or AT75M-KIT adjustable tools or preset ITR075-FL or ITR075 SET .001 to .345 [0.03 to 8.76]

Extraction Tool: ETR075-KIT (includes ITR075-FL & ETR075 – sockets must be FLUSH before extraction)

050-25 Socket

Installation Tool: AT50-KIT or AT50M-KIT adjustable tools or preset ITR050-FL or ITR050-25 SET .001 to .270 [0.03 to 6.86]

Extraction Tool: ETR050-25-KIT (includes ITR050-FL & ETR050-25 – sockets must be FLUSH before extraction)

050-16 Socket

Installation Tool: AT50-KIT or AT50M-KIT adjustable tools or preset ITR050-FL or ITR050-16 SET .001 to .360 [0.03 to 9.14]

Extraction Tool: ETR050-16-KIT (includes ITR050-FL & ETR050-16 – sockets must be FLUSH before extraction)

039-16 Socket

Installation Tool: ITR039-FL or ITR039 SET .001 to .320 [0.03 to 8.13]

Extraction Tool: ETR039-KIT (includes ITR039-FL & ETR039 – sockets must be set FLUSH before extraction)

SOCKETS

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 .300 [7.62]
	1	Single press ring located at .395 [10.03]
	4	Single extra long press ring located at .300 [7.62]
STYLE	Digits	Material/Finish
	0	Spherical. Heat treated BeCu/gold plated over nickel
	3	Chisel. Heat treated BeCu/gold plated over nickel

100 - SDN25 DS
example: 100-SDN250DS3

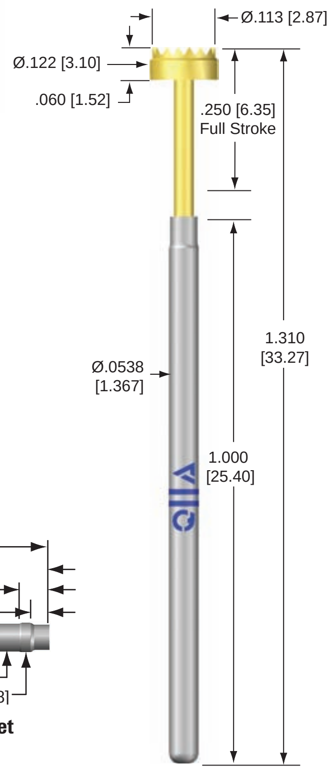
TUBE	Letter	Material/Finish
	N	Nickel silver/no finish
PRESS RING	Digits	Press Ring
	0	Single press ring located at .300 [7.62]
	1	Single press ring located at .395 [10.03]
	4	Single extra long press ring located at .300 [7.62]
STYLE	Digits	Material/Finish
	0	Spherical. Heat treated BeCu/gold plated over nickel
	3	Chisel. Heat treated BeCu/gold plated over nickel

Interface Probes

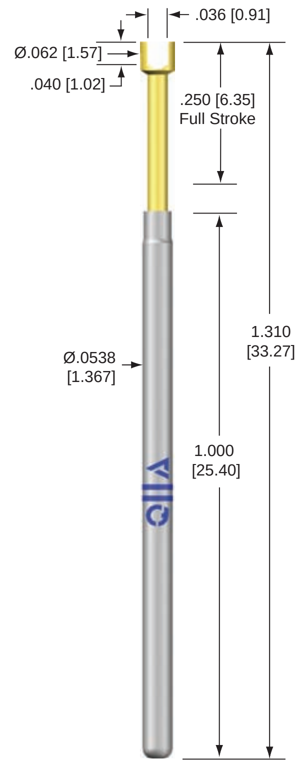
Designed for mixed height, loaded board testing.

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.

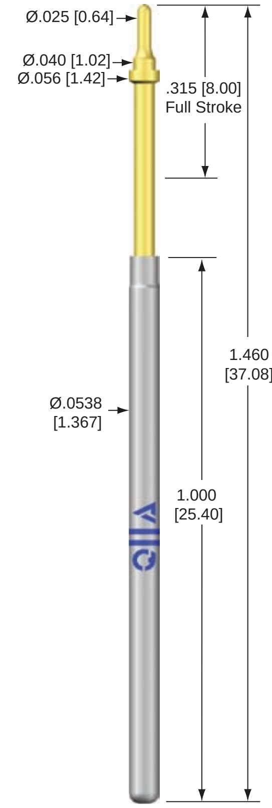
AGILENT – 100-PRP2519L

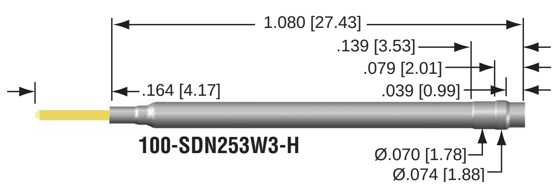


AGILENT – 100-PRP2562L



AGILENT – 100-PRP4070L





Socket for Polarity Check and Test Jet

Agilent Technologies	QA Part Number
All 3070 ICT Testers	100-PRP2519L
Polarity Check	100-PRP2562L
Test Jet	100-PRP4070L
Socket for Polarity Check and Test Jet	100-SDN253W3-H

100 - PRP2519L

	Letter	Material/Finish			Average Resistance	
TUBE	P	Nickel silver/ID precious metal clad			< 15 milliohms	
POINT	Digit	Material/Finish				
	19	Heat treated BeCu/plated gold over nickel				
SPRING	Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
	L	Low	1.3 [37]	3.5 [99]	Stainless Steel	1M min @ .167 [4.24] max

100 - PRP4070L

	Letter	Material/Finish			Average Resistance	
TUBE	P	Nickel silver/ID precious metal clad			< 20 milliohms	
POINT	Digit	Material/Finish				
	70	Heat treated BeCu/plated gold over nickel				
SPRING	Letter	Spring Force	Preload	@ .317 Stroke	Material	Mechanical Life (Cycles @ Stroke)
	L	Low	0.8 [23]	3.0 [85]	Music Wire	1M min @ .317 [8.05] max

100 - PRP2562L

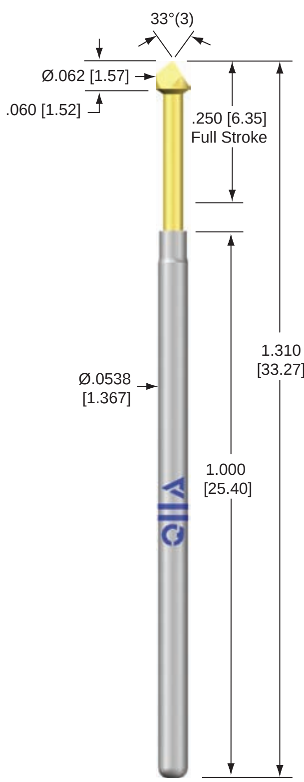
	Letter	Material/Finish			Average Resistance	
TUBE	P	Nickel silver/ID precious metal clad			< 15 milliohms	
POINT	Digit	Material/Finish				
	62	Heat treated BeCu/plated gold over nickel				
SPRING	Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
	L	Low	1.3 [37]	3.5 [99]	Stainless Steel	1M min @ .167 [4.24] max

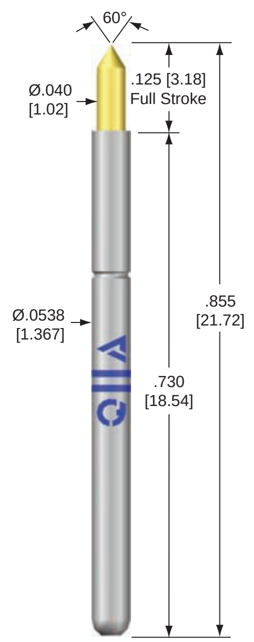
100 - PRP2503L

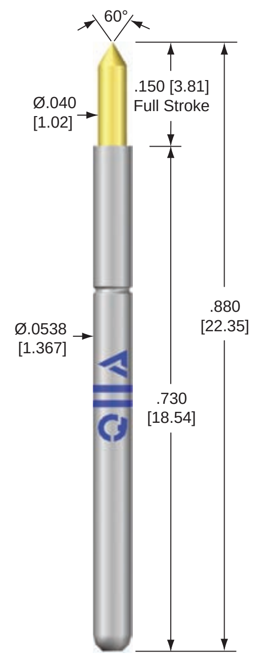
	Letter	Material/Finish			Average Resistance	
TUBE	P	Nickel silver/ID precious metal clad			< 15 milliohms	
POINT	Digit	Material/Finish				
	03	Heat treated BeCu/plated gold over nickel				
SPRING	Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
	L	Low	1.3 [37]	3.5 [99]	Stainless Steel	1M min @ .167 [4.24] max

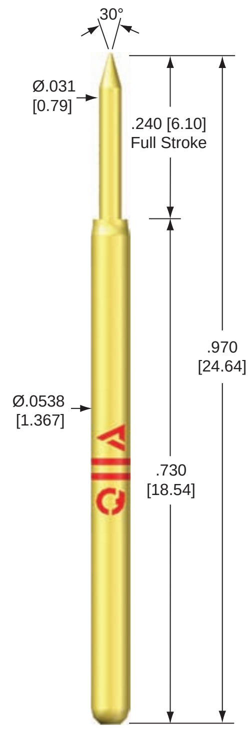
Please refer to pages 38 thru 41 for complete probe specifications.

TERADYNE – 100-PRP2503L	**TERADYNE/GENRAD** 100-PL□1241□-□	**TERADYNE/GENRAD** 100-PL□1541□-□	**TERADYNE/GENRAD** 100-PRG2441S-□









Teradyne/GenRad	QA Part Number
1800 Series 7878	100-PRP2503L
2270, 2271, 2272, 2282 (any model), 2283, 2284, 2286, 2287 built before 7/95	100-PLP1241S or 100-PLP1241S-B
2280, 2281, 2281a, 2287a 228x ICA (any model), 2283, 2284, 2286, 2287 built after 7/95	100-PLP1541S or 100-PLP1541S-B
Tester model numbers ending in "L" (high density capacity)	100-PRG2441S and 100-PLP1541S

						100-PL□1241□-□	**100-PL□1541□-□**	**100-PRG2441S-□**
TUBE	**Letter**	**Material/Finish**				**Average Resistance**		
	P	Nickel silver/ID precious metal clad				< 20 milliohms	< 20 milliohms	N/A
	G	Nickel silver/ID OD gold plated				< 25 milliohms	< 25 milliohms	< 15 milliohms
	N	Nickel silver/No finish				< 45 milliohms	< 45 milliohms	N/A
POINT	**Digit**	**Material/Finish**						
	41	Heat treated BeCu/plated gold over nickel						
SPRING	**Letter**	**Spring Force**	**Preload**	**@.107 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**		
	L	Low	0.7 [20]	1.5 [43]	Music wire	1M min @ .107 [2.72] max	1M min @ .107 [2.72] max	N/A
	S	Standard	1.4 [40]	3.5 [99]	Music wire	1M min @ .107 [2.72] max	1M min @ .107 [2.72] max	N/A
	S	Standard	1.79 [51]	3.5 [99]	Stainless Steel	N/A	N/A	1M min @ .197 [5.00]
	H	High	2.2 [62]	5.5 [156]	Music wire	1M min @ .107 [2.72] max	1M min @ .107 [2.72] max	N/A
	X	Extra	3.0 [85]	8.0 [227]	Music wire	1M min @ .107 [2.72] max	1M min @ .107 [2.72] max	N/A
	U	Ultra	4.5 [127]	10.0 [283]	Music wire	250K min @ .107 [2.72] max	250K min @ .107 [2.72] max	N/A
OPTION	**Letter**	**Description**						
	B	Curved probe tube (pylon replacement)						
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.						
	(blank)	No option required						

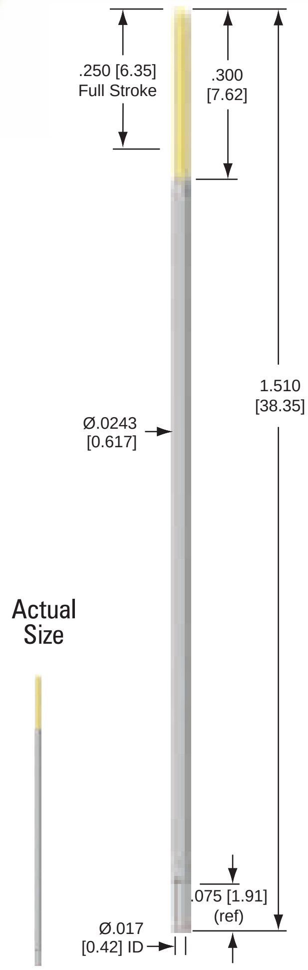
Operating temp.: -50°F to 250°F [-45°C to 120°C]

X31-25 Series

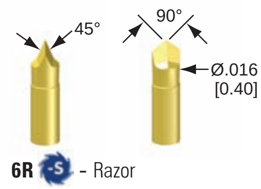
.031 [.800] Centers | .250 [6.35] Stroke

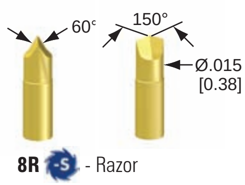
Designed for loaded board testing.

Probe



Razor Sharp Tip Styles (See page 72 for more details)





PROBES

PROBE P/N: X31-PRP25 ☐☐☐-☐

example: X31-PRP256RX-S

	Letter	Material/Finish	Average Resistance		
TUBE	P	Nickel silver/ID precious metal clad	< 90 milliohms		

	Digits	Material/Finish
POINT	See Points	Heat treated steel/plated gold over nickel

	Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
SPRING	S	Standard	1.49 [42]	3.6 [102]	Music wire	1M min @ .167 [4.24] max
	X	Extra	2.22 [63]	5.4 [153]	Stainless Steel	50K min @ .167 [4.24] max

	Letter	Description
OPTION	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
	S	Heat treated steel/plated gold over nickel

Probe Specifications

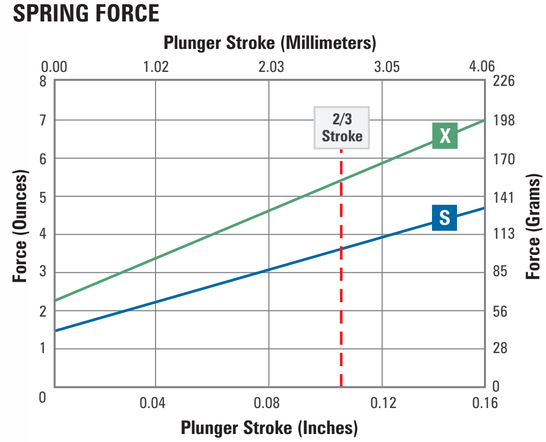
Full stroke: .250 [6.36]

Working stroke: up to .167 [4.24]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

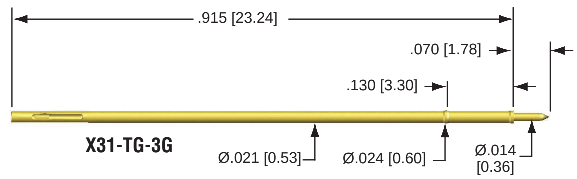
Current rating: 2.5 Amps (see page 83)

SPRING FORCE



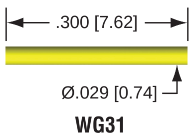
Termination

Mounting holes in AT7000, G10/FR4 or similar materials for the Probe Plate and Back Plate (wired) should be gauged at .0217/.0225 [0.551/0.572], suggested drill size is #74 or .57mm.



Wire Grip Sleeve

For use with G termination pins



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG-X31-P (for Probe Plate) and PG-X31-T (for Back Plate)

Termination Installation Tool: ITRX31-FL or ITRX31 SET .010, .020, .030 or .040

Termination Extraction Tool: ETRX31 (for use when Probe & Spacer Plates are removed). ETRX31-KIT (includes ITRX31-FL and ETRX31)

Termination Extraction Tool: ETRX31-EXT (for use when Probe & Spacer Plates are installed)

Probe Installation Tool: PT50/39

Damaged Probe Tube Extraction Tool: TERX31/039

Wire Grip Installation Tool: GTR31

WIRE GRIP SLEEVE P/N: WG31

	Letter	Material
SLEEVE	WG	Nylon sleeve, yellow
	Digits	**Description**
SIZE	31	.300 [7.62] long, to accept customer supplied 30AWG Kynar solid insulated wire, stripped at .120 [3.05]

TERMINATIONS

TERMINATION P/N: X31-TG-3G-

	Letter	Description/Material
TERMINATION	G	Wire grip termination: Heat treated BeCu, gold plated, accepts wire grip sleeve
	Digit	**Description**
BODY LENGTH	3	.915 [23.24] Body length.
	Digit	**Description**
OPTION	1	X31-TG-3G with WG31 wire grip sleeve

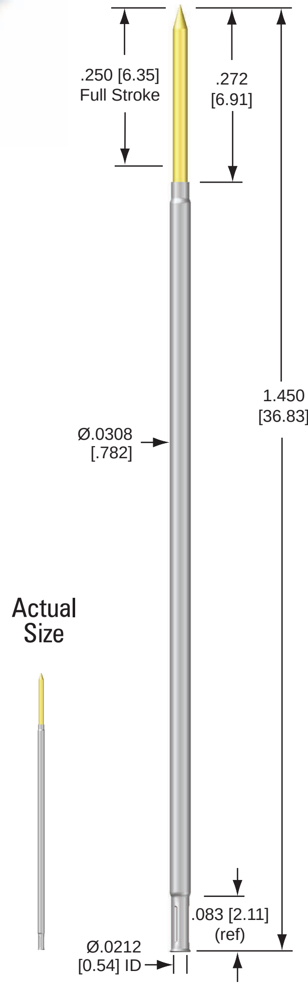
US Patent No. 6,570,399 and 4,885,533

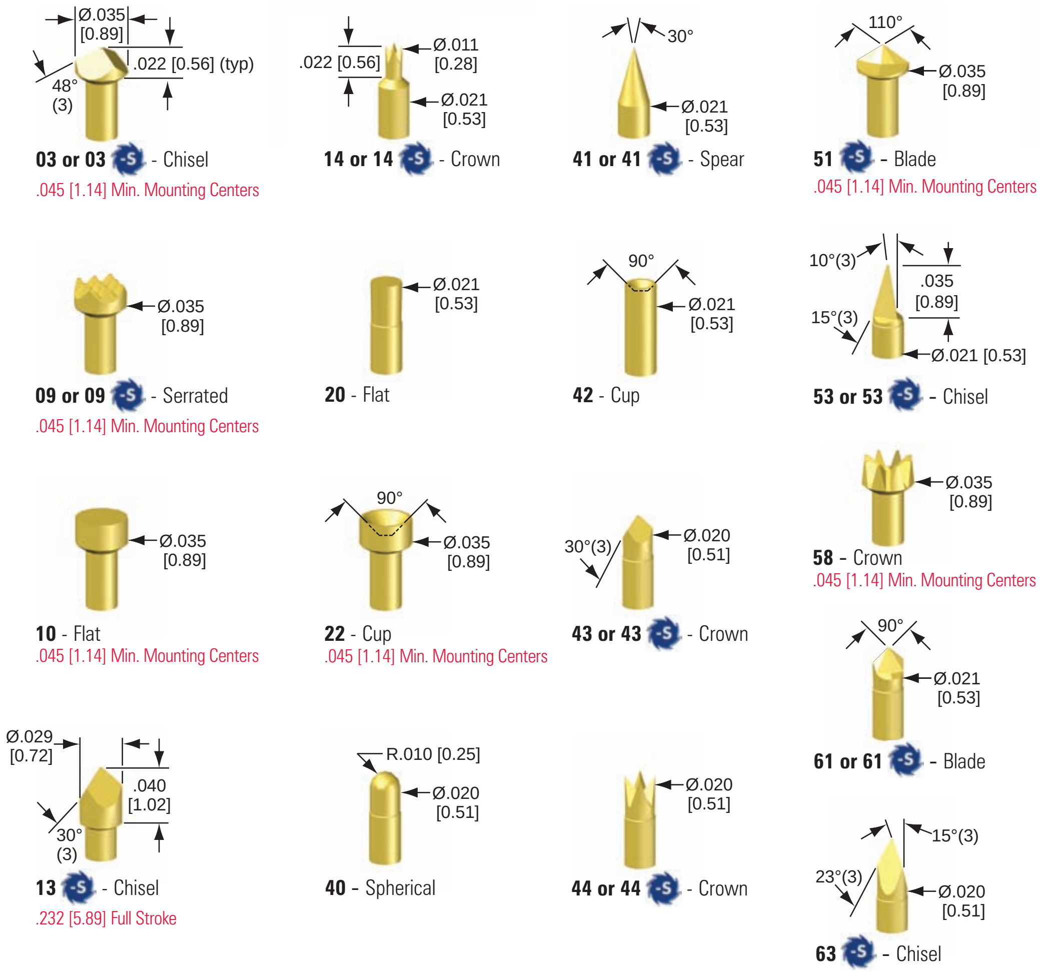
X39-25 Series

.039 [1.00] Centers | .250 [6.35] Stroke

Designed for loaded board testing.

Probe





PROBES

PROBE P/N: X39-PRP25 _ _ _ - _

example: X39-PRP2543S

	Letter	Material/Finish				Average Resistance
TUBE	P	Nickel silver/ID precious metal clad				< 25 milliohms
	Digits	**Material/Finish**				
POINT	See Points	Standard material is heat treated BeCu/plated gold over nickel. (See S options for steel plungers)				
	Letter	**Spring Force**	**Preload**	**@ 2/3 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
SPRING	L	Low	1.2 [34]	3.0 [85]	Music wire	1M min @ .167 [4.24] max
SPRING	S	Standard	1.1 [31]	4.3 [122]	Music wire	1M min @ .167 [4.24] max
SPRING	H	High	2.4 [68]	5.6 [159]	Music wire	1M min @ .167 [4.24] max
SPRING	Y	Elevated	3.2 [91]	8.0 [227]	Stainless Steel	25K min @ .167 [4.24] max
SPRING		**High Preload Spring** – *Available in 43-S, 44-S, 61-S, 63-S, 6R-S, 8R-S & 9R-S point styles.*				
SPRING	E	High Preload	4.2 [119]	8.0 [227]	Stainless Steel	10K min @ .167 [4.24] max
	Letter	**Description**				
OPTION	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				
OPTION	S	Heat treated steel/plated gold over nickel (see Point Styles for availability)				
OPTION	(blank)	No option required				

DISCOVER MasterCard VISA

Probe Specifications

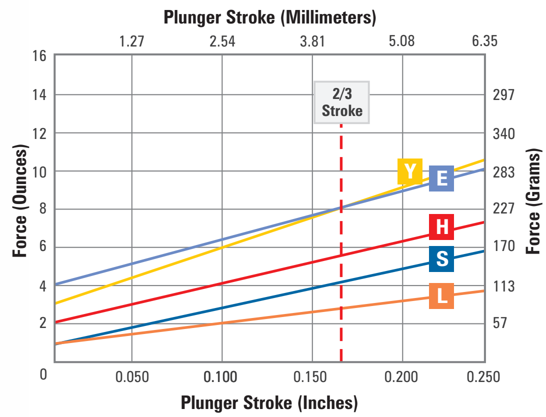
Full stroke: .250 [6.35]

Working stroke: up to .167 [4.24]

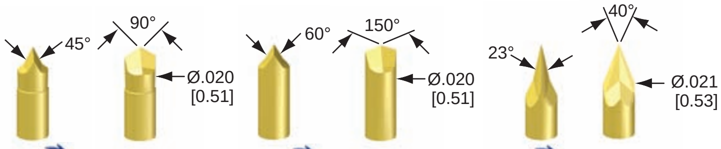
Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 5.5 Amps (see page 83)

SPRING FORCE



Razor Sharp Tip Styles (See page 72 for more details)



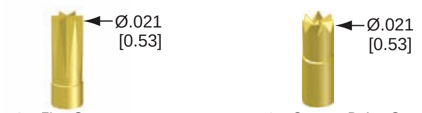
6R -S - Razor **8R** -S - Razor **9R** -S - Razor

Solder Bump/Dome Tip Styles (see page 78 for more details)

16 - Flat Star
.045 [1.14] Min. Mounting Centers

26 - Center Point Star
.045 [1.14] Min. Mounting Centers

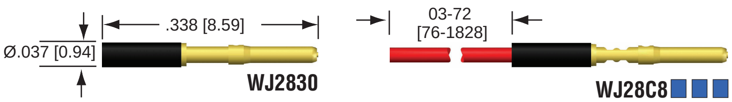
59 - Micro Serrated
.045 [1.14] Min. Mounting Centers



46 - Flat Star **76** - Center Point Star

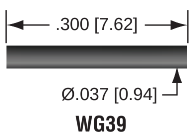
Wire Jacks

For use with J termination pins



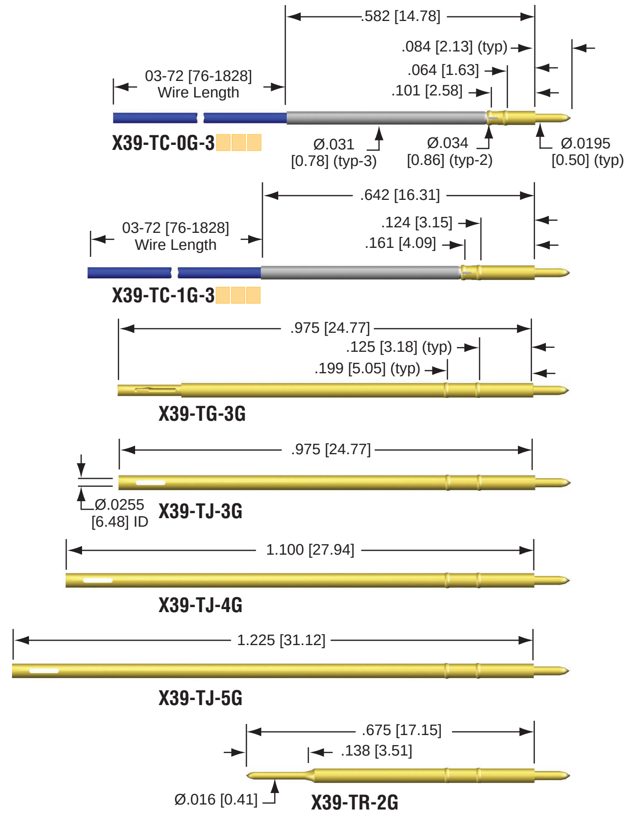
Wire Grip Sleeve

For use with G termination pins



Termination

Mounting holes in AT7000, G10/FR4 or similar materials for the Probe Plate and Back Plate (wired) should be gauged at .0315/.0325 [0.800/0.826], suggested drill size is #66 or .82mm.



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG-X39

Termination Installation Tool: ITRX39-FL or ITRX39 SET -.040 to .100 [-1.02 to 2.54]

Termination Extraction Tool: ETRX39 (for use when Probe & Spacer Plates are removed). ETRX39-KIT (includes ITRX39-FL and ETRX39)

Termination Extraction Tool: ETRX39-EXT (for use when Probe & Spacer Plates are installed)

Probe Installation Tool: PT50/39

Damaged Probe Tube Extraction Tool: TERX39/050 • **Wire Jack Installation Tool:** JTR2830

Wire Grip Installation Tool: GTR39 • **Indicator Probes:** IPX39-2540

WIRE JACK P/N: WJ ▢▢▢▢▢▢▢ - ▢

example: WJ28C8230

	Letter	Material/Finish
JACK	WJ	Brass/gold plated with nylon insulator
	Digits	**Description**
SIZE	2830	Wire Jack only (customer to crimp wire)
	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

Colors Available for 28C & 30C Termination (WIRE)

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

Wire Length Available for 28C & 30C Termination

Specify Length: 03 – 72 [76-1828]

	Letter	Description
OPTION	S	Strip Length 0.000/.669 [0.00/16.99]; Customer to specify Strip Length

WIRE GRIP SLEEVE P/N: WG39

	Letter	Material
SLEEVE	WG	Nylon sleeve, black
	Digits	**Description**
SIZE	39	.300 [7.62] long, to accept customer supplied 30AWG Kynar solid insulated wire, stripped at .120 [3.05]

TERMINATIONS

TERMINATION P/N: X39 - T ▢ - ▢ G - ▢▢▢▢

example: X39-TJ-3G

	Letter	Description/Material
TERMINATION	C	Crimped. Termination material: Heat treated BeCu, gold plated. Tube Material ID: precious metal clad.
	G	Wire Grip. Heat treated BeCu, gold plated, 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.
	Digit	**Description**
BODY LENGTH	0	.582 [14.78] Body length, only available in TC
	1	.642 [16.31] Body length, only available in TC
	2	.675 [17.15] Body length, only available in TR
	3	.975 [24.77] Body length, only available in TJ or TG
	4	1.100 [27.94] Body length, only available in TJ
	5	1.225 [31.12] Body length, only available in TJ
	Digit	**Wire Size Available for TC Termination Only**
OPTION	3	30 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 Only

Specify Length in inches: 03 – 72 [76-1828]

Digit	Available with G Termination Only
2	X39-TG-3G with WG39 wire grip sleeve

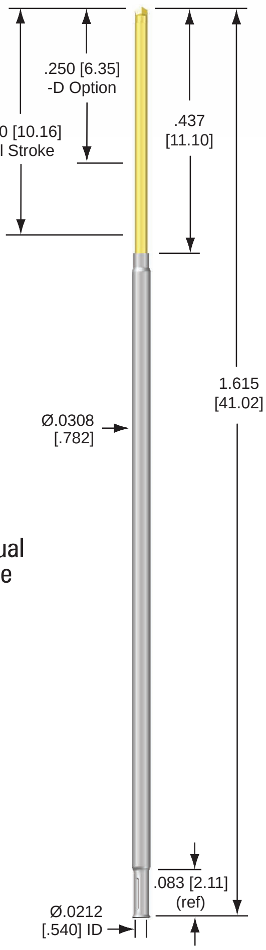
US Patent No. 6,570,399 and 4,885,533

X39-40 Series

.039 [1.00] Centers | .400 [10.16] Stroke

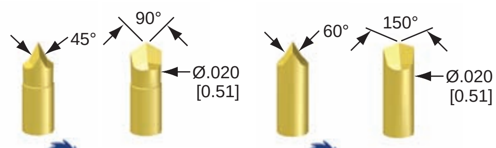
Designed for mixed height, loaded board testing.

Probe



Actual Size

Razor Sharp Tip Styles (See page 72 for more details)



6R -S - Razor **8R** -S - Razor

Solder Bump/Dome Tip Styles (see page 78 for more details)

46 - Flat Star **76** - Center Point Star

PROBES

PROBE P/N: X39 - PRP40 ▢▢▢ - ▢
example: X39-PRP408RX-S

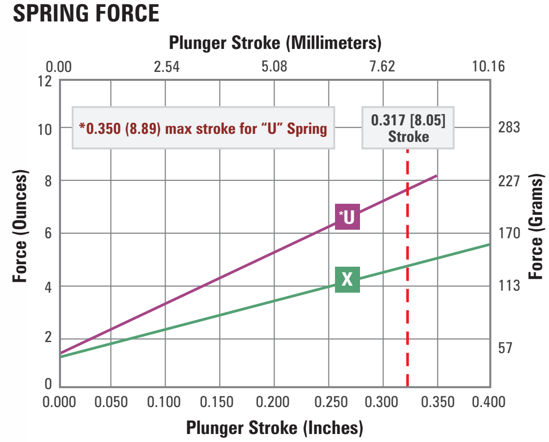
	Letter	Material/Finish				Average Resistance
TUBE	P	Nickel silver/ID precious metal clad				< 55 milliohms
	Digits	**Material/Finish**				
POINT	See Points	Heat treated steel/plated gold over nickel				
	Letter	**Spring Force**	**Preload**	**@ .317 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
SPRING	X	Extra	1.2 [34]	4.75 [135]	Stainless Steel	10K min @ .317 [8.05] max
SPRING	U*	Ultra	1.3 [37]	7.5 [213]	Stainless Steel	10K min @ .317 [8.05] max
	Letter	**Description**				
OPTION	D	Decreased stroke is .250 [6.35]. Must select from X39-25 series spring forces with this option.				
OPTION	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should be only used in applications outside of the probe operating temperature specifications.				
OPTION	S	Heat treated steel/plated gold over nickel				

*0.350 [8.89] max stroke for U spring.

Probe Specifications

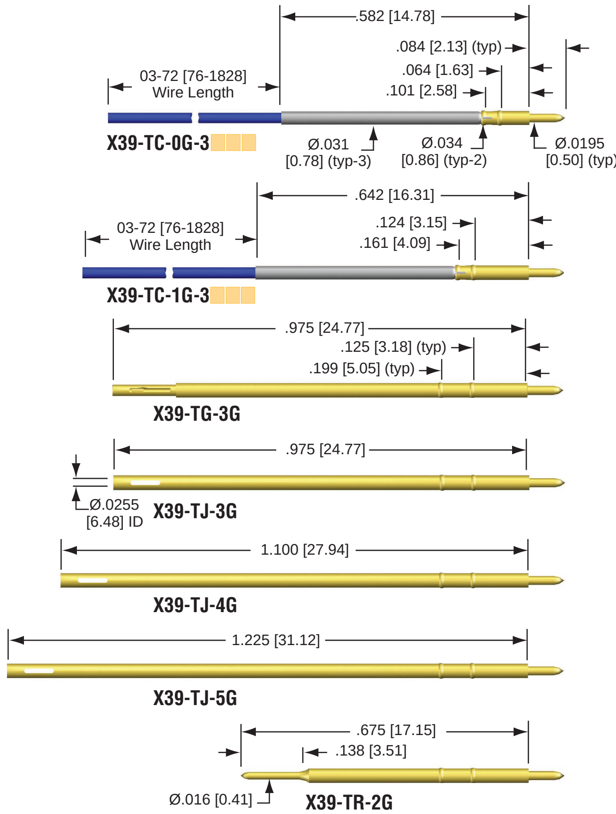
Full stroke: *.400 [10.16]
Working stroke: up to .317 [8.05]
Operating temp.: 40° to 250°F [5°C to 120°C]
Current rating: 7.5 Amps (see page 83)

SPRING FORCE



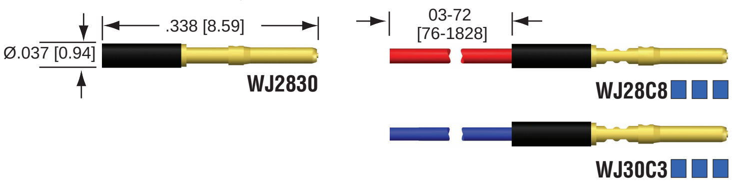
Termination

Mounting holes in AT7000, G10/FR4 or similar materials for the Probe Plate and Back Plate (wired and wireless) should be gauged at .0315/.0325 [0.800/0.826], suggested drill size is #66 or .82mm.



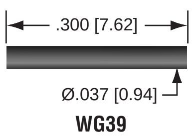
Wire Jacks

For use with J termination pins



Wire Grip Sleeve

For use with G termination pins



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG-X39

Termination Installation Tool: ITRX39-FL or ITRX39 SET -.040 to .100 [-1.02 to 2.54]

Termination Extraction Tool: ETRX39 (for use when Probe & Spacer Plates are removed). ETRX39-KIT (includes ITRX39-FL and ETRX39)

Termination Extraction Tool: ETRX39-EXT (for use when Probe & Spacer Plates are installed)

Probe Installation Tool: PT50/39

Damaged Probe Tube Extraction Tool: TERX39/050

Wire Jack Installation Tool: JTR2830

Wire Grip Installation Tool: GTR39

WIRE JACK P/N: WJ

example: WJ28C8230

	Letter	Material/Finish								
JACK	WJ	Brass/gold plated with nylon insulator								
SIZE	**Digits**	**Description**								
	2830	Wire Jack only (customer to crimp wire)								
	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	Grey
	1	Brown	3	Orange	5	Green	7	Violet	9	White
	Wire Length Available for 28C & 30C Termination									
		Specify Length: 03 – 72 [76-1828]								
OPTION	**Letter**	**Description**								
	S	Strip Length 0.000/.669 [0.00/16.99]; Customer to specify Strip Length								

WIRE GRIP SLEEVE P/N: WG39

	Letter	Material
SLEEVE	WG	Nylon sleeve, black
SIZE	**Digits**	**Description**
	39	.300 [7.62] long, to accept customer supplied 30AWG Kynar solid insulated wire, stripped at .120 [3.05]

TERMINATIONS

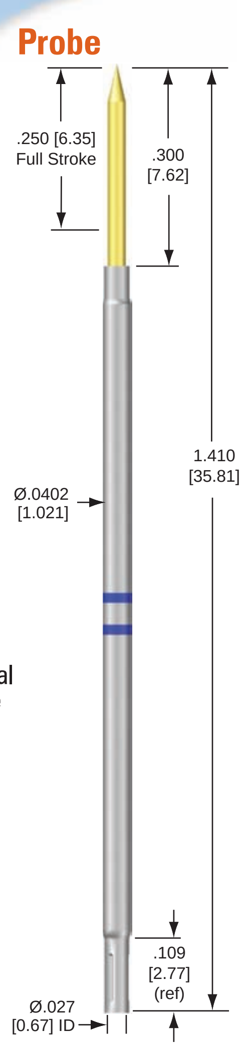
TERMINATION P/N: X39 - T - G -

example: X39-TJ-3G

	Letter	Description/Material								
TERMINATION	C	Crimped. Termination material: Heat treated BeCu, gold plated. Tube Material ID: precious metal clad.								
	G	Wire Grip. Heat treated BeCu, gold plated, 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 LENGTH	**Digit**	**Description**								
	0	.582 [14.78] Body length, only available in TC								
	1	.642 [16.31] Body length, only available in TC								
	2	.675 [17.15] Body length, only available in TR								
	3	.975 [24.77] Body length, only available in TJ or TG								
	4	1.100 [27.94] Body length, only available in TJ								
	5	1.225 [31.12] Body length, only available in TJ								
OPTION	**Digit**	**Wire Size Available for TC Termination Only**								
	3	30 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 Only									
		Specify Length in inches: 03 – 72 [76-1828]								
	Digit	**Available with G Termination Only**								
	2	X39-TG-3G with WG39 wire grip sleeve								

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

Probe



Actual Size

PROBES

PROBE P/N: X50-PRP25 ▢▢▢-▢

example: X50-PRP2584X-S

	Letter	Material/Finish	Average Resistance			
TUBE	P	Nickel silver/ID precious metal clad	< 35 milliohms			
	Digits	**Material/Finish**				
POINT	See Points	Standard material is heat treated BeCu/plated gold over nickel (see S option for steel plungers)				
	Letter	**Spring Force**	**Preload**	**@ 2/3 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
SPRING	L	Low	1.5 [43]	3.1 [88]	Music wire	1M min @ .167 [4.24] max
	S	Standard	2.7 [77]	5.5 [156]	Music wire	1M min @ .167 [4.24] max
	H	High	2.8 [79]	7.0 [198]	Music wire	1M min @ .167 [4.24] max
	X	Extra	2.7 [77]	10.1 [286]	Music wire	100K min @ .167 [4.24] max
		High Preload Spring – *Available in 43-S, 44-S, 6R-S, 61-S, 63-S, 8R-S & 9R-S point styles.*				
	E	High Preload	5.0 [142]	8.0 [227]	Stainless Steel	50K min @ .167 [4.24] max
	Letter	**Description**				
OPTION	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				
	S	-S Heat treated steel/plated gold over nickel (see points for availability)				
	(blank)	No option required				

Probe Specifications

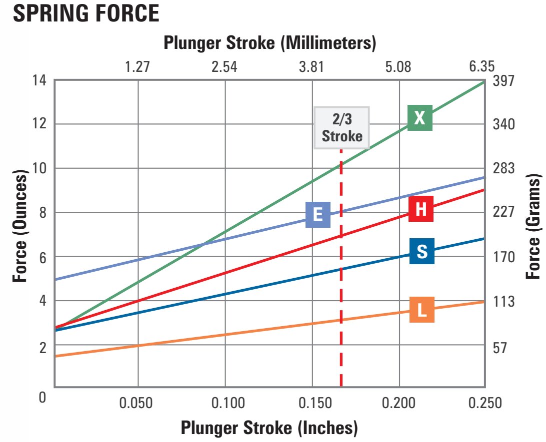
Full stroke: .250 [6.35]

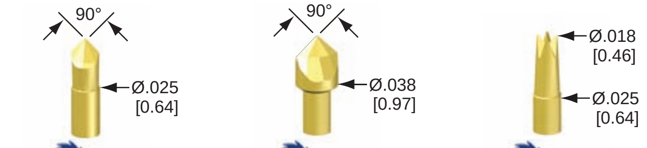
Working stroke: up to .167 [4.24]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

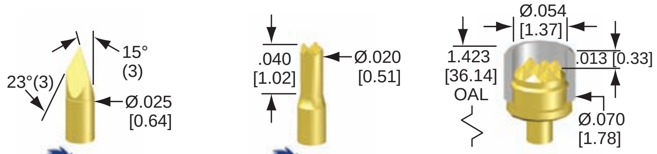
Current rating: 10.0 Amps (see page 83)

SPRING FORCE



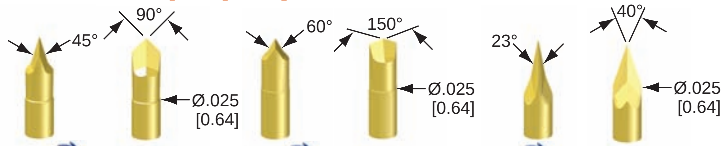


61 - Blade **71** - Blade **84** - Crown



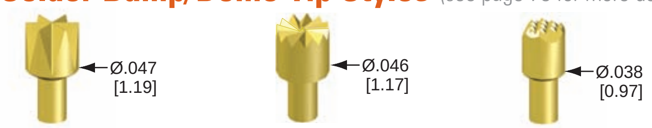
63 - Chisel **74** - Crown **99** - Insulator
.075 [1.91] Min. Mounting Centers

Razor Sharp Tip Styles (See page 72 for more details)

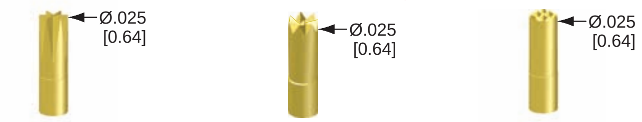


6R - Razor **8R** - Razor **9R** - Razor

Solder Bump/Dome Tip Styles (see page 78 for more details)



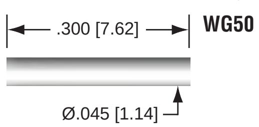
16 - Flat Star
.060 [1.52] Min. Mounting Centers
26 - Center Point Star
.060 [1.52] Min. Mounting Centers
59 - Micro Serrated



46 - Flat Star **76** - Center Point Star **79** - Micro Serrated

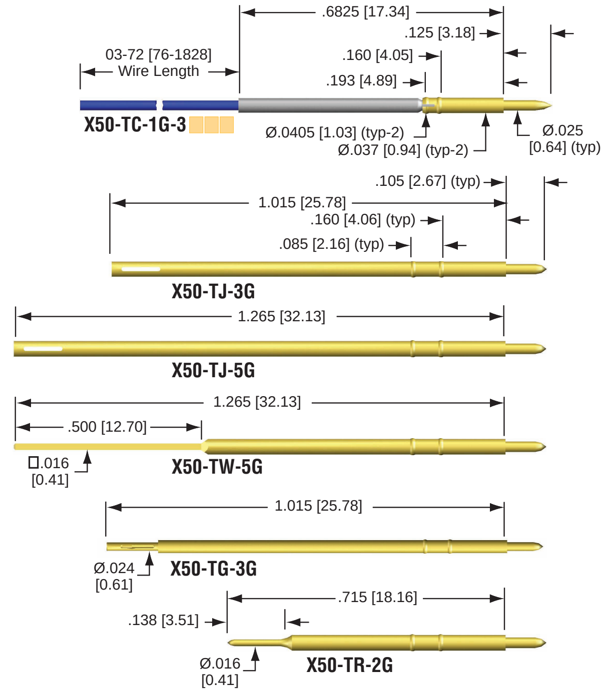
Wire Grip Sleeve

For use with G termination pins



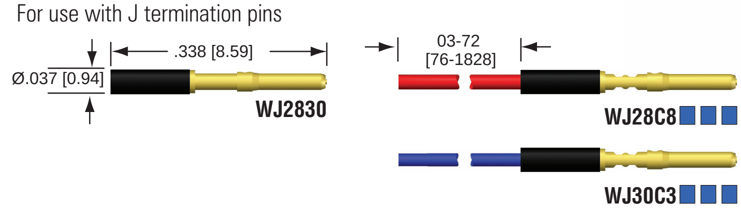
Termination

Mounting holes in AT7000, G10/FR4 or similar materials for the Probe Plate should be gauged .0415/.043 [1.054/1.092], suggested drill size #57. Mounting holes for Back Plate (wired) should be gauged at .038/.039 [0.965/0.990], suggested drill sizes #61 or 1.00mm.



Wire Jacks

For use with J termination pins



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG-X50-P (for Probe Plate) or PG-X50-T (for Back Plate)
Termination Installation Tool: ITRX50-FL or ITRX50 SET .001 to .140 [0.03 to 3.56]
Termination Extraction Tool: ETRX50 (for use when Probe & Spacer Plates are removed). ETRX50-KIT (includes ITRX50-FL and ETRX50)
Termination Extraction Tool: ETRX50-EXT (for use when Probe & Spacer Plates are installed)
Probe Installation Tool: PT100/75 **Damaged Probe Tube Extraction Tool:** TERX50/075
Wire Jack Installation Tool: JTR2830 **Indicator Probes:** IPX50-2540
Wire Grip Installation Tool: GTR50

WIRE JACK P/N: WJ ▢▢▢▢▢▢▢ - ▢

example: WJ28C8230

	Letter	Material/Finish									
JACK	WJ	Brass/gold plated with nylon insulator									
	Digits	**Description**									
SIZE	2830	Wire Jack only (customer to crimp wire)									
	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	Grey	
	1	Brown	3	Orange	5	Green	7	Violet	9	White	
	Wire Length Available for 28C & 30C Termination										
		Specify Length: 03 – 72 [76-1828]									
OPTION	**Letter**	**Description**									
	S	Strip Length 0.000/.669 [0.00/16.99]; Customer to specify Strip Length									

WIRE GRIP SLEEVE P/N: WG50

	Letter	Material
SLEEVE	WG	Nylon sleeve, white
	Digits	**Description**
SIZE	50	.300 [7.62] long, to accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at .120 [3.05]

TERMINATIONS

TERMINATION P/N: X50 - T ▢ - ▢ G - ▢▢▢▢

example: X50-TW-5G

	Letter	Description/Material									
TERMINATION	C	Crimped. Termination material: Heat treated BeCu, gold plated. Tube Material: ID precious metal clad.									
	J	Wire Jack. Heat treated BeCu, gold plated over nickel, accepts wire jack.									
	W	Wire Wrap. Heat treated BeCu, gold plated over nickel.									
	G	Wire Grip. Heat treated BeCu, gold plated over nickel, accepts wire grip sleeve.									
	R	Round post. Heat treated BeCu, gold plated over nickel.									
	Digit	**Description**									
BODY LENGTH	1	.6825 [17.34] Body length, only available in TC									
	2	.715 [18.16] Body length, only available in TR									
	3	1.015 [25.78] Body length, only available in TJ or TG									
	5	1.265 [32.13] Body length, only available in TJ or TW									
OPTION	**Digit**	**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									
	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 Only										
		Specify Length in inches: 03 – 72 [76-1828]									
	Digit	**Available with G Termination Only**									
	3	X50-TG-3G with WG50 wire grip sleeve									

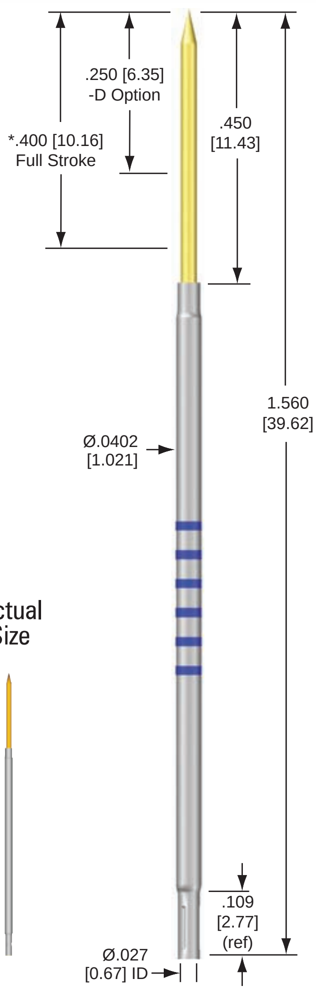
US Patent No. 6,570,399 and 4,885,533

X50-40 Series

.050 [1.27] Centers | .400 [10.16] Stroke

Designed for mixed height, loaded board testing.

Probe



Actual Size

03 - Chisel — .070 [1.78] Min. Mounting Centers
13 -S - Chisel
34 - Crown — .070 [1.78] Min. Mounting Centers
53 -S - Chisel
06 - Star — .070 [1.78] Min. Mounting Centers
20 - Flat
41 - Spear
61 -S - Blade
08 - Triad — .070 [1.78] Min. Mounting Centers
24 - Crown — .070 [1.78] Min. Mounting Centers
43 - Chisel
71 -S - Blade
09 - Serrated — .070 [1.78] Min. Mounting Centers
28 -S - Triad
44 - Crown
94 -S - Crown

PROBES

PROBE P/N: X50-PRP40 ☐☐☐ - ☐

example: X50-PRP4044X

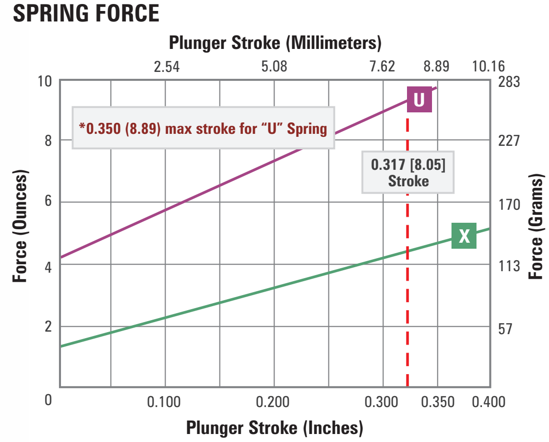
	Letter	Material/Finish				Average Resistance
TUBE	P	Nickel silver/ID precious metal clad				< 35 milliohms
POINT	**Digit**	**Material/Finish**				
	See Points	Heat treated BeCu/plated gold over nickel (see S option for steel plungers)				
SPRING	**Letter**	**Spring Force**	**Preload**	**@ .317 [8.05] Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
	X	Extra	1.2 [34]	4.3 [122]	Stainless Steel	500K min @ .317 [8.05] max
	U*	Ultra	4.1 [116]	9.3 [264]	Music wire	10K min @ .317 [8.05] max
OPTION	**Letter**	**Description**				
	D	Decreased stroke is .250 [6.35]. Must select spring from X50-25 series spring forces with this option.				
	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				
	S	-S Heat treated steel/plated gold over nickel (see points for availability)				
	(blank)	No option required				

*0.350 [8.89] max stroke for U spring.

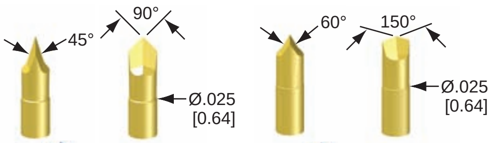
Probe Specifications

Full stroke: *.400 [10.16]
Working stroke: up to .317 [8.05]
Operating temp.: -50°F to 250°F [-45°C to 120°C]
Current rating: 10.5 Amps (see page 83)

SPRING FORCE

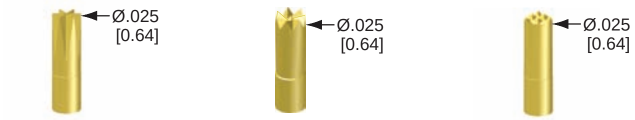


Razor Sharp Tip Styles (See page 72 for more details)



6R -S - Razor **8R** -S - Razor

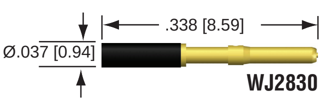
Solder Bump/Dome Tip Styles (see page 78 for more details)

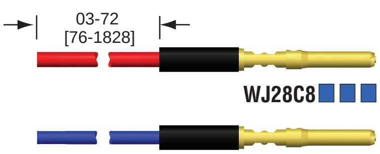


46 - Flat Star **76** - Center Point Star **79** - Micro Serrated

Wire Jacks

For use with J termination pins

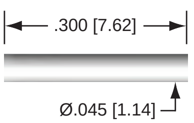




WJ30C3

Wire Grip Sleeve

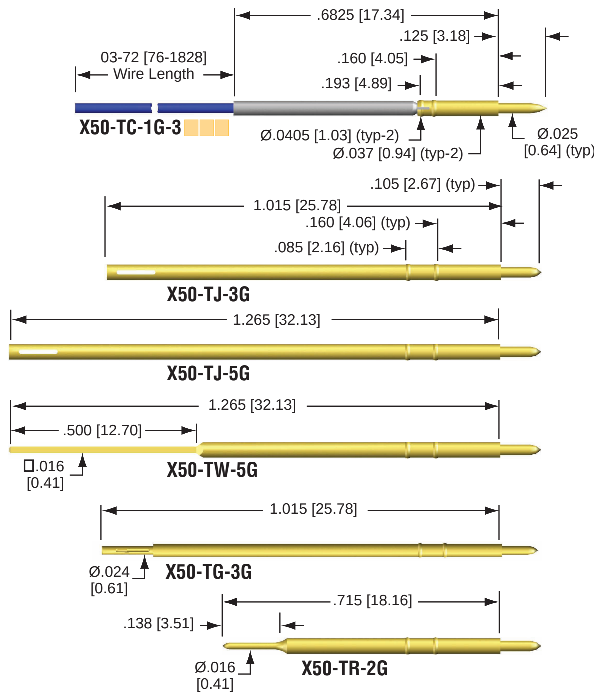
For use with G termination pins



WG50

Termination

Mounting holes in AT7000, G10/FR4 or similar materials for the Probe Plate should be gauged at .0415/.043 [1.054/1.092], suggested drill size #57. Mounting holes for Back Plate (wired) should be gauged at .038/.039 [0.965/0.990], suggested drill sizes #61 or 1.00mm.



Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG-X50-P (for Probe Plate) or PG-X50-T (for Back Plate)

Termination Installation Tool: ITRX50-FL or ITRX50 SET .001 to .140 [0.03 to 3.56]

Termination Extraction Tool: ETRX50 (for use when Probe & Spacer Plates are removed). ETRX50-KIT (includes ITRX50-FL and ETRX50)

Termination Extraction Tool: ETRX50-EXT (for use when Probe & Spacer Plates are installed)

Probe Installation Tool: PT100/75 **Damaged Probe Tube Extraction Tool:** TERX50/075

Wire Jack Installation Tool: JTR2830 **Indicator Probes:** IPX50-4043

Wire Grip Installation Tool: GTR50

WIRE JACK P/N: WJ ■■■■■■■ - ■

example: WJ28C8230

JACK	Letter	Material/Finish								
	WJ	Brass/gold plated with nylon insulator								
SIZE	Digits	Description								
	2830	Wire Jack only (customer to crimp wire)								
	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	Grey
	1	Brown	3	Orange	5	Green	7	Violet	9	White
	Wire Length Available for 28C & 30C Termination									
		Specify Length: 03 – 72 [76-1828]								
OPTION	Letter	Description								
	S	Strip Length 0.000/.669 [0.00/16.99]; Customer to specify Strip Length								

WIRE GRIP SLEEVE P/N: WG50

SLEEVE	Letter	Material
	WG	Nylon sleeve, white
SIZE	Digits	Description
	50	.300 [7.62] long, to accept customer supplied 28AWG or 30AWG Kynar solid insulated wire, stripped at .120 [3.05]

TERMINATIONS

TERMINATION P/N: X50-T■-■-■■■■

example: X50-TW-5G

TERMINATION	Letter	Description/Material								
	C	Crimped. Termination material: Heat treated BeCu, gold plated. Tube Material: ID precious metal clad.								
	J	Wire Jack. Heat treated BeCu, gold plated over nickel, accepts wire jack.								
	W	Wire Wrap. Heat treated BeCu, gold plated over nickel.								
	G	Wire Grip. Heat treated BeCu, gold plated over nickel, accepts wire grip sleeve.								
	R	Round post. Heat treated BeCu, gold plated over nickel.								
BODY LENGTH	Digit	Description								
	1	.6825 [17.34] Body length, only available in TC								
	2	.715 [18.16] Body length, only available in TR								
	3	1.015 [25.78] Body length, only available in TJ or TG								
	5	1.265 [32.13] Body length, only available in TJ or TW								
OPTION	Digit	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								
	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 Only									
		Specify Length in inches: 03 – 72 [76-1828]								
	Digit	Available with G Termination Only								
	3	X50-TG-3G with WG50 wire grip sleeve								

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

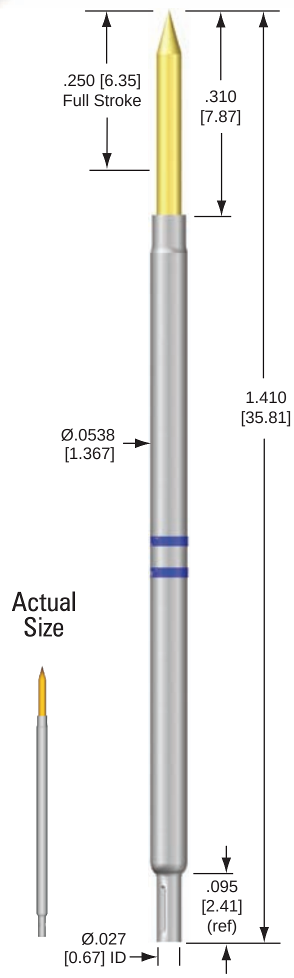
X75-25 Series

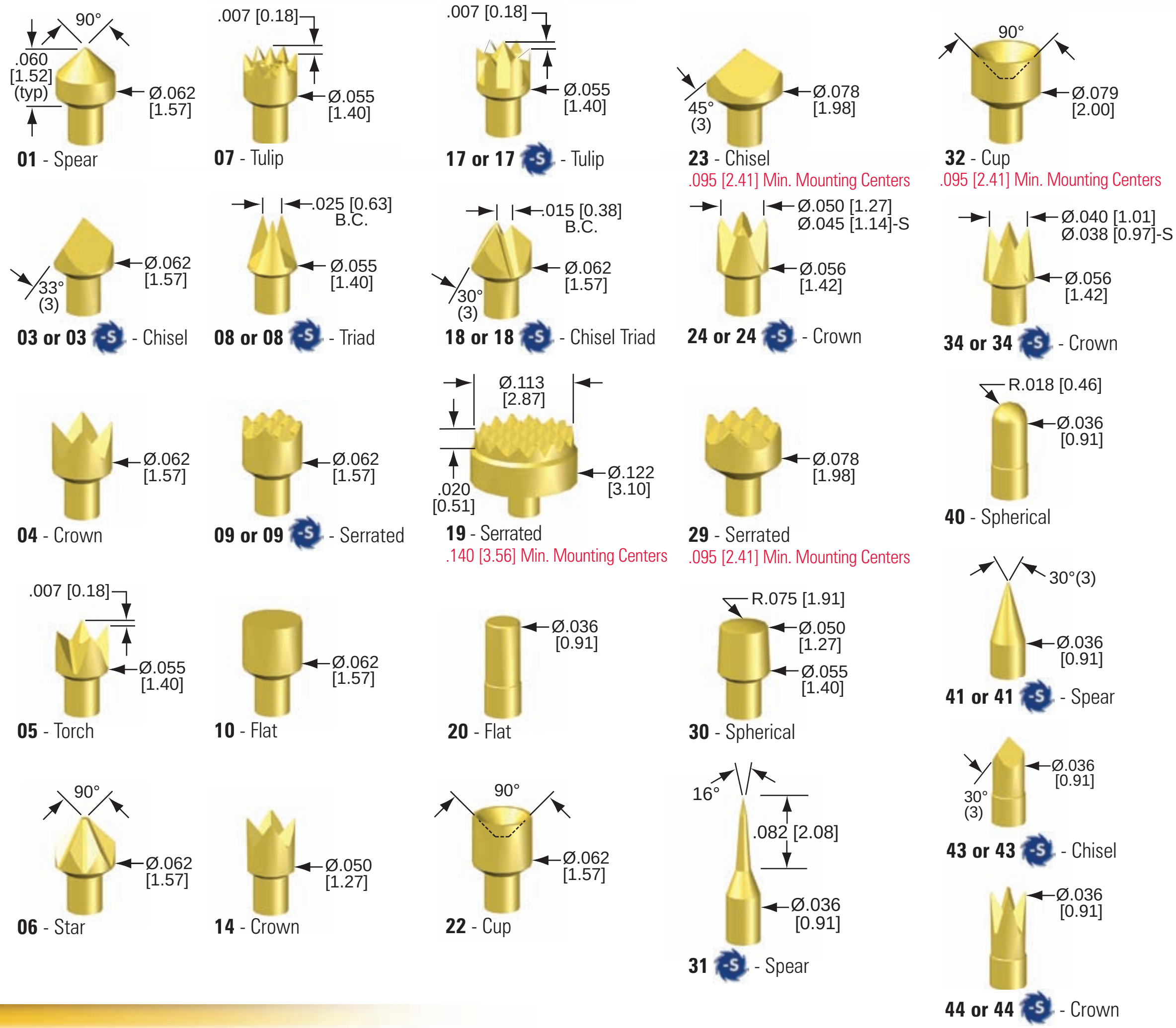
.075 [1.91] Centers | .250 [6.35] Stroke

X PROBE® SOCKETLESS SERIES

Designed for loaded board testing.

Probe





PROBES

PROBE P/N: X75-PRP25 ▢▢▢-▢

example: X75-PRP2503S

TUBE			
Letter	Material/Finish		Average Resistance
P	Nickel silver/ID precious metal clad		< 25 milliohms

POINT	
Digits	Material/Finish
See Points	Standard material is heat treated BeCu/plated gold over nickel. (See S options for steel plungers)

SPRING Letter	Spring Force	Preload	@ 2/3 Stroke	Material	Mechanical Life (Cycles @ Stroke)
L	Low	1.3 [37]	3.5 [99]	Stainless Steel	1M min @ .167 [4.24] max
S	Standard	1.6 [45]	5.5 [156]	Music wire	1M min @ .167 [4.24] max
H	High	2.6 [74]	6.5 [184]	Music wire	1M min @ .167 [4.24] max
Y	Elevated	2.3 [65]	8.1 [230]	Music wire	1M min @ .167 [4.24] max
X	Extra	3.6 [102]	10.8 [306]	Music wire	1M min @ .167 [4.24] max
U	Ultra	3.3 [94]	17.1 [485]	Music wire	100K min @ .167 [4.24] max
	High Preload Spring – *Available in 43-S, 44-S, 61-S, 63-S, 6R-S, 8R-S & 9R-S point styles.*				
E	High Preload	6.0 [170]	8.0 [227]	Stainless Steel	1M min @ .167 [4.24] max

OPTION Letter	Description
N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.
S	Heat treated steel/plated gold over nickel (see Point Styles for availability)
(blank)	No option required

Probe Specifications

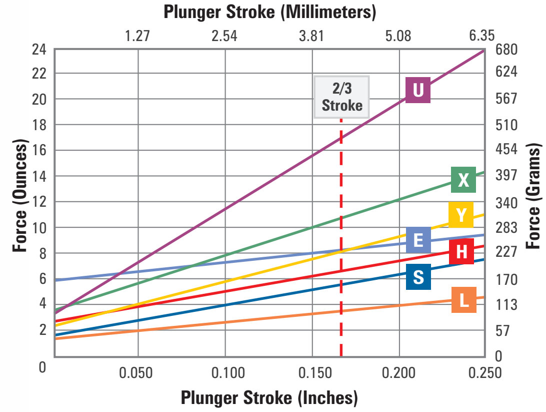
Full stroke: .250 [6.35]

Working stroke: up to .167 [4.24]

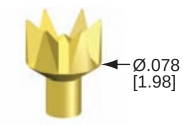
Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 15.0 Amps (see page 83)

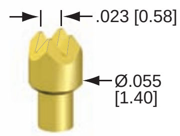
SPRING FORCE



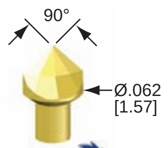
49 - Serrated



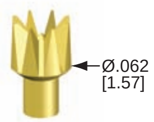
56 - Crown
.095 [2.41] Min. Mounting Centers



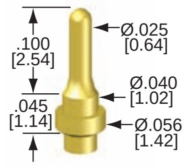
64 - Crown



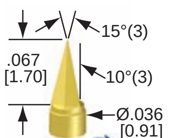
51 or 51 -S - Blade



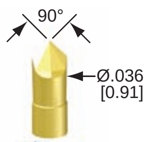
58 - Crown



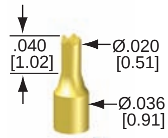
70 - Connector
.165 [4.19] Full Stroke



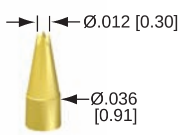
53 or 53 -S - Chisel



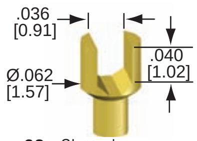
61 -S - Blade



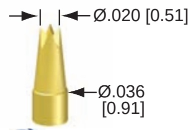
74 or 74 -S - Crown



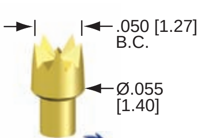
54 - Crown



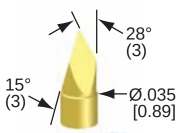
62 - Slotted



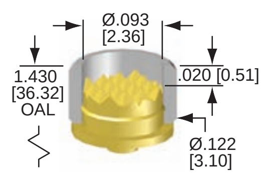
84 -S - Crown



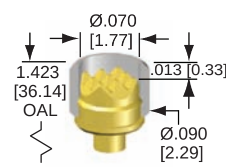
55 or 55 -S - Crown



63 or 63 -S - Chisel



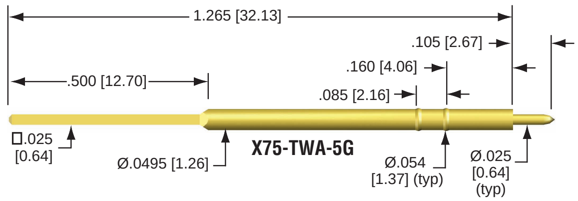
89 - Insulator
.130 [3.30] Min. Mounting Centers

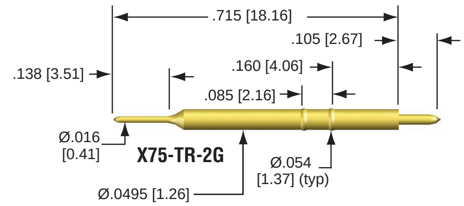


99 - Insulator
.100 [2.54] Min. Mounting Centers

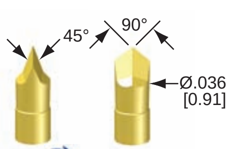
Termination

Mounting holes in AT7000, G10/FR4 or similar materials for the Probe Plate should be gauged at .0545/.056 [1.384/1.422], suggested drill sizes #54 or 1.40mm. Mounting holes for the Back Plate (wired) should be gauged at .0515/.0525 [1.308/1.333], suggested drill sizes #55 or 1.35mm.

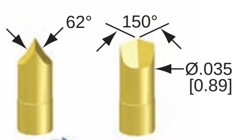




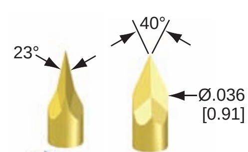
Razor Sharp Tip Styles (See page 72 for more details)



6R -S - Razor

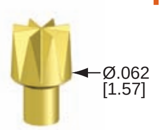


8R -S - Razor

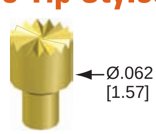


9R -S - Razor

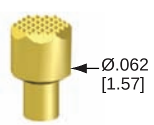
Solder Bump/Dome Tip Styles (see page 78 for more details)



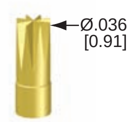
16 - Flat Star



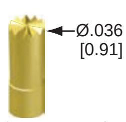
26 - Center Point Star



59 - Micro Serrated



46 - Flat Star



76 - Center Point Star

79 - Micro Serrated

TERMINATIONS

TERMINATION P/N: X75-T▢-▢G

example: X75-TWA-5G

	Letter	Material
TERM.	WA	Heat treated BeCu/gold plated over nickel
	R	Round post. Heat treated BeCu, gold plated over nickel
	Digit	**Description**
BODY LENGTH	2	.715 [18.16] body length, only available in TR
	5	1.265 [32.13] body length, only available in TWA

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

Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG-X75A-P (for Probe Plate) or PG-X75A-T (for Back Plate)

Termination Installation Tool: ITRX75-FL or ITRX75 SET .001 to .140 [0.03 to 3.56]

Termination Extraction Tool: ETRX75 (for use when Probe & Spacer Plates are removed). ETRX75-KIT (includes ITRX75-FL and ETRX75)

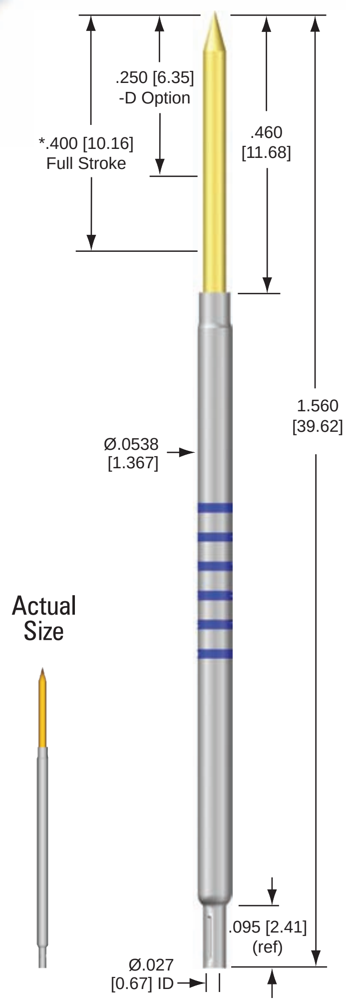
Termination Extraction Tool: ETRX75-EXT (for use when Probe & Spacer Plates are installed)

Probe Installation Tool: PT100/75

Damaged Probe Tube Extraction Tool: TERX75/100

Indicator Probes: IPX75-2510 or IPX75-2540

Probe



PROBES

PROBE P/N: X75-PRP40 ☐☐☐ - ☐
example: X75-PRP4003L

	Letter	Material/Finish				Average Resistance
TUBE	P	Nickel silver/ID precious metal clad				< 20 milliohms
	Digits	**Material/Finish**				
POINT	See Points	Heat treated BeCu/plated gold over nickel (See S options for steel plungers)				
	Letter	**Spring Force**	**Preload**	**@ .317 Stroke**	**Material**	**Mechanical Life (Cycles @ Stroke)**
SPRING	L	Low	0.8 [23]	3.0 [85]	Music wire	1M min @ .317 [8.05] max
SPRING	X	Extra	1.5 [43]	5.7 [162]	Stainless Steel	500K min @ .317 [8.05] max
SPRING	U*	Ultra	4.5 [128]	8.1 [230]	Music wire	10K min @ .317 [8.05] max
	Letter	**Description**				
OPTION	D	Decreased stroke is .250 [6.35]. Must select spring from X75-25 series spring forces with this option.				
OPTION	N	No probe lubrication. Removing probe lubrication greatly reduces cycle life and should only be used in applications outside of the probe operating temperature specifications.				
OPTION	S	Heat treated steel/plated gold over nickel (see Point Styles for availability)				
OPTION	(blank)	No option required				

*0.350 [8.89] max stroke for U spring.

Probe Specifications

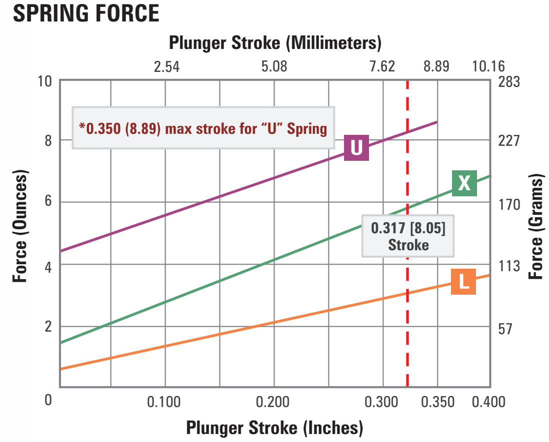
Full stroke: *.400 [10.16]

Working stroke: up to .317 [8.05]

Operating temp.: -50°F to 250°F [-45°C to 120°C]

Current rating: 13.0 Amps (see page 83)

SPRING FORCE



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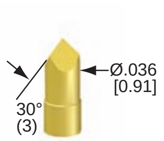
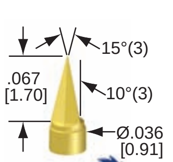
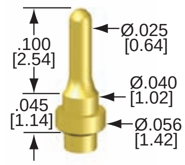


43 - Chisel

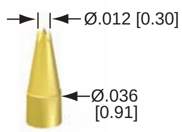


53 or 53 -S - Chisel

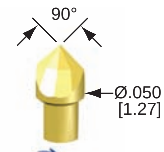


70 - Connector
.315 [8.00] Full Stroke

44 - Crown

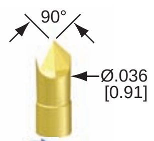


54 - Crown

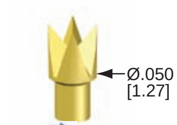


71 -S - Blade

49 - Serrated



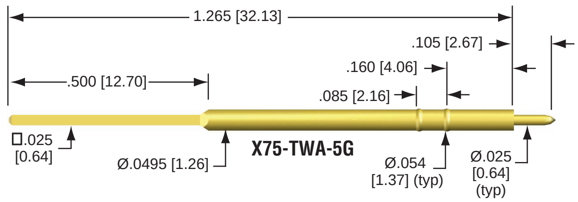
61 -S - Blade

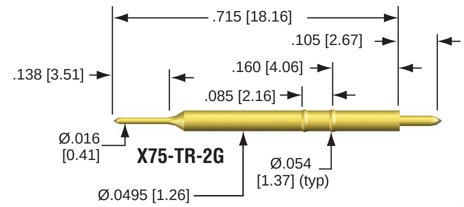


94 -S - Crown

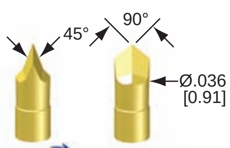
Termination

Mounting holes in AT7000, G10/FR4 or similar materials for the Probe Plate should be gauged at .0545/.056 [1.384/1.422], suggested drill sizes #54 or 1.40mm. Mounting holes for the Back Plate (wired) should be gauged at .0515/.0525 [1.308/1.333], suggested drill sizes #55 or 1.35mm.

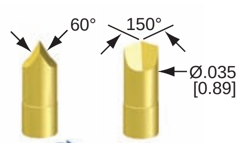




Razor Sharp Tip Styles (See page 72 for more details)



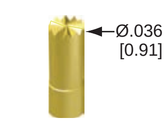
6R -S - Razor



8R -S - Razor

Solder Bump/Dome Tip Styles (see page 78 for more details)

46 - Flat Star



76 - Center Point Star

79 - Micro Serrated

Tools & Accessories (see pages 66 & 67)

Pin Gauge Tool: PG-X75A-P (for Probe Plate) or PG-X75A-T (for Back Plate)

Termination Installation Tool: ITRX75-FL or ITRX75 SET .001 to .140 [0.03 to 3.56]

Termination Extraction Tool: ETRX75 (for use when Probe & Spacer Plates are removed). ETRX75-KIT (includes ITRX75-FL and ETRX75)

Termination Extraction Tool: ETRX75-EXT (for use when Probe & Spacer Plates are installed)

Probe Installation Tool: PT100/75

Damaged Probe Tube Extraction Tool: TERX75/100

Indicator Probes: IPX75-4010 or IPX75-4040

TERMINATION

TERMINATION P/N: X75-T■-■G

example: X75-TWA-5G

	Letter	Material
TERM.	WA	Heat treated BeCu/gold plated over nickel
	R	Round post. Heat treated BeCu, gold plated over nickel
BODY LENGTH	**Digit**	**Description**
	2	.715 [18.16] body length, only available in TR
	5	1.265 [32.13] body length, only available in TWA

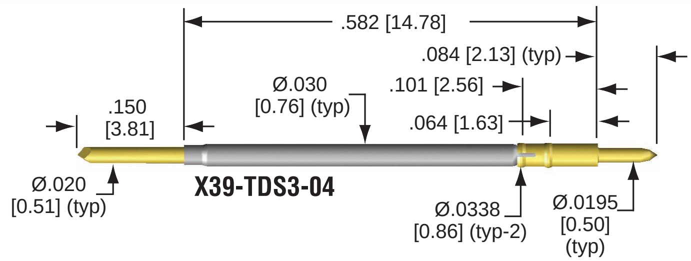
US Patent No. 6,570,399 and 4,885,533

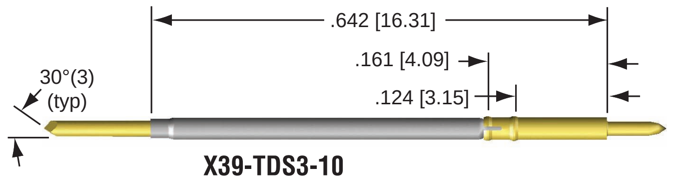
Double-Ended Terminations

Double-ended terminations 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).

Terminations for X39 Wireless Fixtures

Mounting holes in AT7000, G10/FR4 or similar materials for the Back Plate should be gauged at .0315/.0325 [0.800/0.826] suggested drill size #66 or .82mm.





Tools and Accessories (see pages 62 & 63)

X39-TDS Termination

Pin Gauge Tool: PG-X39
Installation Tool: ITRX39-FL or ITRX39 SET -.040 to .100 [-1.02 to 2.54]
Extraction Tool: ETRX39 (for use when Probe and Spacer Plates are removed).
ETRX39-KIT (includes ITRX39-FL and ETRX39)
Extraction Tool: ETRX39-EXT (for use when Probe and Spacer Plates are installed)

TERMINATION P/N: X39 - TDS 3 - ■ ■

example: X39-TDS3-04

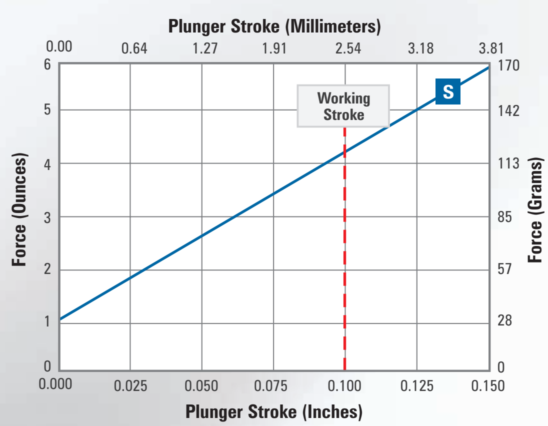
	Digit	Material/Finish
POINT STYLE	3	Chisel, heat treated BeCu/plated gold over nickel
	Digit	**Description**
SET HEIGHT	04	.040 [1.02] low set
	10	.100 [2.54] high set

Interface Probe Specifications

Tube Material: Nickel silver/ID precious metal clad
Full stroke: .150 [3.81]
Working stroke: Up to .100 [2.54]
Operating temp.: Up to 400°F [204°C]

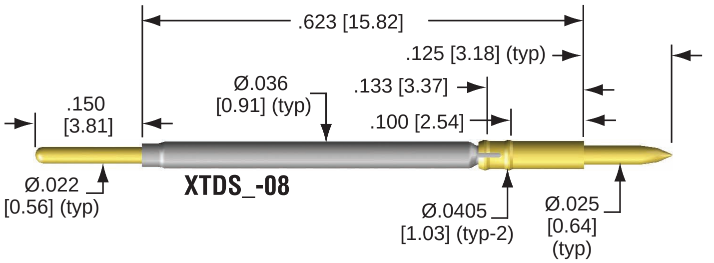
SPRING FORCE

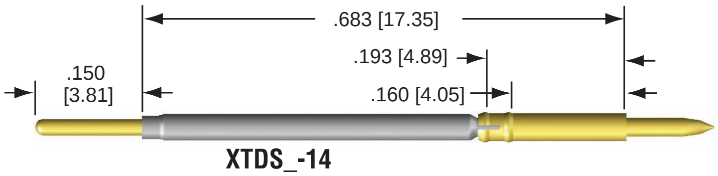
Preload	Full Stroke	2/3 Stroke	Material	Mechanical Life (Cycles @ stroke)
1.00 [28]	5.8 [164]	4.3 [121]	Stainless Steel/gold plated	25K min @ .100 [2.54] max



Terminations for X50 & X75 Wireless Fixtures

Mounting holes in AT7000, G10/FR4 or similar materials for the Probe Plate should be gauged .038/.039 [.97/.99], suggested drill sizes #61 or 1.00mm.



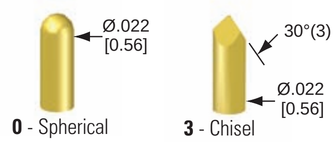


Tools and Accessories (see pages 62 & 63)

XTDS Termination

Pin Gauge Tool: PG-X50-T
Installation Tool: ITRX50-FL or ITRX50 SET .001 to .140 [0.03 to 3.56]
Extraction Tool: ETRX50 (for use when Probe and Spacer Plates are removed).
ETRX50-KIT (includes ITRX50-FL and ETRX50)
Extraction Tool: ETRX50-EXT (for use when Probe and Spacer Plates are installed)

Interface Probe Point Styles

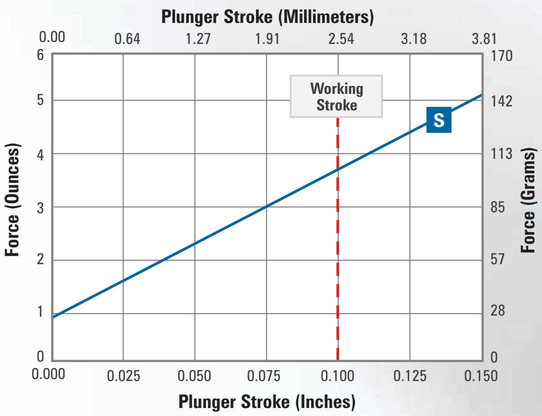


Interface Probe Specifications

Tube Material: Nickel silver/ID precious metal clad
Full stroke: .150 [3.81]
Working stroke: Up to .100 [2.54]
Operating temp.: Up to 400°F [204°C]

SPRING FORCE

Preload	Full Stroke	2/3 Stroke	Material	Mechanical Life (Cycles @ stroke)
.80 [23]	5.22 [147]	3.75 [106]	Stainless Steel/gold plated	100K min @ .100 [2.54] max



TERMINATION P/N: XTDS ▢ - ▢▢

example: XTDS0-08

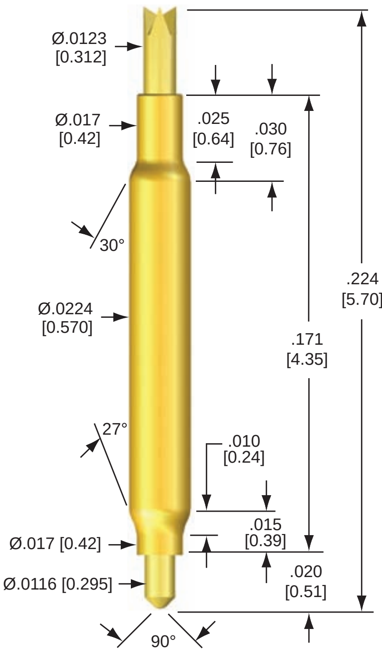
	Digit	Material/Finish
POINT STYLE	0	Spherical, heat treated BeCu/plated gold over nickel
	3	Chisel, heat treated BeCu/plated gold over nickel
	Digit	**Description**
SET HEIGHT	08	.080 [2.03] low set
	14	.140 [3.56] high set

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

08-PR 8 Series

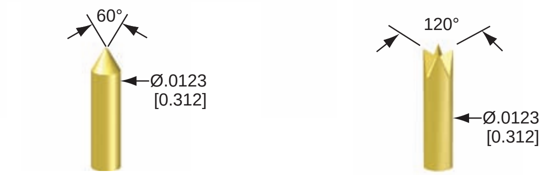
Designed for 0.8 mm standard and custom socket applications. The probe tube must be captured in the socket while the interface plunger remains compressed. The DUT plunger is stroked with each actuation. The interface plunger is typically compressed and fixed at approximately .008 [0.20].

Probe



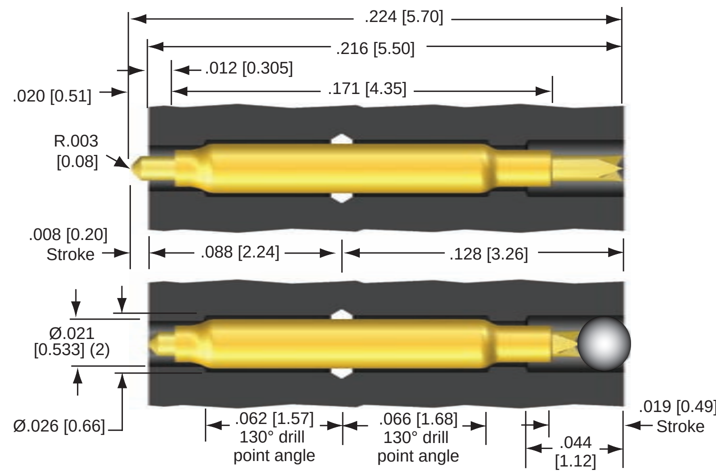
Actual Size

Point Styles for IC Side Only



41 - Spear **44** - Crown

Probe/Socket Mounting Configurations



Probe/Socket Assembly Standard Socket

M08 - PRH89 ☐☐ S ☐

example: M08-PRH8944SL

	Letter	Material/Finish				Average Resistance
TUBE	H	Copper Alloy/ID and OD gold clad				< 30 milliohms
POINT	**Digits**	**Material/Finish**				
	See Points	Heat treated BeCu/gold plated over nickel				
SPRING	**Letter**	**Material/Finish**	**Preload**	**@ .027 [.69] Stroke**	**Mechanical Life @ .027 Stroke**	**Compliance**
	S	Stainless Steel/gold plated	.33 [9.4]	.88 [25]	1,000,000	.035 [.89]
OPTION	**Letter**	**Description**				
	L	Lubricated (Operating temp -50°F to 250°F [-45°C to 120°C])				

Probe Specifications

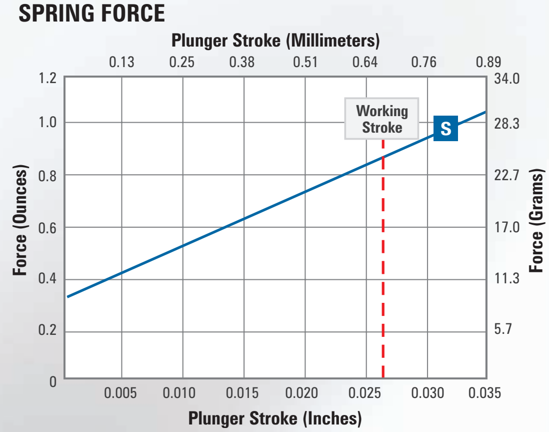
Full stroke: .035 [.89]

Working stroke: Up to .027 [.069] (include both plungers)

Operating temp.: Up to 400°F [204°C]

Current rating: 6.0 Amps (see page 83)

SPRING FORCE



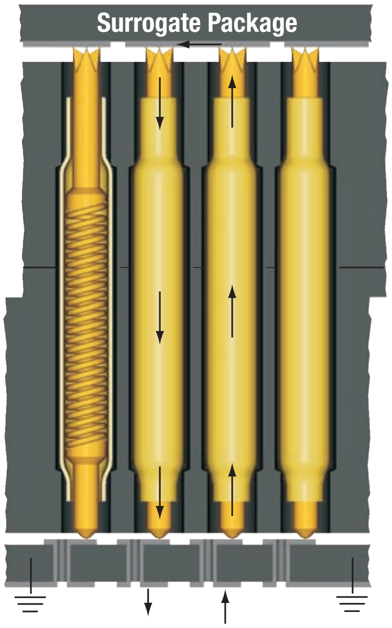
High Frequency Testing

The high frequency performance of a test contactor is of great importance in high speed test applications. QA Technology has made high frequency measurements on a surrogate test contactor populated with our probes. A microwave network analyzer and custom test fixturing was used to test the contactor in the following configurations. Equivalent circuit model data extraction provided by GigaTest Labs®. Contact QA for additional information regarding the full GigaTest® report.

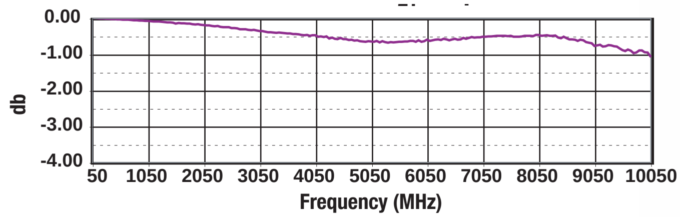
For the Loop-Thru measurement, the test signal travels through the test board via and the first probe to the surrogate package. The isolated trace on the surrogate package couples the signal to the adjacent probe where it is returned back through the second test board via. All the probes surrounding the two signal carrying probes are grounded.

The configuration for the Crosstalk and S_{11} Open measurements are similar, except that the surrogate package does not connect the two probes under test. The coupling between them is primarily capacitive, and it is this coupling effect that is measured.

For the S_{11} Short measurement, the surrogate package shorts the probes under test and the surrounding ground pins together.

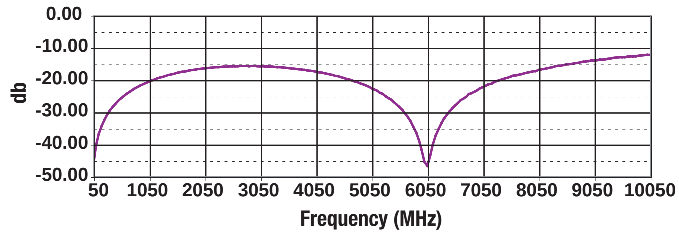


Insertion Loss – S_{21} Loop-Thru



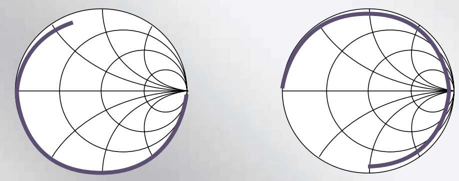
Bandwidth: -1 db @ 10.0 GHz
Self Inductance: 1.13 nH

Crosstalk – S_{21} Open



Maintenance

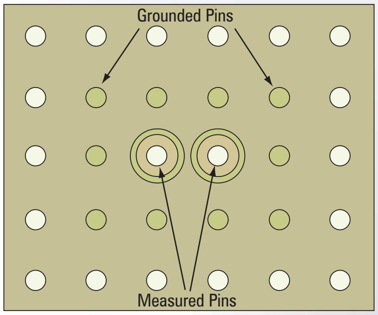
Easy removal and replacement with the use of tweezers. To clean plunger(s); brush with a soft bristle brush. Never use a metal brush as it will damage the gold plating.



S_{11} Open
50 MHz-10.05GHz

S_{11} Short
50 MHz-10.05GHz

Probe/Socket Mounting Configurations



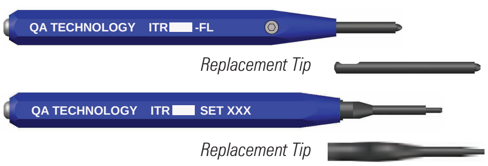
QA Technology has improved upon the design of our Installation and Extraction tools.The key benefit of the new design is to allow you to easily replace a damaged nosepiece on-site without having to return the tool for repair. Simply order a Replacement TIP and follow instructions on page 95:

Installation Tools

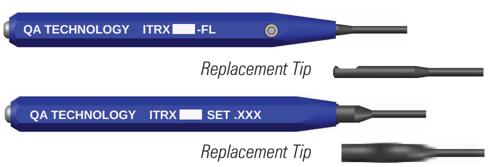
The **AT50(M)-KIT, AT75(M)-KIT** and **AT100(M)-KIT** Adjustable Installation Tools allow insertion of sockets at varying set heights in inches (millimeters).

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

Conventional Sockets



X Probe Socketless



INSTALLATION TOOLS						
	FLUSH Tools		PRESET Tools			Adjustable
Product Series	**FLUSH** Tool Part Number	Replacement TIP Part Number	**PRESET** Tool Part Number	*Set Height (min to max)*	Replacement TIP Part Number	Tool Part Number
039 16 039 25	ITR039-FL	ITR039-FL-TIP	ITR039- Set .___	*.001 to .320* *[0.03 to 8.13]*	ITR039-TIP Set .___	
050 05 050 16	ITR050-FL	ITR050-FL-TIP	ITR050-16- Set .___	*.001 to .360* *[0.03 to 9.14]*	ITR050-16-TIP Set .___	AT50-KIT AT50M-KIT
050 R25 050 T25 050 40	ITR050-FL	ITR050-FL-TIP	ITR050-25- Set .___	*.001 to .270* *[0.03 to 6.86]*	ITR050-25-TIP Set .___	AT50-KIT AT50M-KIT
075 25 075 40	ITR075-FL	ITR075-FL-TIP	ITR075- Set .___	*.001 to .345* *[0.03 to 8.75]*	ITR075-TIP Set .___	AT75-KIT AT75M-KIT
100 05	ITR100-FL	ITR100-FL-TIP				
100 16	ITR100-FL	ITR100-FL-TIP	ITR100- Set .___	*.001 to .190* *[0.03 to 4.83]*	ITR100-TIP Set .___	AT100-KIT AT100M-KIT
100 25 100 40	ITR100-FL	ITR100-FL-TIP	ITR100- Set .___	*.001 to .345* *[0.03 to 8.76]*	ITR100-TIP Set .___	AT100-KIT AT100M-KIT
125 25	ITR125-FL	ITR125-FL-TIP	ITR125- Set .___	*.001 to .250* *[0.03 to 6.35]*	ITR125-TIP Set .___	
X31 25	ITRX31-FL	ITRX31-FL-TIP	ITRX31- Set .___	*.010, .020,* *.030, .040*	ITRX31-TIP Set .___	
X39 25 X39 40	ITRX39-FL	ITRX39-FL-TIP	ITRX39- Set .___	*-.040 to .100* *[1.02 to 2.54]*	ITRX39-TIP Set .___	
X50 25 X50 40	ITRX50-FL	ITRX50-FL-TIP	ITRX50- Set .___	*.001 to .140* *[0.03 to 3.56]*	ITRX50-TIP Set .___	
X75 25 X75 40	ITRX75-FL	ITRX75-FL-TIP	ITRX75- Set .___	*.001 to .140* *[0.03 to 3.56]*	ITRX75-TIP Set .___	

EXTRACTION TOOLS					
Product Series	Extraction Tool Part Number	Replacement TIP Part Number	Kit Tool Part Number	EXT Extraction Tool Part Number	EXT Replacement Tip Part Number
039 16 039 25	ETR039	ETR039-TIP	ETR039-KIT		
050 05 050 16	ETR050-05 ETR050-16	ETR050-05-TIP ETR050-16-TIP	N/A ETR050-16-KIT		
050 R25 050 T25 050 40	ETR050-25	ETR050-25-TIP	ETR050-25-KIT		
075 25 075 40	ETR075	ETR075-TIP	ETR075-KIT		
100 05 100 16 100 25 100 40	ETR100	ETR100-TIP	ETR100-KIT		
125 25	ETR125	ETR125-TIP	ETR125-KIT		
X31 25	ETRX31	ETRX31-TIP	ETRX31-KIT	ETRX31-EXT	ETRX31-EXT-TIP
X39 25 X39 40	ETRX39	ETRX39-TIP	ETRX39-KIT	ETRX39-EXT	ETRX39-EXT-TIP
X50 25 X50 40	ETRX50	ETRX50-TIP	ETRX50-KIT	ETRX50-EXT	ETRX50-EXT-TIP
X75 25 X75 40	ETRX75	ETRX75-TIP	ETRX75-KIT	ETRX75-EXT	ETRX75-EXT-TIP

Extraction Tools

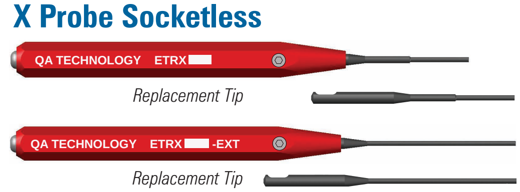
Socket Extraction Tools, **ETR** remove sockets or termination pins without damaging the mounting hole.

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 a ***ITR-FL*** and ***ETR*** tool for each product series.

Conventional Sockets

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

X Probe Socketless



Direct Sales **(603) 926-0348** • Support (603) 926-1193 • Fax (603) 926-8701 • Email: sales@qatech.com • **www.qatech.com**

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	Product Series	PG Tool Part Number Back Plate	PG Tool Part Number Probe Plate
025 16	PG25	X31 25	PG-X31-T	PG-X31-P
039 16 039 25	PG39	X39 25 X39 40	PG-X39	PG-X39
050 05 050 16	PG050-05/16	X50 25 X50 40	PG-X50-T	PG-X50-P
050 R25 050 T25 050 40	PG050-25	X75 25 X75 40	PG-X75A-T	PG-X75A-P
075 25 075 40	PG75			
100 16 100 25 100 40	PG100			
125 25	PG125			

Wire Plug Installation Tool

WTR28 or **WTR30** Wire Plug Installation Tools are used to install Wire Plug, into the back of the socket.

Wire Jack Installation Tool

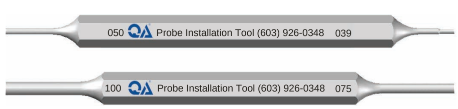
JTR2830 Wire Jack Installation Tools are used to install Wire Jacks for the wire assembly into the back of the socket or termination pin.

Wire Grip Installation Tool

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.

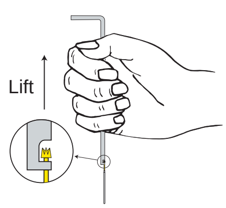
Probe Installation Tool

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



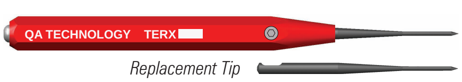
Probe Extraction Tool

PE75 or **PE100** Probe Extraction Tools allow easy removal of probes with headed point styles.



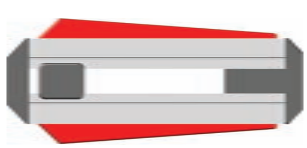
Damaged Probe Tube Extraction Tool

TERX31/039, TERX39/050, TERX50/075, and **TERX75/100** tools are used to remove a damaged probe tube.



Wire Strippers

WS30 or **WS28** Wire Strippers are preset at .120 [3.05] and are used with Wire Plugs, Wire Jacks or Wire Grip Sleeves.



Indicator Probes

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

050-T25 & 050-R25 Series

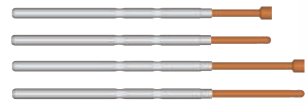
IP050-T2510
IP050-T2540
IP050-R2510
IP050-R2540

075-25 Series

IP075-2510
IP075-2540

100-25 & 100-40 Series

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



X39-25 Series

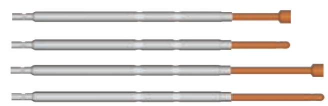
IPX39-2540

X50-25 & X50-40 Series

IPX50-2540
IPX50-4043

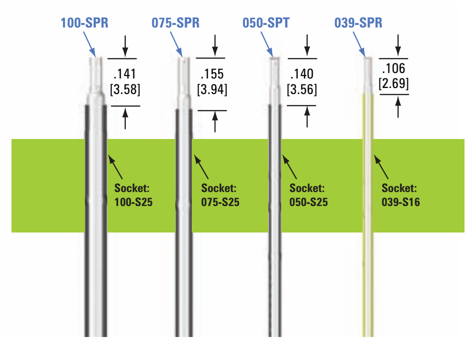
X75-25 & X75-40 Series

IPX75-2510
IPX75-2540
IPX75-4010
IPX75-4040



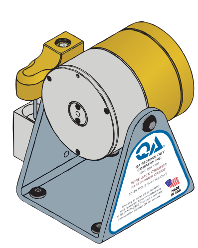
Socket Plugs

Used as quick and easy solution to plug a conventional socket where a test point is no longer needed.



Wire Jack Crimping Tool

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



SPRING FORCE CONSIDERATIONS

When selecting probe spring force for vacuum fixtures, consider these factors:

- **Total probe spring force**
  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.
- **Condition of contact surfaces**
  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 pad and the probe tip.
- **Distribution of probes across the probe field**
  Avoid densely concentrated areas of high force so as not to damage the product or cause fixture actuation problems. Spring force is not the sole determinant of good electrical contact. Surface contact area, tip geometry, contact materials, cleanliness, vibration and impact as the product engages the probe tips, all affect contact resistance.

Calculating the Limits

For a conventional vacuum fixture, the total spring force limit is calculated by multiplying the surface area of the product by atmospheric pressure, then dividing the result by the spring force per probe. The result is multiplied by an efficiency factor that accounts for fixture leaks, spring force tolerances, vacuum considerations (details below), etc. Improving the system efficiency will allow a faster rate of actuation and can increase the capacity of the fixture, but spring force may never exceed the force applied by atmospheric pressure.

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.

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

Units	Area of Board	x	Atmospheric Pressure	x	Force Unit Conversion	÷	Force per Probe	x	System Efficiency		Max No. of Probes
English	60 in^2	x	14.7 psi	x	16 oz/lb	÷	5.5 oz	x	60%	=	1,500
Metric	387 cm^2	x	1.03 kg/cm^2	x	1000 gm/kg	÷	156 gm	x	60%	=	1,500

Probe Distribution

Concentrations of probes around connectors or large pin packages may exceed one (1) atmosphere in a small area of the product while the total force may be below the maximum limit. If the concentration of probes is near the edge of the product, the vacuum seal may break and prevent the product from seating in the fixture. Uneven probe distribution can result in excessive flexing of the product – particularly with thin boards. Applying the same formula, the maximum probes per square inch can be calculated: This limit can be exceeded if the stiffness of the board or pattern of probe allows an even distribution of the collective spring force over the surface of the product.

Units	Area of Board	x	Atmospheric Pressure	x	Force Unit Conversion	÷	Force per Probe	x	System Efficiency		Max No. of Probes
English	1 in^2	x	14.7 psi	x	16 oz/lb	÷	5.5 oz	x	60%	=	25
Metric	6.45 cm^2	x	1.03 kg/cm^2	x	1000 gm/kg	÷	156 gm	x	60%	=	25

Vacuum Consideration

When calculating probe spring force limitations, the efficiency factor is used to define the vacuum system's ability to overcome probe spring force. The two factors that are typically referenced are "CFM" and "Inches of Mercury." Cubic feet per minute is the measure of the vacuum system's capacity 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 .60 which represents 18 inches of mercury.

Calculating Spring Force for a Chosen Stroke

Probes are not always used at rated stroke, and it is necessary to know the spring force at any given stroke in order to properly design the fixture. A probe's spring force at any chosen stroke can be calculated with the formula:

F = P + (S(Fg - P) ÷ Sg) where:

F	= The force at a chosen stroke (oz or gm)
S	= The chosen stroke (in or mm)
P	= The preload force (oz or gm)
Fg	= The force at a given stroke (oz or gm)
Sg	= The given stroke (oz or gm)

Example: Find the force at .200 [5.08] stroke for the standard force spring in the 100-25 series:

Known:

P = 1.6 oz [45 gm], 5.5 oz [156 gm] at Sg = .167 [4.24]

F = 1.60 + (.200(5.5 - 1.60) ÷ .1670)
= 6.3 oz [179 gm]

Spring Force vs. Contact Resistance

Close examination of the probe tip and the contact surface reveals that the surfaces are comprised of microscopic hills and valleys. The hills, not all being the same height or angle to the target, do not all make contact with the target surface. The current flow through the probe tip is constricted through the hills that make contact. Increasing the pressure forces the taller hills to penetrate and allows the shorter hills to come into contact thus increasing the surface area capable of carrying current.

Most lead platings and solders contain tin. Tin alloys form a thin, hard, brittle oxide layer within minutes when exposed to air. This oxide layer is highly resistive. Fortunately, the underlying material remains softer than the oxide layer and easily deforms under sufficient pressure. The oxide layer is stretched and broken as the underlying layer is deformed. The cracks between the oxide layer become the primary path for current. When spring force is increased, greater deformation takes place and allows increased break-up of the oxide layer.

Specifying spring force is not a casual consideration. Check spring force selection or changes with the fixture manufacturer since these choices are closely tied to the fixture design.

References

Robert Mroczkowski, *Connector Contact, Critical Surfaces* Advanced Materials & Processes, Metal Progress, 12/88 pp 49–54, 1988.

Morton Antler, *Effect of Surface Contamination on Electric Contact Performance* Treatise on Clean Surface Technology, Vol 1, pp 8–18, March 1987

Morton Antler, *Field Studies of Contact Materials: Contact Resistance Behavior of Some Base and Noble Metals*. IEEE Trans, Components, Hybrids, Manuf. Technology., Vol 5 No. 3 pp 301–307, 1982

PROBE TUBES FINISH OPTIONS

Probe tubes may be clad, plated, or left unplated, depending on the intended application. The following is a summary of the various options and their applications:

"N" style probe tube

This nickel silver tube with no cladding or plating is suitable for most bare board test applications where probe resistance below one ohm is acceptable, or when cost is an issue. Oxides which form on the inside surface of the tube can impede current flow between the tube and plunger.

"G" style probe tube

The "G" tube is a nickel silver tube with a layer of gold plating on the outside surface of the tube. On .100 [2.54] and .075 [1.91] center probes, the plating also covers the inside of the probe tube and improves performance considerably compared to the "N" tube.

"P" style probe tube

The "P" tube is deep-drawn from nickel silver alloy with precious metal clad on the inside surface, and is used for in-circuit testing where low and consistent electrical resistance is necessary. The deep-drawing process hardens the gold, improving wear characteristics and resulting in a gold layer of extremely uniform thickness along the entire inside surface of the tube.

"H" style probe tube

The "H" tube is made from a proprietary, high conductivity alloy, gold plated. These tubes are used in high current applications, very humid environments, or where extremely low electrical resistance is required.

"F" style probe tube

Same as the "P" tube, but with an oversized probe tube diameter (.0542) used as a Factron replacement probe.

Tube	Materials	Color Code
N	Nickel Silver; No Finish	Red
G	Nickel Silver; Gold Plated OD	Red
P	Nickel Silver; ID Precious Metal Clad	Blue
H	High Conductivity Alloy; Gold Plated	Black
F	Factron Replacement (Oversize "P" Tube)	Green

NO-CLEAN FLUX APPLICATIONS

Reductions in the use of CFCs for board cleaning have led to increased use of no-clean fluxes. Properly tuned fluxing processes with modern low-solids fluxes result in boards that are readily testable. However, the real world often presents test engineers with no-clean boards coated with layers of contamination ranging in texture from hard and brittle to soft and gummy. The following summarizes recommendations for probe selection to make reliable contact through contamination layers. This information is drawn from industry studies and from customer feedback about probes in production environments.

The principle behind making electrical contact through contamination is that higher contact pressures better displace and penetrate contamination, resulting in higher reliability. With spring probes, contact pressure is affected by both spring force and contact area. Sharper points will reduce the contact area, thereby increasing the contact pressure; and higher spring force will increase contact pressure as well. But simply putting the strongest spring behind the sharpest point is not always the solution – there are other factors to consider:

- Although using higher spring forces will improve contact reliability, the ability of the test fixture to overcome the spring force and actuate fully must be considered.
- The tip style chosen must be physically stable on the surface being contacted. For example, although a sharp chisel point may be ideal for a via or pad, using it for a through-hole component lead will result in glancing and side loading.
- Ultimately, the selection of point styles is a subjective decision – experienced test engineers will often have different preferences for the best point style to use on a given contact surface. Testing and field use have shown a particular group of point styles to be well-suited for contacting heavily contaminated contact surfaces:
    - For pads, use Sharp Chisels (53 and 63), Sharp Triad (08), Spears (31 and 41) or Razors (6R-S, 9R-S).
    - For leads, use Self-Cleaning Crowns (24, 34 and 55), Tulip (17), and Sharp Triad (08) tips.
    - For vias, use Sharp Chisels (53 and 63), Chisel Triad (18), Blades (51-S and 61-S), or Razors (6R-S, 8R-S, and 9R-S) tips.

Steel plungers are harder and will remain sharp longer than beryllium copper, so steel is recommended for applications requiring greater durability. Many of the point styles listed above are available in various combinations of beryllium copper or hardened steel.

ORGANIC SOLDERABILITY PRESERVATIVES (OSP)

Organic Solderability Preservatives (OSP) coatings are increasingly being used due to the advantages they offer the PCB manufacturing process. By preventing oxidation of bare copper pads, OSP offers the elimination of the bare board solder-coating process Hot Air Solder Leveling (HASL), and allows multiple passes through reflow ovens without degradation of solderability.

The OSP coating is dissolved by the flux when solder paste is applied to the pads and should not create an insulating barrier to the test probes. However, in cases where a PCB has components on one side and test points on the other, bare copper pads coated with OSP remain as test points. Reliable penetration of this coating by the test probe is required to test the PCB, which should not be a problem if thickness and temperature is controlled in the OSP coating process. The coating thickness recommended by OSP manufacturers is between 0.25 and 0.35 microns. Higher contact pressure such as 6 to 10 ounces consistently provides a more reliable contact when the thickness of the OSP is greater than the specified 0.35 microns. Therefore the use of higher spring forces may be the best testing option.

Generally, the same tips used on no-clean flux processes are recommended such as the 51, 6R, 61, 53, 63, 8R and 9R. QA typically recommends using these tip styles in our steel option.

LEAD-FREE SOLDER PCB PROCESSES

QA Technology continues to work closely with solder manufacturers to determine the major factors to consider when using lead-free solder processes. Here is an overview of these factors:

Reflow Process

This process is the most affected by the switchover to Pb-Free solder. The recommended ovens should generally have a minimum of seven (7) zones, which are needed to provide the proper ramp and hold times required for Pb-Free solder paste. This is to insure that the board and its components reach the higher reflow temperatures required for Pb-Free solders. Nitrogen is recommended in the reflow process to help improve the wetting between the board and the components. Older reflow ovens will have the most difficult time where as modern ovens that can more accurately control the ramp up times and temperatures will have better results.

Wave Soldering

Because of the increase in melting temperatures (424°F - 440°F [218° - 227°C] versus 361°F [183°C]) associated with Pb-Free alloys, added maintenance is required. Tin is reactive and will eventually corrode the stainless steel solder pots and components. The high tin alloys dissolve the actual materials used in this equipment. Parts will need to be replaced with cast iron or coated with a material that will protect the surfaces. A more active liquid flux may also be required.

Cross Contamination

Any time a probe contacts a UUT, some of the flux or solder paste that makes up the contact will be transferred to the probe tip. The residues may be minimal and insignificant but the possibility exists that these residues will transfer to subsequent boards being tested. The transfer of lead residues does not end here. As a UUT is tested, particles of the contact (lead, tin, flux etc.) are fragmented during the test and fall into the fixture. As the fixture is cycled, these contaminants are spread throughout the fixture and related test equipment by the vacuums pull-down and release cycles. As a result, these contaminants can be deposited onto a lead free UUT. These contaminants are frequently seen when cleaning the equipment.

Keep in mind that if a product line is converted from leaded to lead free, the first boards tested will have the highest concentrations of lead contamination while subsequent boards will have a lower contamination level.

By just changing to new probes, you are not guaranteed that you will have a Pb-free environment. A complete rework/cleaning of the test unit and all fixtures would be required. Depending on the application and level of lead allowed, you may need to go to even greater steps.

Inspection

Because of the larger grain structure of Pb-Free, the solder joints appear dull and pitted. This appearance does not mean it is not a good solder joint.

Test Probes

In test environments, the flux is going to be the problem area. The flux must be designed to be thermally stable. Because the flux has to withstand the higher reflow temperatures (464°F [240°C] versus 419°F [215°C]) associated with Pb-Free, they will be harder to penetrate due to "charring" and chemistry breakdown. Some of the fluxes that were tested tended to "fracture" and stick to the tips. This is similar to what the industry experienced when no-clean fluxes were first introduced requiring more maintenance for test probes. Incidentally, the "domed" surfaces of the Pb-Free pads were relatively free of solder flux. Most of the flux pooled around the base of the pad. Contacting the pad at the base could be a potential for false test failures. Flux chemistry is still evolving and future fluxes will be more compatible with the higher reflow temperatures.

We have found that all Pb-Free test pads were easily contacted with sharp probes. Even low spring force probes will work with Pb-Free as they left nice witness marks on the surfaces with low recorded resistance levels. To insure the best possible test environment, work closely with your solder manufacturer to make certain that the solder is being applied to the manufacturers recommendations. Make sure the solder is labeled as "Pin Testable" on the material specification sheet supplied with the solder.

In summary, QA Technology recommends that Pb-Free finishes be tested with:

- **Tip Styles:** The selection of point styles is a subjective decision. Experienced test engineers often have different preferences for the best point styles to use on a given contact surface. QA recommends sharp pointed tips.
- **Spring Forces:** Feedback from production test environments that have changed lines to Pb-Free solders have had to select the next higher spring force option. In some cases, the existing spring forces and tip styles were adequate.
- **Plungers:** Steel plungers are recommended to help increase probe tip life when contacting the harder and possibly more abrasive flux residues.

SOLVING TODAY'S TEST CHALLENGES – STEEL RAZOR TIP STYLES

Faced with the challenges of making contact through today's problem processes such as OSP, Lead-Free solder paste and No-Clean, QA Technology has a family of razor-sharp steel tips to solve these extreme conditions.

Benefits

- Lower board test costs
  - Significantly reduce NDFs (No Defects Found)
  - Increase first pass yields
  - Extend probe life
  - Faster board throughput due to fewer actuations
- Reduce board flex
  - Lower spring forces are possible under dense areas
- Improved electrical contact on vias and test pads

QA's 8R Steel Razor cuts though fluxes without the added time and cost of repeated fixture actuations and false failures. This 150° tip penetrates without bottoming out in the via flux pool, as typically seen with steeper angled tip styles.

Increase First Pass Yields

This razor-sharp tip slices through hard to probe fluxes and contaminants, increasing your first pass yields. When contacting extremely difficult to contact lead-free pasted (filled) vias and test pads, razor tip styles have been proven to reduce the number of fixture actuations from as many as five or more, to as few as one.

In three independent studies run in actual contract manufacturing environments, the 8R Steel Razor outperformed conventional probes with consistent and reliable contact (see Graph A).

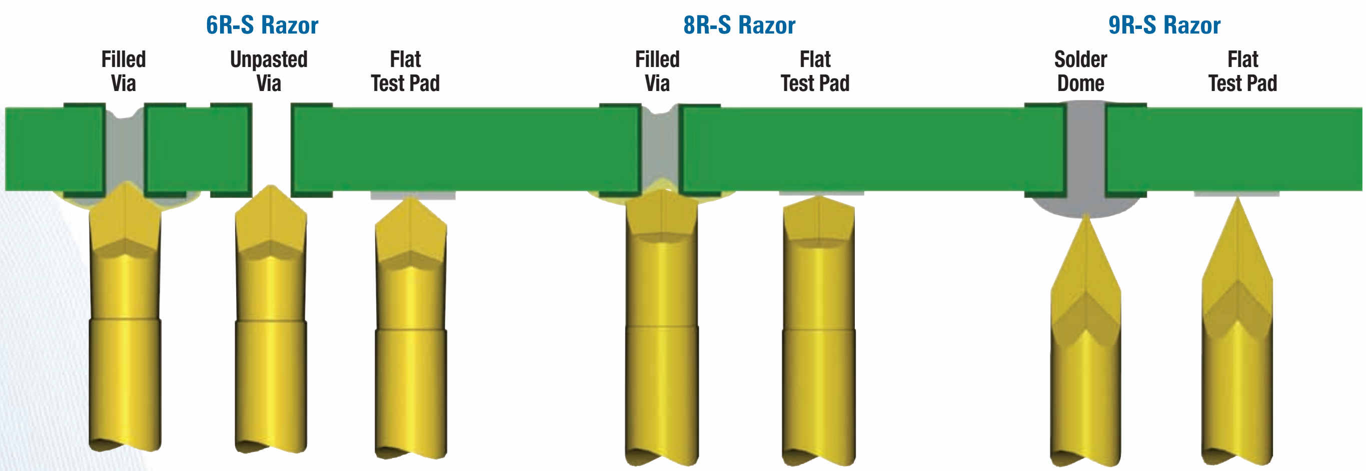
In Test 1, First Pass Yields with a single actuation increased from 55% to 96% with the 8R Steel Razor, and 100% yields were achieved with the 2nd actuation.

In Test 2, First Pass Yields with a single actuation increased from 82% with Conventional to 100% with the 8R Steel Razor. False failures were completely eliminated even when lower spring forces were used (6.5 oz vs. 8.1 oz).

In Test 3, even in a worse case scenario where conventional probes only achieved 11% on the first actuation, the 8R Steel Razor with a lower spring force yielded 96% on the 1st, and achieved 100% with an additional actuation.

For Test 2 and 3, spring forces were lowered to reduce stress on the PCBs.

Increasing First Pass Yields allows for faster board throughput, saving time and lowering board test costs.

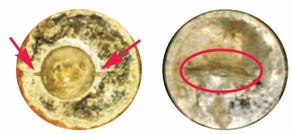


6R-S, the 90° sharp center is designed to contact **VIAS & TEST PADS** while maintaining the razor sharp edges.

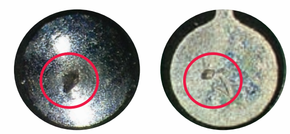
8R-S, the 150° shallow angle is designed to contact filled or solder pasted **VIAS** reducing the chance of being blocked by a pool of flux. Also works well on flat **TEST PADS**.

9R-S, the 40° sharp center is designed to contact **SOLDER DOMES & TEST PADS**.

6R-S Razor witness marks on a lead-free pasted OSP VIA, no-clean process (left) and a lead-free pasted TEST PAD (middle) and an unfilled copper VIA (right)



8R-S Razor witness marks on a lead-free pasted OSP VIA, no-clean process completely filled with flux (left) and a pasted, no-clean process TEST PAD (right)



9R-S Razor witness marks on a SOLDER DOME (left), and a pasted, no-clean process TEST PAD (right)

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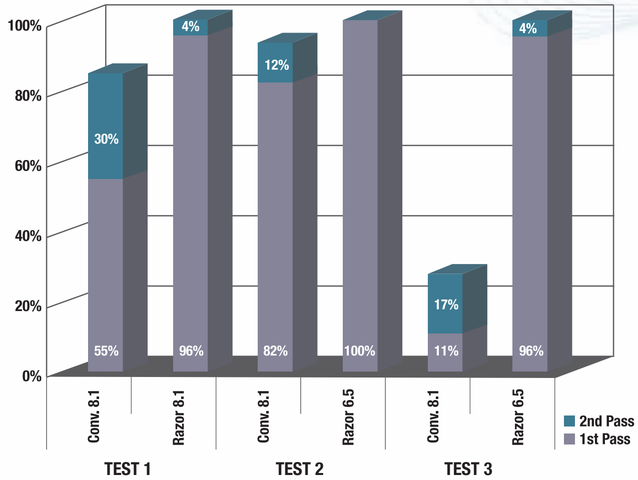
Graph A

Lead-Free Pasted Vias with No-Clean Process



Reduce NDFs by Virtually Eliminating False Failures

QA's 8R Steel Razor works on a wide variety of process materials such as Immersion Au (Gold), Ag (Silver), Sn (Tin) and OSP (Organic Solderability Preservative), and many different lead-free solders and fluxes. It also works well with many manufacturing methods, including wave, select wave and reflow (single and double).

Actual photo of 8R Steel Razor still performing with a single actuation after 58,000 cycles on OSP, Lead-Free solder pasted (filled), No-Clean processed vias with heavy tip contamination.

Performance

QA's Steel Razor family works on a wide variety of process materials such as Immersion Au (Gold), Ag (Silver), Sn (Tin) and OSP (Organic Solderability Preservative) and many different lead-free solders and fluxes. It also works well with many manufacturing methods including: wave, select wave and reflow (double and single).

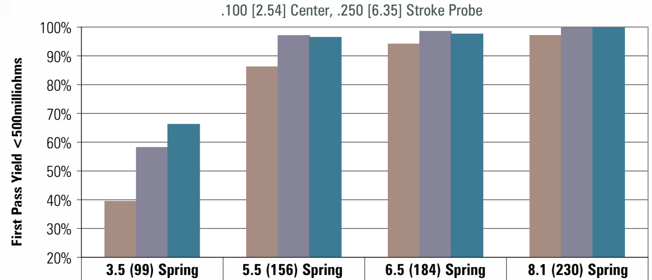
These advanced designed tips slice through these challenges and increases your first pass yields by reducing the number of fixture actuations from as many as five or more, to as few as one. Increasing your first pass yields allows for faster board throughput, saving time and lowering board test costs.

The charts to the top right show the performance of both the 6R and 8R in "Difficult to Probe" (Graph B) and "Pin-Testable" (Graph C) solder pastes in various spring force configurations showing the success rate of first pass yields on both tips.

Graph B

Difficult To Probe Solder Paste – Alpha OM338, DSDR

.100 [2.54] Center, .250 [6.35] Stroke Probe



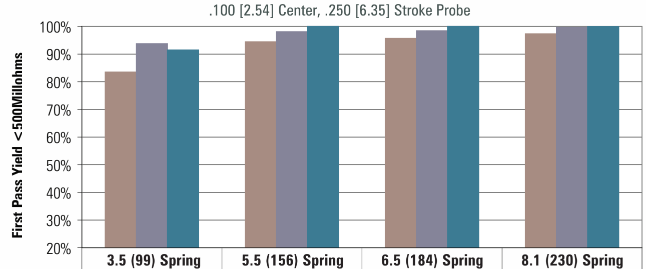
	3.5 (99) Spring	5.5 (156) Spring	6.5 (184) Spring	8.1 (230) Spring
Blade	39.4%	86.2%	94.1%	97.1%
6R-S	58.1%	97.0%	98.5%	99.7%
8R-S	66.2%	96.4%	97.5%	99.8%

"Spring force is in ounces (gms) at 2/3 stroke."

Graph C

Pin-Testable Solder Paste – Alpha OM338-PT, DSDR

.100 [2.54] Center, .250 [6.35] Stroke Probe



	3.5 (99) Spring	5.5 (156) Spring	6.5 (184) Spring	8.1 (230) Spring
Blade	83.5%	94.4%	95.7%	97.3%
6R-S	93.8%	98.1%	98.4%	99.7%
8R-S	91.5%	100.0%	100.0%	100.0%

"Spring force is in ounces (gms) at 2/3 stroke."

Performance is based on one (1) fixture actuation on OSP, lead-free pasted, no-clean processed VIAS.

Longer Life

Life cycle tested to over 60,000 cycles with 99.9% success rate, tip sharpness remained.

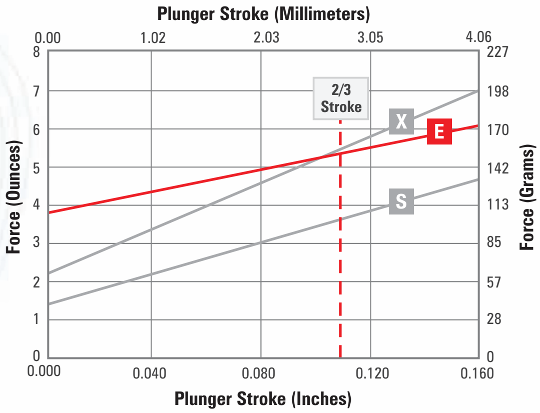
	Fixture Actuations	Cycle Life	Board Tested
Standard Steel Blade	5	60,000	12,000
8R Steel Razor	1	60,000	**60,000**

Example of how fewer actuations can result in more boards tested. Results may vary depending on your processes.

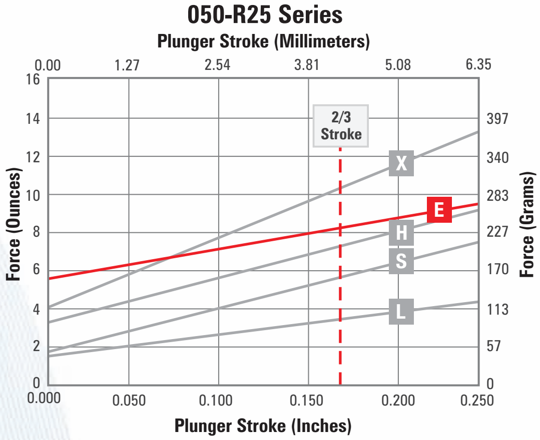
HIGH PRE-LOAD SPRING OPTION FOR PB-FREE, OSP AND NO-CLEAN

QA Technology's High Preload springs gives an additional solution in solving today's challenging test environments, such as excessive fluxes and contaminants in Pb-free, OSP and No-Clean processes. QA's high preload springs offer a higher force during the first 2/3rd of actuation, resulting in better probe tip penetration and higher first-pass yields. The force is also more consistent when the probe travel is affected by variations due to board flex, fixture tolerances and target heights. To the right are graphs comparing our high preload springs vs. our current standard spring force offerings. See applicable product series for available tip styles.

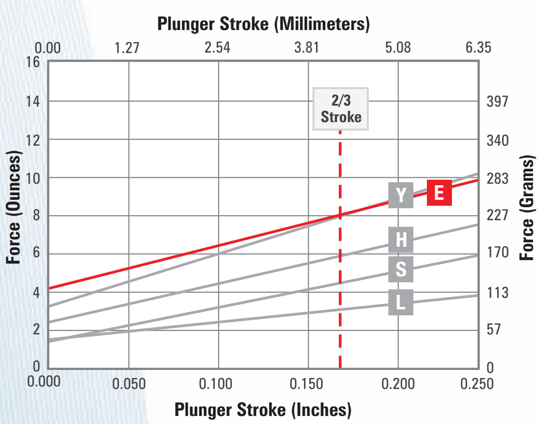
039-16 Series



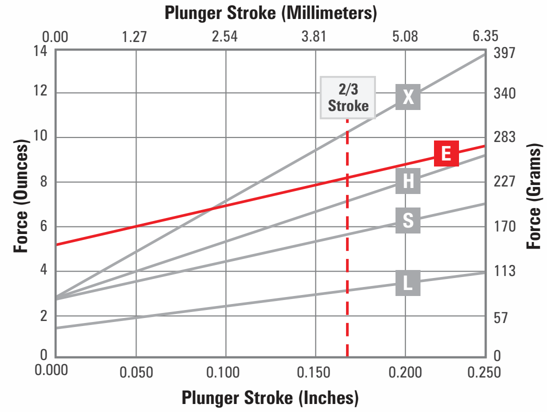
050-R25 Series



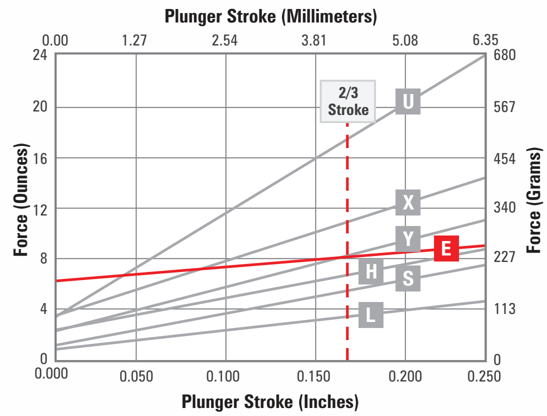
050-T25 • X39-25 Series



075-25 • X50-25 Series



100-25 • X75-25 Series

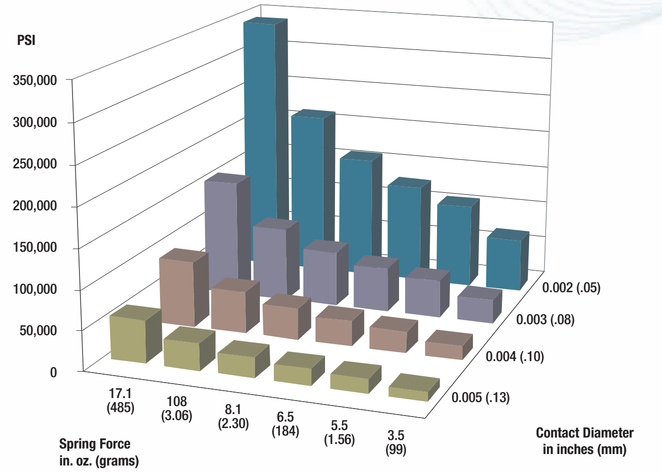


HOW PROBE TIP GEOMETRY AFFECTS CONTACT RELIABILITY

Table A and Graph A show calculated contact pressures (spring force divided by contact area) for the 100-25 Series spear point probe contacting a flat surface. The calculations are based on nominal spring forces and a circular contact area ranging from .002 [.05] to .005 [.13] in diameter.

The actual contact area depends largely on the geometry and condition of the probe tip. A tip which is blunt (either by design or because it has become worn or flattened during use) will make contact over a larger area than a sharp tip, resulting in lower contact pressures and reduced ability to penetrate contamination layers.

Note that the contact pressures shown here are significantly higher than the yield strength of solder, and will cause the solder surface to deform. As a sharp point initially bears against a solder pad, the solder will yield, the area will increase, and the contact pressure will drop until the pressure reaches the yield strength of the solder. As the solder yields, the oxide or flux which covers the solder is disrupted, and uncontaminated solder is brought into contact with the probe tip, allowing electrical contact to be made. The result is a witness mark left in the solder pad.



***Graph A**: A probe with lower spring force and a relatively sharp tip can develop higher contact pressure than one with high force and a worn tip.*

Spring Force in Ounces [gms]	Contact Pressure in Pounds per Square Inch [MPa] — Diameter of Contact Area in Inches [mm]			
	0.002 [.05]	0.003 [.08]	0.004 [.10]	0.005 [.13]
3.5 [99]	69,630 [480]	30,947 [213]	17,408 [120]	11,141 [77]
5.5 [156]	109,419 [755]	48,631 [335]	27,355 [189]	17,507 [121]
6.5 [184]	129,313 [892]	57,473 [396]	32,328 [223]	20,690 [143]
8.1 [230]	161,144 [1111]	71,620 [494]	40,286 [278]	25,783 [178]
10.8 [306]	214,859 [1482]	95,493 [659]	53,715 [370]	34,377 [237]
17.1 [485]	340,194 [2391]	151,197 [1063]	85,048 [598]	54,431 [382]

Table A

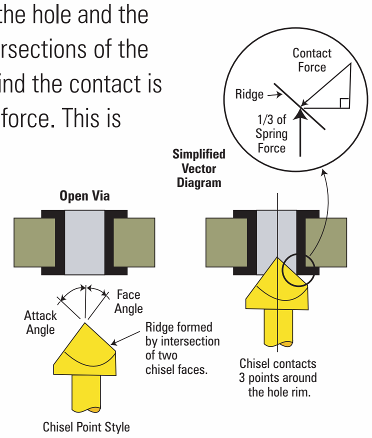
Probe Series	Point Style	Face Angle	Attack Angle	Spring Force
100-05	03	53	69	.357
	13	53	69	.357
	23	66	77	.342
	33	73	81	.337
	53	76	83	.336
	63	30	49	.442
100-16	03	30	49	.442
	13	30	49	.442
100-25	03	30	49	.442
100-40	43	30	49	.442
075-25	53	N/A	15	1.288
075-40	63	15	28	.710
050-05	13	53	69	.357
	43	30	49	.442
050-16	03	30	49	.442
	13	45	63	.374
050-16	03	45	63	.374
	13	30	49	.442
	11	N/A	15	1.288

Spring Force Multipliers for Chisel Points

Table B

For multiple-tip point styles contacting flat pads, make the worst-case assumption that all tips will be touching the pad, and multiply the surface area by the number of points. For example, in the case of the triad point the contact pressure would be one third that of the spear point pressures listed at left.

A chisel contacting the rim of an open via is a special case (a chisel is essentially a pyramid with a triangular base). The area of contact is easy to envision – it is spread over three regions which are the points of contact between the rim of the hole and the three ridges formed by the intersections of the chisel faces. But the force behind the contact is actually higher than the spring force. This is because the reaction force is perpendicular to the attack angle of the ridge and increases geometrically as a function of this angle.



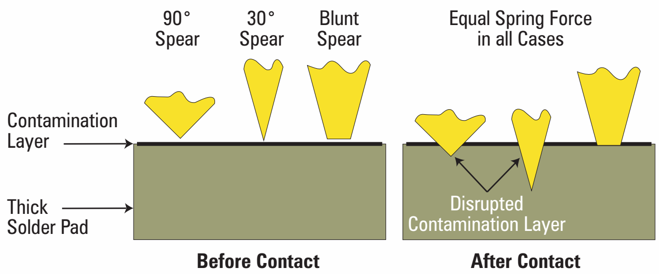
$$\text{Contact Force} = \frac{\text{Contact Force}}{3 \sin(\text{Attack Angle})}$$

The vector diagram on the next page describes this, but the important concept in the case of chisels in open vias is that contact pressure will increase not only in response to sharper ridge edges and higher spring force, but also as the attack angle becomes more acute.

Table B compares the effect of attack angles on contact force for various chisel point styles. The contact force at each of the three contact points around the rim of the hole is equal to the spring force times the Spring Force Multiplier. The table shows, for example, that a 53 point style (sharp chisel) has nearly three times higher penetrating power than an 03 point style (standard chisel) with the same spring.

This attack angle principle is the same for the various blade point styles (a blade is essentially a pyramid with a diamond-shaped base), but the pressures are higher since there are two points of contact on the rim of the hole instead of three. Blades are the most aggressive point styles for use in open vias. But blades bring another key principle into play – the role of the included angle of the ridge.

The included angle is the angle formed between the faces that intersect to make the ridge. For a blade point style, the included angle is smaller (forming a sharper wedge) than for a chisel. The smaller the included angle, the more the contact surface will deform as it yields. Greater deformation means more disruption of the contamination layer, and therefore more reliable contact between the exposed uncontaminated solder and the probe tip. The end result is that even with contact area held constant, more acutely angled points make more reliable contact through contamination. This is demonstrated in the example on the next page.



It is easier to visualize the effects of included angle with spears than chisels. Consider the case of two spears contacting a flat pad with a thick solder coating. One spear has an included angle of 90º, the other an included angle of 30º. Both have 3.5 ounces of spring force pushing behind them. Since solder yields at about 5000 psi, both spears will penetrate the solder until a conical hole of .007 [.18] diameter (at the top) is formed. At this diameter, the solder will no longer yield, since the contact pressure has been reduced to 5000 psi. This means that the 90º spear will penetrate to a depth of .004 [.10], while the 30º spear will penetrate much deeper to .014 [.36].

The greater penetration will cause more disruption of the contamination layer, and more reliable contact will result. For an extreme case, imagine a spear with a .007 [.18] diameter flat on the end. This spear would not penetrate the solder at all.

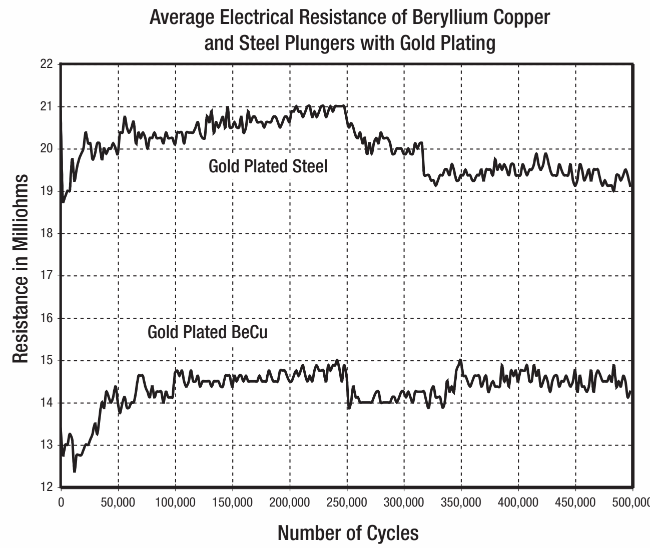
Note that sharp spears against thin solder layers can penetrate the solder layer. In such cases, the spear will bear against the substrate and stop before achieving the depth calculated.

PLUNGER MATERIALS–BERYLLIUM COPPER VS. STEEL

Graph A compares the electrical performance of 100-25 series probes with beryllium copper and steel plungers with gold plating.

There is a slight but measurable difference in the average resistance between the two base materials. The steel plungers average 5 or 6 milliohms higher resistance than the equivalent plungers made of BeCu. Note that the bulk electrical resistance of BeCu is .08 microΩ-meters at 20°C, while the steel in QA plungers is .18 microΩ-meters. Although steel has about twice the bulk resistance of BeCu, the difference it makes in probe resistance will not affect the vast majority of test applications. The hardness of steel plungers typically ranges between 58 and 60 on the Rockwell C scale, versus 38-42 for beryllium copper. Steel plungers will, therefore, remain sharp longer than BeCu plungers, but note that the superior machinability of BeCu means that BeCu plungers generally start out sharper.

In cases of heavy side loading over many cycles, testing shows virtually no difference in wear between BeCu and steel plungers. Sixteen pieces each of 100-PRP2524S and 100-PRP2524S-S were run for 500,000 cycles at two-thirds travel against a contact surface angled 30º from horizontal. There was no difference in life between BeCu and steel, see Graph A and Table A.



Graph A

Electrical Resistance (mΩ) Summary for 30˚ Side Load Over 500,000 Cycles				
Base Material	Min.	Max.	Avg.	Std. Dev.
BeCu	7	16	11	1.22
Steel	10	24	15	2.35

Table A

LONG STROKE PROBES FOR DUAL-LEVEL TESTING

QA Technology's .400 [10.16] long stroke probes are designed for use in dual-level (Functional/In-Circuit) test fixtures. The long stroke probes are easily mixed with their standard-stroke .250 [6.35] counterparts. Long stroke and standard stroke probes with the same center spacing install in identical sockets, and mounted at the same set height. This allows the probes to be interchanged freely from one socket or termination pin to another as test needs dictate.

As shown in Diagram A, the long stroke probe tips are .150 [3.81] higher than neighboring standard stroke tips when the fixture is not actuated. In the functional test position, the long stroke probes are deflected .060 [1.52], leaving .090 [2.29] clearance to the tips of the standard stroke probes. During in-circuit test, deflection of the long stroke probes is .317 [8.05], and the standard stroke probes are deflected .167 [4.24], which is the recommended two-thirds stroke position.

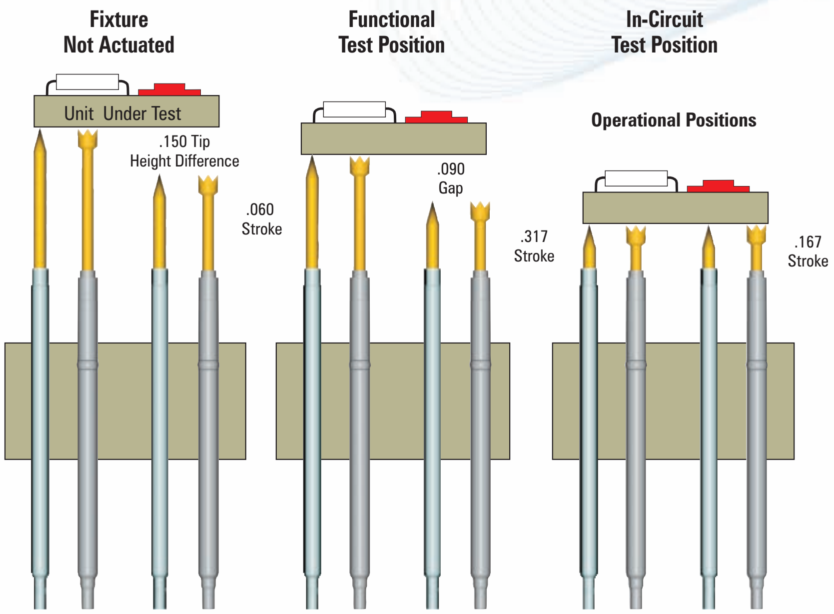
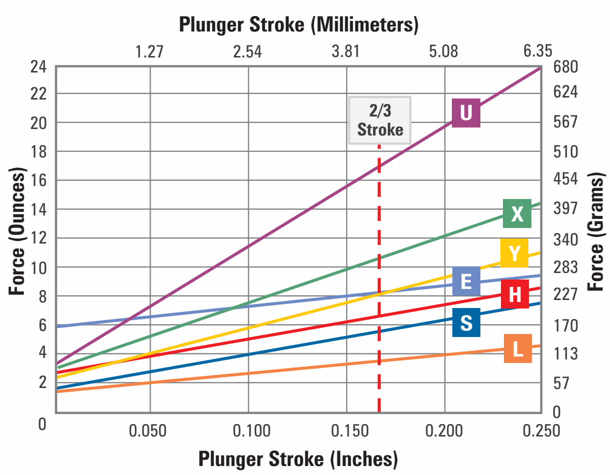


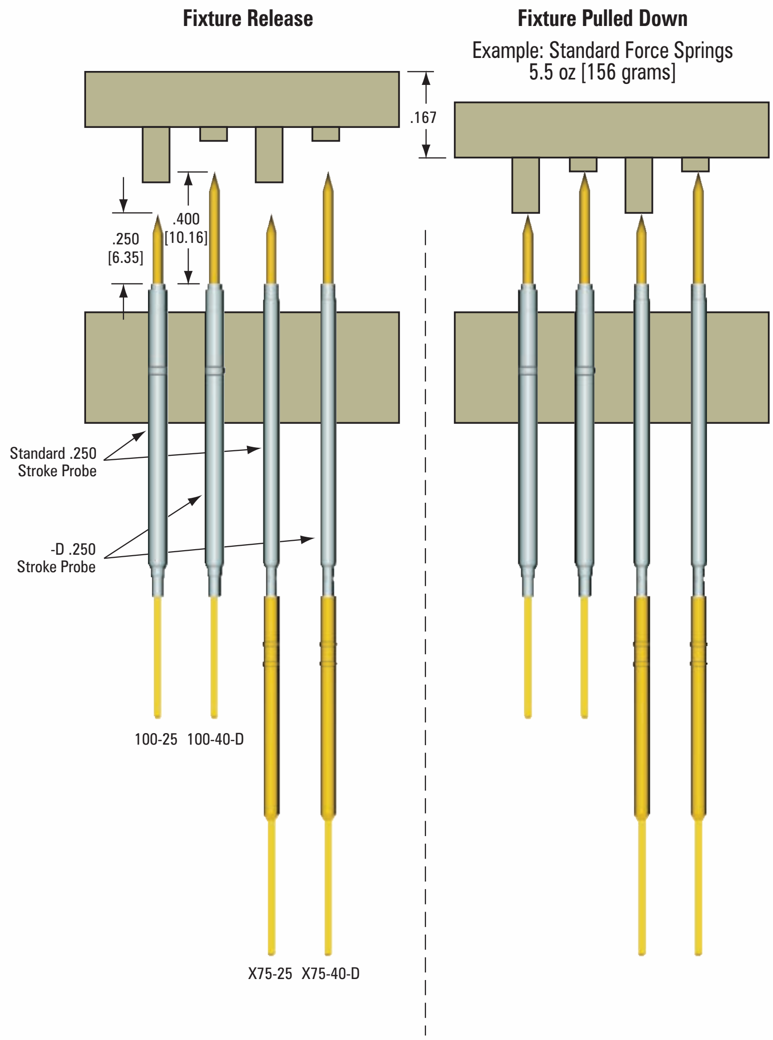
Diagram A

DECREASED STROKE PROBES

The decreased stroke (-D) option is available in our .400 [10.16] long stroke probes. The design combines standard .250 [6.35] stroke springs and tubes with .400 [10.16] stroke plungers. This produces a probe with the same overall length as the .400 [10.16] stroke series probes with a decreased full stroke of .250 [6.35]. At the .250 [6.35] stroke the springs are fully compressed to solid height preventing further movement. These probes are typically used when contacting loaded boards where there is a big difference between the heights of pads and components.

Example of 100-40-D & X75-40-D

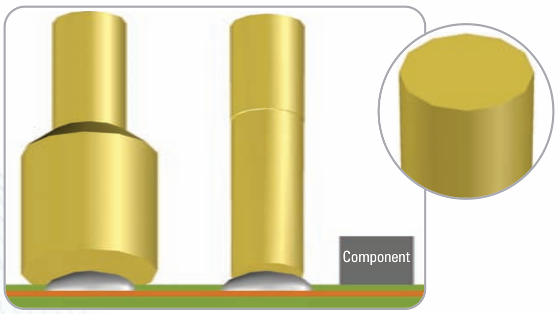




PROBING SOLDER BUMP/DOME TARGETS

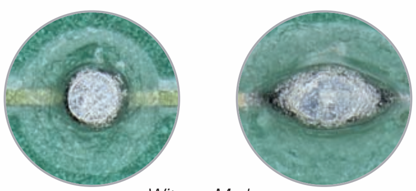
Solder bump technology places test points on pasted traces that has solder mask removed. This technology was developed to provide test point accessability, utilizing a large headed probe to contact a small solder bump that is placed on the trace. Since the solder bumps on the traces can be staggered, it is not necessary to route traces for conventional test pads.

QA Technology offers a variety of tip style designs for probing solder bump/dome targets. These styles are available in headed, as well as headless. Headless tip styles are for applications where nearby components are located too close to the intended target, or where the fixture utilizes a guided probe plate.

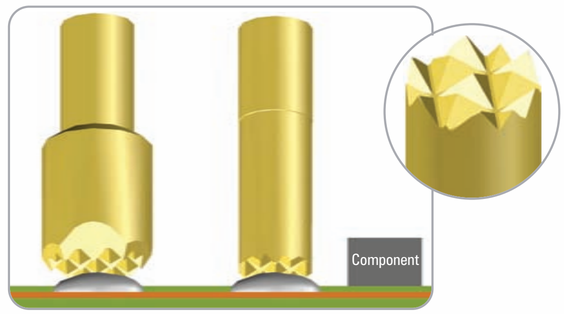


Flat 10 and 20 tip styles have a smooth flat face and are the least aggressive tip designs.

These are recommended for clean processes where a minimal witness mark is desired.

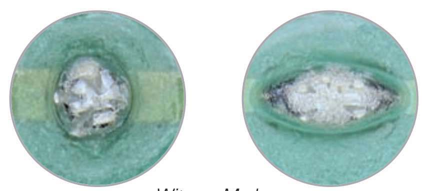


Witness Marks

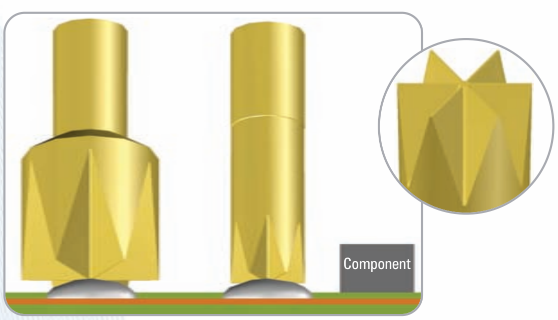


Micro Serrated 59 and 79 are moderately aggressive with small serrations running across the face of the tip.

This durable tip is more aggressive than the Flat 10 and 20 tip styles and will work with contact points that have light flux residues.



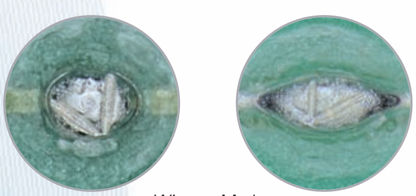
Witness Marks



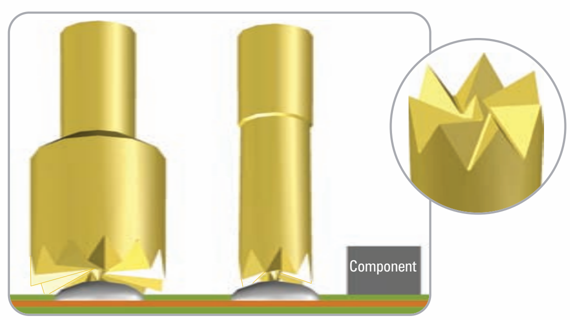
Flat Star 16 and 46 tip styles have deep radial grooves extending from the center which makes them self-cleaning.

These are recommended for clean and no-clean flux systems. The deep channels are designed to handle heavier flux residues.

This moderately aggressive tip style is recommended when a board is going through debug and the board will see high cycle counts/re-tests.



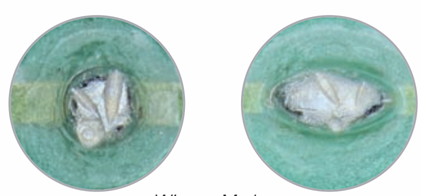
Witness Marks



Center Point Star 26 and 76 tip styles are the most aggressive making them ideal for no-clean flux processes where sharper cutting edges are needed.

The sharp radial edges along with a sharp center point tip minimizes the contact area which allows them to penetrate deeper into the solder bump.

The self-cleaning design forces flux away from the cutting edges.



Witness Marks

LUBRICATED VS. UNLUBRICATED PROBES

QA Technology's standard test probes are lubricated to increase their life. The lubricant drastically reduces the normal wear from the sliding metal-to-metal contact within the probe. There are significant performance differences between lubricated and unlubricated probes.

Unlubricated 100-25 series probes had electrical resistance greater than 50 milliohms as early as 8,000 cycles. Three probes out of sixteen had failed by 30,000 cycles. (Note that cycle counts on a tester in a controlled laboratory environment are considerably higher than those in a production environment).

The lubricated probes were tested to 250,000 cycles with no measurements greater than 24 milliohms. The test was stopped at this point due to the condition of the unlubricated probes. Lubricated probes are routinely tested to one million cycles with electrical resistance below 50 milliohms.

Wear of the unlubricated probes generated a considerable amount of filings. The black wear particles were not only evident on the plunger shanks, but also formed piles around the socket bases. This wear not only results in electrical failure, but the particles also cause stick down failures. By the end of the test, six out of the sixteen unlubricated probes (38%) exhibited stroke failures, the earliest at 40,000 cycles.

There is a significant increase in the amount of force required to compress an unlubricated probe. This observation is based on the relative condition of the contact platen after the test. The marks made by lubricated probes were almost unnoticeable, but the platen had obvious indents and damage from the crown points of the unlubricated probes. This is probably not an issue on solder pads for single board tests, but may damage gold or otherwise delicate contact surfaces. More important, the increased force may cause fixture actuation problems.

WORKING TEMPERATURE RANGES

QA Technology test probes can be used over a wide range of temperatures without affecting their performance. The following discusses some items to consider when using QA test probes at the limits of operating temperature.

Upper Temperature Limit

The internal lubricant and the spring material govern the upper temperature limit of a test probe. At elevated temperatures the lubricant properties are altered and the strength of the spring material is reduced, therefore yielding may occur when the probe is deflected. 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.

Lower Temperature Limit

The lubricant used within the probe governs the lower temperature limit of a spring probe. Lubricants are commonly used to prevent wear of the precious metal internal surfaces of the probe, thus extending probe life and maintaining low electrical resistance.

The viscosity of lubricants used for probes will increase as temperature decreases. If probes are exercised below their rated low temperature, the lubrication may not be adequate, and galling of the plunger and inside surface of the probe tube may occur. This wear could allow the base metal to form oxides, which would greatly reduce electrical performance.

If, however, it is necessary to perform tests below the rated low temperature limit, the probes can be actuated at room temperature, and then refrigerated or moved to the cold environment without harm to the plating or materials. The probes should not be exercised when the temperature of the lubricant is below the lower temperature limit.

In some applications, movement of the plunger (by deliberate actuation, thermal contraction or vibration), at low temperatures is unavoidable. The increased viscosity of the lubricant at these temperatures causes sluggish movement of the plungers, which could result in intermittent contact. In spite of their reduced life, unlubricated probes should be used in these cases, so that plungers will move freely. There is no known lower temperature limit for unlubricated probes.

COMMON FAILURE MODES FOR TEST PROBES

High electrical resistance between the probe tip and the contact surface is the most common failure mode for probes. This is caused by one or more of the following:

- **Contamination buildup on the probe points** (in the valleys and on the tips) which forms an insulating layer and prevents reliable contact. This contamination is commonly composed of:
  - Flux residue from the contact surface.
  - Solder oxides and solder particulate from the contact surface.
  - Fibrous contamination from clothing, gloves or the recently sheared PCB material.
- **Impenetrable oxides, flux residue or other coatings (i.e. conformal coatings) on the Unit Under Test itself.** In some cases, component leads have also picked up bits of plastic as they are slid into and removed from storage totes and plastic queuing racks.
- **Damage to the probe tip plating** which allows formation of oxides on the plunger base material. This effect is compounded in fixtures that sit idle for long periods between use, and further compounded in humid environments.
- **Damaged probe points** which can no longer create contact pressure high enough to make reliable contact. Points are commonly damaged by improper installation, bottoming during use, or lateral motion between the tip and the Unit Under Test.

Internal wear is the next most common failure mode for probes. Internal wear is caused by:

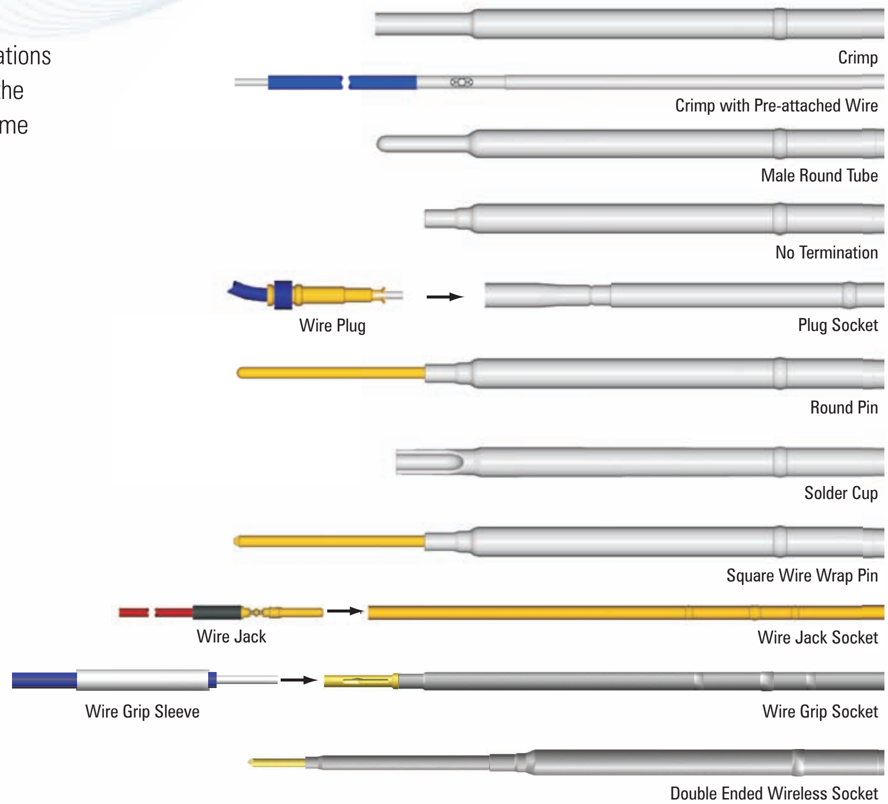
- Wear of plating on internal contact surfaces, which in turn is caused by:
  - Sideloading of the plunger (contacting angled component leads with crowns, contacting misaligned open vias with chisels, etc.).
  - Lack of lubricant, caused by rinsing with solvent, or using unlubricated probes.
  - Normal wear of contact surfaces caused by extended cycling.
- **Introduction of contamination into the internal contact surfaces.** For example, rinsing dirty plungers with solvent is an ideal (and unfortunately, common) method of bringing contamination onto the critical internal contact areas.
- **Deflecting probes beyond their rated working stroke** (particularly in cases of extremely high force springs) will cause fatigue failure of the spring, which in turn creates a loss of contact force (both at the tip and internally). The probe will often continue to function after fatigue failure, but the broken coils will quickly damage the internal contact surfaces.

Spring failure is the least-common failure mode, and it falls into two categories:

- **Fatigue failure,** probes are rated for a particular cycle life and working stroke. When these values are exceeded fatigue failure of the spring can occur. Generally, overstroking causes fatigue failure. Fatigue failure of the spring affects contact reliability in the following ways:
  - The plunger may no longer extend fully to make contact.
  - The spring force is reduced, which decreases contact pressure and contact reliability.
  - The broken coils of the spring will damage the critical inside contact surfaces of the probe tube as the plunger is exercised.
- **Temperature relaxation** which occurs when springs are exposed to temperatures greater than 250º F [120º C] for music wire and 400º F [204º C] for stainless steel for extended periods. Temperature relaxation reduces spring force and therefore contact reliability.

SOCKET SELECTIONS

QA Technology offers a wide variety of socket terminations to fit your application. The following is a summary of the various options and their applications. Please note, some of these socket styles are only available in specific probe series.



- **Crimp**
  Allows the user to manually attach custom wiring (i.e. different length or colors).
- **Crimp with Pre-attached Wire**
  Used primarily on close center/ fine pitch probe sizes where wire wrap is not available. For a reliable connection these sockets are available with a four-jaw, eight (8) indent crimp for the wire attachment. Various wire gauges, lengths and colors are available.
- **Male Round Tube**
  Available with an .039 [1.00] OD with different termination length options. Typically mounted onto edge cards, ribbon cable assemblies or other type connectors. Made to accept a one (1) millimeter female plug. These sockets are made of stainless steel and are recommended for corrosive environments. They are not recommended for solder applications.
- **No Termination**
  Typically used as an inexpensive option. These sockets can be soldered directly to a board or with care can be crimped or soldered into the open end.
- **Wire Plug**
  Allows the user to easily disconnect wire from the socket for trouble-shooting or repair. Bottom of socket is formed to accept wire plugs (sold separately).
- **Round Pin**
  Used primarily for female connectors but can also be directly soldered into board vias.
- **Solder Cup**
  Highly reliable connection used primarily in low-density areas. Can be wave or hand soldered and used in vias or with wire.
- **Square Wire Wrap Pin**
  The most commonly used termination in ATE fixturing. Used for large-scale wiring. Provides excellent electrical integrity by providing a gas-tight connection therefore preventing the effects of corrosion. One of the most cost-effective connection methods for skilled fixture makers because it is fast, reliable and inexpensive.
- **Wire Jack**
  Designed around 039 mil and 050 mil center spacing. These sockets are used in configuration with our wire jacks (sold separately).
- **Wire Grip**
  Allows the user to connect user-supplied 28 or 30 AWG solid conductor wire directly to the socket. Slide a wire grip sleeve over the wire and onto the socket to complete the electrical connection and provide insulation and spacing between adjacent contacts.
- **Double Ended**
  Used in wireless fixtures, these sockets offer shorter signal path lengths for improved signal integrity from the tester circuits to the unit under test (UUT) than conventional wired designs.

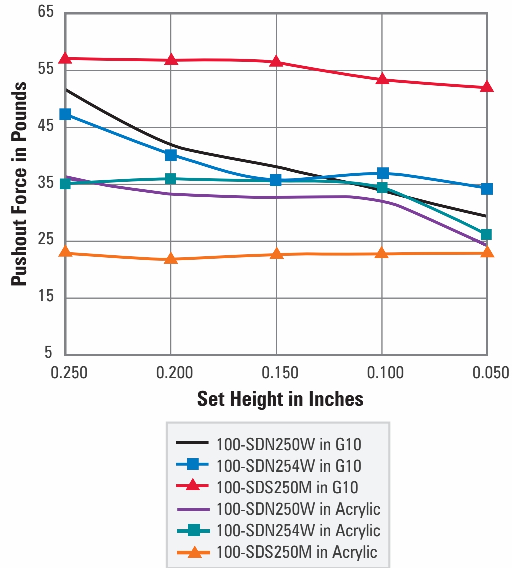
SOCKET PUSH OUT FORCE

- In G10, epoxy fiberglass increasing the socket set height increases the socket pushout force. This is due to the abrasive nature of G10, which removes material from the press ring as the socket is pushed in to lower set heights and thus reduces the interference fit.
- In acrylic, pushout force is less dependent on set height, since acrylic is not as abrasive as G10 and therefore does not appreciably remove press ring material as the socket is pushed in to lower set heights.
- Sockets mounted in G10 have greater pushout forces than sockets mounted in acrylic.
- At set heights greater than .125 [3.18] in G10, .100 [2.54] centers sockets with the standard press ring have higher pushout force than sockets with extended press rings. However, sockets with extended press rings have higher pushout force at set heights below .125 [3.18]. This effect is also present with .075 [1.91] centers sockets, but the set height threshold is .225 [5.72].
- The pushout force for .050 [1.27] centers sockets in G10 does not appreciably vary for different set heights. The 050-25 series tested uses triple press rings; the top ring enters the plate as the lower one wears and exits, holding pushout force constant.

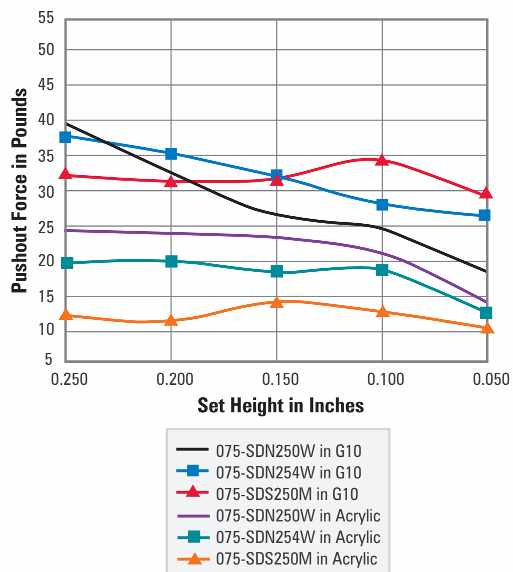
Test Procedure

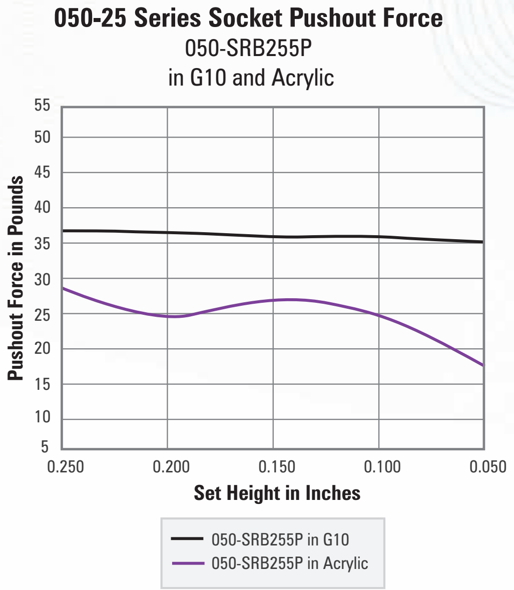
Test plates were made from 5/16" thick G10 and acrylic, and holes on .100" grid were automatically drilled using solid carbide circuit board drills. Finished hole diameters were .067/.069 [1.70/1.75] for .100 [2.54] center sockets, .053/.055 [1.35/1.40] for .075 [1.91] center sockets, and .038/.039 [0.97/0.99] for .050 [1.27] center sockets. Ten samples of each of the seven socket types tested were installed to five different set heights (see data) in each of the two plate materials. A screw-driven press was used to ensure that the sockets were installed at consistent speed, as previous tests have shown that varying installation speed will affect pushout force. Sockets were pushed out using the same press and a digital force gage to measure maximum pushout force.

100-25 Series Socket Pushout Force
100-SDN250W vs 100-SDN254W vs
100-SDS250M in G10 and Acrylic



075-25 Series Socket Pushout Force
075-SDN250W vs 075-SDN254W vs
075-SDS250M in G10 and Acrylic





CURRENT CARRYING CAPACITY

This test report presents the data and describes the procedures for testing the current-carrying capacity for QA's test probes. Actual current carrying will depend upon the specific application. The current carrying capacity values listed for our products are based on a 144°F temperature rise.

This information can be used for test and design engineers when calculating probe requirements for high current and temperature applications.

Scope

Measure the current capacity of test probes. Two types of tests were performed; both were simulations of common applications for probes. The first tested a solitary probe mounted in a G10 fixture plate, while the second tested a group of probes (3x3 Grid pattern).

Background

The current-carrying ability of a probe is measured with respect to probe temperature. (See Working Temperature Ranges page 79 for additional information.)

Test Procedure

A controllable DC current source was used to provide a constant current through the probe and socket assembly being tested, while a thermocouple was used to track the temperature of the probe. The current was increased in one-Ampere intervals (one-half intervals for the 025-16, 039-16 and M08-89 Series), and sufficient time was allowed between increases for the temperature to stabilize. As current increased, probe temperature increased, and testing continued until the 250° F [120° C] threshold was reached.

For the first test, a solitary probe was oriented as shown in Diagram A. A probe from each series was mounted in a 5/16" block made of G10. The block stood horizontally on four legs and airflow was blocked by baffles arranged around the test block.

A type K thermocouple was used, with 40 AWG (.003" diameter conductor) Chromel/Aluminel wire connected to the socket just below the bottom surface of the mounting plate. The .003" wire diameter minimized heat transfer from the socket and reduced response time.

Wires for supplying current to the probe were 20 AWG or greater. One current supply wire was connected directly to the tail of the socket; the other was connected to a solder-coated plate, which was in contact with the probe tip. This contact plate was mounted such that the probe was compressed to its rated 2/3 stroke. The test set up was intended to closely simulate typical applications for test probes.

Diagram A
Setup for measuring current temperature for a single probe.

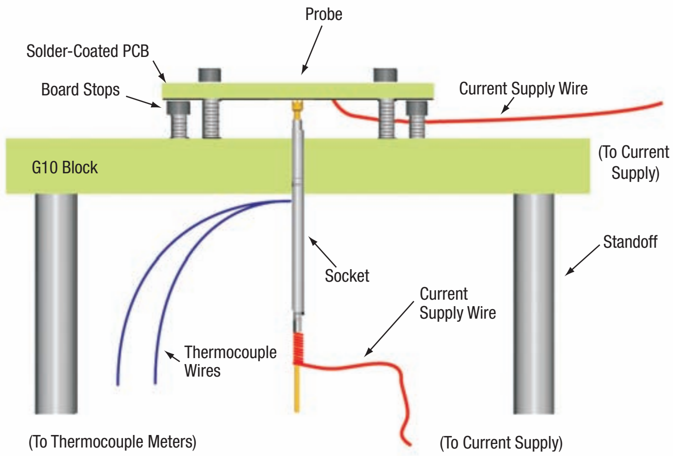


Table A

Probe Series	Center Spacing	Amps
025-PRP16	.025 [0.63]	2.5
039-PRP16	.039 [1.00]	7.0
039-PRP25	.039 [1.00]	7.0
050-PLP05	.050 [1.27]	5.0
050-PLP16	.050 [1.27]	8.5
050-PRP25	.050 [1.27]	8.5
050-PTP25	.050 [1.27]	7.5
050-PTP40	.050 [1.27]	10.0
075-PRP25	.075 [1.91]	9.5
075-PRP40	.075 [1.91]	11.0
100-PLP05	.100 [2.54]	13.5
100-PLP16	.100 [2.54]	12.0
100-PRP25 100-PRH25	.100 [2.54]	12.0 20.0
100-PRP40 100-PRH40	.100 [2.54]	12.0 21.0
125-PRG25 125-PRH25	.125 [3.18]	17.0 20.0
M08-PRH89	.031 [0.80]	6.0

For a single probe with a 144°F temperature rise. P=Precious Metal Clad, G=Gold Plated, H=High Conductivity

For the second test, nine probes and sockets were mounted on a three-by-three grid of the appropriate center spacing. All nine probes were wired in series by connecting the appropriate socket tails, and by selectively jumping the tips in succession with a solder-coated plate simulating a typical printed circuit board. In this way, the same current was assured to run through all nine probes. The thermocouple was connected to the center socket at the same location as in the previous test.

Table B

Socket Part Numbers and Set Heights Used for Each Series	
025-SBP160C-3	FLUSH
039-SDC165J	.150 [3.8]
050-SBB050C6530	.150 [3.81]
050-SBB160C6530	.150 [3.81]
050-STB255C6530	.150 [3.81]
050-SRB255C6530	.150 [3.81]
075-SDN250W*	.150 [3.81]
100-SDN050W	FLUSH
100-SDN160W	.150 [3.81]
100-SDN250S*	.150 [3.81]
100-SDH250W	.150 [3.81]
125-SDN250S	.150 [3.81]
M08-PRH89	NA
*Both the .250 and .400 stroke probes use the same socket.	

The M08-PRH89 probes setup utilized a fixture designed around the typical application for this probe and consisted of three plates with the probes sandwiched between a top and bottom plate. The top and bottom plates had the appropriate routing to test both a single probe and 3x3 Grid.

Data

The plotted graphs compare the temperature versus current for all of the probe series. The sockets used for each series are listed in the Table B; note that the M08-PRH89 probe does not utilize a socket in its application. The 100-25 Series were all tested in 100-SDN250S sockets with exception to the 100-PRH2509S probes which were tested in 100-SDH250W sockets and plotted on the 100-25 Series graphs. Additional tests included the testing of the various spring forces and varying the stroke lengths for the 100-25 Series.

Conclusion and Application Notes

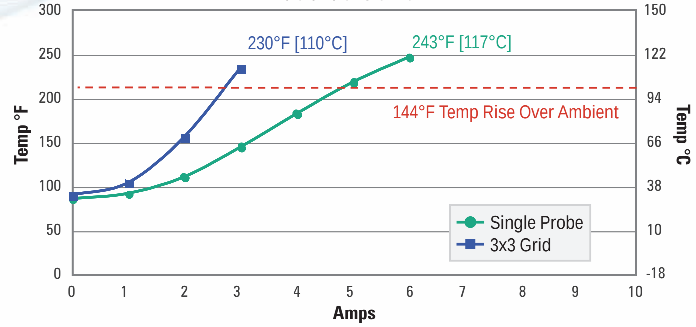
As the group data shows, higher probe densities decrease the probes current carrying ability. This is due to the combined heat generated by the probes and the decrease of air circulation via natural convection. Because each application is unique, it is recommended that appropriate tests be conducted before probes are put into service in applications with high currents, high probe densities or limited airflow.

- These temperature measurements were made in the absence of any forced convection. Providing airflow (by means of a fan, for example) around the sockets 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.
- For conditions where the ambient temperature differs from the 75° F [24° C] ambient of these tests; shift the data by the same amount that the ambients differ to determine whether the 250° F [120° C] limit is exceeded. For example, a 100-25 series probe with a P tube operating in an environment with an ambient temperature of 120° F [49° C] will exceed 250° F [120° C] at 18 Amps (instead of 22 Amps at 75° F [24° C] ambient).
- Differences in current carrying capacity for various springs are not significant.
- Differences in current carrying capacity for various strokes are not significant.
- Note that although the probe will not be damaged from operation at temperatures up to 250° F [120° C], some types of plastics used as mounting plates will not withstand this temperature. Also, the operator must be protected against contacting probes at high temperatures.

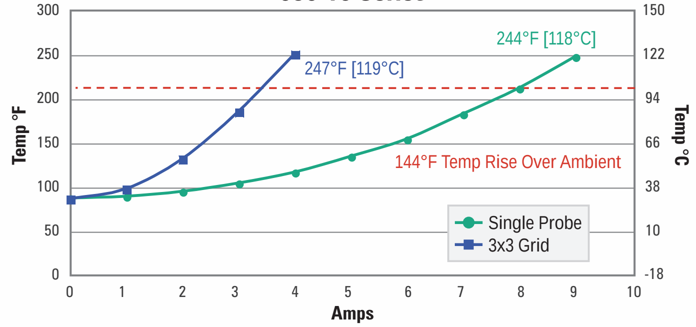
  This data reflects performance at 100% duty cycle. Higher currents can be carried for pulses of short duration. For simplicity, apply higher currents for no longer than one second (longer pulses may be carried, but require that thermal inertia and rate of temperature gain be known). For example, the electrical resistance of 100-PRH2509S in 100-SDH250W averages 7mΩ and carries a maximum current of 20A; it is able to continuously dissipate a maximum of 2.8W (P=I²R). At 50A, it would dissipate about 17.5W, which means the duty cycle must be reduced to 16%. So, to avoid overheating this probe at 50A, power must be applied for no more than 160 milliseconds (1 second x 16%). Similarly, the 125-25 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 125-PRH2509S when mounted into a 125-SDN250S socket has an average electrical resistance of 6mΩ and carries a maximum current of 20 Amps; it can continuously dissipate a maximum of 3.17W (P=I²R). At 50 Amps it would dissipate about 15W reducing the duty cycle to 21%.

- For comparison, note that a Kynar-insulated solid copper wire the same diameter as a 100-25 series probe tube (.054) reaches 250° F [120° C] at 29A.

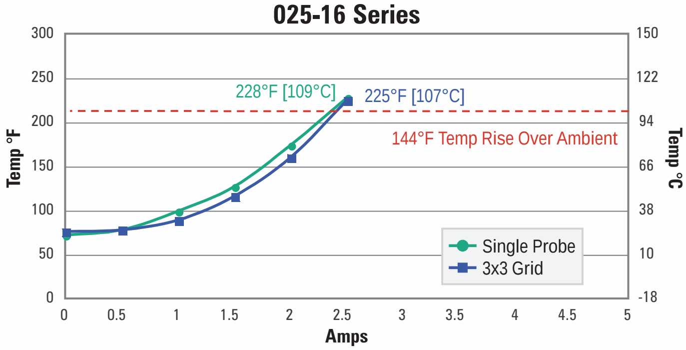
050-05 Series



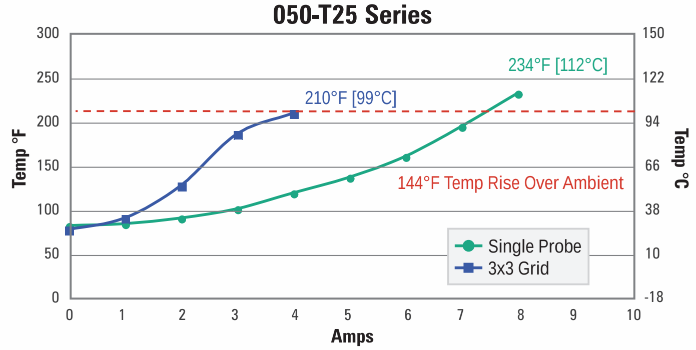
050-16 Series



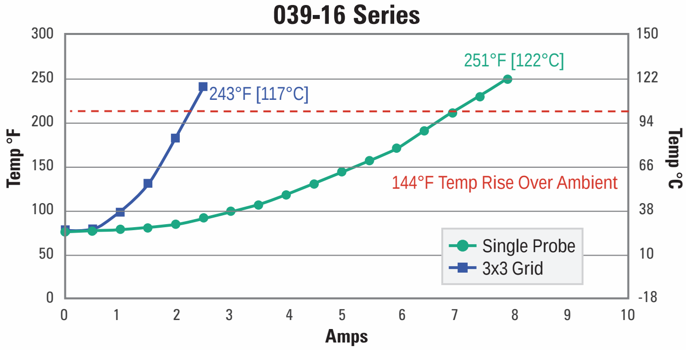
025-16 Series



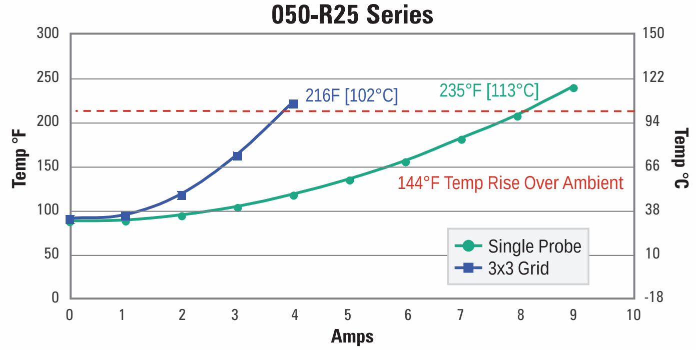
050-T25 Series



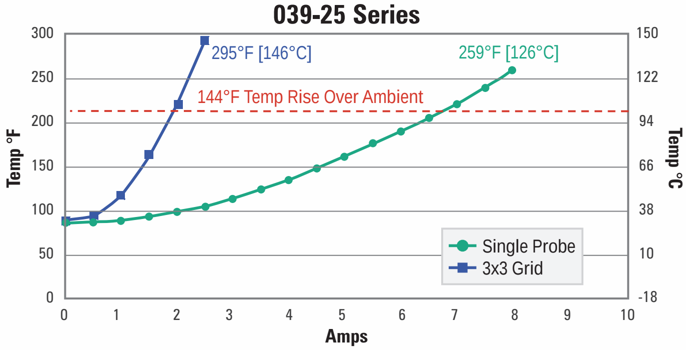
039-16 Series



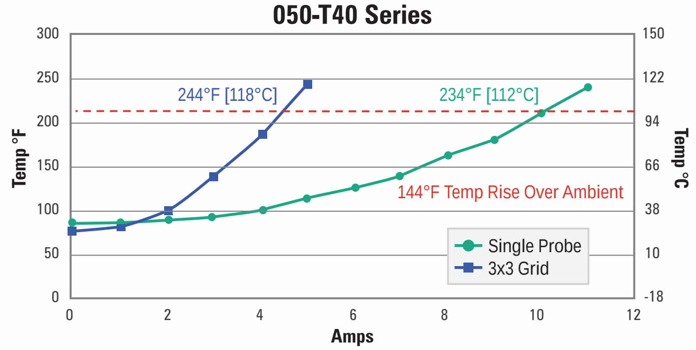
050-R25 Series



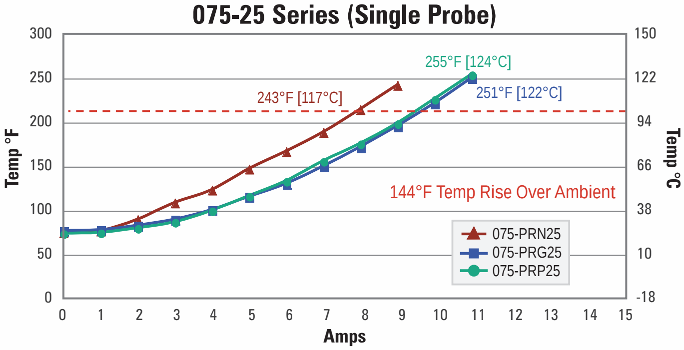
039-25 Series



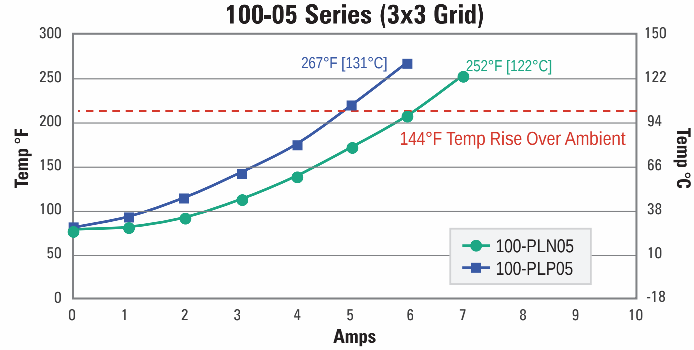
050-T40 Series



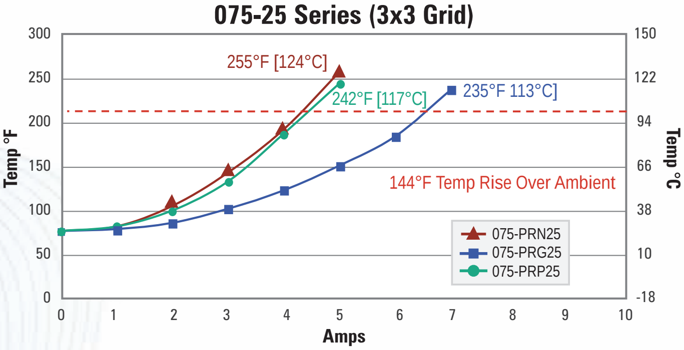
075-25 Series (Single Probe)



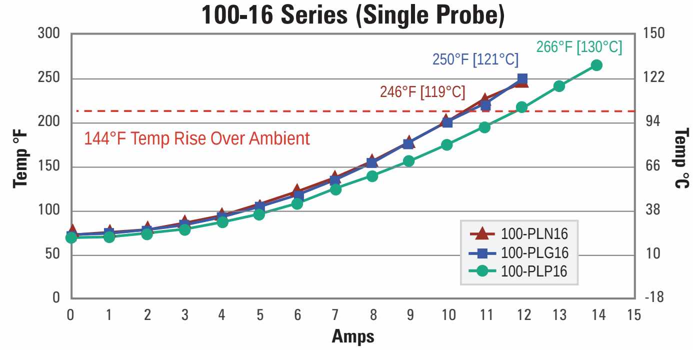
100-05 Series (3x3 Grid)



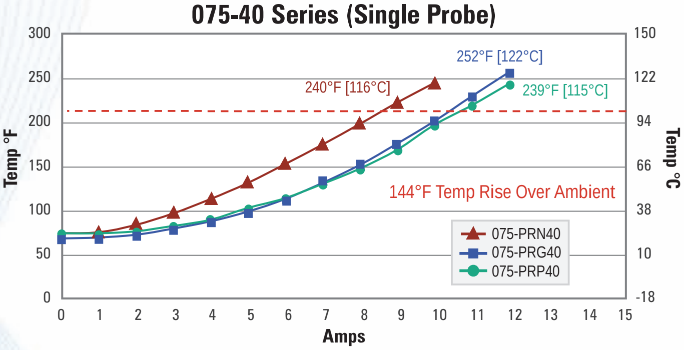
075-25 Series (3x3 Grid)



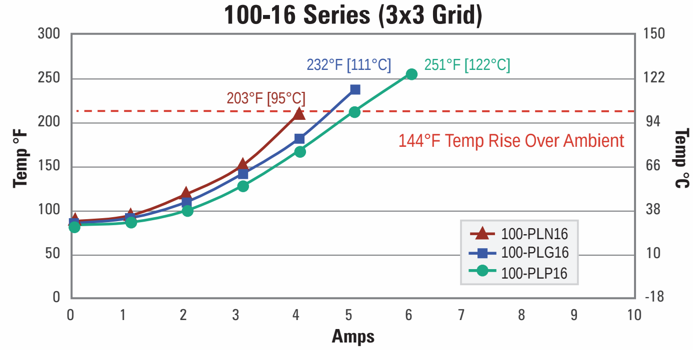
100-16 Series (Single Probe)



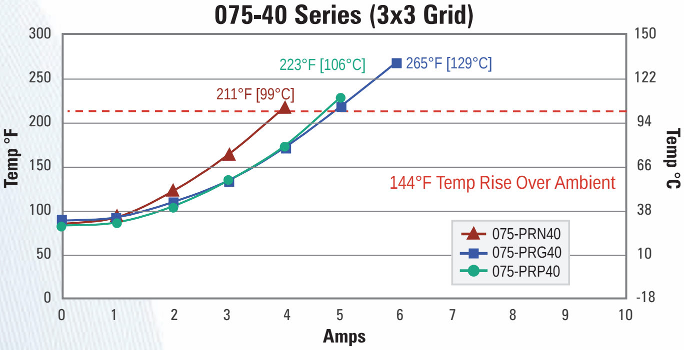
075-40 Series (Single Probe)



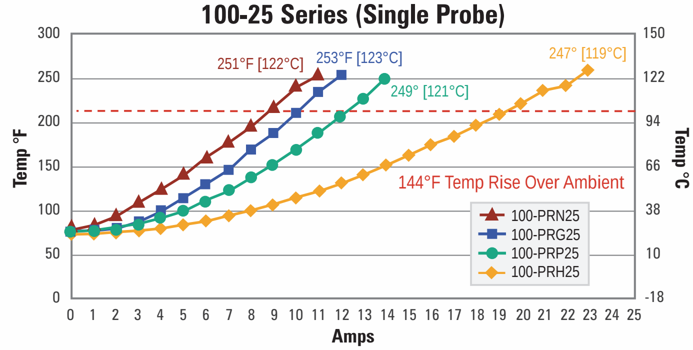
100-16 Series (3x3 Grid)



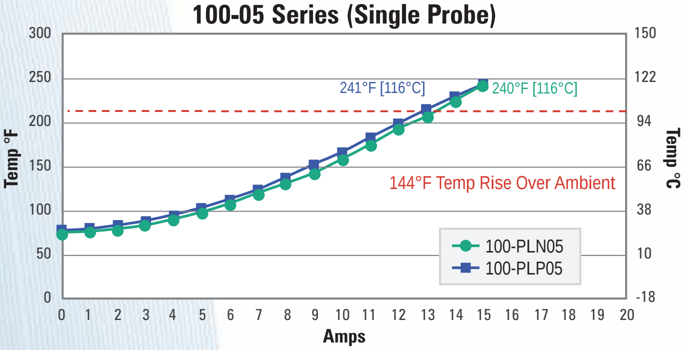
075-40 Series (3x3 Grid)



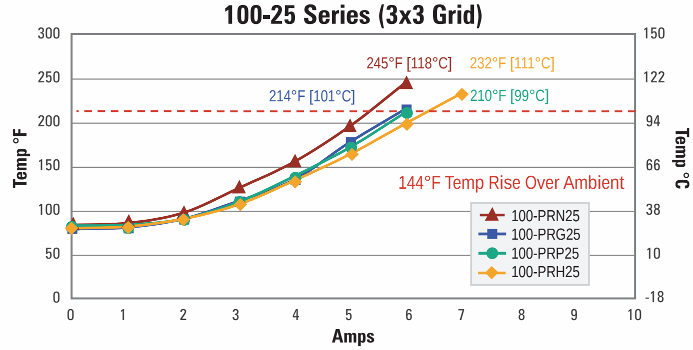
100-25 Series (Single Probe)



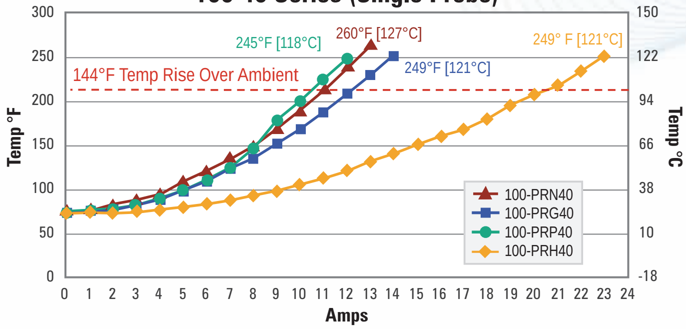
100-05 Series (Single Probe)



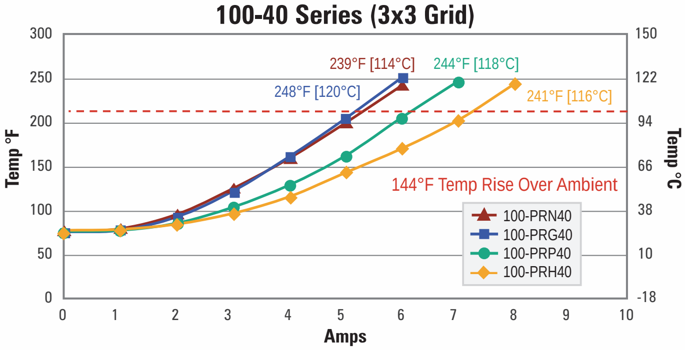
100-25 Series (3x3 Grid)



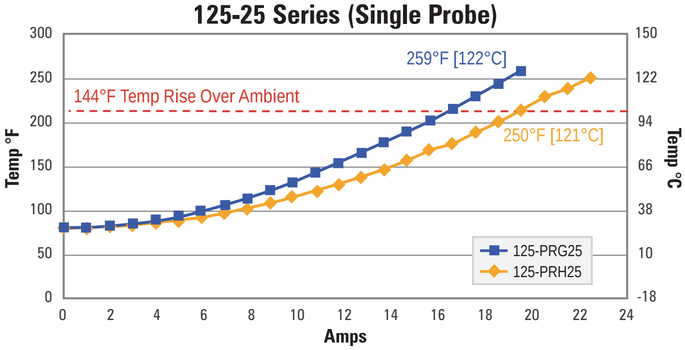
100-40 Series (Single Probe)



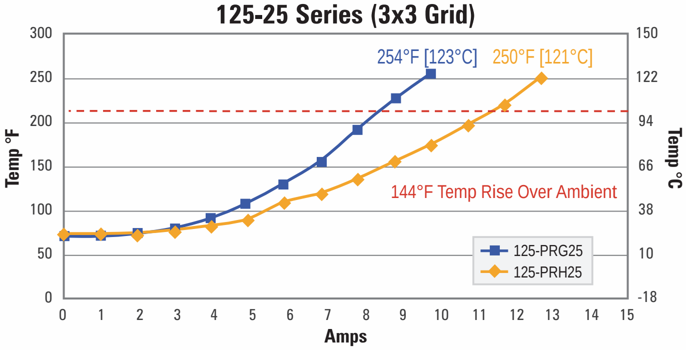
100-40 Series (3x3 Grid)



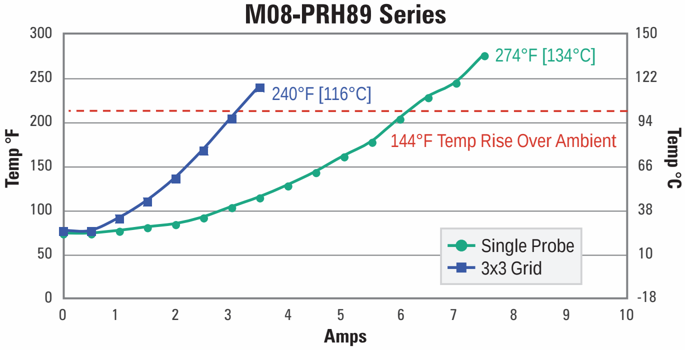
125-25 Series (Single Probe)



125-25 Series (3x3 Grid)



M08-PRH89 Series



POINTING ACCURACY

During the testing of Printed Circuit Boards (PCB's), spring loaded test probes contact test sites on the Unit Under Test (UUT) and the specified electrical test is performed.

The test sites include but are not limited to pads, vias, leads, posts, components, and connectors. In an ideal situation, the probe tip will make contact with the test site every time. Unfortunately, if not considered during the design stages, the component tolerances between the board, fixture, and probe manufacturers can create a situation where the probes tips miss the test site and a false test failure is encountered. Until recently, detailed pointing accuracy studies concentrated mainly on close-center SMD probes. However, as larger probes are increasingly used for contacting small targets, their accuracy becomes just as important as that of their smaller counterparts.

The information in this section is meant to explain the variables, define the tests, and most importantly, to provide engineers and designers with needed probe accuracy specifications.

Scope

This study presents empirical pointing accuracy data for loaded and bare-board probes made by QA Technology. The information can be used in conjunction with tolerances from the test fixture and PCB boards to properly size test pads for reliable contact.

When discussing the ability of a probe to accurately contact, its intended target, the effects of standard groups of tolerances must be classified. The tolerances which affect a probe's ability to accurately contact its target can be broadly divided into four groups as follows (refer to Figure 1, next page):

1. **"Fixture Offset"** tolerances related to the Unit Under Test and the test fixture. This group includes artwork registration; guide pin clearance to the UUT, pin location, pin straightness, location and tolerance of the socket mounting hole, etc.
2. **"Scatter Pattern Offset"** tolerances from the probe and receptacle. These tolerances are not affected by actuation of the probe and therefore remain relatively constant. Items such as tilting of the socket in its hole, plunger bend, and eccentricity of the probe tip fall into this category.
3. **"Scatter Pattern Diameter"** tolerances from the probe. This group comes from clearances within the probe assembly and varies from one probe actuation to the next, resulting in a roughly circular scatter pattern of probe tip contact points.
4. **"Pointing Accuracy"** is the combined effects of the "Scatter Pattern Offset" and 50% of the "Scatter Pattern Diameter". This is measured directly by rotating a probe and socket assembly around the sockets centerline and measuring the Total Indicator Reading (TIR) at the probes tip and dividing by two (2), pointing accuracy = ½ TIR. (Refer to Figure 2, next page)

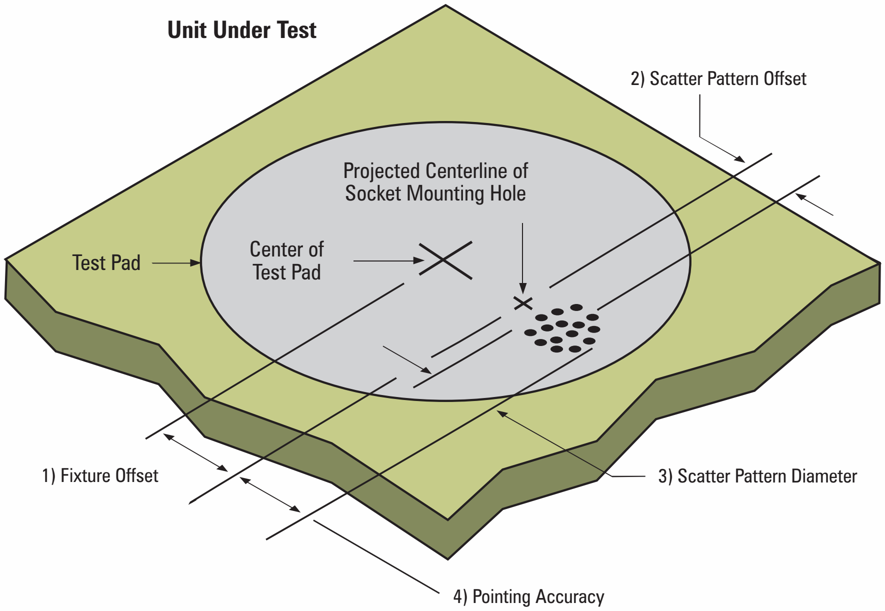


Figure 1: *The three tolerance groups which create the error between the Test Pad Center and the actual Probe Contact Area.*

This report focuses on tolerance groups two and three, which are the ones involving test probes. Tolerance group one (Fixture Offset) is controlled by the fixture builder and printed circuit board manufacturer. Group one is typically larger than both the other groups combined. Although the probe manufacturer largely controls groups two and three, the tilt of the socket when installed in its mounting hole is controlled by the fixture builder and is largely dependent on their installation method.

Test Procedure

Fifty spear point probes from each series were inserted into their appropriate sockets and the TIR of the probe and socket assemblies were measured. The socket was placed into a fixture and a probe was installed into it with a Probe Tool (PT). This was done to replicate how a probe would be installed into a production fixture. The probe and socket were then mounted in a three-roll concentricity gage at a given set-height and then rotated around its axis. The set height was determined by the location of the sockets press rings so that the press rings 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, recorded as TIR (Total Indicator Reading) and divided by two (2) to get the Pointing Accuracy. Once the data was collected, the Minimum, Maximum, Average and Standard Deviations were calculated.

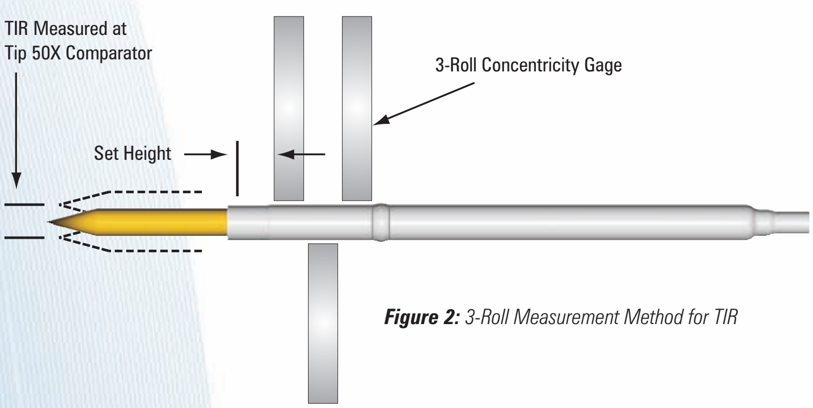


Figure 2: *3-Roll Measurement Method for TIR*

Summary

The table summarizes the overall pointing accuracy for each series. The average data ranges from a minimum of .0007 (0.018) for the 050-05 series to a maximum of .0034 (0.086) for the 075-40 series. When comparing pointing accuracy data between a standard probe and an X Probe for a given series, the X Probe will have a better pointing accuracy since this series does not utilize a socket for mounting.

Probe Series	Set Height	Minimum	Maximum	Average	Standard Deviation
025-16	.035 [0.89]	.0003 [0.008]	.0035 [0.089]	.0018 [0.046]	.00083 [0.0211]
039-16	.085 [1.65]	.0006 [0.015]	.0037 [0.093]	.0017 [0.043]	.00081 [0.0206]
039-25	.085 [2.16]	.0000 [0.000]	.0052 [0.132]	.0019 [0.048]	.00124 [0.0315]
050-05	.000 [0.00]	.0001 [0.003]	.0020 [0.051]	.0007 [0.018]	.00033 [0.0084]
050-16	.085 [2.16]	.0003 [0.008]	.0022 [0.056]	.0013 [0.033]	.00047 [0.0119]
050-T25	.085 [2.16]	.0001 [0.003]	.0026 [0.066]	.0011 [0.028]	.00062 [0.0157]
050-R25	.085 [2.16]	.0001 [0.003]	.0038 [0.097]	.0016 [0.041]	.00088 [0.0224]
050-T40	.085 [2.16]	.0004 [0.010]	.0068 [0.173]	.0031 [0.079]	.00133 [0.0338]
075-25	.085 [2.16]	.0004 [0.010]	.0050 [0.127]	.0023 [0.058]	.00115 [0.0292]
075-40	.085 [2.16]	.0004 [0.010]	.0077 [0.196]	.0034 [0.086]	.00176 [0.0447]
100-16	.065 [1.65]	.0001 [0.003]	.0036 [0.091]	.0014 [0.036]	.00085 [0.0216]
100-25	.085 [2.16]	.0002 [0.005]	.0055 [0.140]	.0023 [0.058]	.00111 [0.0282]
100-40	.085 [2.16]	.0001 [0.003]	.0076 [0.193]	.0029 [0.074]	.00180 [0.0457]
125-25	.085 [2.16]	.0004 [0.010]	.0057 [0.145]	.0031 [0.079]	.00138 [0.0351]
X31-25	.085 [2.16]	.0003 [0.007]	.0048 [0.121]	.0017 [0.042]	.00077 [0.0195]
X39-25	.085 [2.16]	.0001 [0.003]	.0027 [0.069]	.0012 [0.030]	.00058 [0.0147]
X50-25	.085 [2.16]	.0001 [0.003]	.0033 [0.084]	.0015 [0.038]	.00078 [0.0198]
X50-40	.085 [2.16]	.0001 [0.003]	.0059 [0.150]	.0031 [0.079]	.00141 [0.0358]
X75-25	.085 [2.16]	.0001 [0.003]	.0040 [0.102]	.0019 [0.048]	.00097 [0.0246]
X75-40	.085 [2.16]	.0003 [0.008]	.0059 [0.150]	.0024 [0.061]	.00142 [0.0361]

Applications:

The data represented is from a sample size of fifty (50) parts randomly selected from QA's inventory. 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. Plus or Minus one standard deviation added to the average is also called +/- one sigma or +/- 1σ and represents 64% of all of the readings. Additionally by adding two (2) standard deviations (+/- 2σ) or three (3) standard deviations (+/- 3σ) we can represent 95.44% and 99.74% respectively of all of the readings. These numbers are more useful than the average in that that it gives the fixture designers a higher confidence level that they will be able to meet their design and test objectives.

As space on circuits becomes increasingly limited, reliable contact of smaller test pads becomes a requirement. By improving on manufacturing, assembly methods, and designing for testability, false test failures can be greatly reduced.

The probe accuracy specifications listed above can be used together with fixture and circuit board tolerances to accurately determine the smallest test pad necessary for reliable contact. For example, the appropriate pointing accuracy specification for the probe from above can be added to the total fixture and circuit board tolerances and multiplied by two to yield the minimum test pad size.

By studying test fixtures and probes in this way, reliable contact can be predicted while using the minimum possible test pad size.

Probe Series	+/- 2 Sigma (95.44%)	+/- 3 Sigma (99.74%)
025-16	.0035 [0.089]	.0043 [0.109]
039-16	.0033 [0.084]	.0041 [0.104]
039-25	.0044 [0.112]	.0056 [0.142]
050-05	.0022 [0.056]	.0027 [0.069]
050-16	.0014 [0.036]	.0017 [0.043]
050-T25	.0034 [0.086]	.0043 [0.109]
050-T40	.0058 [0.147]	.0071 [0.180]
050-R25	.0024 [0.061]	.0031 [0.076]
075-25	.0046 [0.117]	.0058 [0.147]
075-40	.0069 [0.175]	.0087 [0.221]
100-16	.0031 [0.079]	.0039 [0.099]
100-25	.0045 [0.114]	.0056 [0.142]
100-40	.0065 [0.165]	.0083 [0.211]
125-25	.0059 [0.150]	.0073 [0.185]
X31-25	.0032 [0.081]	.0040 [0.101]
X39-25	.0023 [0.058]	.0029 [0.074]
X50-25	.0031 [0.079]	.0039 [0.099]
X50-40	.0059 [0.150]	.0073 [0.185]
X75-25	.0038 [0.097]	.0048 [0.122]
X75-40	.0053 [0.135]	.0067 [0.170]

WIRELESS PROBING AND HIGH FREQUENCY PERFORMANCE

Background

Ever-increasing circuit performance challenges all aspects of test technology. 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 to the signal transmission path. QA's wireless X Probes and Double-Ended Sockets address the limitations of fixture wiring by eliminating the wire.

Scope

To better understand the possibilities of wireless fixturing, QA has examined the high frequency performance of wireless X Probes as well as Double-Ended Sockets and Probes. A network analyzer was used to measure the frequency response characteristics of a wide variety of probe configurations. Initial testing of Double-Ended Sockets utilized an RF network analyzer covering the frequency range of 300 KHz to 3 GHz. Subsequent testing using a newer 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. A TDR oscilloscope was used to look at the impedance of the signal path through the test fixture. Time domain impedance information was also obtained by use of the time domain transform option of the microwave network analyzer.

Procedure

Test fixtures were constructed for .100 [2.54], .075 [1.91], and .050 [1.27] Double-Ended Socket products. These fixtures consisted of a .250 [6.35] G-10 socket mounting plate, a .062 [1.57] G-10 socket spacer plate and two electrical interface boards attached to the socket mounting plate with non-conducting standoffs. Test fixtures for the wireless .075 [1.91], .050 [1.27] and .039 [1.00] X Probes were built up from numerous G10 plates totaling 1.562 [39.67] thick. This stack-up was then 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 consisted of different spacings 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 .075 [1.91] center X Probes. Comparable data for .050 [1.27] and .039 [1.00] center X Probes as well as .100 [2.54], .075 [1.91] and .050 [1.27] Double-Ended assemblies are summarized on page 92. Figure 1 (below) 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 (next page), the probes are on their nominal .075 [1.91] centers. On these closer centers, a -1dB frequency response to over 400 MHz is achieved. This improvement results from 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 (on next page) shows the impedance of two wireless .075 [1.91] X Probes on .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 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.

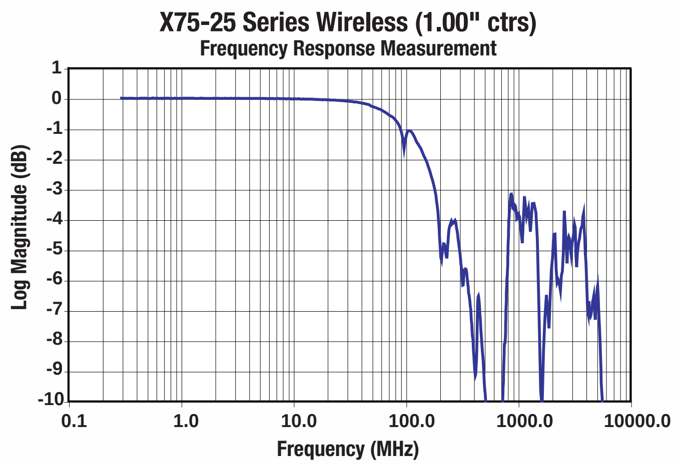


Figure 1: *Frequency response of two .075 [1.91] wireless X Probes (signal and ground) on 1.00 [25.4] centers.*

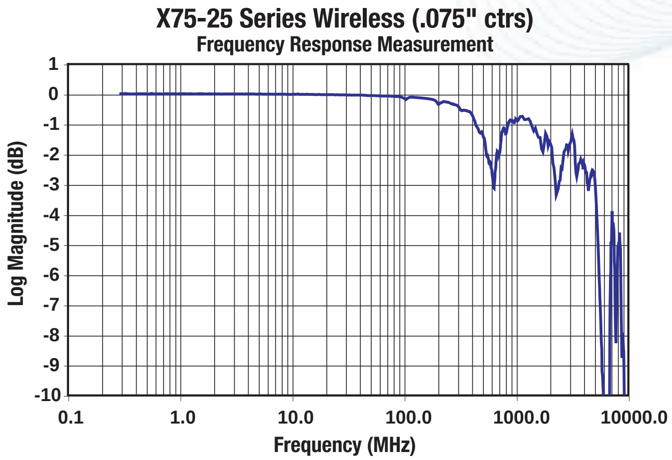


Figure 2: *Frequency response of two .075 [1.91] wireless X Probes (signal and ground) on .075 [1.91] centers.*

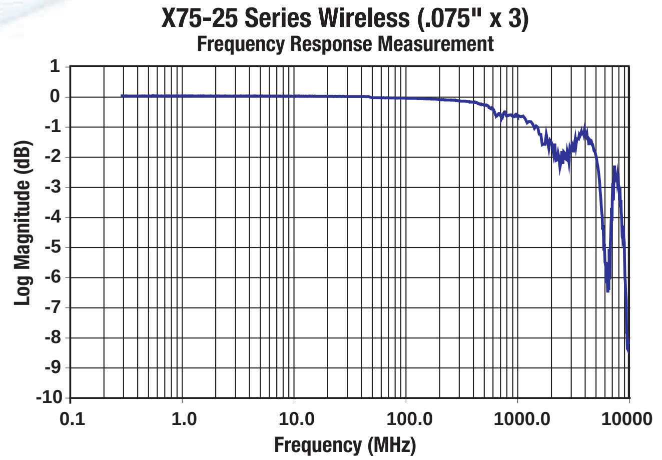


Figure 4: *For a three-probe configuration (signal between two grounds) excellent performance to more than 1400MHz was achieved.*

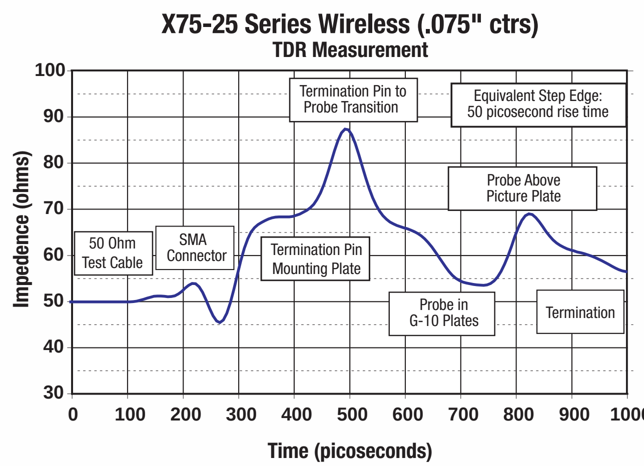


Figure 3: *Impedance of the transmission line created by two .075 [1.91] wireless X Probes (signal and ground) on .075 [1.91] centers. Note: the 50-picosecond equivalent rise time equates to an effective test frequency of 7 GHz.*

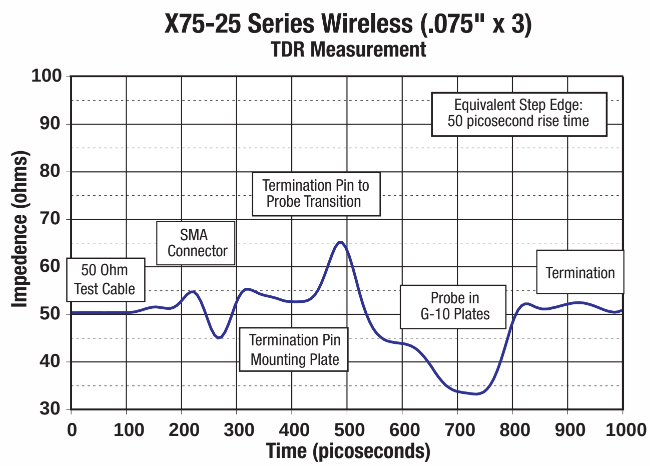


Figure 5: *The TDR plot for the three-probe configuration shows a better match to the 50-ohm test environment. This results in a higher bandwidth frequency response.*

Figure 4 shows the performance of a three-probe in-line configuration on .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 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 .075 [1.91] wireless X Probes on .075 [1.91] centers appears in Figure 6.

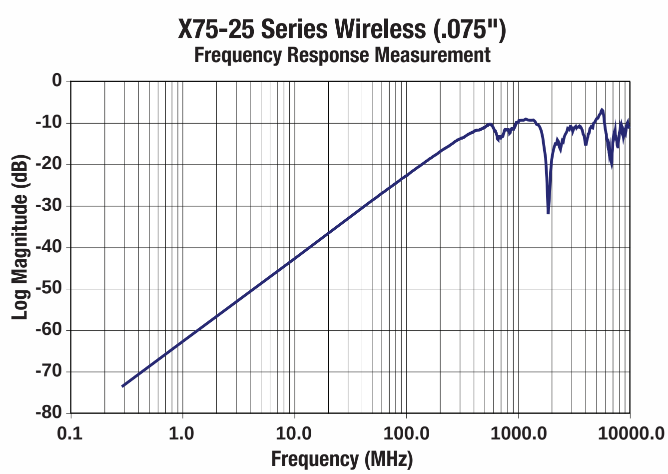


Figure 6: *Crosstalk between two pairs of X75 probes on a .075 [1.91] grid.*

Conclusions

Wireless Probe Series	Two Probes on 1.00-inch Centers (Signal-Ground)		Two Probes on Nominal Centers (Signal-Ground)		Three Probes on Nominal Centers (Ground-Signal-Ground)	
	-1dB (MHz)	-3dB (MHz)	-1dB (MHz)	-3dB (MHz)	-1dB (MHz)	-3dB (MHz)
050-16	81	119	336	2930	2500	<3000
050-25	92	185	585	3050	2250	3700
075-25	94	140	222	306	771	2420
100-25	84	125	321	352	771	2320
X39-25	87	170	540	4950	740	7550
X50-25	90	178	530	4750	1800	5450
X75-25	92	182	435	630	1450	5600

A wireless probing solution is capable of delivering 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 results in cleaner, distortion-free test signals and higher performance testing.

PROBE MAINTENANCE

Test probes used in production testing will eventually get dirty enough to cause contact problems. The following steps will eliminate contact problems caused by dirty probes:

Preventative Maintenance

Some recommendations to help keep test probes clean:

- **Test Environment**
  The test environment is one of the largest contributors to probe contamination. Minimize airborne contamination such as dust, clothing fibers or particles from a nearby wave-solder machines to improve contact reliability.
- **Circuit Boards**
  Printed circuit boards, which are being tested, should be as clean as possible. If 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 will leave residues behind on the probe tips, which impede the next test as well.
- **Dust Covers**
  Use dust covers over idle fixtures 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 the fixture is first put 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.
- **Receiver Bays**
  Like the probes in test fixtures, probes which are exposed on a test system's receiver bay should also be protected. Keep bays covered with either a dust cover or a test fixture, and maintain clean electrical contact surfaces on all fixtures.
- **Probe Cleaning**
  In some cases, especially in high volume production (where the probes see many cycles over a short time) it may be practical to clean the tips of the probes.

  Virtually all manufacturers of low-resistance, long-life probes use some sort of lubricant to prolong the life of the probe's internal sliding contact surfaces. Cleaning a probe by bathing it in Freon or other solvent will remove this important lubricant. Even spot-cleaning the probe tips with solvent can wash particles down into the critical internal surfaces where they can drastically affect performance.

  To clean probe tips, remove lint, fibers, flux, and other contaminants by gently brushing the probe tips with a small brush and vacuuming away the dislodged particles. A brush with nylon or natural fiber bristles works well; metallic bristles may damage the probe plating and are not recommended.

Maintenance Programs

A practical maintenance program for fixtures can save considerable time and money at the production level. Testing becomes more reliable, thus reducing the chance of false failures and lost rework expense.

Diagnosing contact problems as they arise and replacing test probes one at a time is more expensive than replacing probes on regular intervals. Use cycle counters on test fixtures to help establish a maintenance program, which calls for cleaning or replacing probes after a predetermined number of cycles.

Developing such a program requires some tracking to determine the average life of the probes in a particular application. Since test conditions vary widely, it is difficult to generalize probe life. Some applications call for replacement as often as every few thousand cycles, while probes in clean environments or applications with wide electrical tolerances can last far longer. Better test yields and reduced downtime are the rewards for keeping fixtures and probes in top condition.

INSTRUCTIONS

SOCKET SET HEIGHTS

Socket set height is a critical factor in the performance and life of a test probe. 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, resulting in decreased spring life or possible tip damage due to bottoming. To calculate proper set height, follow these steps:

Step 1

Make a cross-sectional sketch of the fixture in the actuated position. Figure 1 is typical of many vacuum fixtures.

Step 2

Dimension the thickness of the items that stack up on the top surface of the probe mounting plate. Add these dimensions to get a final distance (H) from the top of the plate to the contact surface of the UUT. Subtract the average lead length from this dimension if contacting leaded components.

Step 3

Calculate the distance (P) from the probe tip to the top of the socket in which it is mounted. Remember to calculate this dimension with the probe compressed to its recommended working travel. See table 1 for key probe dimensions.

Step 4

Subtract P from H. The result is the proper set height.

Figure 1

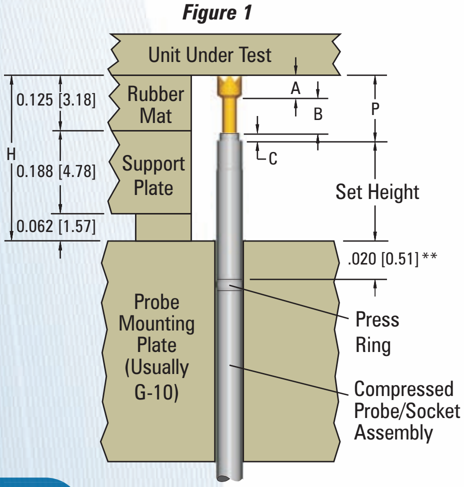


Table 1

Key Probe Dimensions for Calculating Set Height				
	Probe Tip Height A	Exposed Shank B	Probe Tube Extension C	Recommend Extension P
025-16*	.010 [0.25]	.053 [1.35]	.020 [0.51]	.083 [2.11]
039-16	.015 [0.38]	.053 [1.35]	.024 [0.61]	.092 [2.11]
039-25	.015 [0.38]	.118 [3.00]	.024 [0.61]	.157 [3.99]
050-05*	.040 [1.02]	.000	.000	.040 [1.02]
050-16	.020 [0.51]	.051 [1.35]	.000	.073 [1.85]
050-25****	.022 [0.56]	.083 [2.11]	.083 [0.96]	.143 [3.63]
050-40	.022 [0.56]	.098 [2.49]	.043 [1.09]	.163 [4.14]
050-40-D***	.022 [0.56]	.248 [6.30]	.043 [1.09]	.313 [7.95]
075-25	.050 [1.27]	.083 [2.11]	.030 [0.76]	.163 [4.14]
075-40	.050 [1.27]	.083 [2.11]	.030 [0.76]	.163 [4.14]
075-40-D***	.050 [1.27]	.233 [5.92]	.030 [0.76]	.313 [7.95]
100-05*	See Page 28	.000	.005 [0.13]	See Page 28
100-16	.080 [2.03]	.053 [1.35]	.010 [0.25]	.143 [3.63]
100-25	.060 [1.52]	.083 [2.11]	.020 [0.51]	.163 [4.14]
100-40	.060 [1.52]	.083 [2.11]	.020 [0.51]	.163 [4.14]
100-40-D***	.060 [1.52]	.233 [5.92]	.020 [0.51]	.313 [7.95]
125-25	.080 [2.03]	.083 [2.11]	.005 [0.13]	.168 [4.27]

**100-05, 050-05 and 025-16 Series sockets are all mounted flush (set height is zero).*

***To account for irregularities at the hole ends, a margin of at least .020 [0.51] is recommended between the press ring and the closest plate surface.*

****See page 76 "Decreased Stroke Probes" for more information.*

*****When installing the 050-T25 socket for the .250 [6.35] stroke probe for dual level testing, the socket must be set .015 [.38] higher to achieve the designed .150 [3.81] tip height difference when the fixture is not actuated.*

Example for 100-25 Series

H = **Spacer + Support Plate + Rubber Mat**
= .062 [1.58] + .188 [4.78] + .125 [3.18] = .375 [9.53]

P = .163 [4.14] (from table)

Set Height = H - P
= .375 [9.53] - .163 [4.14] = .212 [5.39]

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Related Notes

To mix-mount probes, calculate the proper set height for each series used in the fixture. Thicker mounting plates allow the greatest set height range, but hole straightness may suffer. For dual level testing, .400 [10.16] stroke probes are mounted in the same sockets, at the same set height, as standard .250 [6.35] stroke probes. As a result, they can be interchanged freely from one socket to another as test needs dictate.

SOCKET AND PROBE INSTALLATION INSTRUCTIONS

Following these instructions will ensure that QA Technology sockets are installed in the correct manner for best pointing accuracy, retention force and overall performance.

Step 1

Inspect the Mounting Hole:
Before installing sockets, check that the mounting hole is the correct diameter with the appropriate PG Tool. When drilling laminates such as AT7000, 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 selection of the proper diameter drill. Solid carbide, printed circuit board drills with 1/8" shanks are recommended.

Step 2

Insert the Socket in the Mounting Hole:
The socket should slide easily into the hole until the press ring makes contact with the top surface of the mounting plate.

Step 3

Install the Socket:
Fit the nosepiece of the proper Installation Tool over the top end of the socket (the end closest to the press ring). Install the socket by lightly tapping the striker back of the tool several times with a hammer until the nose of the tool contacts the plate. Sockets installed with several light taps will have at least double the pushout force of sockets installed with a single blow.

Step 4

Install the Probe:
Slide the appropriate probe into the socket. Seat the probe fully by pushing in a controlled manner with the proper Probe Installation Tool or other non-metallic object.

TOOL TIP REPLACEMENT INSTRUCTIONS

QA Technology has improved upon the design of our Installation and Extraction Tools. The key benefit of the new design is to allow you to easily replace a damaged nosepiece on-site without having to return the tool for repair. Simply order a Replacement TIP and follow the instructions below:

ITR-SET tools:

Step 1

Remove damaged/worn/broken tip assembly:

a. Clamp handle in vise. Soft jaws are recommend to prevent damage to the aluminum anodizing and engravings on the handle.
b. Using the 4.5mm open ended wrench, unscrew the ITR-TIP from the aluminum handle by turning the wrench counter clockwise when viewed from the tip end of the tool (these are right hand threads).
c. Option: Applying heat to the threaded area with a torch (low heat) will help to loosen threads when Loctite has been applied.

Step 2

Clean the Internal threads using compressed air or cotton swab. If needed use a mild solvent to help dissolve contaminants and dry.

Step 3

If the ITR-TIP is UNSET, follow instructions for setting the ITR tool to the proper set height.

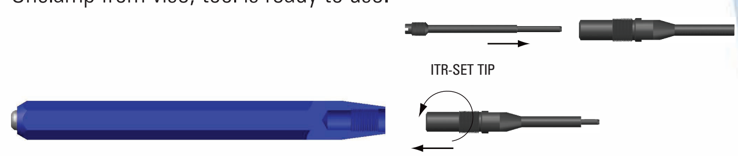
Step 4

Thread the ITR-TIP into the handle and tighten with the 4.5mm wrench to 46 in-lb (5.2 N-m).

a. If the IRT-TIP does not stay tight during use apply Loctite 262 or equal to the Nose threads prior to assembly.

Step 5

Unclamp from vise, tool is ready to use.



Note: Since the handles are engraved with the specific tool part number, it is critical that it exactly matches the one being replaced.

ITR-FL, ETR, WTR, JTR, GTR and TERX tools:

Step 1

Remove damaged/worn/broken Tip assembly:

a. Clamp handle in vise. Soft jaws are recommend to prevent damage to the aluminum anodizing and engravings on the handle.
b. Using the 1.5mm hex key, loosen the M3 x 0.5 cup point set screw from the aluminum tool handle by turning the hex key counter clockwise.
c. Option: Applying heat to the tip area with a torch (low heat) will help to loosen the tip where Loctite has been applied.
d. Pull tip from handle (use pliers if necessary).

Step 2

Clean the smooth bore using compressed air of cotton swab. If needed use a mild solvent to help dissolve contaminants and dry.

Step 3

Insert replacement tip into bore while keeping the set screw flat on the replacement tip aligned with the set screw on the handle (make sure that the tip bottoms out in the bore).

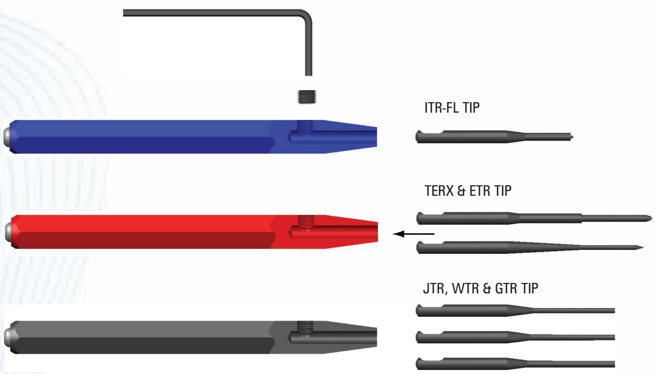
Step 4

Tighten the set screw to 1.25 N-m (11 in-lb) with the 1.5mm hex key.

a. If the Tip does not stay tight during use apply Loctite 262 or equal to the Tip prior to assembly.

Step 5

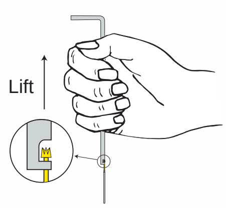
Unclamp from vise, tool is ready to use.



Note: Since the handles are engraved with the specific tool part number, it is critical that it exactly matches the one being replaced.

PROBE REMOVAL INSTRUCTIONS

All types of probes can be removed with fingers, tweezers or small pliers by grasping the head or shank and pulling straight up out of the socket. Be careful not to damage the shank or the tips if the probe is to be reused. Probes which are not headless are easiest to remove with a Probe Extraction Tool. Hook the tool under the head and pull straight up.



If a plunger comes out or is broken off and leaves the probe tube and spring behind in a socket, it can be removed without damaging the socket by one of these three methods:

Method A: QA Technology's TERX tools are designed for removing such damaged probe tubes without damaging the socket or fixture. These tools are comprised of a tapered steel pin that is wedged into the probe tube ID.

Step 1

If necessary, remove any of the remaining components (i.e. spring or plunger) of the broken probe using tweezers or needle-nose pliers.

Step 2

Insert the appropriate sized TERX tool into the broken probe tube and push firmly. If the probe tube ID has been damaged the pointed nose of the tool can be used to reform the tube.

Step 3

Pull straight up on the tool. The portion of the broken probe tube will be removed as the tool is pulled out.

Method B: Pin Vise and Drill Bit

Put a close-fitting gauge pin inside the probe. Close a pin vise (available from industrial tool suppliers) tightly around the short section of the probe tube which protrudes from the socket. The gauge pin will prevent the tube from crushing and allow it to be pulled out.

Method C: Solder Buss

Drop several small pieces of solder into the probe tube. Obtain the largest diameter piece of pre-tinned buss wire which will find inside the tube. Hold the wire with locking pliers, heat the end of the wire to red hot with a torch and quickly plunge it into the tube. The solder will reflow and once cooled will bond the buss wire to the inside of the probe tube. Pull on the wire to remove the tube.

SOCKET REMOVAL INSTRUCTIONS

QA Technology's Socket Extraction Tools are used for removing the sockets from their mounting plates. Two tools are required to remove a socket: a Flush Installation Tool and an Extraction Tool. These tools may be purchased separately or combined in an Extraction Tool Kit.

Extraction Tools are used when a probe/socket assembly has been damaged and must be replaced. Removal of sockets on closely-spaced grids is a delicate process. Care must be taken not to damage neighboring probes and not to enlarge the mounting hole. Depending on the probe series and socket set height, it may be necessary to remove probes from adjacent sockets to provide clearance for the tool. Proper preparation of the damaged assembly and careful use of the tool will successfully remove the socket.

Sockets are most often pushed out from the top (probe tip) side. **It is important that the tool be fitted onto the socket only when the socket is flush with the surface of the plate.** Otherwise, the tool may split the tube down the side, and wedge into the hole.

Step 1

Remove the probe and wire from the socket:

A pair of tweezers or needle-nose pliers will make probe removal easier. Probes that are not headless may be removed with the appropriate Probe Extraction tool. Disconnect the wire by unwrapping, de-soldering, unplugging, or cut the wire if enough remains for reconnection.

Step 2

Make the tube flush with the plate surface:

Use the appropriate ITR-FL Installation Tool to drive the socket flush, taking care not to damage nearby probes. In most cases, 050-05 and 100-05 series sockets will already be mounted flush.

Step 3

Drive out the socket:

Fit the nose of the appropriate Extraction Tool onto the flush end of the socket, and tap the tool lightly with a hammer to drive out the socket. A new socket can then be installed in the same hole using the proper Installation Tool. If the hole was enlarged or damaged during the operation, it may be necessary to use adhesive to retain the replacement socket.

There are some situations where it is not possible to remove the socket by driving it through the mounting plate with our standard extraction tools, such as in a wireless fixture, limited access, or when the socket is damaged. Here are a few alternate methods that can be used:

Method A: Pin Vise/Pliers *(Preferred Method for Double-Ended Sockets)*

With the probe still installed in the socket, use needle-nose pliers or pin vise and grab the top of the socket extending from the mounting plate and pull socket and probe out together. Leaving the probe in the socket helps prevent the socket from crushing. Both the extracted probe and socket will need to be replaced.

Method B: Solder Buss Wire

From the top side, drop several small pieces of solder into the socket tube. Obtain the largest diameter piece of pre-tinned buss wire which will fit inside the tube. Hold the wire with locking pliers, heat the end of the wire to red hot with a torch and quickly plunge it into the tube. The solder will reflow and once cooled, will bond the buss wire to the inside of the socket tube. Pull on the wire to remove the socket.

Also from the bottom side, solder a piece of buss wire along the outside of the socket, then pull on the wire to remove the socket. Note, this method cannot be used with stainless steel sockets.

Method C: Removal from Bottom-side

Headed probes will need to be removed from the top side first. Remove sockets from the bottom side by pulling carefully with needle-nose pliers. Headless probes do not need to be removed, as they will make the job easier since the spring inside reduces crushing of the socket tube. Sockets with tail pins may be pulled out by the tail pin, the joint between the socket tube and pin is stronger than the tube itself.

Also, the tail pin can be snipped off and driven out from the bottom to the top with a hammer and small metal pin.

INSTALLATION AND REMOVAL OF 025-16 SERIES PROBES AND SOCKETS

Installing .025 [.64] center probes is a delicate process. Three areas require special attention:

1. Drilling straight holes of precise diameter and location to optimize probe registration and targeting.
2. Fixturing such that the sockets do not touch each other (the gap between socket bodies is .005 [0.13] nominal).
3. Installing probes and sockets in a controlled manner to minimize the possibility of damage to the delicate components.

Drilling

The finished mounting hole diameter is .0205/.0215 [0.521/0.546]. Use a #75 or .55 mm drill, depending on the material, drill feeds and speeds, and drilling technique.

Homogeneous plate materials such as Lucite®, Nylon and Delrin are recommended. It is more difficult to drill straight holes of this diameter in fibrous materials such as AT7000, G10/FR4 and phenolic. So extra care is required.

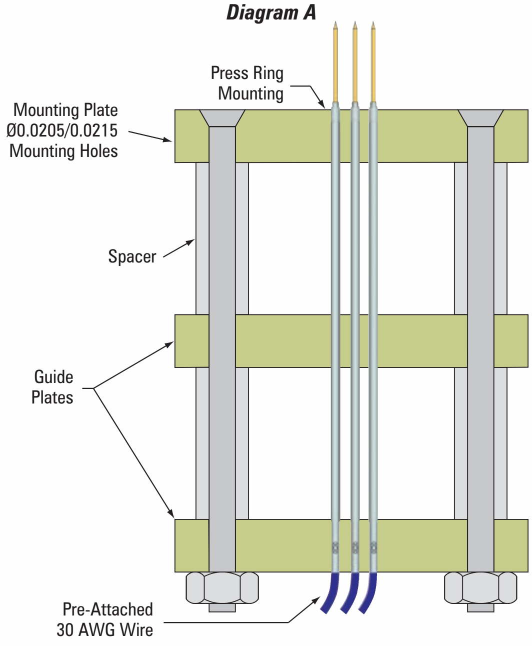
For best registration, first center-drill the mounting holes. For the finished hole, use a drill with the shortest flutes that will clear the material thickness. Solid carbide, PC-board drills with 1/8" diameter shanks are recommended.

Chip removal is important and can be easily done by peck drilling while a small air stream clears chips at the top of the hole. Check the finished hole diameter from both sides with gauge pins (PG25) Go/No-Go tool.

Fixturing

A primary concern in the design of small- probe fixtures has been eliminated since the sockets are retained by interference fit instead of by epoxy mounting. The major difference between fixturing methods for these probes and most larger center spacing probes is that extra consideration must be given to preventing adjacent sockets from shorting. Three drilled plates, properly registered, will provide this protection as shown in Diagram A.

Diagram A



Installation

Slide the socket into the fixture assembly carefully by hand until the press ring portion rests against the top edge of the mounting hole.

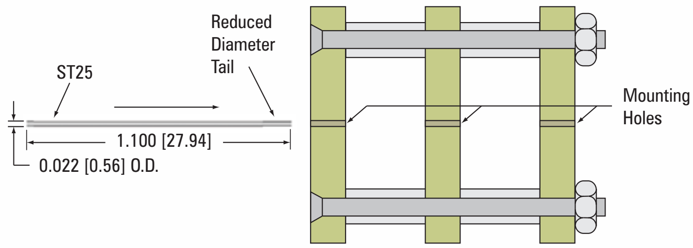
If using sockets with pre-attached wire in multi-plate fixtures, use the ST25 socket threading tool to facilitate feeding the wire through the plates. Slide the tool (reduced end first) into the plates until it is flush with the top plate. Then feed the 1.0 [25.40] long stripped end of the wire into the tool until it protrudes from the reduced end. Pull the wire through with the tool and slide the socket in as described in Diagram B.

Install the sockets by pushing them flush with a small press or other controlled method of applying force perpendicular to the mounting plate. A hard, flat pusher (the end of a gauge pin, for example) should be used for socket installation. Install sockets one at a time. Install groups of sockets on .025 [.64] grid together to avoid reducing the diameter of adjacent mounting holes.

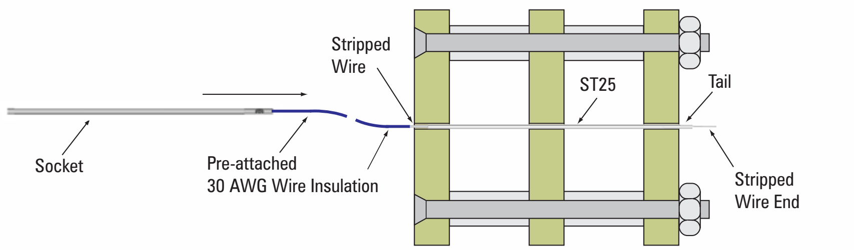
Insert the probes into the sockets and push gently with a flat, non-metallic object to seat them fully.

Diagram B

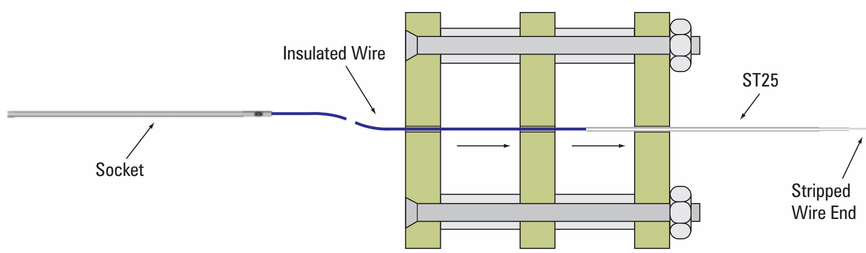
Fixture Block



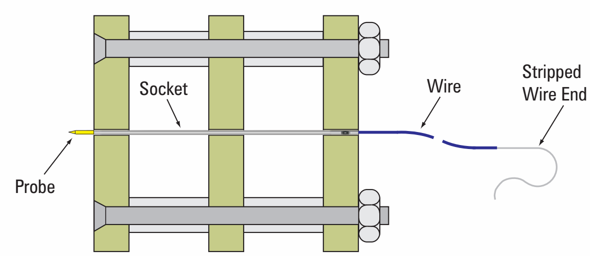
Step 1: *Slide ST25 fully into the socket mounting holes*



Step 2: *Thread 1.0 inch long stripped end of socket wire into ST25 until wire end emerges from tail and insulation contacts top of ST25*



Step 3: *Feed wire into hole while pulling wire end and ST25 out*



Step 4: *Slide ST25 off wire, install socket and probe.*

Extraction

A 025-16 Series socket can be removed a number of different ways. Note that it does not take a lot of force to remove these sockets. The socket is designed to mount flush with the top of the socket mounting plate because the press ring is at the top of the socket.

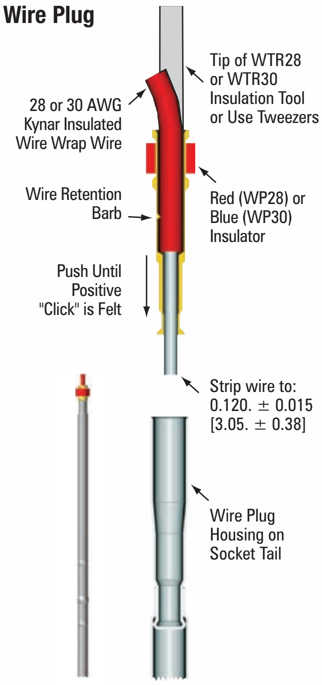
1. If mounting in acrylic or similar plastics, the socket can be pulled through the mounting plate by gently pulling on the pre-attached wire or body of the socket with needle nose pliers. (It is often better to leave the probe in the socket if pulling on the socket with needle nose pliers as the probe helps the socket to resist crushing).
2. 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.
3. You can also take a .021 [0.53] diameter gage pin, place it on top of the socket and gently push or tap the socket out.
4. Another method is to put a small drop of "instant glue" on the end of a probe and install it into the socket and once hardened, pull both out together. Care must be taken not to glue the socket into the mounting hole. Alternately, the probe can be soldered into the socket and then pulled straight out.

WIRE PLUG INSTALLATION INSTRUCTIONS

Wire Plugs are used to connect 28 or 30 AWG solid conductor, Kynar insulated wire to all QA Technology .050 [1.27] centers "P" termination sockets. Sockets are also available with pre-attached wire and other termination styles.

Wire Plugs are easily plugged into sockets and can be unplugged and reused. They are self-insulating and color-coded for wire gauge. WP28 is used for 28 AWG wire and has a red insulator, WP30 is used for 30 AWG wire and has a blue insulator.

Wire Plug



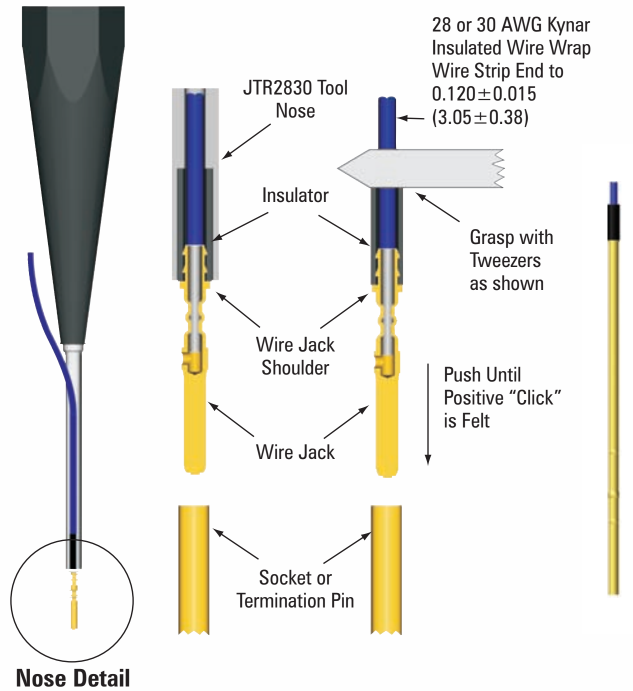
- Insert 28 or 30 AWG solid conductor Kynar insulated wire, stripped to .120 [3.05], into WP28 or WP30. Insertion is complete when insulation stops against internal shoulder and bare wire protrudes through tip of Wire Plug.
- Using tweezers or appropriate WTR Installation Tool, insert Wire Plug and wire assembly into back of socket until Wire Plug shoulder is flush with socket opening. A positive "click" will be felt when assembly is complete.
  - Wire Plugs are reusable and may be removed by pulling straight back on the wire. The Wire Plug will remain attached to the wire.
  - Wire plugs maybe reused many times.
  - If Wire Plug installation or retention force is noticeably reduced, the wire is worn. Simply cut and re-strip the wire to restore original forces.
  - Multiple-strand wire may not be used. Use solid conductor wire only.
  - Proper wire strip length is important. Wire strippers WS28 or WS30 pre-set to the proper strip length of .120 [3.05] are available.

WIRE JACK INSTALLATION INSTRUCTIONS

Wire Jacks are used to connect 28 or 30 AWG solid conductor, Kynar insulated wire to 039-16, 039-25, X39-25, X39-40, X50-25 and X50-40 series sockets and termination pins. The same Wire Jack (WJ2830) is used for both wire gauges. Wire Jacks are available with or without pre-attached wire.

- When using the JTR2830 tool, place the Wire Jack wire assembly into the slotted channel and seat the Wire Jack insulator into the end of the nose of the tool.
- Insert the Wire Jack and wire assembly into the back of the Socket or Termination Pin until the Wire Jack seats against the receptacle. A positive "click" will be felt when the assembly is complete.
- This can also be done with tweezers by gripping the wire just above the insulator and following the above step.
- Wire Jacks are reusable and may be removed by pulling the wire straight back. The Wire Jack will remain attached to the wire.

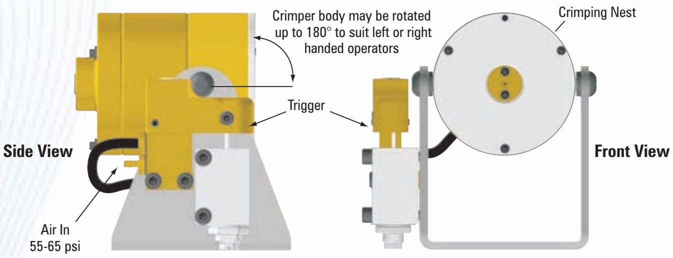
JTR2830 Tool



WIRE JACK CRIMPER OPERATING PROCEDURE

An air-actuated crimper (CR2830) is available for permanently attaching customer-supplied wire to Wire Jacks. The crimper is a precision tool that requires no maintenance other than occasional adjustment of crimp depth.

- Connect the crimper to $60^{\pm 5}$ psi [$4.2^{\pm 0.4}$ kg/cm^2] conditioned air.
- Strip the 28 or 30 AWG solid conductor, Kynar insulated wire to .120 [3.05]. QA offers WS28 and WS30 wire strippers preset to this length.
- Insert the wire fully into the Wire Jack, making certain the Kynar insulation bottoms inside.
- Insert the wire and Wire Jack assembly fully into the crimping nest.
- Depress the trigger and release.



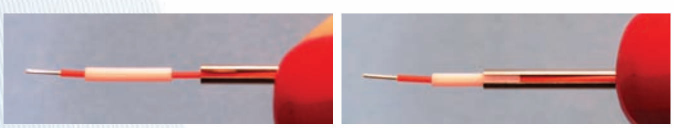
WIRE GRIP INSTALLATION INSTRUCTIONS

Step 1

Slide the WG wire grip sleeve onto the .120 [3.05] stripped solid wire.

Step 2

Lay the wire and sleeve into the channel of the GT tool. Slide wire and sleeve into the nose until the WG sleeve bottoms on the inner shoulder of the GT tool.

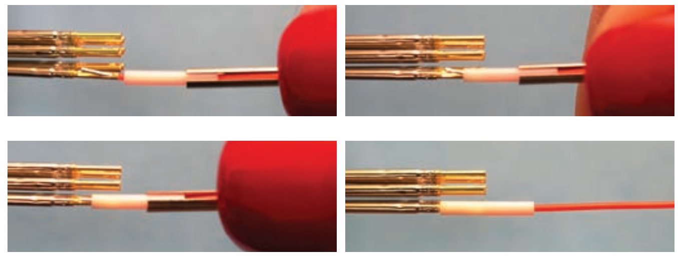


Step 3

While holding the wire firmly with your thumb, insert and push the wire into the socket until the insulation bottoms on the termination. The stripped wire will be exposed through the slot of the termination.

Step 4

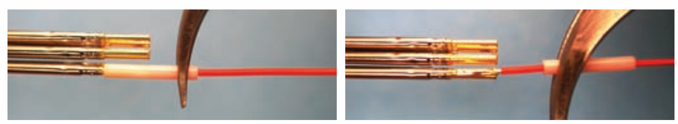
Next, slide the sleeve over the socket using the GT tool until the stripped wire is completely encased.



WIRE GRIP REMOVAL INSTRUCTIONS

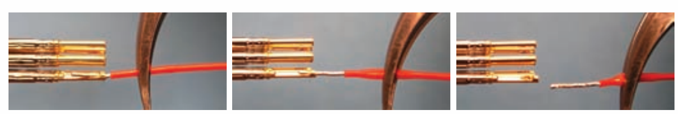
Step 1

With tweezers or needle-nose pliers, slide the wire grip sleeve off the socket and wire.



Step 2

Next, pull straight back while wiggling the wire back and forth, until the wire is freed from the socket. Any broken pieces of wire should be removed to prevent possible shorting in the fixture.



WIRE WRAPPING INSTRUCTIONS FOR 50-MIL CENTERS

QA Technology's 050 center sockets and X Probe terminations can be wire wrapped on .050 [1.27] centers.

Wire and Wrap Type

The recommended wire is a solid 30 AWG Kynar insulated copper wire. Larger diameter wires will cause crowding between adjacent sockets due to the .050 [1.27] center spacing. The recommended strip length (shiner) should be a minimum of .625 [15.90] to achieve the recommended six to seven wire turns with a regular type wrap.

Modified wraps are not recommended as the finished diameter exceeds the .050 [1.27] center spacing.

Kynar Heat Shrinkable Tubing

Due to the center spacing, Kynar heat shrinkable tubing is required on every other connection to prevent adjacent sockets from shorting together. Kynar tubing is stiffer than other types making installation easier. Colored tubing (blue shown) is recommended over clear tubing as it helps identify progress during the wrapping operation. Cut lengths of .313 [8.0] will completely cover the wire wrap post on the 050 sockets while .500 [12.70] is required on the X50.

Recommended Tools

Wire wrap tools designed for .050 [1.27] centers are recommended. These tools have a .060 [1.52] nose diameter that allows better access to the posts. The standard tools typically used on .075 [1.91] and .100 [2.54] centers are larger and could damage adjacent posts.

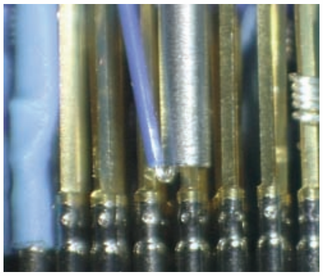


Photo 1: *Tool with wire on .016" square post*

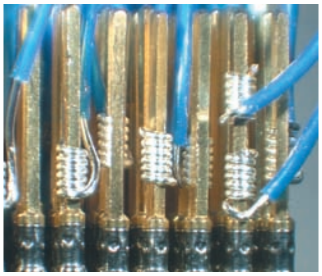


Photo 2: *Every other post has been wrapped*

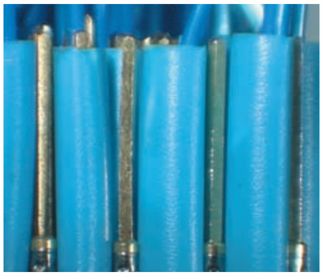


Photo 3: *Shrink tubing is even with top of post*

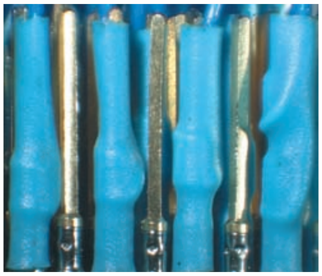


Photo 4: *Tubing has been shrunk on posts*

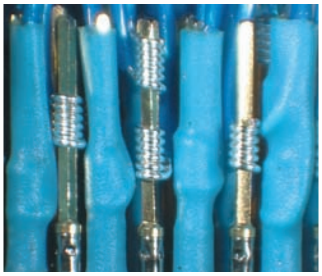


Photo 5: *Finished Assembly*

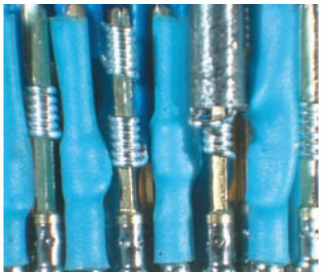


Photo 6: *Unwrap Tool is being used to remove a wire.*

Installation Procedure

- Install sockets into the socket mounting plate at the desired set height with the proper QA installation tools.
- Slide the Kynar heat shrinkable tubing over the 30 AWG wire.
- Wire wrap every other socket (ref. Photo 2).
  - Insert the wire into the smaller of the two holes nearest to the outer periphery of the bit until the wire insulation makes contact with the bit face.
  - For a clockwise wrap (as viewed from the top of the socket), make a bend to the left at the nose of the wire wrap tool. Reverse the bend direction for a counterclockwise wrap (ref. Photo 1).
  - Align the center hole on the wrapping tool nose with the post and slide the tool down the post to the desired wrap location. If more than one wrap is to be made, adjust wrap location accordingly.
  - Anchor the insulated portion of the wire and exert a small amount of pressure on the wire to prevent it from spinning.
  - Trigger the wire wrap gun while using light forward pressure. If the operator presses too hard the result may be over wrapping. If removed too soon, spiral or open wraps may result. Keep the tool on the post until the wrap is completed.
- Slide the Kynar tubing over the wrapped post, the top of the shrink tubing should be even with the top of the wire wrap post (ref. Photo 3).
- (optional) Shrink the tubing with a heat gun intended for the purpose, note that the Kynar tubing has a shrink temperature of 347°F [175°C] (ref. Photo 4).
- Wire wrap the remaining posts without insulation (ref. Photo 5).

Wire Unwrapping Procedure

- Remove shrink tubing by slitting it longitudinally with a penknife and pulling it off with long nose pliers. This can be difficult and care must be taken to avoid damage to the wire wrap post.
- Place the unwrapping tool on terminal/post, use moderate forward pressure and rotate in a direction opposite to the wrap. (ref. Photo 6)
- Maintain forward pressure until the coil has loosened sufficiently and can be removed by hand.

Notes

Shrink tubing: Kynar heat shrinkable tubing 3/64" diameter, 347°F [175°C] shrink temperature available from electronic distributors.

INDICATOR PROBES

The Indicator Probe is a special use probe, which shows the amount that standard probes are deflected in a test fixture. The Indicator Probe's plunger does not return to its original extended position after deflection. Indents in the side of the probe tube interfere with the free motion of the plunger and hold it at the position of maximum deflection. After numerous uses the Indicator Probe may lose its ability to remain in the deflected position and should be replaced.

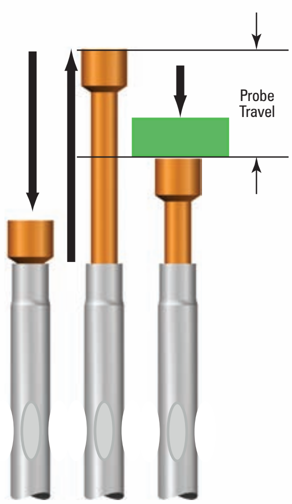
Indicator Probes are identical in external dimensions to their standard counterparts. The entire plunger is unplated, so that it can be easily distinguished from a standard probe. Indicator probes are not intended for use as electrical contacts.

Indicator Probes are available with the 10-Headed Flat tip or the 40-Headless Spherical tip, with the exception of the X50-40 series which is available in the 43-Headless Chisel tip only. The Headless Spherical tip is intended for use in guided probe fixtures. See product series for part number and availability.

Instructions

Step 1
Remove the standard probe from the socket.

Step 2
Install Indicator Probe. When Indicator Probe is installed into the socket the plunger will stick down.



Step 3
Extend Plunger. Hold the top of the probe tube in the socket with tweezers while pulling up on the plunger with another set of tweezers.

Step 4
Reassemble the fixture and cycle once.

Step 5
The plunger will remain in the deflected position, showing its position when the fixture is actuated.

Step 6
Measure the difference in height. This is the probe travel in which the fixture actuated while in production.

SOLDER CONNECTIONS ON SOLDERED SOCKETS

Solder connections are normally made on solder cup sockets. But in some cases it is desirable to make solder connections on the tail pin (round or square) of QA's lead-free (Pb-free) soldered sockets. This can be done safely. Here are a few specifics on the subject:

Q: If the tube is heated to the point where the solder in the joint flows, will the tail pin (round or square) move?

A: No. The pin is press-fit into the tube, so even without solder holding the pin, it takes a minimum of about ten (10) pounds (of axial force) to move the square pin and about one (1) pound to move the round pin.

Q: At what temperature does the solder melt?

A: The solder melts at about 430° Fahrenheit [221° C].

Q: If the socket is upside down or sideways when heated, will the solder in the joint flow to the area where the probe tube seats?

A: No. There is not enough solder in the joint for this to happen.

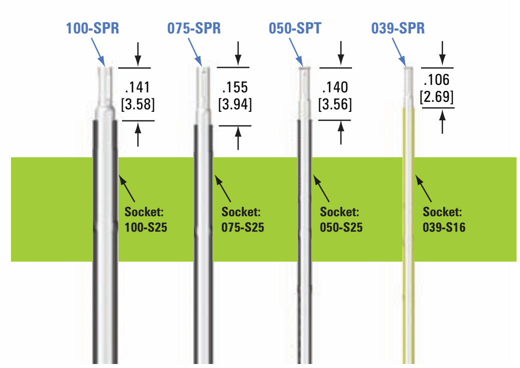
Q: If the socket tube is heated, and solder is fed into the joint, is it possible to solder a probe in the socket or introduce enough solder into an empty socket that probes cannot be completely installed?

A: Yes. But this possibility can be eliminated by not feeding solder into the joint. Keep added solder away from the tail pin/tube junction.

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, eliminating the potential error of re-installing a probe resulting in a test error.

Insert the applicable Socket Plug into a conventional socket with the smaller diameter end up. When the fixture is actuated, the top of the Socket Plug is short enough to prevent contact with UUT. If the test point is to be used again, simply remove the Socket Plug and re-install the proper probe.



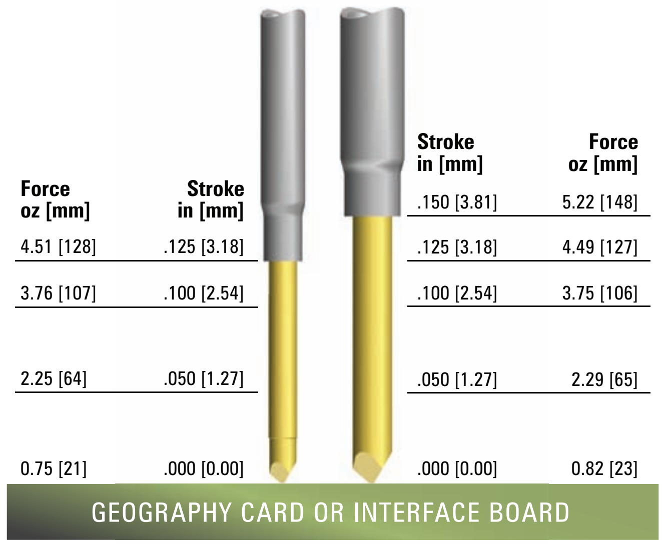
DOUBLE-ENDED SOCKETS FOR WIRELESS FIXTURING (HIGH-FREQUENCY TESTING)

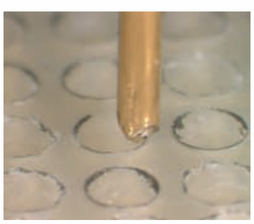
Double-Ended Sockets allow construction of fixtures with shorter signal path lengths compared to conventional wire-wrapped designs. The shorter path length allows for improved signal integrity from the tester circuits to the Unit Under Test (UUT). Fixtures built in this manner are referred to as "wireless," type test fixtures. The impedance characteristics are improved, allowing greater bandwidths for analog test signals and higher vector rates for digital testing. For three probes on .100 [2.54] centers (signal between two grounds), excellent performance to more than 2 Ghz was achieved. For more information on high frequency testing, please see Wireless Probing and High Frequency Performance (page 90).

A Double-Ended Socket consists of a conventional socket with a non-replaceable interface probe contact as its termination. The interface probe typically contacts a flat plated surface, which is part of a dedicated PCB that interfaces with the interface probes on the specified tester. Basic tip styles such as spherical and chisel, are offered on the bottom side probe due to the flat contact surface. Because the bottom probe is used in non-cycling applications, it will last the life of the socket. In the event that the socket is damaged or worn, the complete Double-Ended assembly is replaced.

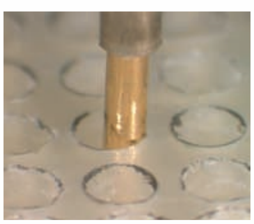
The top of the socket accepts standard probes from our 039-25, 050-16, 050-T25, 075-25, and 100-25 series and is replaceable, as routine maintenance requires.

When mix mounting QA's 39mil wireless double ended sockets with 50mil, 75mil and 100mil wireless sockets, the fixture designer must take into account that the full plunger stroke of the 39mil doubled ended socket is only .125 [3.18] stroke versus the .150 [3.81] stroke for the others. The illustration below shows a typical fixture layout where the interface/translator board is designed to stroke the interface plunger at the recommended .100 stroke across all probe series. The distance from the top of the interface/translator board to the interface tube will be .025 [.64] on the 39mil series and .050 [1.27] for the other sizes. Ultimately, the set height and board layout is dependant upon the specific fixture design and application. See page 45 for suggested fixture layout.

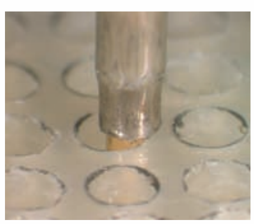




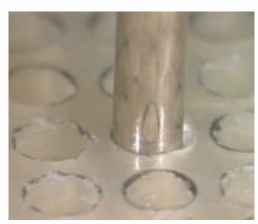
Double-ended plunger enters straight hole.



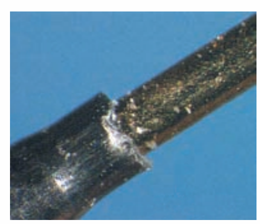
Plunger aligns itself to pass through.



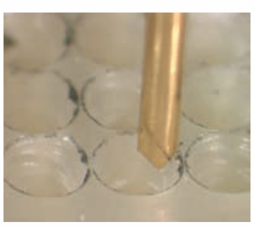
Leading edge of socket tube catches on edge of straight hole.



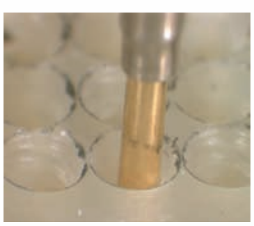
Edge of straight hole is skived by the socket tube during insertion.



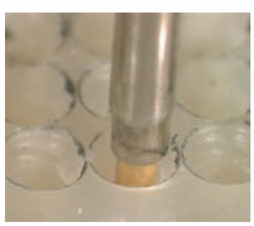
Damage to the socket tube will occur.



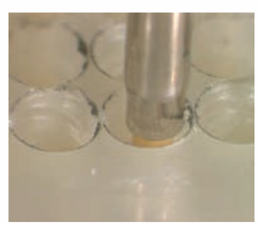
Double-ended plunger enters countersunk hole.



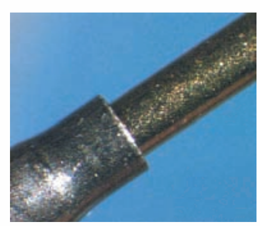
Plunger passes easily through countersunk hole.



Clearance at leading edge of socket tube is good.



Countersunk hole is left intact.



Socket damage has not occurred.

X PROBE SOCKETLESS TECHNOLOGY

SOCKETLESS TECHNOLOGY

The X Probe design concept is taking a larger more robust probe and mounting it on closer centers compared to a conventional probe and socket system. By eliminating the socket from the system, the following shows the sizes that you can now mount on with our X Probe Series.

Conventional Probe Center Spacing	Can now be Mounted on X Probe Center Spacing	With X Probe Series
.100 [2.54]	.075 [.191]	X75 Series
.075 [.191]	.050 [1.27]	X50 Series
.050 [1.27]	.039 [1.00]	X39 Series
.039 [1.00]	.031 [.800]	X31 Series

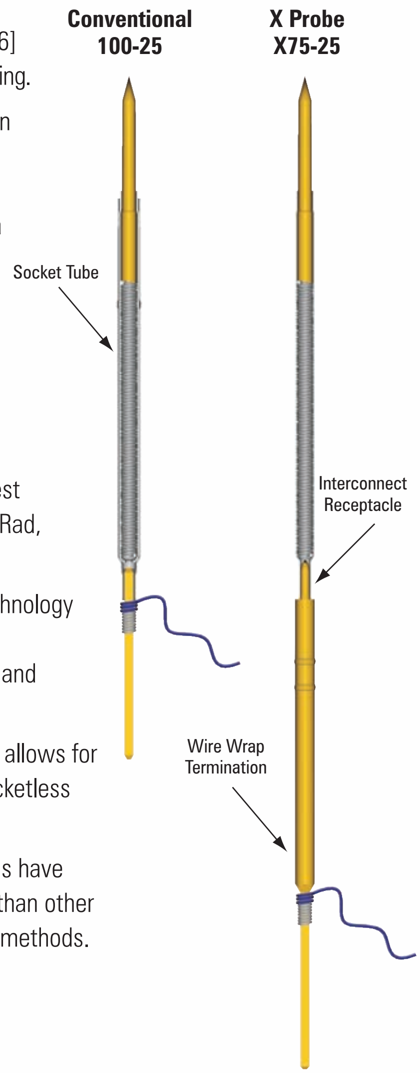
The X Probe Socketless Series is comprised of two parts; a probe and a termination pin. The probe is designed around our patented rolled probe tube design with a modified interconnect receptacle on the bottom. This interconnect receptacle increases the X Probe tube length slightly. All other aspects 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 of 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 utilizing two retention beads while providing a reliable electrical connection from the probe to the test fixture.

ADVANTAGES AND FEATURES

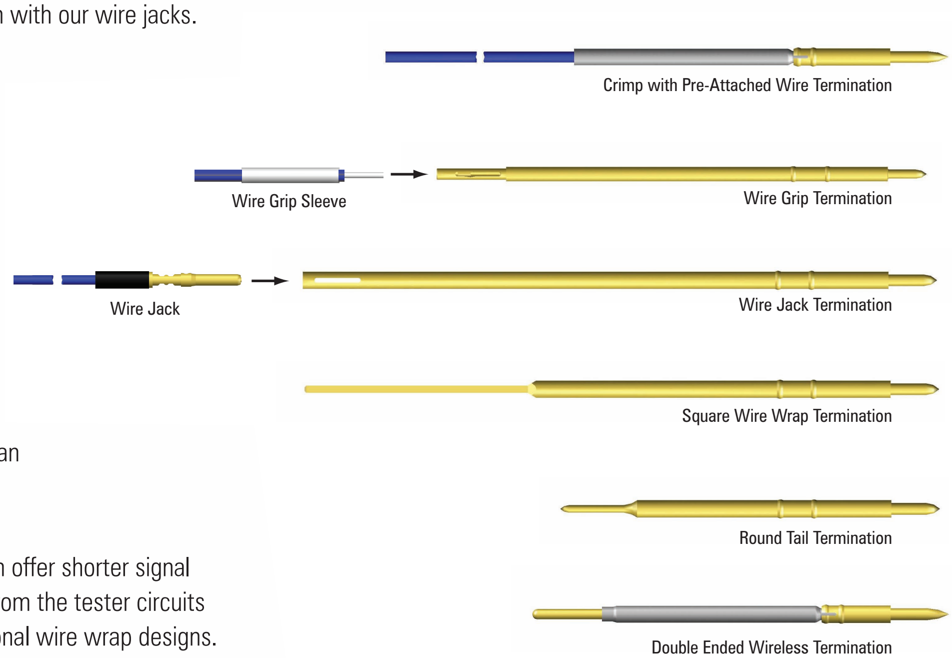
- Mount "larger" probes on closer centers for longer probe life.
- Eliminating the single press ring socket increases pointing accuracy.
- Replace socketless probes as easily as conventional probes for preventive maintenance.
- Extensive probe to termination pin insertions versus competitive products.
- Multiple set heights allow for various test probe height requirements.
- Wide variety of tip styles and spring force selections to accommodate various test targets.
- Available in .050 [1.27] and .039 [1.00] center probes with .400 [10.16] stroke for dual level testing.
- Decreased stroke option (-D) in the .400 [10.16] stroke probe offering higher spring forces in a longer probe.
- Double-ended termination available for wireless test fixtures.
- Easily incorporated into fixture designs for all test platforms: Agilent, GenRad, Teradyne and others.
- X Probe Socketless Technology is compatible with all existing manufacturing and assembly techniques.
- Larger termination pins allows for faster drill times for socketless fixture construction.
- X Probe termination pins have significantly longer life than other socketless termination methods.



TERMINATION SELECTIONS

QA Technology offers a wide variety of terminations to fit your application. The following is a summary of the various options and their applications. Please note, some of these termination styles are only available in specific probe series.

- **Crimp with Pre-attached Wire**
  A reliable connection used primarily on close center/fine pitch probe sizes where wire wrapping is not available. Various wire gauges, lengths and colors are available.
- **Wire Grip**
  Allows the user to connect user-supplied 28 or 30 AWG solid conductor wire directly to the termination. Slide a wire grip sleeve over the wire and onto the termination to complete the electrical connection and provide insulation and spacing between adjacent contacts.
- **Wire Jack**
  Designed around 039 mil and 050 mil center spacing.
  These termination are used in configuration with our wire jacks.
- **Square Wire Wrap Pin**
  The most commonly used termination in ATE fixturing. Used for large-scale wiring. Provides excellent electrical integrity by providing a gas-tight connection therefore preventing the effects of corrosion. One of the most cost-effective connection methods for skilled fixture makers because it is fast, reliable and inexpensive.
- **Round Pin**
  Used primarily for female connectors but can also be directly soldered into board vias.
- **Double Ended**
  Used in wireless fixtures, these termination offer shorter signal path lengths for improved signal integrity from the tester circuits to the unit under test (UUT) than conventional wire wrap designs.



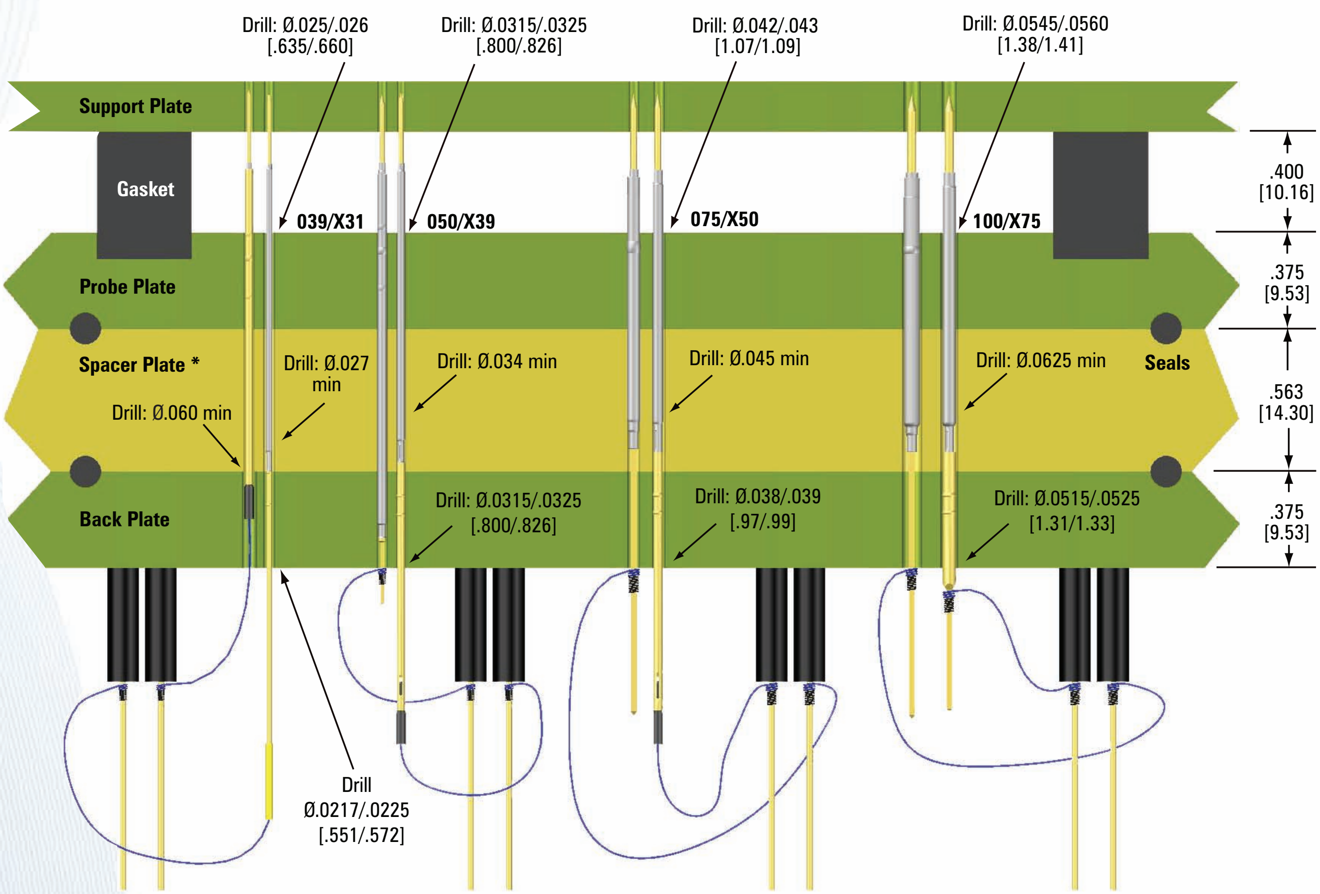
The X Probe is compatible with Agilent, GenRad, Teradyne, and others. Existing fixture kits are able to accommodate X Probes even when additional plates are required. In general, the height of the fixture is increased to maintain the depth of the wiring area to accommodate the personality pins and alignment 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 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.

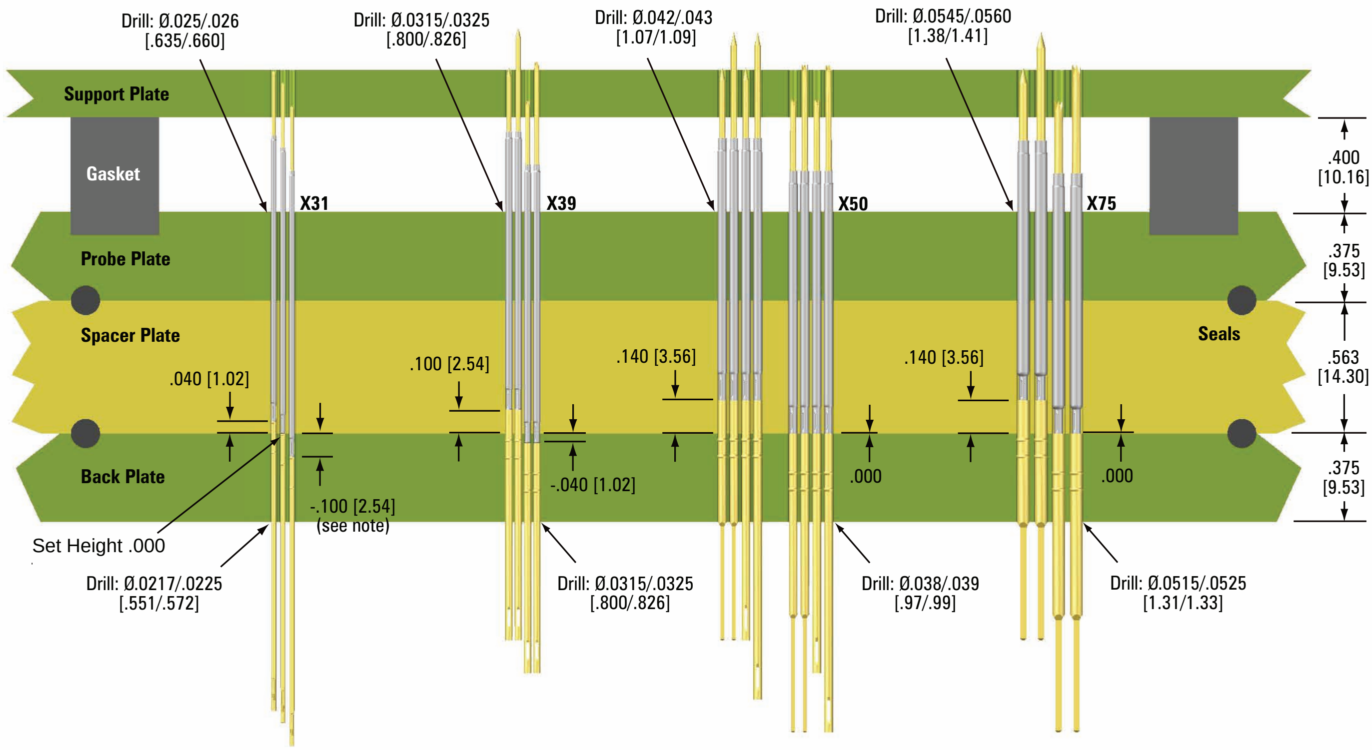
When incorporating mix mounting into your X Probe fixture kit design or comparable, you must plan ahead to account for the added overall height of the X Probe and termination pin.

Mixed X Probe Socketless and Conventional Technology



**An optional Spacer Plate can be used as an intermediate support for the Back Plate and aid in the alignment of the probe to the termination pin during probe installation.*

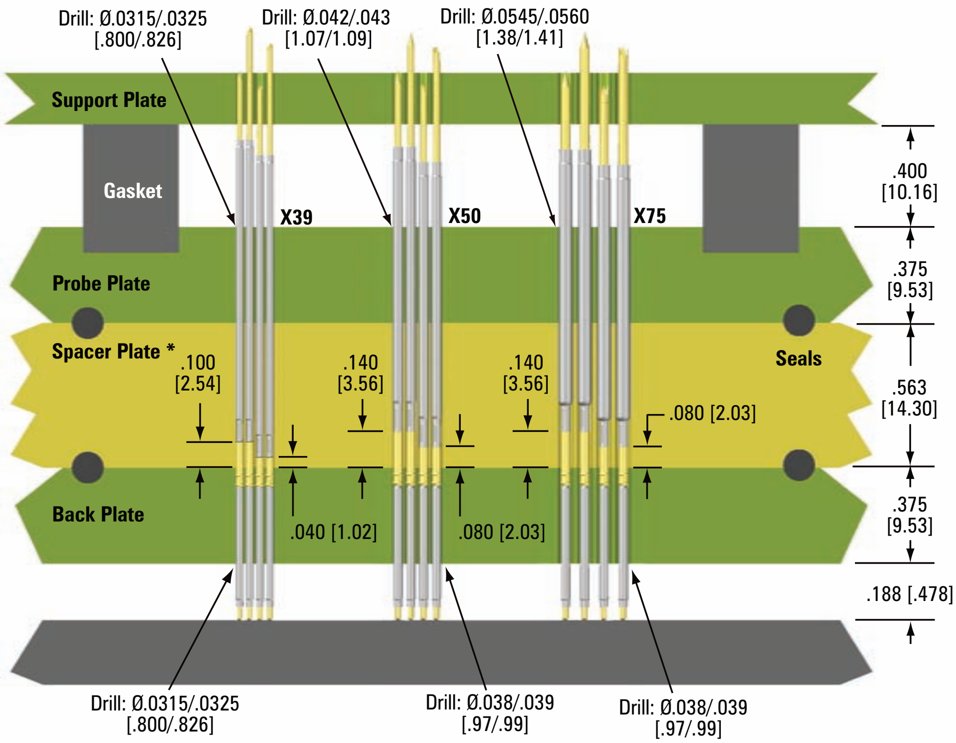
Wired with Multiple Set Heights



Note: When using a set height of below FLUSH for X31 Terminations, back plates will need to be counter drilled at Ø.025/.026 [.635/.660] to the proper depth to allow clearance for probe tubes

**An optional Spacer Plate can be used as an intermediate support for the Back Plate and aid in the alignment of the probe to the termination pin during probe installation.*

Wireless With Multiple Set Heights



**An optional Spacer Plate can be used as an intermediate support for the Back Plate and aid in the alignment of the probe to the termination pin during probe installation.*

X Probe Drill Sizes

Series	Fixture Plates	Hole Specifications	Suggested Drill Sizes **BOLD** (decimal)*	Pin Gauge Tools
X31	Probe Plate	0.025/0.026 [0.635/0.66]	**#71 (.026)**, .65mm (.0256)	PG-X31-P
	Optional Spacer Plate	0.027 [0.686] min	.7mm (.0276), **#70 [.028]**	
	Back Plate (Wired Termination)	0.0217/0.0225 [0.551/0.572]	.57mm (.0224), **#74 (.225)**	PG-X31-T
	Back Plate (Wireless Termination)	N/A	N/A	
X39	Probe Plate	0.0315/0.0325 [0.80/0.83]	.82mm (.0323), **#66 (.033)**	PG-X39
	Optional Spacer Plate	0.034 [0.860] min	.85mm (.0335), **#65 (.035)**	
	Back Plate (Wired Termination)	0.0315/0.0325 [0.80/0.83]	.82mm (.0323), **#66 (.033)**	PG-X39
	Back Plate (Wireless Termination)			
X50	Probe Plate	0.0415/0.0430 [1.05/1.09]	#58 (.042), **#57 (.043)**	PG-X50-P
	Optional Spacer Plate	0.045 [1.14] min	1.15mm (.0453), **#56 (.0465)**	
	Back Plate (Wired Termination)	0.038/0.039 [0.97/0.99]	**#61 (.039), 1.00mm (.0394)**	PG-X50-T
	Back Plate (Wireless Termination)			
X75	Probe Plate	0.0545/0.0560 [1.38/1.42]	**#54 (.055), 1.40mm (.0551)**	PG-X75A-P
	Optional Spacer Plate	0.0625 [1.59] min	1/16 (.0625), **1.6mm (.063)**	
	Back Plate (Wired Termination)	0.0515/0.0525 [1.31/1.33]	**#55 (.052), 1.35mm (.0531)**	PG-X75A-T
	Back Plate (Wireless Termination)	0.038/0.039 [0.97/0.99]	**#61 (.039), 1.00mm (.0394)**	PG-X50-T

**QA Technology highly recommends that holes initially drilled in fixture plates be verified using pin gauge tools due to the tolerances of purchased drill bits which can be undersized by as much as .0005" or more. The machine feed rate, RPM and material used, can also affect the hole size. Undersized holes will not pass Go/No-Go pin gauge testing. Undersized holes will not only create problems when inserting the termination pins but also cause bent/or stuck down plungers within the finished fixture. Therefore, QA Technology strongly suggests the use of pin gauges for hole size verification before attempting termination pin or X Probe installation during the assembly of the fixture.*

ENGINEERING CHANGE ORDERS (ECO)

Additional X Probes and termination pins can be added to a completed fixture. However, note that during initial fixture design, Engineering Change Orders should be taken into consideration.

Because the X Probe system relies on accurately drilled and aligned holes, one approach is to remove all of the X Probes and each of the individual plates. The new hole locations must be accurately registered from the original reference points and drilled in each plate separately so that the X Probe and termination pin will align during assembly.

The alternate approach is to carefully drill through the plates without removing the X Probes and disassembling the fixture. This requires a slow, careful drilling process with extra attention paid to accuracy.

DRILLING SUGGESTIONS

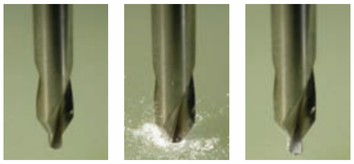
When drilling X Probe fixtures, the size and straightness of the hole is very important. The holes must be straight, without a taper and must be aligned to each other when the plates are stacked together.

A B C D

Drill A: Center Drill
Drill B: Carbide Circuit Board Drill
Drill C: Carbide Circuit Board Drill (with extended flute)
Drill D: High Speed Steel Drill

Step 1

Drill A: A center or spot drill bit is used to start the hole, ensuring straight holes for subsequent drilling.

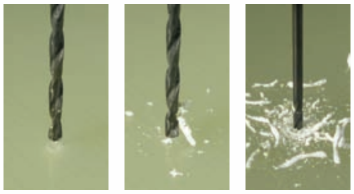


Step 2

Drills B and C: Carbide circuit board drill finishes hole. Extended flute (Drill C) can be used for thicker plates. Peck drilling on smaller diameters will also help achieve straighter holes.

Step 3 (when required)

Drill D: Used for Engineering Change Orders (ECOs) or when plates cannot be taken apart. After steps 1 & 2, a conventional high speed steel drill bit (Drill D) is used to finish the hole. This drill type has along flute length to accommodate thicker plate(s).



Check Hole Sizes

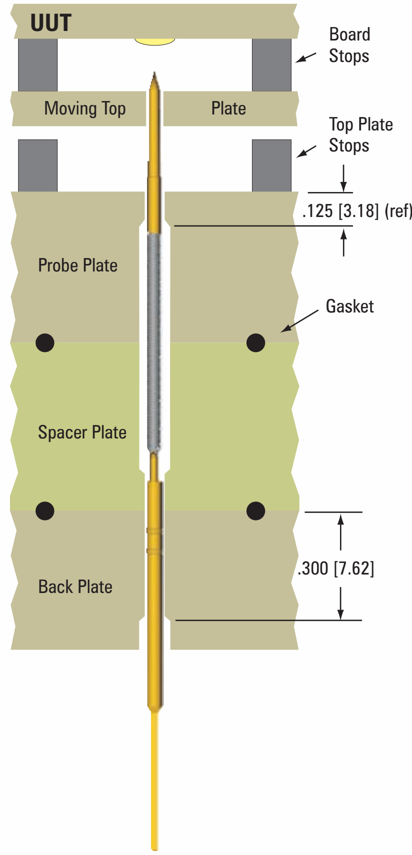
Pin gauge tools, or Go-No/Go Gauges are used to test if the hole is sized correctly. The holes must be checked with both ends of the gauge to ensure the hole falls within the correct tolerance.

The **NO/GO** end of the gauge should not enter into the hole. If the **NO/GO** enters, the hole is oversized and the plate may need to be redrilled.

The **GO** end of the gauge should go into the hole. If the **GO** end does not fit, the hole is undersized and must be resized.

Although the hole sizes are important, it is not required to drill the recommended holes sizes all of the way through the plates. The following suggestions should allow you to drill the X Probe fixture plates faster, more accurately and more efficiently.The following are the locations where the recommended holes sizes must be followed:

- **Top of the Probe Plate –** this guide hole is where the X Probe is installed and ensures that the probe is aligned with its intended target. The diameter of this hole is slightly larger than the diameter of the probe tube. Having close tolerances between the X Probe tube OD and the hole diameter ensures that the pointing accuracy will be optimized. We recommend that the first 0.125 [3.18] of the hole depth meet the hole diameter requirements. The plate can now be flipped over and drilled from the backside with a larger drill.
- **Bottom of the Spacer Plate –** this hole guides the interconnect receptacle on the bottom of the X Probe to the interconnect pin on the termination. This hole diameter is less critical compared to the Probe Plate and its sole responsibility is to guide the X Probe onto the termination. This is a clearance hole and tight tolerances are not required. In addition, if a termination requires replacement, the Spacer Plate helps to guide the X Probe extraction tool onto the termination.
- **Top of the Back Plate –** the hole diameter must be within the recommend hole tolerance to ensure that the termination has the proper insertion and retention force. This hole should also be accurately located to optimize the pointing accuracy. We recommend that the first 0.300 [7.62] of the hole depth meet the hole tolerance requirements. The plate can now be flipped over and drilled from the backside with a larger drill if the plate thickness exceeds 0.300 [7.62].



PROBE SOCKETLESS SERIES

CALCULATING TERMINATION SET HEIGHTS

X Probe Termination pin set height is a critical factor in the performance and life of the X Probe. When set too low, the X Probe is under-stroked, reducing the contact force and the probe's ability to penetrate surface contaminants. When set too high, the X Probe is over-stroked, resulting in decreased spring life or possible tip damage due to bottoming. To calculate the proper set height, follow these steps:

Step 1

Make a cross-sectional sketch of the fixture in the actuated (2/3 stroke) position. Diagram A is typical of many vacuum fixtures.

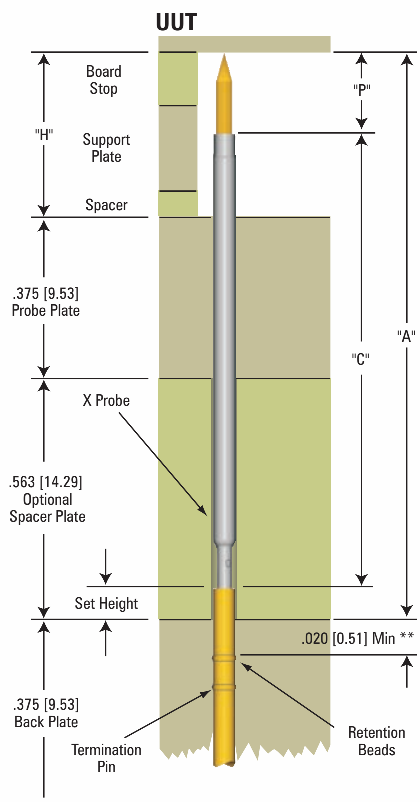
Step 2

Dimension the thickness of the items that stack up on the top surface of the probe mounting plate. Add these dimensions to get a final distance (H) from the top of the plate to the contact surface of the UUT. Subtract the average lead length from this dimension if contacting component leads.

- (A) is the distance from the UUT to the top of the Back Plate.
- (C) is the X Probe tube length (see Table A).
- (P) is the distance from the X Probe tip to the top of the X Probe tube (see table). Remember this dimension is with the X Probe compressed to its recommended working travel.
- (A) = (H) + .375 [9.53] (Probe Plate) + .563 [14.29] (optional Spacer Plate). Use actual plate thickness or standoff lengths as per your design.
- Proper set height = (A) - (C) - (P)

Example for X39-25 Series

Diagram A



H = Spacer + Support Plate + Board Stop
= .062 [1.58] + .196 [4.98] + .125 [3.18] = .383 [9.73]

P = .105 [2.67] (from table)

Set Height = (A) - (C) - (P)
1.321 [33.55] - 1.178 [29.92] - .105 [2.67] = .038 [.97]

Related Notes

To mix X Probe Series within a fixture, calculate the proper set height for each series used in the fixture. Thicker mounting plates allow the greatest set height range, but hole straightness may suffer.

For dual level testing, a .400 [10.16] stroke X Probe is mounted using the same termination pin at the same set height, as a standard .250 [6.35] stroke X Probe. As a result, .250 [6.35] and .400 [10.16] stroke X Probes can be interchanged freely from one termination pin to another as test needs dictate

Table A

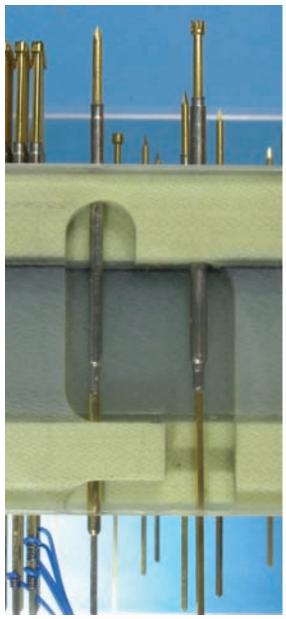
Key Probe Dimensions for Calculating Set Height		
Series	Probe Tube Length C	Recommended Extension P
X31-25	1.210 [30.73]	.133 [3.38]
X39-25	1.178 [29.92]	.105 [2.67]
X50-25	1.110 [28.19]	.133 [3.38]
X50-40	1.110 [28.19]	.133 [3.38]
X50-40-D*	1.110 [28.19]	.283 [7.19]
X75-25	1.100 [27.94]	.143 [3.63]
X75-40	1.100 [27.94]	.143 [3.63]
X75-40-D*	1.100 [27.94]	.293 [7.44]

* *See page 77 for more information*
** *To account for irregularities at the hole ends, a margin of at least .020 [0.51] is recommended between the press ring and the closest plate surface.*

TERMINATION INSTALLATION INSTRUCTIONS

The ITR set tools are designed to install termination pins into the Back Plate at a specified set height. Installation is performed with the Probe Plate and optional Spacer Plates removed.

These tools can be ordered preset at your specified set height or unset. Instructions are included with unset tools that allow the user to set the tool at a desired set height.



The X Probe termination pins are installed in the back plate of the fixture and are used to adjust the set height of the probe while providing the electrical connection from the probe to the fixture wiring. The X Probe Socketless Series is available in two termination types: wired and wireless. The chart on page 109 gives recommended hole sizes and pin gauges for AT7000, G10/FR4 or similar materials.

Step 1

Insert the termination into the correctly gauged mounting hole, tail end first. The bottom retention bead should be sitting on top of the Back plate. **When installing TC terminations (crimped with 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 thru the plate by the attached wire; the crimp tube body can pull apart from the termination retention bead portion of the assembly causing damaged parts.**

Step 2

Place the nose of the ITR tool over the termination interconnect pin.

Step 3

Tap lightly on the ITR tool with a 4-6 ounce hammer until the tool's stop has contacted the mounting material.

Note

Because of the delicate nature of the ITRX31 and ITRX39 tools, extra care must be taken so that the tool does not get damaged.

Troubleshooting

QA's X Probe terminations are easily installed into the Back Plate when the hole sizes are accurate. Some common errors that could occur if the holes are too small:

- Retention beads are sheared off during installation causing shorts (see Figure A). Check the hole sizes using the PG Tools.
- Termination damage, plate damage and inconsistent set heights. Excessive hammering on the insertion tool (see Figure B and C).

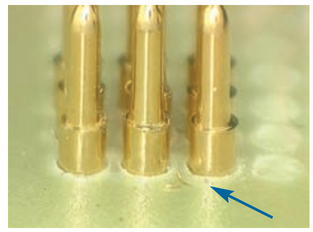


Figure A: *Metal shavings*

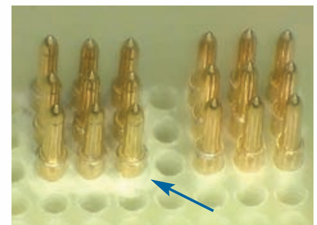


Figure B: *Mounting plate material has been displaced due to excessive hammering of the installation tool. Termination pins to the right have been installed properly.*

Figure C: *The shoulder of the termination pin has been damaged due to excessive hammering of the tool. Inconsistent set heights may also occur.*

PROBE INSTALLATION

The X Probe is inserted into the mounting hole in the Probe and Spacer Plates during installation. X Probe installation is accomplished by using the standard PT50/39 or PT100/75 tools for the X31, X39, X50 and X75 respectively to seat even the sharpest point styles without damaging the tips.

The following method should be used when installing all probes. QA's Probe Installation Tools **(PT)** are highly recommended to avoid damage to sharp tips.

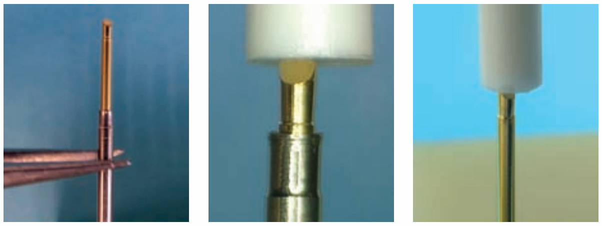
Step 1

Probe Installation Tool (PT 100/75)

X Probes can be installed by hand or using tweezers. When placing the X Probe into the mounting hole with tweezers, grab the probe tube avoiding the mouth area.

Step 2

Using QA's PT tool, push on the Probe tip to guide it into the termination pin.



Step 3

Continue pushing until the X Probe is seated onto the termination pin.

Ensuring proper X Probe installation is key. The following are some things to check if poor electrical contact or shorts are experienced:

- The X Probe may have missed the termination pin (Figure 1) and is not making the connection. Remove the X Probe and re-install. A properly drilled spacer plate will prevent this.
- Improper connection of the X Probe onto the termination pin. If the X Probe is sitting too high, it may not be seated properly (Figure 2).
- Complete the installation until a positive click is felt (Figure 3).

***Figure 1:** X Probe missed termination pin.*

***Figure 2:** X Probe not fully installed.*

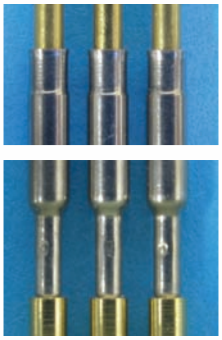


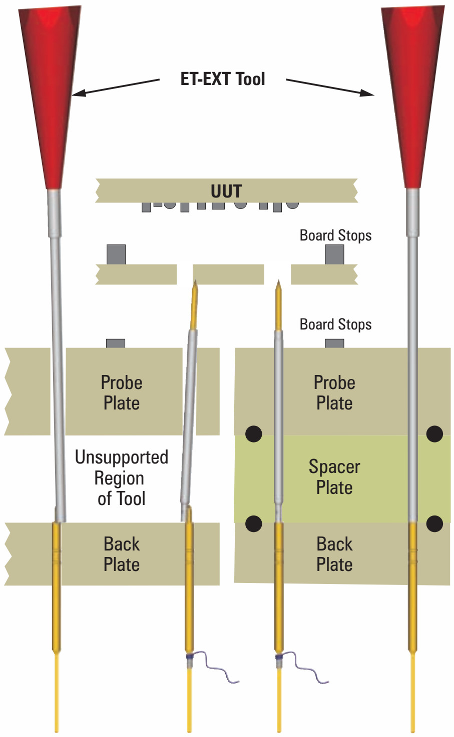
***Figure 3:** Proper Installation – All of the X Probes are at the same set height and have been seated properly.*

X PROBE® SOCKETLESS SERIES

BENEFITS OF THE SPACER PLATE

X Probe Technology incorporates different plates than conventional fixtures. We recommend using a Spacer Plate. Some of the benefits when using this plate are:

- Stiffer Fixture
- Accurate probe installation (less chance of X Probe missing the termination pin)
- Ease of tool use
- Better vacuum isolation options when mix mounting with conventional probes
- Easier maintenance
- Easier to incorporate ECOs (drill is guided when drilling through plates)
- Prevents shorting between contacts



TERMINATION REMOVAL INSTRUCTIONS

Terminations can be removed with or without the probe and optional spacer plates installed.

Removing termination pins and probes with the Probe and Spacer Plates INSTALLED:

The ETR-EXT tools are designed to remove and install terminations pins from the Back Plate with the Probe and Spacer Plates in place. These tools would typically be used for field repairs where it is not practical to remove all of the probes and disassemble the Probe and Spacer Plates from the fixture.

The tools are designed to remove and install termination pins in Back Plates up to .625 [15.88] in thickness when the fixture is designed around QA's Fixture Layout Examples. Note: the Probe and Spacer Plates must be in place in order to prevent the tool from being damaged. If these plates are removed, use the standard ETR tools for termination pin removal and the ITR tools for installation.

Step 1

Remove the X Probe from the Probe Plate with QA's PE tools, tweezers, or needle nose pliers. Identify the termination pin from the bottom side of the Back Plate for removal and move adjacent wires and components to prepare the termination pins to be removed. This will help prevent damage to nearby contacts while the termination pin is being driven out.

Step 2

Guide the nose of the tool into the mounting hole in the Probe Plate until the nose of the tool contacts the interconnect pin on the termination pin. Make a small mark on the shank of the tool located at the top of the Probe Plate with a pencil or fine line marker. This mark will be used to gauge the set height when installing the replacement termination pin.

Step 3

The termination pins are removed by tapping lightly on the tools "striker" with a 4-6 ounce [113-170 gram] hammer.

Note

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-EXT tool would be used, not the ETRX75A-EXT tool.

Removing termination pins and probes with the Probe and Spacer Plates REMOVED:

The termination pin removal requires use of an ETR tool. These tools are used when a termination pin has been damaged and must be replaced. These tools are designed to remove the termination pins from the Back Plate once the Probe and Spacer Plates have been removed. Following these instructions will ensure that the Back Plate will not be damaged:

Step 1

Be sure that the termination pins are set flush, prior to extraction.

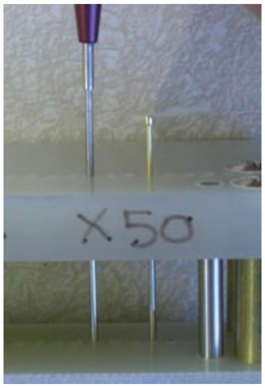
Step 2

The ETR tool is placed onto the interconnect pin of the termination and driven out by tapping lightly on the tools "striker" with a 4-6 ounce [113-170 gram] hammer. With care, the tool will also remove the termination pins with broken interconnect pins. The tool is designed to remove termination pins in mounting plates up to .625 [15.88] in thickness. To help prevent the tool from being damaged it is recommended that the termination pin first be set to .000 with an ITR__-FL tool (on termination pins set below .000, this step is not required).

Note

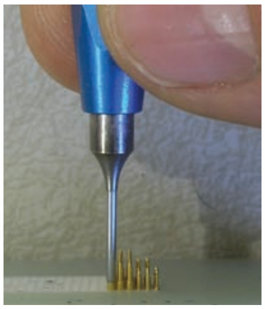
Because of the delicate nature of the ETRX31 and ETRX39 tool, extra care must be taken so that the tool does not get damaged.

Use the ETR-EXT extended tool only when the top plate and spacer plates are installed. The ETR-EXT tools are delicate and may buckle if proper support is not in place.

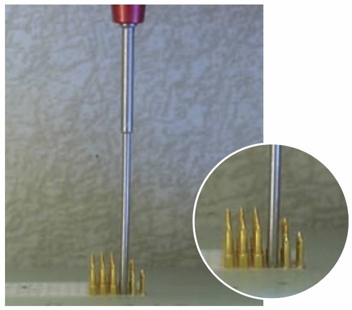


Proper use of termination extraction tool with spacer plate and probe plates installed.

Incorrect use of tool. EXT tool may buckle.



Termination being set FLUSH with an ITR__-FL tool.



Use ETR extraction tool to remove the termination.

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REMOVAL TECHNIQUES FOR DAMAGED X PROBES

In some cases it may be necessary to remove a broken X Probe. We have designed a tool TERX which will help to remove a broken X Probe tube without damaging the fixture. The TERX tool is comprised of a tapered steel pin that is designed to lock into the X Probe tube ID.

If the broken X Probe is in the center of a group of probes, the surrounding probes may have to be removed first so that you can gain access.

Step 1

If necessary, remove any of the remaining components (i.e. spring or plunger) of the broken X Probe using tweezers or needle-nose pliers.

Step 2

Insert the appropriate sized TERX tool into the broken probe tube. If the probe tube ID has been damaged the pointed nose of the tool can be used to reform the tube.

Step 3

Push the tool firmly into the probe tube. Do not push the tool too hard so as to move the termination pin below.

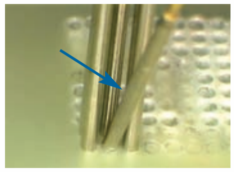
Step 4

Pull straight up on the tool. The portion of the broken probe tube will be removed as the tool is pulled out.

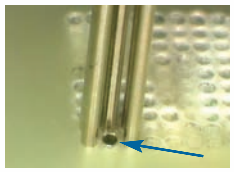
Step 5

The use of tweezers or needle-nose pliers may be required to slide the probe tube off of the nose of the tool.

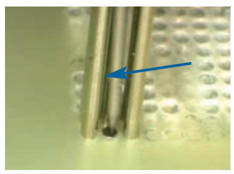
In situations where a tool is not on hand, there are two alternate methods that could help to remove a broken X Probe. The first method is to solder a piece of buss wire or a plunger into the broken probe tube and pull it out with tweezers. A second method is to use a pin vise and appropriately sized drill bit.



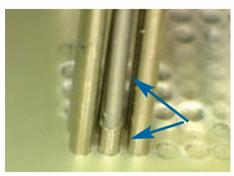
X Probe is broken.



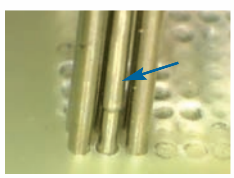
Damaged X Probe tube remains.



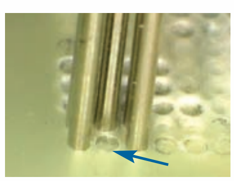
Insert the nose of the TERX Tool into the tube.



TERX Tool grabs the X Probe tube.

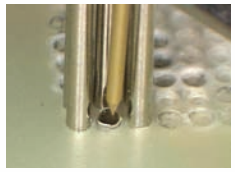


X Probe tube is almost removed.



X Probe is removed.

Method Two: Solder Buss Wire or Used Probe Plunger

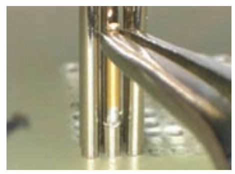


Step 1

Insert a plunger point end first into the end of the broken off probe tube.

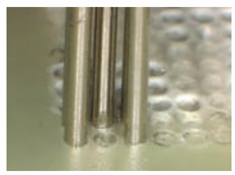
Step 2

Solder the plunger or buss wire into the broken off probe tube. In some cases where the tube does not allow a plunger to be installed, a pointed awl or needle can be used to reform the hole.



Step 3

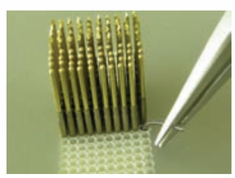
Pull the damaged probe from the fixture plate with tweezers or needle-nose pliers.



Step 4

Inspect the hole for damage and clean up by hand with an appropriate sized drill mounted in a pin vise.

Method Three: Pin Vise and Drill Bit

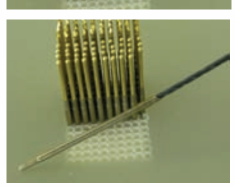


Step 1

Remove any remaining components of the broken probe using tweezers or needle nose pliers.

Step 2

Using a small pin vise and the appropriate size drill bit*, insert the drill bit straight down into the broken off probe tube and twist.



Step 3

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 it can be pulled straight out of its hole.

** Drill Bit Sizes:*
X31 = Method #3 is not recommended as standard drill bits are not readily available
X39 = #70 Drill bit (.0280) [0.71]
X50 = #66 Drill bit (.0330) [0.84]
X75 = #57 Drill bit (.0430) [1.09]

REINSTALLING THE TERMINATION

If installing with spacer plate removed see page 112 for termination installation instructions.

Step 1

Check the mounting hole to make sure nothing is obstructing it. The appropriate ETR-EXT 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 Probe or Spacer Plate hole, the ETR-EXT tool can be used to push it to its starting position on the top of the Back Plate. If the termination pin requires more than a light tap of the hammer to pass the termination pin through the Probe and Spacer Plate, the mounting holes in the Probe and Spacer Plates will have to be enlarged to the sizes listed on page 109.

Step 3

The termination pins are installed by tapping lightly on the tools "striker" with a 4-6 ounce [113-170 gram] hammer. Only install the termination pin to the point where the mark (made previously) on the tool shank aligns with the top of the Probe Plate. This ensures that the termination pin is at the same set height as the previously removed termination pin.

Step 4

Reinstall the proper X Probe with appropriate PT tool or other plastic pusher.

Step 5

Reconnect fixture wiring to the tail of the termination pin.

CURRENT CARRYING CAPACITY

Introduction

This test report presents the data and describes the procedures for testing the current-carrying capacity for QA's test probes. Actual current carrying capacity will depend upon the specific application. The current carrying capacity values for our products are based on a 144°F temperature rise above ambient.

This information can be used for test and design engineers when calculating probe requirements for high current and temperature applications.

Scope

Measure the current carrying capacity in relation to the temperature rise of the X Probes and Terminations when mounted in a fixture designed around the Suggested Fixture Layout drawings for this Series. Two types of tests were performed; both were simulations of common applications for probes. The first tested a solitary probe mounted in a G10 fixture, while the second tested a group of probes (3x3 Grid pattern).

Background

The current-carrying ability of a probe is measured with respect to probe temperature. The spring material determines the upper temperature limit of a spring probe. Springs which are made of music wire can be used without adverse effects up to 250° F [120° C]. Although stainless steel springs are also used in QA probes and can withstand temperatures up to 400° F [204° C], 250° F [120° C] is used for the upper temperature limit since the probe user may not always be certain of the spring material. See Working Temperature Ranges for QA Probes page 79 for additional information.

Test Procedure

A controllable DC current source was used to provide a constant current through the X Probe and Termination assembly being tested, while a thermocouple was used to track the temperature of the probe. The current was increased in one Ampere intervals and sufficient time was allowed between increases for the temperature to stabilize. As current increased, probe temperature increased, and testing continued until the 250° F [120° C] threshold was reached.

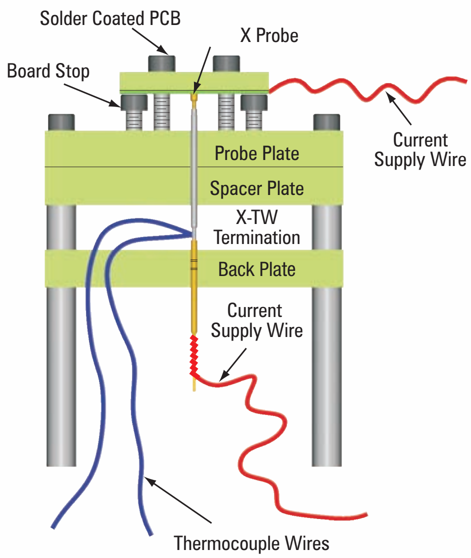
For the first test, a solitary X Probe and Termination was installed in a fixture as shown in Diagram A. The fixture stood horizontally on four legs, and airflow was blocked by baffles arranged around the test block.

A type K thermocouple was used, with 40 AWG (.003 [.076] diameter conductor) Chromel/Aluminel wire connected to the bottom of the probe tube just above the tube's Interconnect Housing. The .003 [.076] wire diameter minimized heat transfer from the assembly and reduced response time.

Wires for supplying current to the probe were 20 AWG or larger. One current supply wire was connected directly to the tail of the Termination. The other was connected to a solder-coated plate that was in contact with the probe tip. This contact plate was mounted such that the probe was compressed to its rated $^{2}/_{3}$ stroke. The test set up was intended to closely simulate typical applications for test probes.

The second test (probe groups, 3x3 Grid), nine X Probes and Terminations were mounted on a three-by-three grid of the appropriate center spacing. All nine probes were wired in series by connecting the appropriate Termination tails, and by selectively jumping the tips in succession with a solder-coated plate simulating a typical printed circuit board. In this way, the same current was assured to run through all nine probes. The thermocouple was connected to the center probe at the same location as in the previous test.

Diagram A



Setup for measuring current versus temperature for a single probe/termination assembly.

Data

The plotted graphs compare the temperature versus current for all of the probe series. X39-TJ-3G Terminations were set at .100 [2.54] for the X39-25 Series. X50-TW-3G and X75-TWA-5G Terminations were set to .140 [3.56] and used for both the X50-25 and X50-40 and the X75-25 and X75-40 Series respectively.

Conclusions and Application Notes

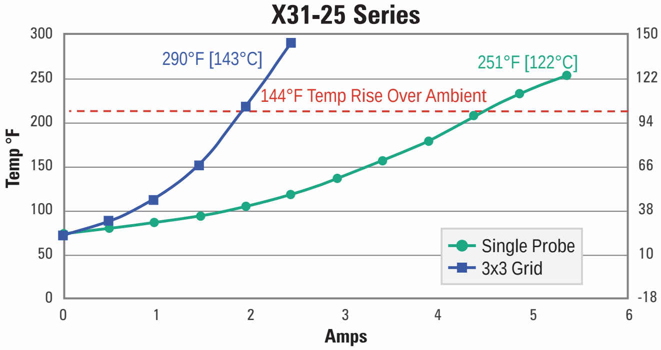
- As the group data shows, higher probe densities decrease the probes current carrying ability. This is due to the combined heat generated by the probes and the decrease of air circulation via natural convection. Because each application is unique, it is recommended that appropriate tests be conducted before probes are put into service in applications with high currents, high probe densities or limited airflow.

Probe Series	Center Spacing	Amps*
X31-25	.031 [.800]	4.5
X39-25	.039 [1.00]	5.5
X39-40	.039 [1.00]	7.5
X50-25	.050 [1.27]	10.0
X50-40	.050 [1.27]	10.5
X75-25	.075 [1.91]	15.0
X75-40	.075 [1.91]	13.0

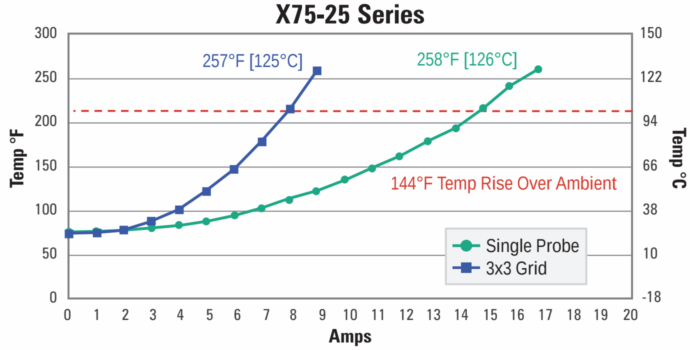
** For a single probe in ambient ait with a 144°F temperature rise.*

- These temperature measurements were made in the absence of any forced convection. Providing airflow (by means of a fan, for example) around the terminations 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.
- For conditions where the ambient temperature differs from the 75° F [24° C] ambient of these tests; shift the data by the same amount that the ambient differ to determine whether the 250° F [120° C] limit is exceeded. For example, a single X75-25 series probe operating in an environment with an ambient temperature of 120° F [49° C] will exceed 250° F [120° C] at 14.5 Amps (instead of 16.5 Amps at 75° F [24° C] ambient).
- Note that although the probe will not be damaged from operation at temperatures up to 250° F [120° C], some types of plastics used as mounting plates will not withstand this temperature. Also, the operator must be protected against contacting probes at high temperatures.
- 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). For example, the electrical resistance of X75-PRP2509S in a X75-TWA-5G Termination averages 15mΩ and carries a maximum current of 17A (at 250°F [120° C]); it is able to continuously dissipate a maximum of 17^2 x .015 = 4.33W ($P = I^2R$). At 50A, it would dissipate about 37.5W, which means the duty cycle must be reduced to 11.6%. So, to avoid overheating this probe at 50A, power must be applied for no more than 116 milliseconds (1 second x 11.6%).
- When comparing the X Probe current carrying capacity to a standard probe with socket, the X Probe will carry more current on the same center spacing. In most cases, by using a larger probe on closer centers, we gain an advantage in that the probes' internal contact area is also increased thus providing a greater current path (larger conductor). For example, the X75-PRP2509S with a X75-TWA-5G Termination will carry 15 Amps with a 144°F temperature rise while a standard 075-PRP2509S with a 075-SDN250W socket will carry 9.5 Amps at the same temperature rise.

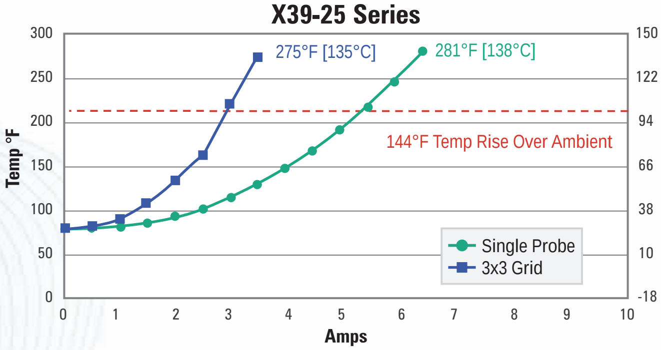
X31-25 Series



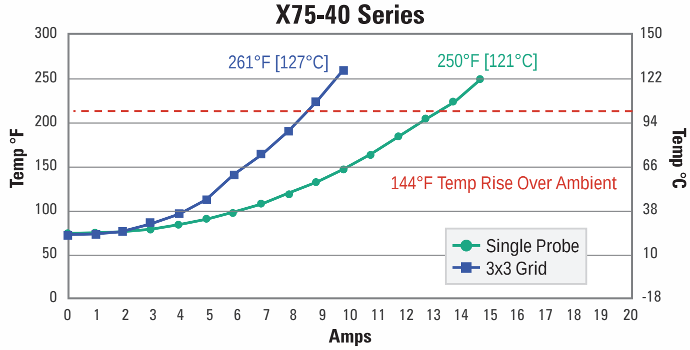
X75-25 Series



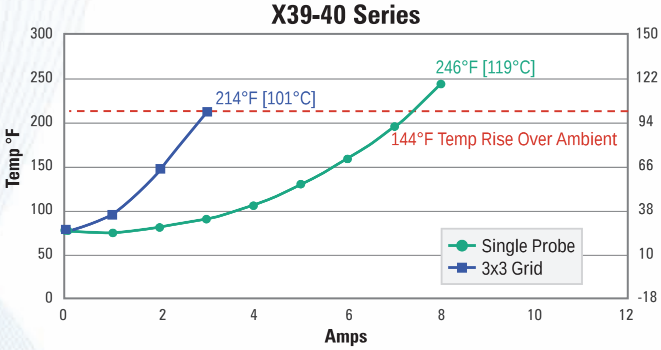
X39-25 Series



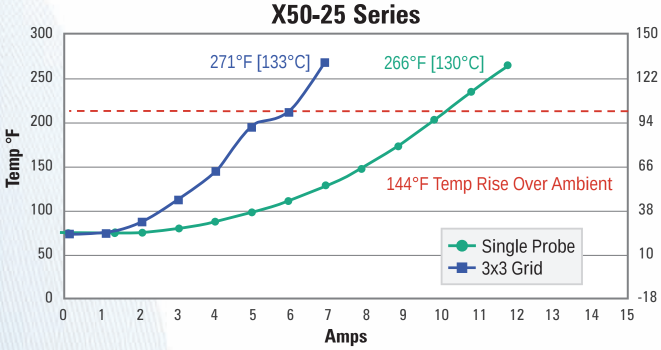
X75-40 Series



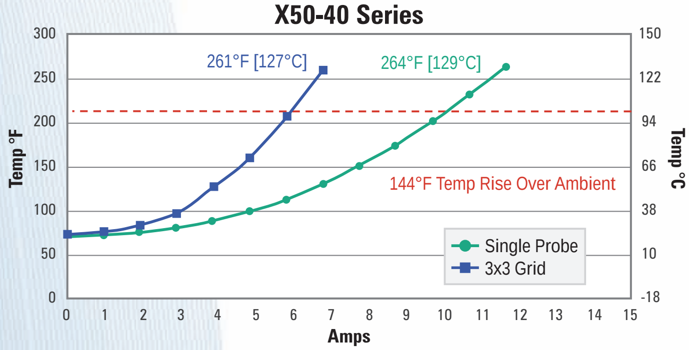
X39-40 Series



X50-25 Series



X50-40 Series



CONVENTIONAL PRODUCT FAQs

Q: Can test probes be used on closer centers than what's listed in the catalog?

A: Yes, the center-to-center designation is based on an industry standard of commonly found center spacing on PCB's. Fixture designs may have to be modified because the web thickness between adjacent sockets is reduced.

The following chart details the minimum recommended distance (center-to-center spacing) between QA Conventional Test Probes and Sockets. This information should be used as a guideline and is dependent on the user's drilling/fixturing capabilities, as well as the tool clearances.

Conventional Test Probe and Socket Series				
Centers	.039 [1.00]	.050 [1.27]	.075 [1.91]	.100 [2.54]
.039 [1.00]	.039 [1.00]	.043 [1.09]	.052 [1.32]	.060 [1.53]
.050 [1.27]	.043 [1.09]	.048 [1.22]	.057 [1.45]	.064 [1.63]
.075 [1.91]	.052 [1.32]	.057 [1.45]	.068 [1.73]	.075 [1.91]
.100 [2.54]	.060 [1.53]	.064 [1.63]	.075 [1.91]	.085 [2.16]

Note: When removing a larger center socket that is located next to a smaller center socket, the smaller center socket/termination must be removed first using the proper extraction tool.

Q: Why do black residues develop on the plunger shank over time?

A: Black residues are any combinations of flux, plating wear particles, lubricant, and or contaminants from the environment. Unless these contaminants are extremely heavy or washed down into the probe tube through improper cleaning, the black residues do not adversely affect the electrical resistance of the probe. As a fixture is cycled, air is continuously drawn across and into the probes. Contaminants in the air and from the UUT collect on the probes' surfaces and by combining these with the plating wear particles formed during sideloading from fixture cycling, create a black residue. By maintaining filters in wave soldering and reflow ovens and by using filters on the vacuum release port and covering the fixtures when not in use, contaminants will be reduced. Maintaining fixture alignment, selecting the proper point style for the intended contact, and performing proper probe and fixture maintenance will reduce Sideloading.

Q: I need a probe with a higher temperature limit than the 250°F [120°C] that's listed in the catalog.

A: The 250°F [120°C] temperature limit is for lubricated probes. The temperature limit is increased to 400°F [204°C] by selecting an unlubricated probe that is assembled with stainless steel springs.

Q: Why are steel plungers (tips) recommended over beryllium copper (BeCu) for testing PCB's with no-clean flux, OSP and lead free systems?

A: No-clean fluxes can be hard and very abrasive. Steel tips, due to their increased hardness (58-60 HRC) over BeCu (38-42 HRC), will remain sharper longer and resist abrasion better than BeCu. Note that not all point styles are available with the steel (-S) option.

Q: What is a Factron probe tube?

A: The Factron probe has an oversized probe tube OD. This probe tube was developed as a direct replacement to Factron probes. The OD of the probe tube is .0542 [1.377] versus the standard .0538 [1.367]. This option can also be used in standard sockets that have been worn due to many probe replacements or in new sockets where high probe retention is required. The Factron probe tube is available in our 100-25 and 40 Series.

Q: Do the probe extraction tools (PE75 and PE100) remove all probes in 075 and 100 series?

A: No, the PE75 and PE100 are designed to remove headed probes only. These tools are ideal in cases where a large number of headed probes must be removed quickly without damaging the probe. For headless probes and probes on closer centers, tweezers or miniature precision long nose pliers are recommended. Care must be taken when removing probes that are to be reused as pliers and tweezers can damage the plating and or bend the plunger.

Q: Probes in the 100-40, 075-40 and 050-T40 Series are available with a -D option, what does this mean?

A: The -D stands for decreased stroke. When a -D option is selected in these series, the total stroke is reduced from .400 [10.16] to .250 [6.35]. This is accomplished by using the springs from our 100-25, 075-25 and 050-T25 Series with our 100-40, 075-40 and 050-T40 Series plungers and probe tubes. This option is used when longer reach probes with higher spring forces are required.

Q: Why is there a difference between Working Stroke and Full Stroke as listed in the catalog on some probe series while on others, they are the same?

A: The Full Stroke is the maximum designed travel of the plunger and is the distance from full extension to full compression (bottomed out). The working stroke is the recommended design stroke and takes into account spring fatigue life. In general the working stroke is $^2/_3$ of the full stroke. By compressing the plunger beyond the working stroke, spring life (cycle life) will be reduced. Some spring designs allow full stoke of the plunger while still providing a 1,000,000-cycle fatigue life. The fatigue life and rated stroke for each spring are listed in each series.

Q: How long will my test probe last/how many cycles can I expect from my probe?

A: The fatigue life listed in our catalog is dependent on the mechanical life cycle of the spring. In probe designs where the spring is highly stressed, the fatigue life is reduced accordingly. All of our probes are routinely cycled in a controlled environment to the fatigue life indicated. When running probes in a production environment there are many factors that will reduce the life cycle expectations of a probe such as: contaminants on the UUT (Unit Under Test) and in the environment, side-loading during actuation, damage to the probe's tip, plating, etc. These factors make it virtually impossible to determine how long a probe will last in a specific test environment. The best method to determine probe life is to monitor probes in the test environment and to develop a maintenance program for your specific application.

Q: Can my termination wire be soldered to the wire wrap post (tail) on the socket?

A: Yes, the tail is a gold and nickel plated phosphor bronze part and is easily soldered to. When feeding solder onto the tail care must be taken not to flow additional solder into the socket/tail junction. This junction is also a soldered connection and flowing additional solder into this joint will cause solder to wick into the bottom of the socket either causing a probe to be soldered into the tube or prevent a probe from being able to be fully installed in the socket.

Q: Can the probe tube be soldered directly to the termination?

A: Yes, although not recommended, the probe tube can be directly soldered to the termination. Probe tubes are typically made from nickel silver and this material is easily soldered to. Precautions must be taken 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 compressing fully (not obtaining full plunger travel). This application is common when installing probes directly into PCB's or similar.

Q: If the socket tube is heated to the point where the solder in the joint flows, will the tailpin (round or square) move?

A: No, the pin is press-fit into the tube, so even without solder holding the pin, it takes a minimum of 10 pounds (of axial force) to move the square pin and about 1 pound to move the round pin. After the socket cools, the solder will solidify and the integrity of the joint will remain unchanged.

Q: What is the difference between the 050-PRP25 and 050-PTP25 Series?

A: The main difference between the 050-PRP25 and 050-PTP25 Series is that the 050-PRP25 Series has a longer overall length 1.700 [43.18] versus 1.362 [34.59] for the 050-PTP25 Series. The increased length allows a longer spring to be installed in the probe tube. As a result, the maximum spring force for the 050-PRP25 Series is 10.1 oz [286 gms] versus 8.0 oz [227 gms] for the 050-PTP25 Series.

Q: What material is recommended for mounting the sockets 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.

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. 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. Finally, the voltage must not be present while the probes are actuating against the DUT as arcing will occur.

Q: B option (curved probe tube — Pylon replacement), when and where is this used?

A: The –B option for QA test probes is designed for use with the old style Pylon brand sockets that do not incorporate a probe retention indent in the socket body. Because the Pylon socket was basically made up of a straight tube, the –B (bend) in the probe is the retention method to hold the probe in the socket. As a general rule, we do not recommend that the –B option be used with QA sockets as our sockets incorporate probe retention indents in the socket tube. 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 permanent repair to 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 PCB's, 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 Unit Under Test, the following are recommended:

- The probes must be contacting the terminals on the UUT and compressed before the test is run.
- The probes must not be retracted 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 causing high resistance at this junction. In-turn, the higher resistance will cause localized heating and possible arcing at the tip.
- Sufficient distance and or insulation between the conductors must be maintained 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 High to Extra High spring forces.

X PROBE® SOCKETLESS SERIES — PRODUCT FAQS

Q: What is the difference between an X Probe and a standard probe?

A: The main difference between, for example, an X75-PRP2509S and a 100-PRP2509S is that the probe tube on the X75 Series is 1.110" [28.19] long versus 1.000" [25.4] long for the 100-PRP probe. The added length of the X75 Series is required to form the interconnect housing on the bottom of the probe tube. All other aspects of the probe are the same. The X Probes when used with standard sockets will sit up approximately .085 [2.16] higher than a standard series probe in the same socket. This can be useful in special applications where it's desirable to have the probe sit up higher in a standard socket.

Q: What is the main advantage of using QA's X Probe over conventional probe and sockets?

A: The X Probe allows larger more robust probes to be mounted on closer centers.

Conventional Probe Center Spacing	Can now be Mounted on X Probe Center Spacing	With X Probe Series
.100 [2.54]	.075 [.191]	X75 Series
.075 [.191]	.050 [1.27]	X50 Series
.050 [1.27]	.039 [1.00]	X39 Series
.039 [1.00]	.031 [.800]	X31 Series

Q: Will pointing accuracy be affected when comparing standard probes and sockets to the X Probe Series?

A: Pointing accuracy is defined as the maximum radial deviation of a probe tip from the true centerline of a probe's mounting hole. The total probe-to-target accuracy is dependent upon the "Fixture Offset", the "Scatter Pattern Offset", and the "Scatter Pattern Diameter". When compared to standard probes and sockets, the X Probe's pointing accuracy is increased because the "Scatter Pattern Offset" is reduced through the elimination of the socket.

Q: What is the termination pin made of and how long will it last?

A: The termination pin is a hardened (38 HRC minimum) BeCu with a plating of hard gold over electroless nickel. The termination pin must not only provide a good electrical path from the probe to the wire termination but also be able to withstand forces during installation, wire wrapping, and many probe insertions and extractions. The termination pin is designed to perform for the life of the fixture under typical test conditions.

Q: How many times can the same X Probe be reinstalled on a termination pin?

A: An X Probe can be reinstalled on a termination pin approximately 5 times. After this, the probe retention is reduced to the point where the probe is loose on the interconnect pin. The probe retention indents on the probe are the mechanical features that hold the probe to the terminations pin. The X Probe is designed to be the "wear point" in the system, by replacing the probe, you've restored the retention force.

Q: How many times can a new X Probe be installed on a termination pin?

A: 100 separate new X Probes were subsequently installed and then removed from a single termination pin. The retention force of the probe(s) to termination pin was consistent and the interconnect pin showed only light plating wear (viewed at 20X). The termination pin is designed to last the life of the fixture under normal operating conditions. If damaged, however, the pin can be be replaced.

Q: How do we wire wrap on the X50 Probe Series and can more than one wire be wrapped to the post?

A: The X50 termination pin is designed around a .500 [12.7] long .016 [0.41] square post. The length of the post allows up to four 30 AWG wires to be wrapped to it. Due to its size, a regular style wrap and the installation of shrink tubing on every other post is recommended.

Q: When installing the terminations into AT7000, G10/FR4 we notice that little shavings of metal form around the base of the termination, what causes this?

A: The hole diameter in the Back Plate is too small and the retention bead(s) is being sheared off during installation. These shavings will create shorts between adjacent terminations. The shavings will "float" and be moved by the vacuum so that the shorts may occur at random making troubleshooting difficult. To prevent the shavings, make sure that the hole diameter is within the recommended hole sizes for the termination pin being installed. Please do not assume that drilling AT7000, G10/FR4 or equal with a .038 [.965] carbide circuit board drill will result in a .038 [.965] diameter hole. Quite often, the drills diameter starts .0003 [.0076] undersized and the end hole diameter can be as much as .001 [.0254] undersized. Spot-check hole diameters with the proper Pin Gauge (PG) while drilling to ensure that the hole diameter stays within tolerance.

X PROBE® SOCKETLESS SERIES

FIXTURING FAQS

Q: Can the X Probe be used on existing test platforms?

A: Yes, the X Probe is compatible with 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.

Q: Can the X Probe be used with pneumatic, mechanical or 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 are to be mounted and design inserts with gaskets to accommodate them.

Q: Can X Probes be used on closer centers than what is listed?

A: Yes, the following chart details the minimum recommended distance (center-to-center spacing) between our X Probe Series. This information should be used as a guideline and is dependent on the user's drilling/fixturing capabilities, as well as the tool clearances.

X Probe Series				
Centers	X31	X39	X50	X75
X31	.030 [.76]	.035 [.89]	.040 [1.02]	.046 [1.17]
X39	.035 [.89]	.038 [.97]	.043 [1.09]	.052 [1.32]
X50	.040 [1.02]	.043 [1.09]	.048 [1.22]	.057 [1.45
X75	.046 [1.17]	.052 [1.32]	.057 [1.45]	.068 [1.73]

These dimensions are based on the stop diameter of the X Probe Installation Tool.

Q: What type of plate materials can we use for the fixture?

A: Standard epoxy fiberglass laminates such as AT7000, G10/FR4 and similar materials are recommended.

Q: Is the Spacer Plate shown on the "Fixture Layout Examples" drawings necessary?

No, the Spacer Plate is an intermediate support plate that when fixed to the Back Plate adds additional strength. On small to medium sized fixtures this can be replaced with fixture standoffs or flanges. Note that the Spacer Plate does help with the alignment of the probe to the termination pin during probe installation.

Q: Should the Spacer Plate be drilled larger than the recommended minimum hole size?

A: In large fixtures where the alignment of holes between the three plates is difficult to maintain, it is recommended that the holes in the Spacer Plate be enlarged to accommodate any misalignment, as the size of these holes is not crucial to the X Probe assembly. The holes in the Spacer Plate act as a guide for the X Probe interconnect receptacle onto the interconnect pin. If a relieved hole is desired on the Spacer Plate it is recommended that the oversized hole be on the top surface versus the bottom as this additionally guides the probe.

Q: Can the Probe Plate holes be relieved on the bottom side to help maintain hole accuracy when drilling?

A: Yes, the purpose of the .375 [9.525] thick Probe Plate that is shown on our Fixture Layout Examples is to support the probe and guide it to the intended target. The backside or bottom of this plate can be drilled oversized to reduce the top-hole depth.

Q: How is the distance from the Probe Plate to the tip of the probe adjusted for the various heights of components on my PCB?

A: The height of the probe is controlled by the set height of the termination pin. Note that the set height of conventional fixtures is calculated from the Probe Plate where as the set height of an X Probe fixture is from the Back Plate.

Q: How are additional 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 of the probes and plates. The new hole locations must be accurately registered from the original reference points so that the probe and termination pin will align during assembly.

Q: How are the termination pins replaced?

A: If a termination pin breaks during fixture assembly, the termination pin can be driven out with our ETR extraction tools. If there is enough room around the top of the termination pin, pliers or similar tools can be used to pull the termination pin out from the top. In order to replace a termination pin in a completely assembled fixture our ETR-EXT tools must be used. These tools are designed to remove and replace a termination pin with the Probe and Spacer Plates in place.

Q: What is the difference in average resistance values between the X Probe and Conventional Probes for both the .250 and .400 stroke series?

A:

Average Resistance Values of X Probe Versus Conventional Probes	
.250 Stroke	
X PROBE	Conventional
X31-PRP25 = <90mΩ	039-PTP25 = <65mΩ
X39-PRP25 = <50mΩ	050-PTP25 = <30mΩ
X50-PRP25 = <35mΩ	075-PRP25 = <20mΩ
X75-PRP25 = <25mΩ	100-PRP25 = <15mΩ
.400 Stroke	
X PROBE	Conventional
X39-PRP40 = <55mΩ	050-PTP40 = <35mΩ
X50-PRP40 = <35mΩ	075-PRP40 = <20mΩ
X75-PRP40 = <20mΩ	100-PRP40 = <20mΩ

Q: How much weight will be added to a fixture designed around the X Probe?

A: Approximately 20 lbs for an average sized fixture. An X Probe fixture requires a Top Plate (Support Plate), Probe Plate, Optional Spacer Plate, and Back Plate while the conventional fixture has a Top Plate and Probe Plate (Socket Mounting Plate).

Q: When comparing the prices of two identical test fixtures, one built with standard probes and the other with 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 75 mil, 50 mil, and 39 mil center probes than 100 mil center probes.

The following is for use as a guideline to determine if X Probe Technology should be considered for your fixture.

When comparing the costs of conventional probes to X Probes of like centers (i.e. the 075 to the X75), you will find using X Probes to be more cost advantageous.

- If a fixture is predominately 100 mil centers, the cost using X Probe Socketless Technology would be greater than a conventional 100 mil center probe fixture.
- If a fixture is predominately 75 mil centers, the cost using X Probe Socketless Technology could be equal to or less than a 75 mil center conventional probe fixture.
- If a fixture is predominately 50 mil centers, the cost using X Probe Socketless Technology could be equal to or less than a conventional 50 mil center probe fixture.
- If a fixture is predominately 39 mil centers, the cost using X Probe Socketless Technology should be less than a conventional 39 mil center probe fixture.

But QA does not build fixtures, only a fixture house can determine actual fixture costs/pricing.

Founded in 1981, QA Technology Company, Inc. is the leader in high-reliability, long-life test probes and sockets.

Our industry and company milestones include:

1984
- Introduction of the industry's first Computer Controlled Life Cycle Tester

1985
- Introduction of the .050 inch centers, .160 inch stroke (050-16 series) test probes, sockets and wire plugs

1986
- Open House at our new manufacturing facility at 4 Merrill Industrial Drive in Hampton, New Hampshire
- U.S. patent #4,597,622 is granted for WP30 and WP28 wire plug and plug housing
- Probe marking system is introduced for visual designation of spring force and tube materials/finishes

1987
- U.S. Patent #4,659,987 is granted for 050-16 Series test probes and connectors

1988
- Introduction of the more accurate double press ring socket design for the 050-16 Series

1989
- The rolled tube design 100-25, 100-40 and 075-25 Series test probes are introduced
- U.S. Patent #4,885,533 is granted for the rolled tube designs

1993
- Building expanded an additional 20,000 square feet, bringing QA's headquarters to a total of 35,000 square feet
- Introduction of the industry's first triple press ring socket for the 050-25 Series
- Introduction of an automatic socket assembly machine creating leaktight receptacles, hermetically soldering the wire wrap pin into the socket

1996
- U.S. Patent #5,524,466 is granted for the triple press ring socket

1998
- Awarded ISO9001 Certification
- Introduction of the .039 inch centers, .160 inch stroke (039-16 Series) test probes, sockets and wire jacks

1999
- Broke ground on new 70,000 square foot headquarters

2000
- Introduction of our .125 inch centers, .250 inch stroke (125-25 Series) test probes and sockets

2001
- Introduction of our X75 and X50, X Probe® Socketless Series probes and termination pins
- Move into new facility located at 110 Towle Farm Road, Hampton, New Hampshire

2002
- Introduction of our X39-25 X Probe® Socketless Series probes and termination pins

2003
- Introduction of our Micro IC Probe Series for BGA and integrated circuit testing
- U.S. Patent #6,570,399 is granted for X Probe® Socketless Technology

2004
- Introduction of lead-free (Pb-free) sockets

2005
- U.S. Patent #6,876,530 is granted for X Probe® Socketless Technology jack termination

2007
- Introduction of integraMate® .6mm hyperboloid contacts (ICO6 Series) and circular connectors (DO2 Series)

2008
- Introduction of integraMate® 1.5mm hyperboloid contacts (ICOA5 Series)

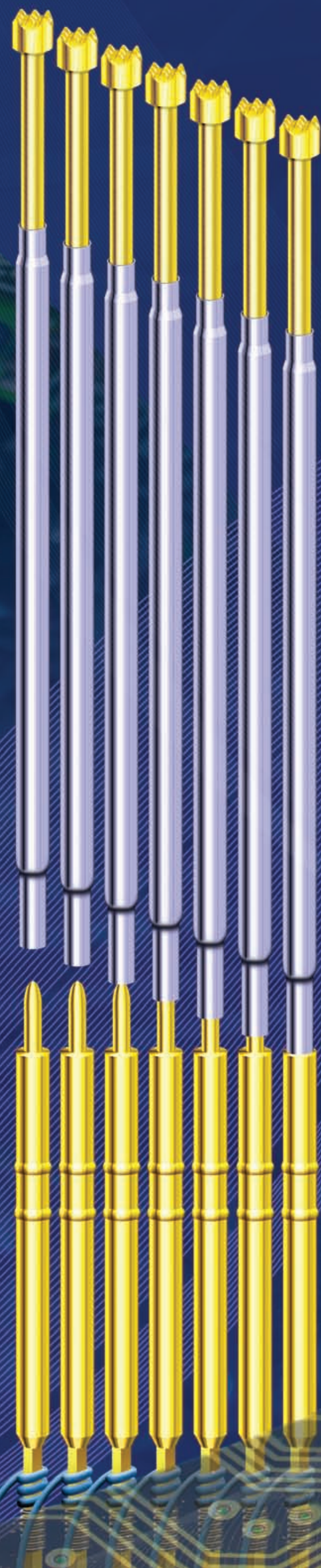
2008
- Introduction of new Steel Razor Tip Style, solving today's test challenges

2009
- Introduction of .050 inch center, .400 stroke (050-T40 & X39-40 Series) test probes

2011
- Introduction of X31-25 X Probe Socketless Series probes & termination pins
- Introduction of new wire grip termination for 50 mil sockets and X Probe terminations.

2012
- Introduction of conventional 039 mil double-ended socket for wireless testing.

QA® Technology Company, Inc.



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