### Tecon Spring Contact Probes



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### Our company

Tecon was founded in 2008 by Mr. Giacomo Pastres, after gaining a conspicuous experience, being in this field since 1986. The Market was changing and Technology evolved.

Since the beginning, the company developed its business thanks to its international approach, technological innovation and quality commitment toward customers.

Our customer's projects became more complexed and a personalized consultation service was necessary, to respond at the increasingly demanding need of customization. Mr Pastres, passed on his values to all of his Team, inspiring innovation and commitment in offering our customers the best service, excellent quality products and cost-effective solutions.

Our state-of-the-art equipment, the constant investments in research and development (R&D) and the human component, present in every step of the manufacturing process, allow us to have complete control in the production of new items. Therefore, we are able to intervene in real time on each production cycle and on the manufacturing method, in order to obtain a finished product that respects all the specifications of the project, even during prototyping stage.

Our corporate structure and In-House Expertise allow us to meet various requests for small parts (our lathes have a max 16mm bar passage limit). We have aligned our production standards to the specific needs of our customers, creating custom made micromechanical parts in both large and small-scale productions. Furthermore, we can customize products to meet your requirements and offer our assistance and Know-How to engineer the best product to meet your needs.

Our offer ranges from spring contact probes for In-Circuit (ICT) test benches, to dedicated items for special applications, such as Ball Grid Array testing (BGA), High Frequency (HF) device testing, Bare Board Test (BBT) for every universal Printed Circuit Board (PCB).

We are now one of the leading manufacturer and supplier of spring contact probes and custom Micro-Mechanical parts for the Industrial and Consumer Electronics, Automotive, Aerospace, Communications, Beauty and Medical Technology industries etc.

We enjoy and value a high level of trust and esteem from partners globally around the world.

### Who we are



Giacomo Pastres Founder and CEO



Anna Pastres Chief Technical Office



Sebastiano Guardini Chief Production Manager

### Quality and flexibility at Tecon

Our Company manufactures all products In-House, from raw material to the finished product.

This allows us to have complete control of every single piece we make and the absolute certainty of its perfection. We are one of the leading manufacturer and supplier of Spring Contact Probes.

Below you will find a quick overview of all the production process, consulting service and the technology.

We can provide a wide range of spring contact probes, our core business, or dedicated items for special applications and Micro-Mechanical parts. Furthermore, we can customize products to meet your requirements and offer our assistance and know-how to engineer the best product to meet your needs.

### Technical office



Planning is the passion of our technicians and each project has to be evaluated, improved and optimized according to each individual need. Communication with our customers is essential at this stage.

Our expertise and in-depth knowledge allow us to overcome all the issues that can arise during the study, development, production and testing of a standard or non-standard Spring Contact Probe or Micro Mechanical part.

We are producers and we can offer our assistance and Know-How to engineer the best product.

### Assistance and consulting

Since 2008 the company developed its business thanks to an international approach, technological innovation and quality commitment leading the customer into choosing the right product, because in all these decades of experience, we have developed skills and abilities to quickly recognize the functional and technical needs of each request.

The curiosity, passion and excellent results that we collect daily are the motivations that drive us to work with dedication and innovative spirit.



#### Turnery



Our Turning Department is a perfect machine for the production of Spring Contact Probes since we have traditional cam-type lathes, state-of-the-art CNC lathes, Machining Centers and above all, the expertise and experience of our staff.

Every single project that leaves the Technical Office has been studied in depth to identify the tolerances or the best couplings between the components. Only then, the raw material begins to take shape quickly and safely in our lathes.

The quality of our semi-finished products is confirmed by regular quality checks performed after each production step. We refined our high-precision processing technology over many decades.

We can offer cost-effective solutions to realize small scale productions of Spring Contact Probes or micro-mechanical components, ideal for prototyping.

#### Surface treatment

The following step, for all the semi-finished items that are manufactured in our Turnery, is the Polishing Department. Here, all components are treated with vibration tumblers and ultrasonic cleaning devices, in order to make the surface perfectly polished and to ensure the absence of production remnants.

This process helps the perfect assembly and proper functioning of our components. At this stage our attention is focused on the execution of the best possible surface treatment.

The aim is to improve wear and corrosion resistance, to create a smooth surface for aesthetic or functional purposes and to prepare the surface for the next process: Plating Treatment.

In addition, the perfect polishing and surface treatment optimizes the operational functioning of Spring Contact Probes or micro-mechanical parts.



#### Micro-Milling



In our Micro-Milling department there are special High-Precision machines that allows to perform micromilling on semi-finished products, in order to create the geometry of the head style of the plunger or a Micro-Mechanical part.

As an internal company choice, thanks to the experience and Know-How gained over the decades, we carry out the "refining" process, as a working phase itself, in order to have the certainty that every single piece meets the Design specifications.

In this Department our highly qualified personnel, checks the measurements and tolerances, verifies the precision of the milling angles and ensure that the item respects all the project's requirements.

#### Heat treatments

The materials available for the production of our components are represented by special alloys such as Copper-Beryllium and Tempered Steel, which require specific heat treatments to achieve the characteristics needed by the testing machines.

The dedicated Department in our facility has various types of furnaces capable of reaching high temperatures, which combined with the right time, ensure that the material acquires the technical characteristics of hardness and endurance required.

Our commitment is to give the customer a quality product, which responds to the increasingly demanding testing requirements and with a longer life expectancy even in very hostile working conditions.



#### Plating



It's one of the most important and delicate step of the production of Spring Contact Probes and Micro-Mechanical parts.

By means of specific chemical and electrolytic processes, we can perform chemical nickel, gold, gold plus and silver plating to the individual component.

Regardless of the purpose to which they will be set, these components demand both durability and conductivity. The plating treatment can modify the surface properties of the component by improving conductivity, endurance to wear in tough working conditions.

Here, experience is combined with experimentation, creating a fundamental bond to determine a wellbalanced coating and precise thicknesses required by the project.

Our Technicians perform quality tests according to industry standards, internal standards and the customer specifications, using state of the art equipment, to monitor and measure the coating thicknesses, the adhesion strength, the porosity and other parameters with accuracy.

### Assembly

The Assembly of our Spring Contact Probes is done almost entirely by machine. Our experienced and highly specialized personnel, is able to easily recognize the level of perfection of the item and to intervene in the possible customization of Spring Contact Probes that require "closures" or "strokes" different from the standards.

Each of our Spring Contact Probes is checked and assembled to respect all specifications.



#### Quality control



Every action before this stage is monitored by the everpresent human component. Nevertheless, our highly qualified personnel and experienced technicians benefit from state-of-the-art measuring equipment and testing device in our laboratories, being able to carry out several kinds of checks and tests on the items we produce to make sure they comply to the industry standards.

We measure the hardness, check the finish, the precision, the tolerances and the durability of all components that leave our Factories.

We are convinced that the human factor, present in every production phase, is crucial for preventing and solving any inconvenience in real time.

The loyalty and esteem of our customers can testify it

and encourages us to commit ourselves, day after day and to pass on this vision to future generations.

# What Spring Contact Probes are and what they are for

The name Spring Contact Probe comes from the device that connects the DUT (Device Under Test) with the electronics of the test machine, also called Contact Probes, Test Probes, Spring Probes or Pogo Pins.

They are used in two different ways:

### Spring Contact Probes for In-Circuit test (ICT)

Spring Contact Probes are essential precision components that connect the DUT and the testing machine, in order to collect data during the In-Circuit Test (ICT).

At this stage the main object is to test a Printed Circuit Board (PCB) by checking the different parameters of the components of the electrical circuit, such as the resistance/impedance, the presence of defective components and whether or not there are short circuits.

### Spring Contact Probes for Functional Test (FCT)

Spring Contact Probes are also used to perform Functional-Circuit Tests (FCT), during which real working conditions/environment is replicated and the entire intended function is tested. At this stage, one of the parameters that can be checked is the functionality of the power supply line of the DUT itself.

For the success of the testing process, there are different types of Spring Contact Probes, which vary in total length, installation method, grid size, head style, spring load and type of connection.

#### Our Series:

- ICT/FCT Standard Probes
- High Current Probes
- Short Travel, Battery and Solderable Probes
- Screw-in Probes
- Switch Probes
- Interface Contacts
- Double Plunger Probes
- Rigid Pins
- Flying Probes
- Insertion / Extraction Tool

### Fields of application



The sectors in which Spring Contact Probes are used are many and completely different from each other. Their peculiarity is the customization of each component, based on the role it will play during the testing process. They are mainly used in three ways:

- interconnection between DUT and electronics of the testing machine
- interfaces
- easily replaceable electrical connections

By customizing materials, dimensions, electrical and mechanical characteristics, we can produce Spring Contact Probes for multiple areas of application, where high quality standards of electrical devices are required. We make Spring Contact Probes for a variety of sectors such as: Industrial and Consumer Electronics, Automotive, Aerospace, Communications, Lighting Industry, Beauty & Medical Technology and more.

The possibility of customizing Spring Contact Probes, with their own characteristics and distinct geometries, depends on the skills of our Technicians and R&D. They improved our existing products and are constantly bringing new innovations to exceed the challenging demands of our customers and meet the needs of adaptability and performance specifically for each request.

### **Technical characteristics**



The functioning of a Spring Contact Probe depends on the quality and processing of the three main parts that makes it up: barrel, spring and plunger.

Its design, on the other hand, varies according to each individual need and for each specific electrical circuit.

### The Barrel

The barrel is used to house the spring and the plunger travels through it. It's the most solid element.

It extends in length and, depending on its function, has various diameters.

It can be made in brass, bronze or nickel silver.

Each Spring Contact Probe can have a different size and diameter of the barrel, according to our customer's needs, but it must have the right size for the perfect coupling with the receptacle. This is essential to be able to replace the Test Probe quickly and easily at the end of its working cycle.

#### The Spring

The spring of a Spring Contact Probe plays a key role in ensuring optimal contact and the right amount of force to be applied on the contacting point of the PCB (Printed Circuit Board).

For this reason, we pay close attention to three aspects:

- The quality of the Spring material, which guarantees a high number of working cycles
- The Heat Treatment, which significantly optimizes the duration and performance of these components
- The Plating in Gold or Silver, which improves conductivity, reduces electrical resistance and prevents from oxidation

Our springs can be made with three different materials:

- Bronze: An alloy with low resistance, but develops a reduced load
- Music wire (Harmonic Steel): A very hard steel and excellent for the construction of springs due to its elastic properties and strength
- Stainless steel: Very hard material and generally used for High Current Probes or if the spring will work in corrosive environments

The load, specified when choosing the Contact Probe, will correspond to the operating stroke of the plunger and will increase as the travel of the plunger increases.

Normally, our Spring Contact Probes are produced making sure that the spring, in resting conditions, is slightly compressed, thus providing a so-called pre-load and ensuring that the plunger is exactly at travel point "0":

- A harder spring will help penetration through the soldering remnants on the PCB, but it may leave head marks on the surface or even cause the PCB to flex. It is commonly used when the current values to be measured are high.
- A lighter spring force avoids the risk of leaving marks or bending the PCB.

The spring force has a tolerance of  $\pm$  20%, but it is possible to reduce this value upon request.

### The Plunger

The plunger consists of a "body" and a tip or head. The latter, depending on the chosen shape or style, can adapt to any type of surface that the customer needs to test.

We are able to provide excellent technical advice to help choosing and engineering the most suitable head or tip style according to the device to be tested.

The plungers can be made of:

- BeCu (Beryllium-Copper Alloy): It's the most used alloy for plungers. After an adequate heat treatment, this alloy guarantees hardness and precision, as well as excellent conductivity
- Tempered Steel: According to the requirements of the project or for specific working environments, we also use tempered steel, which provides extreme hardness and endurance, especially if working with High Currents or tough working conditions
- We can also make plungers in brass, bronze, stainless steel and different types of plastics

All the milling process of head or tip is carried out in a dedicated department. In our Micro-Milling department there are state-ofthe-art Hi-Precision machines that allow to perform micro-milling on semi-finished products, in order to create the geometry of the head style of the plunger with the maximum accuracy.

In the galvanic laboratory we apply Gold, Silver and Nickel plating to ensure the lowest electrical resistance and excellent conductivity, as well as to prevent oxidation of the plungers.

### The coupling play

The good functioning of a Spring Contact Probe also depends on the functional tolerance of the barrel and the plunger. This condition leads to a "coupling play or wobble" between the barrel and the plunger that will contact the PCB. The main factors influencing this coupling, are the design tolerance and the length of the plunger.

Being a producer of Spring Contact Probes for many decades, gives us the confidence to exactly define the right tolerances between plungers and barrels. This allows our highly qualified staff to assemble the Probe in the best possible way, in order to drastically reduce the play between the two elements.

#### Current path

One of the aspects Tecon pays most attention to, is the study of current flow in Contact Probes.

With standard probes, the current path flows mainly from the plunger, then through the barrel and receptacle. A small part is flowing also through the spring, which acts as a resistance, causing stress and overheating. This value increases as the duration of the test is longer.

With more than 30 years of experience in test probes manufacturing, Tecon has developed in-depth knowledge and innovative technologies to guarantee a more precise and long-lasting test probe:

- series GLP503 with "continuous plunger".

This special probe guarantees the current flow through the plunger, which is directly soldered to the wiring.

### Life expectancy



We promise our customers two things:

To always find a solution to the challenges associated with using of Spring Contact Probes and to commit ourselves every day, to increase the life expectancy of our products.

Our efforts focus on the duration of Spring Contact Probes, since the quality of Your work depends on this feature. The life expectancy of the Spring Contact Probe is determined by the way in which it is built and the conditions in which it will work (high current, lateral forces, PCB automations).

What we do is:

- intervene on the production stage, by studying and developing every day procedures, to increase the working cycles of our products and performing quality check at every stage
- carefully monitor the Turning and Finishing steps of semi-finished components
- ensure increasingly accurate Heat and Galvanic Plating treatments
- have the assembly carried out by highly specialized personnel
- carry out tests on our Spring Contact Probes, measuring the variations in the spring force and the resistance of the Probe after thousands of strokes

Our production system, now tested over many decades of experience, guarantees high-performance products even in very hostile working conditions and for a longer testing cycle.

### Head shape (or tip) and pitch (or grid)



### Tip (head shape)

Choosing the right Contact Probe's head makes the difference between achieving a normal contact or an excellent electrical contact.

In order to get the best results, our Technical Office is available to help you choosing the right Tip/Head style (and accordingly an appropriate spring force) depending on the shape, size or conditions of the point to be tested.

There are several types of Head Style to choose from, according to the working conditions, for example:

- We recommend using an aggressive Head style (such as n°02, n°21 or n°12) if the surface to test is contaminated with residues from the soldering process or oxidations
- If the tested surface is rather delicate and there is a risk of leaving marks, the choice of a Head style with a less aggressive profile is recommended. We suggest n°03, n°01 or n°04
- To test Vias our Head styles n°13, n°11 or n°05 are the ideal solution

### Pitch (grid)

In order to choose the right Head for the Spring Contact Probe we need to consider the Pitch, which is the distance between the probes in the testing grid.

The most common pitches are at 2.54mm, 1.91mm and 1.27mm. We also have to consider the Head diameter in relation to the distance of the holes on the grid.

We are able to make Spring Contact Probes with a head diameter up to 0,2 mm.

## Tip style

01		Tip style 01 - Concave Long leads, terminal and Wire Wrap pads	
02		Tip style 02 - Conic head 30° Cuts oxidations and contaminations	
03		Tip style 03 - Flat head Gold edge fingers, leaves no marks	
04		Tip style 04 - Dome head Gold edge fingers, plated through-holes, leaves no marks	
05		Tip style 05 - Conical Plated through-holes	
06		Tip style 06 - Conic rounded head Circuitry and testpads, leaves no marks	<b>1</b>
07		Tip style 07 - SMD serrated 9 points Small pads and lands, no bridge risks (0,6 mm)	
08		Tip style 08 - 9 points serrated Universal tip-style for lands, pads, leads, terminals	
09		Tip style 09 - HSS spear For contaminated and unwashed PC boards	
10		Tip style 10 - 16 points serrated Universal tip-style for lands, pads, leads, terminals	
11		Tip style 11 - 3 sided pyramid Plated through holes, cuts through contamination	
13		Tip style 13 - 6 fluted star Plated through holes, pads, lands	
14	$\bigcirc$	Tip style 14 - Dagger HSS Very aggressive, general purpose tempered steel nikel/gold plated	
15		Tip style 15 - Pyramid Very aggressive, general purpose tempered steel nikel/gold plated	
17		Tip style 17 - 4 sided chisel Plated through holes, cuts through contaminations	

19		Tip style 19 - Concave Pins and wire wrap posts	
20		Tip style 20 - Kaleidoscope Wire Wrap and pads	
21		Tip style 21 - 4 points crown testpads, lead solder points	
22		Tip style 22 - 8 points crown Applications similar to Tip 21	
24		Tip style 24 - 4 points tapered crown For pads, lands and holes	
25		Tip style 25 - Tulip For almost all applications	
26		Tip style 26 - 5 points crown Application similar to Tip 25	
27		Tip style 27 - SMD 4 points Self cleaning, small lands and pads (0,6 mm)	
28	5	Tip style 28 - HSS spear For contaminated and unwashed PC boards	
30		Tip style 30 - 3 points crown Suitable for SMD testing due to its small head diameter	
33		Tip style 33 - Concave Wire Wrap pads	
35		Tip style 35 - Spear Aggressive tip, for contacting solder pads and holes	
39		Tip style 39 - For Screw-in probes For connector test and component presence	
50		Tip style 50 - Spade Spade flat surface, used for connectors elements	
88		Tip style 88 - Insulating cap Standard serrated tip with outer delrin sleeve, designed for component presence check.	

### The working travel



Each Spring Contact Probe has a defined working travel.

### **Resting travel**

In this case the total length is defined and the spring has a given pre-load. The tip head is not subject to any pressure.



#### Total travel

It's the distance between the plunger's head and one end of the barrel. The spring is subject to a great stress. Damages may occur.



#### **Recommend travel**

The recommended travel (or working travel) is 2/3 of the total travel length and it should not be exceeded. The nominal spring force is reached at the recommended travel.

### Current rating capacity



When we refer to Industrial Electricity in everyday life, we often think of very high current intensities. Although our work is closely related to Industrial work, "high current" does not have the same meaning for everyone and therefore, it "depends on the point of view".

In fact, in electrical testing, we usually talk about of currents that do not exceed 2-3 A. In addition, the current load tolerated by a Spring Contact Probe is always measured during an electrical test, which normally lasts a few seconds at the most.

Our product range has a current rating capacity of 2-3A. Our HCP series, has a current rating capacity ranging from 5A to 100A.

This high current capacity is possible thanks to the manufacturing characteristics of the Probe, such as the Silver-Plated spring and barrel, which allow for a great reduction in resistance and guarantee excellent performance both in the ICT (In-Circuit Test) and FCT (Functional Circuit Test).

If the customer needs to perform functional tests for an extended time, our Technical Office is able to provide support and advice in selecting the most suitable product.

### **Electrical resistance**



The electrical resistance of a Spring Contact Probe is determined by five factors:

- The material used to make the spring
- The type of galvanic plating of each component of the spring probe
- The tip style
- The spring load
- The quality of contact (± accurate) that is applied

The combined choice of all these elements will always have different and variable results

In fact, depending on the field of application, the type of fixture on which they will be installed, the tests to be performed and the parameters that has to be monitored, each project/customer will have different specifications.

Thanks to our Know-How, our workforce and the specialization of our departments (technical design and production), we are able to address every request and guarantee the best performance of our products.

### **Raw materials**



The choice of the base materials for the production of Spring Contact Probes depends on several factors:

- field of application and working environment
- type of material to test
- processing of each single element (plunger, barrel, spring)

Below you will find an overview of the raw materials and their properties. Our Technical Office is available to discuss your needs and suggest the optimal combination for better results.

### Be-Cu (Beryllium - Copper)

Beryllium-Copper alloy is widely used for the production of Probe's plungers. This alloy combines hardness, strength and high conductivity. It is also quite ductile, therefore easy to work and has non-magnetic properties. It can be tempered to increase strength and conductivity. Suitable for multiple applications.

#### Brass



Brass metal alloy is used to produce barrels and receptacles. It has a high electrical conductivity, good wear resistance and it is very malleable.

It can be treated with galvanic Plating to change or improve its properties.

#### Steel



Steel alloy is used to build plungers with a very aggressive head shape, as its extreme hardness and wear resistance, guarantees a considerably long life-expectancy, compared to other materials.

### Nickel silver



Nickel Silver alloy is used to build barrels and receptacles. It is a good conductor, resistant to corrosion and is very easy to work, with a shaping technique called "Deep Drawn".

#### Bronze

Bronze alloy has many interesting properties such as an excellent electrical conductivity, good wear resistance and it is very ductile. It is widely used in the production of Probe's barrels.

### The galvanic plating



All of our Semi-Finished components undergo galvanic plating treatment to protect them from corrosion or oxidation and to improve their electrical conductivity, which is probably the most important parameter for test probes.

In our Galvanic Department, we can perform Chemical Nickel Plating, Gold and Silver baths.



#### Chemical nickel

It consists on the deposition of a nickel-phosphorous alloy using an auto-catalytic bath.

This treatment guarantees a uniform coating especially on complex geometries (for example plungers with an aggressive Head Style) and it has high corrosion resistance.



#### Silver

It is mainly used on springs and barrels for High Current Probes, to significantly improve the electrical conductivity.



#### Gold

Ensures excellent electrical performances and prevents oxidation or corrosion of treated components.



### Gold + (Gold plus)

This special treatment guarantees a thicker and more durable gold plating and it is particularly recommended for applications where testing conditions are very demanding.

### The receptacle



When using test equipment machines, the receptacle is an important component, not only because it supports the Spring Contact Probe, but also because it allows for their quick and correct replacement.

According to functional needs, the Spring Contact Probe can be inserted or screwed into the receptacle simply using an insertion or extraction tool, that we design specifically for each type of receptacle.

How are the receptacles made?

- With collar: Receptacles with a collar can be inserted into the fixture with a set value and guarantee a precise installation height.
- With swelling: The swelling during the insertion of a receptacle is used as an "end-of-travel" or to create interference in the housing hole. In the event that the swelling is used as an "end-of-travel", it acts as stop when inserting the receptacle in the fixture plate. If, on the other hand, the swelling is used to create interference, it will be possible to insert the receptacle at different heights in the fixture.
- Retaining Mark (or IMPRINT): It represents an extra security to prevent the Spring Probe from coming out of the receptacle. Being "notches" that are made on the receptacle and that allow to create a rubbing surface between barrel and receptacle, they guarantee the perfect union between them.
- Screw-in: For specific applications, especially in the Automotive Industry and whenever we have extremely challenging testing conditions, lateral forces or vibrations, threaded Receptacles and Spring Probes guarantee the perfect seal.

### Type of connection

There are different methods to connect the receptacle to the electronics of the test machine by wires:







#### Solder

Crimp

It consists in soldering the wire of the test machine on the dedicated seat of the receptacle, ensuring excellent electrical contact and easier replacement of the receptacle. It is often used for low-density Test Fixtures. It consists in crimping the wire of the test machine inside the dedicated hole on the receptacle. It is used for high-density test fixtures or when the available space doesn't allow for Wire Wrapping. It consists in wrapping up the wire of the test machine around the square-end of the receptacle.

Wire-Wrap



#### **Round Post**

This system consists in inserting the round-end of the receptacle directly into a dedicated housing hole on the test fixture.

#### How are receptacles mounted?

Before proceeding with the assembly, it is very important to make sure that the housing-holes on the fixture are accurately drilled, in order to guarantee that the receptacles are correctly positioned.

For each receptacle, we specify the correct diameter of the drill bit, although the material, the type of drill bit and the rotation speed may influence the shape of the hole.

Finally, for each article, we make specific insertion and extraction tools, designed for safety and accurately inserting and extracting receptacles from the test fixture.

### **Micro-mechanics**



Spring Contact Probes is our core business, but we also specialize in the production of custom Micro-Mechanical components and tools for the Automotive, Aerospace, Communications, Beauty and Medical Technology industries etc.

We are involved in all production stages, from the design to the development of the component and we can provide our customers with tailored solutions.

Our Technical Office will assist during the initial stage of the project and will prepare a scalable and cost-effective manufacturing process.

Working mainly with Computer Numerical Control Lathes (CNC), we offer a wide range of processes, from turning, transversal drilling, tapping, milling with centesimal tolerances.

Our lathes have a 16mm bar maximum passage limit.

The components can be treated with Heat Treatment or Galvanic Plating.

### **ICT/FCT Standard Probes**



The ICT (In-Circuit Test) and the FCT (Functional Circuit Test) allow to detect the main faults that can be found on a PCB (Printed Circuit Board), such as short circuit or a defective component and to measure the values of resistance and capacity. Dimensions, the correct head shape, the perfect spring load or the most suitable base material and galvanic finish are the characteristics that make a Spring Contact Probe suitable for the various types of testing conditions and surfaces to be tested.

#### Recommended minimum center (grid-pitch)

Our standard range of Spring Contact Probes for ICT/FCT can be used within various installation distances ranging from 1.27 mm to 5.08 mm.

### Current rating

The standard current of Tecon Spring Contact Probes ranges from 2 to 12 A, depending on the type of material used and the technical specifications adopted during manufacturing.

For higher current tests, High Current Probes are recommended.

### Typical contact resistance

Depending on the various types of Spring Contact Probes, the typical contact resistance ranges from 14 m $\Omega$  to 50m $\Omega$ .

### Materials and plating

The Spring Contact Probe for ICT/FCT is made of three components: a barrel, a spring and a plunger.

The barrel can be made of:

- Bronze, material with good hardness and good malleability
- Brass, material with excellent electrical conductivity and malleability, but not as hard as bronze

- Nickel silver, this alloy is widely used for its workability with punching techniques and for its good electrical characteristics. The barrel can be gold plated.

The spring is made of:

- music wire (harmonic steel), a hard steel, excellent for the construction of springs due to its elastic properties and

strength. The standard spring force ranges from 100 to 400 gr, but it can vary accordingly to the customer's specifications. The spring can be plated in gold to improve the electrical conductivity.

The plunger can be made of:

- Beryllium-Copper (Be-Cu)
- Steel
- Brass

The plunger can be plated in gold or nickel.

### Receptacle

It can be of various types:

- Solder, to solder the wire directly on the receptacle
- Crimp, for crimping the wire inside the receptacle
- Wire-Wrap, to wrap the wire around the square end of the receptacle
- Round Post, to insert the end of the receptacle directly in the housing hole

The height of the swelling on the receptacle (that determines the height of installation) and the position of the retaining marks or imprints (which allow for perfect and firm insertion) can be customized according to the project requirements.

#### Head shape

There are many standard Spring Contact Probes tip styles to choose from, according to the application, size, diameter and surface condition of the tested device.

### Summary of Standard Probes

Test probes version	Series	Pitch size (≥mm)	Working stroke (mm)	Max. stroke (mm)	Current rating (A)	Spring force (g)		Installation heights (mm) v = variable			Page
				()		min	max	min	max	v	
	GLP 030	1,27	4,30	6,35	2 - 3	100	150	8,10	16,00	v	25
	GLP 050	1,27	4,30	6,35	2 - 3	80	200	8,10	16,00	v	26
	GLP 0	1,27	1,78	2,60	3	40	100	3,60	6,30	v	28
	GLP 20	1,27	4,25	6,35	3	100	200	8,50	16,00	v	29
	GLP 1	1,91	1,78	2,54	3	80	100	4,00	8,00	v	30
	GLP 17	1,91	2,40	3,00	3 - 4	80	100	4,55	8,55	v	31
	GLP 1L	1,91	4,30	6,35	3	40	200	8,40	16,02	v	32
	GLP 101	1,91	4,00	5,30	3 - 4	50	200	-	12,50	-	34
Standard stroke	GLP 25	2,54	4,30	6,35	2 - 3	60	300	8,38	16,00	v	35
Stanuaru Stroke	GLP 26	2,54	4,30	6,35	2 - 3	100	300	10,60	18,22	v	37
	GLP 100	2,54	1,27	1,52	3	70	100	-	1,53	-	39
	GLP 2	2,54	2,70	4,06	2 - 3	100	200	6,10	11,95	v	40
	GLP 104	2,54	2,60	3,50	3	30	400	5,80	7,60	-	41
	GLP 3	3,18	4,30	6,30	5	120	300	8,30	15,92	v	49
	GLP 3C	3,18	4,30	6,30	5	120	300	8 <i>,</i> 65	18,77	v	51
	GLP 3F	3,18	4,30	6,30	5	120	300	8,40	16,02	v	52
	GLP 4	4,75	4,30	6,35	7 - 8	100	300	8,89	16,51	v	62
	GLP 5	4,75	4,30	6,35	10	200	600	8,89	16,51	v	63
	GLP 050L	1,27	4,30	6,35	2 - 3	60	200	13,40	21,30	v	27
	GLP 1LL	1,91	8,00	11,00	3	100	200	12,60	20,22	v	33
Long studio	GLP 25L	2,54	9,30	11,80	2 - 3	150	300	13,83	21,45	v	36
Long stroke	GLP 3L	3,18	8,00	10,00	5	120	300	12,00	19,62	v	50
	GLP 5L	4,75	8,00	10,00	10	200	600	12,50	20,12	v	64
	GLP 102	2,54	4,80	6,50	5 - 8	150	500	12,50	18,50	-	41
	GLP 112	2,54	4,00	5,30	5 - 8	100	300	10,30	31,30	v	43
	GLP 912	2,54	4,00	5,00	5 - 8	100	300	10,00	31,00	v	44
	GLP 212	2,54	8,00	10,00	5 - 8	100	300	15,00	36,00	v	45
	GLP 422	2,54	6,40	8,00	5 - 8	100	300	16,00	32,00	v	46
	GLP 103	4,00	4,80	6,00	5 - 8	80	500	12,30	17,50	-	53
	GLP 113	4,00	4,00	5,30	5 - 8	150	500	10,30	15,50	-	54
Metric standard	GLP 114	4,00	4,00	5,50	5 - 8	150	500	10,50	15,70	-	55
	GLP 133/16	4,00	9,00	11,00	5 - 8	150	500	16,00	16,20	-	56
	GLP 133/19	4,00	12,00	14,00	5 - 8	150	500	19,00	19,20	-	57
	GLP 133/23	4,00	15,00	17,50	5 - 8	150	500	23,00	23,20	-	58
	GLP 133/27	4,00	15,00	17,50	5 - 8	150	500	27,00	27,20	-	59
	GLP 133/37	4,00	15,00	17,50	5 - 8	150	500	37,00	37,20	-	60
	GLP 416	4,00	9,2	11,50	-	-	500	18,00	23,20	-	61
	GLP 150	5,08	4,40	5,50	10 - 12	300	500	10,50	10,80	-	65
Non-rotating	GLP 610	2,54	4,00	5,00	5	150	300	16,00	16,20	-	48
probes	GLP 614	5,08	4,00	4,50	10	300	500	16,00	16,20	-	66



Material	Tip Style	ømm
В	01	0,50 0,90
B S	02	0,50
В	03	0,50 0,90
В	04	0,50 0,90
В	05	0,50 0,90
В	08	0,50 0,90
В	11	0,50 0,90
В	13	0,50 0,90
S	14	0,50
S	15	0,50
В	21	0,50 0,90

Available Tip Styles



#### **Technical Data**

Recommended minimum centers:	1,27 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	2,0 - 3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	150 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø0,95 - Ø0,96
Drills for press ring insert:	Ø0,98 - Ø1,00



1:1	

### GLR 030C crimp 7,6 GLR 030S solder cup 21.6

31,6

Ser	ies		Tip S	Style	Spring			Force		
GLP	030	В	08		09	90	10	00	G	
	Material B=BeCu S=Steel				Tip Ø	) mm			Plating G=Gold N=Nickel	





#### Technical Data

Recommended minimum centers:	1,27 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	2,0 - 3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	80 g
	200 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø0,95 - Ø0,96
Drills for press ring insert:	Ø0,98 - Ø1,00





#### Ordering example:

Series		Tip Style		Spring	Force	
GLP 050	В	04	050	20	00	G
Ī	Materia B=BeCu S=Steel	Ī	Tip Ø mm			Plating G=Gold N=Nickel



pre-wired

### GLP 050L ICT/FCT Standard Probes ≥ 1,27 mm / ≥ 50 mil





#### Technical Data

Recommended minimum centers:	1,27 mm
Recommended working stroke:	8,00 mm
Maximum stroke:	10,00 mm
Current rating:	2,0 - 3,0 A
Tipical contact resistance:	<40 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force: 1 Alternative: 6 8 2

#### 100 g 60 g 80 g 200 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø0,95 - Ø0,96
Drills for press ring insert:	Ø0,98 - Ø1,00





Series		Tip Style		Spring	Force	
GLP 050	LB	04	050	8	0	G
	Materi B=BeCu S=Steel	al	Tip Ø mm			Plating G=Gold N=Nickel







#### Technical Data

Recommended minimum centers:	1,27 mm
Recommended working stroke:	1,78 mm
Maximum stroke:	2,60 mm
Current rating:	3,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	40 g
	60 g
	80 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø0,86 - Ø0,87
Drills for press ring insert:	Ø0,89 - Ø0,93









Series		Tip Style		Spring	Force	
GLP 0	В	11	089	10	00	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel

GLP 020ICT/FCT Standard Probes  $\geq$  1,27 mm /  $\geq$  50 mil





#### Technical Data

Recommended minimum centers:	1,27 mm
Recommended working stroke:	4,25 mm
Maximum stroke:	6,35 mm
Current rating:	3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	200 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø0,94 - Ø0,95
Drills for press ring insert:	Ø0,98 - Ø1,00





# GLR 20C crimp 7,62 37,5 GLR 20S solder cup 01,03 00,94 GLR 20W wire wrap 7,62 37,5

Ser	ies		Tip S	Style			Spring	Force	
GLP	20	В	0	2	07	74	1(	00	G
		Materia	I		Tip Ø	mm			Plating
		B=BeCu							G=Gold
		S=Steel							N=Nickel

#### Available Tip Styles





#### Technical Data

Recommended minimum centers:	1,91 mm
Recommended working stroke:	1,78 mm
Maximum stroke:	2,54 mm
Current rating:	3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	80 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø1,32 - Ø1,33
Drills for press ring insert:	Ø1,39 - Ø1,40







Series		Tip Style		Spring	Force	
GLP 1	В	11	122	10	)0	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel

#### Available Tip Styles

Material	Tip Style	ø mm
В	01	0,74 1,52
B S	02	0,74
В	03	0,74 1,52
В	04	0,74 1,02 1,22
В	08	0,74 1,02 1,22
В	11	1,52
В	21	0,74 1,02 1,52



#### Technical Data

Recommended minimum centers:	1,91 mm
Recommended working stroke:	2,40 mm
Maximum stroke:	3,00 mm
Current rating:	3,0 - 4,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	80 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø1,32 - Ø1,33
Drills for press ring insert:	Ø1,39 - Ø1,40







Series		Tip Style		Spring	Force	
GLP 17	В	03	152	10	)0	G
	Materia B=BeCu S=Steel	Tip Ø mm			Plating G=Gold N=Nickel	

Available Tip Styles						
Material	Tip Style	ø mm	1			
		0.60				
R	01	1 22				
		1 40				
		1,40				
В	00	0.00				
l c	02	0,60				
		0,60				
B	03	1,22				
		1,40				
		0,60				
B	04	1,02				
		1.22				
	· ~	0.60				
I R	05	0,00				
S		1,22				
<u> </u>		0.60				
B		1 02				
S		1 2 2				
		1,22	22			
В		1 22	,.			
S		1,22				
В		0,60				
	13	1 2 2				
3		-,				
s	14	0.60				
		0,00				
S	15 🧹 📉	0,60				
п		0,60	1			
В	21	1,22				
S		1.40				
	-	_,				
B	22	1 22				
S		1,22				
<u> </u>						
B	25	1 22				
S		1,22				
<u> </u>						
		0,80				
I R	88	1.22				
		_,				



#### Technical Data

Recommended minimum centers:	1,91 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	40 g
	60 g
	150 g
	200 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø1,32 - Ø1,33
Drills for press ring insert:	Ø1,39 - Ø1,40





Ser	ies		•	Tip S	Style			Spring	Force		
GLP	1L	В	B 01		14	10	10	)0	6	S	
Material T B=BeCu				Tip Ø	mm		P G	latin =Golo	g d		
		S=Stee	el						N G	=Nick ⁺=Gol	el d Plus







#### **Technical Data**

Recommended minimum centers:	1,91 mm
Recommended working stroke:	8,00 mm
Maximum stroke:	11,00 mm
Current rating:	3,0 A
Fipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

lunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
pring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	150 g
	200 g

#### Hole size for receptacle

Drills for press ring as a stop:	Ø1,32 - Ø1,33
Drills for press ring insert:	Ø1,39 - Ø1,40





Series		Tip Style		Spring	Force	
GLP 1LL	В	01	140	10	00	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel

40

7,62

GLR 1LW

wire wrap

#### Available Tip Styles

Material	Tip Style	ø mm
В	01	1,15 1,50
B S	02	0,50
В	03	1,15 1,50
В	04	0,50 1,15
В	05	1,15
В	08	1,15 1,50
В	11	1,30
В	13	1,15
В	21	0,50 1,15
В	21	1,15



#### Technical Data

Recommended minimum centers:	1,91 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,30 mm
Current rating:	3,0 - 4,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	150 g
Alternative:	50 g
	100 g
	200 g

#### Hole size for receptacle

Drills: Ø1,31 - Ø1,32





#### GLR 101C crimp 0,15 0,15 22GLR 101S solder cup 0,4 0,132 0,64GLR 101W wire wrap 24

Series		Tip Style		Spring	Force	
GLP 101	В	03	150	15	50	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel

Availa	able Tip S	Styles	
Material	Tip Style	ø mm	
B	01	0,90	
D		1,52	
B S	02	0,90	
B		0 90	
P	03	1,52	
		0,90	
В	04	1,27	
		1,52	
с В	05	0,90	
5		1,52	
В	07	0,50	
		0,60	
		0,90	3
в	08	1,52	
		0.60	
S	09	0,90	
		-	
В	10	1,52	
В	11	1,52	
D	12	1,52	
D		1,70	
S	14 🖉 🕀	0,90	
В	19	1,80	
		0.90	
В	21	1,27	
S	25	1,52	
Р	22	1,52	
В		2,00	
_			
В	24	0,50	
	4		
B	25	1,40	
3			
в	27	0,50	
		0,60	
		0.00	
В	30	0,90	
		1 5 2	
В	88	2.00	
		_,	
S	97	0,90	



#### Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	2,0 - 3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	200 g
Alternative:	60 g
	100 g
	150 g
	300 g

#### Hole size for receptacle (see page 38)

Drills for press ring as a stop:	Ø1,67 - Ø1,68
Drills for press ring insert:	Ø1,70 - Ø1,75





Series		Tip Style		Spring	Force	
GLP 25	В	21	152	20	0	G
	Materia B=BeCu S=Steel P=Plastic	I	Tip Ø mm		P G N G	lating =Gold =Nickel *=Gold Plus

Available Tip Styles				
Material	Tip Style	ø mm		
В	01	0,90 1,52		
B S	02	0,90		
В	03	0,90 1,52		
В	04	0,90 1,27 1,52		
B S	05	0,90 1,52		
В	07	0,50 0,60		
В	08	0,90 1,52		
S	09	0,60 0,90		
В	10	1,52		
В	11	1,52		
В	13	1,52		
S	14	0,90		
B S	21	0,90 1,27 1,52		
B S	25	1,40		
В	27	0,50 0,60		
S	97	0,90		



#### Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	9,30 mm
Maximum stroke:	11,80 mm
Current rating:	2,0 - 3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	200 g
Alternative:	150 g
	300 g

#### Hole size for receptacle (see page 38)

Drills for press ring as a stop:	Ø1,67 - Ø1,68
Drills for press ring insert:	Ø1,70 - Ø1,75



1:1

Series		Fip Style Spring Force			
GLP 25L	В	10	152	200	G
	Materia B=BeCu S=Steel	I	Tip Ø mm	P G N G	ilating =Gold =Nickel
Available Tip Styles					
----------------------	-----------	--------------	--	--	--
Material	Tip Style	ømm			
B S	02	0,90			
В	03	0,90 1,52			
В	05	0,90 1,52			
В	08	0,90 1,52			
В	11	0,90 1,52			
S	14	0,90			
S	15	0,90			
В	21	0,90 1,52			
S	97	0,90			



Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	2,0 - 3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

## Spring Force (g ±20%)

Spring force:	200
Alternative:	100
	150
	300

## Hole size for receptacle (see page 38)

g g g g

Drills for press ring as a stop:	Ø1,67 - Ø1,68
Drills for press ring insert:	Ø1,70 - Ø1,75





Serie	S		Tip Style		Spring	Force	
GLP 2	.P 26 S		14	090	200		G
Material B=BeCu S=Steel			I	Tip Ø mm		P G N G	lating =Gold =Nickel *=Gold Plus

# Receptacles for GLP 25 - GLP 25L - GLP 26 $\geq$ 2,54 mm / $\geq$ 100 mil

	ø1,8 ø1,67	Mat
GLR 25C crimp	7,62	Rece
,	**	Hole
GLR 25S solder cup	7,62 30	Drills Drills
GLR 25S -12 solder cup	<u>12</u> 30	1
GLR 25S -BO solder cup	ø1,9 ø1,67 30	
GLR 25S -0,2 solder cup	ø1,8 ø1,67 0,2 27,7	
GLR 25S -2,5 solder cup	2,5 26,9	N 0 64
GLR 25W wire wrap	7,62 40	
GLR 25R round post vacuum-sealed	7,62 40	ø0,64
GLR 25WV wire wrap vacuum-sealed	-7,62 40	0,64
GLR 25W -12 wire wrap	12 40	-
GLR 25W -0,2 wire wrap vacuum-sealed	ø1,8 ø1,67 0,2 37,9	9,3
GLR 25W -2,5 wire wrap vacuum-sealed	2,5 36,8	

### Materials

Receptacle:

Nickel-silver or Brass, gold plated

## Hole size for receptacle

Drills for press ring as a stop: Ø1,67 - Ø1,68 Ø1,70 - Ø1,75 Drills for press ring insert:



### Available Tip Styles Mat. Tip Style ø mm Tip Height 1,02 В 01 1,52 1,96 1,02 1,27 В 03 1,96 1,02 В 0,71 04 1,96 8,76 1,96 В 05 1,02 1,02 В 1,52 08 1,96 1,52 В 11 1,96 2,49 1,02 3,30 3,96 1,02 В 1,52 21 1,96 В 33 1,96 0,71



## Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	1,27 mm
Maximum stroke:	1,52 mm
Current rating:	3,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

BeCu or Steel, nickel or gold plated
Nickel-silver or Brass, gold plated
Music wire, gold plated
Nickel-silver or Brass, gold plated

### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	70 g

## Hole size for receptacle

Drills for press ring as a stop:	Ø1,67 - Ø1,68
Drills for press ring insert:	Ø1,70 - Ø1,75





Ordering example: <u>Series Tip Style Tip Height</u>							Plating G=Gold N=Nickel	
GLP 1	.00	В	11	15	2	102	100	G
	I E S	Materia 3=BeCu 5=Steel	l	Tip Ø	mn	n Sp	oring For	ce

Material	Tip Style	ø mm
В	01	1,02 1,52
B S	02	1,02
В	03	1,02 1,52
В	04	1,02 1,27 1,52
B S	05	1,02 1,52
В	07	0,60
В	08	1,02 1,52
S	09	0,60 0,80 1,02
В	10	1,91
В	11	1,52
В	13	1,52
S	14	0,80 1,02
B S	21	1,02 1,27 1,52
B S	25	1,02



## Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	2,70 mm
Maximum stroke:	4,06 mm
Current rating:	2,0 - 3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

### Spring Force (g ±20%)

Spring force:	200 g
Alternative:	100 g

## Hole size for receptacle

Drills for press ring as a stop:	Ø1,67 - Ø1,68
Drills for press ring insert:	Ø1,70 - Ø1,75







Series		Tip Style		Spring	Force	
GLP 2	В	01	152	20	)0	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel



plated

### Available Tip Styles

Material	Tip Style	ømm
В	01	1,90
B S	02	1,00
В	03	1,90 3,00
В	04	1,90
В	05	1,90
В	08	1,90 3,00
В	13	1,90
В	21	1,90



### **Technical Data**

Recommended minimum centers:	2,54 mm
Recommended working stroke:	2,60 mm
Maximum stroke:	3,50 mm
Current rating:	3,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	30 g
Alternative:	80 g
	150 g
	300 g
	400 g

### Hole size for receptacle

Drills:

Ø2,00 - Ø2,01





Series		Tip Style		Spring	Force	
GLP 104	В	05	190	3	0	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel





\*Insulated tip to support PCB. Total length 43,5 mm



## Technical Data

2,54 mm
4,80 mm
6,50 mm
5,0 - 8,0 A
<20 mΩ
-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

## Spring Force (g ±20%)

Spring force:	150 g
Alternative:	300 g
	500 g

### Hole size without receptacle

Drills: Ø2,00 - Ø2,01

### Hole size with receptacle

Drills:

Ø2,50 - Ø2,51





Series		Tip Style		Spring	Force	
GLP 102	В	03	140	15	50	G
	Materia B=BeCu S=Steel P=Plastic	I	Tip Ø mm			Plating G=Gold N=Nickel









Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,30 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°
Maximum stroke: Current rating: Tipical contact resistance: Operating temperature range:	-5,30 mm 5,0 - 8,0 A <20 mΩ -50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	200
Alternative:	100
	150
	250
	300

### Hole size without receptacle

g

g

g

g

g

Drills: Ø1,66 - Ø1,67

### Hole size with receptacle (see page 47)

Drills: Ø1,99 - Ø2,00

*Collar	Total	
неідпі	Length	
2	32,3	
3	33,3	Different collar heights and spacers (DR) are
5	35,3	available to vary the total installation height
7	37,3	of the probe.
8	38,3	
10	40,3	

Series	N E S	Materia B=BeCu S=Steel	і _ <u>т</u>	ipømn	<u>n_</u>	Plating G=Gold <u>N=Nickel</u>
GLP 112	-2	В	08	180	200	G
(	Collar Height	-	Tip Style	Sp	oring Fore	ce



Material	Tip Style	ø mm
В	01	1,30 1,80 2,00
B S	02	1,30
в	03	1,30 1,80 2,00
В	04	1,30 1,80 2,00
B S	05	1,80 2,00
В	08	1,30 1,80 2,00
В	10	2,00
В	11	2,00
В	13	1,30 1,80 2,00
S	14	1,30
B S	21	1,30 1,80 2,00
B S	25	1,30 1,80 2,00
В	88	1,80



## Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

## Spring Force (g ±20%)

Spring force:	200 g
Alternative:	100 g
	150 g
	250 g
	300 g

### Hole size without receptacle

Drills: Ø1,66 - Ø1,67

### Hole size with receptacle (see page 47)

Drills: Ø1,99 - Ø2,00

* Collar Height	Total Length	
2	32	Different collar heights
3	33	and spacers (DR) are
5	35	total installation height
7	37	of the probe.
10	40	





### Available Tip Styles Material Tip Style ømm 1,00 01 В 1,80 2,00 В 1,00 02 S 1,00 1,80 В 03 2,00 1,00 В 04 1,80 2,00 В 1,80 05 S 2,00 1,00 1,80 В 08 2,00 2,00 В 10 2,00 В 11 1,00 1,80 2,00 В 13 S 1,00 14 S 1,00 15 1,00 1,80 В 21 S 2,00 1,00 В 1,80 25 S 2,00



## **Technical Data**

Recommended minimum centers:	2,54 mm
Recommended working stroke:	8,00 mm
Maximum stroke:	10,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	200 g
Alternative:	100 g
	150 g
	250 g
	300 g

### Hole size without receptacle

Drills: Ø1,66 - Ø1,67

### Hole size with receptacle (see page 47)

Ø1,99 - Ø2,00 Drills:

★Collar Height	Total Length	
2	37	Different collar heights
3	38	and spacers (DR) are
5	40	total installation height
7	42	
10	45	

Series	N E S	Materia 3=BeCu 5=Steel	і _ <u>т</u>	ipømn	<u>n_</u>	Plating G=Gold <u>N=Nickel</u>
GLP 212	-5	В	01	200	200	G
	Collar Height	_	Tip Style	Sp	oring Fore	ce







## Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	6,40 mm
Maximum stroke:	8,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	200 g
Alternative:	100 g
	150 g
	250 g
	300 g

### Hole size without receptacle

Drills: Ø1,66 - Ø1,67

### Hole size with receptacle (see page 47)

Drills: Ø1,99 - Ø2,00

*Collar Height	Total Length	Barrel Length	Different collar heights
5	38,4	27,4	available to vary the
8	38,4	30,4	of the probe.





R 912

Receptacles for GLP 112 - GLP 912 - GLP 212 - GLP 422 ≥ 2,54 mm / ≥ 100 mil



All dimensions are in millimeters - Specifications subject to change without notification

GLP 610 ICT/FCT Standard Probes  $\geq$  2,54 mm /  $\geq$  100 mil

### Available Tip Styles





## Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,00 mm
Current rating:	5,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	150 g
Alternative:	300 g

### Hole size without receptacle

Drills: Ø1,66 - Ø1,67

### Hole size with receptacle

Drills:

Ø1,99 - Ø2,00





Ø2,2 Ø2 GLR 912 E 0,20 S 0,2 30 solder cup

Series		Tip Style		Spring	Force	
GLP 610	В	50	300	15	50	N
	Materia B=BeCu S=Steel	l	Tip Ø mm			Plating G=Gold N=Nickel

Availa	able Tip S	tyles		Øs. tbl.
Material	Tip Style	ø mm		-
В	01	1,30 2,54	6.2	ø1.30
B S	02	1,30	,0,3	
B P	03	1,30 2,54		
В	04	2,03 2,54		
B S	05	2,54		
В	07	1,00	33,2	
В	08	1,30 2,54		
В	10	2,54 4,00	A	
В	11	2,54		
S	14	1,30		
В	17	1,30 2,54		
B S	20	2,54		ø2,03
B S	21	1,30 2,54		
B S	26	2,54		

Recommended minimum centers:	3,18 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,30 mm
Current rating:	5,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

### Spring Force (g ±20%)

Spring force:	120 g
Alternative:	200 g
	300 g

## Hole size for receptacle

Drills for press ring as a stop:	Ø2,36 - Ø2,37
Drills for press ring insert:	Ø2,40 - Ø2,45



1:1

Series		Tip Style		Spring	Force	
GLP 3	В	01	254	12	.0	G
	Materia B=BeCu S=Steel P=Plastic	l	Tip Ø mm			Plating G=Gold N=Nickel







Recommended minimum centers:	3,18 mm
Recommended working stroke:	8,00 mm
Maximum stroke:	10,00 mm
Current rating:	5,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

## Spring Force (g ±20%)

Spring force:	120 g
Alternative:	200 g
	300 g

## Hole size for receptacle

Drills for press ring as a stop:	Ø2,36 - Ø2,37
Drills for press ring insert:	Ø2,40 - Ø2,45





### Ordering example:

<u>Seri</u>	ies		Tip Style		Spring Force			
GLP 3	30L	. В 05		165 1		120 G		
Material B=BeCu S=Steel				Tip Ø mm			Plating G=Gold N=Nickel	



All dimensions are in millimeters - Specifications subject to change without notification

GLP 3CICT/FCT Standard Probes  $\geq$  3,18 mm /  $\geq$  125 mil





ICT/FCT Standard Probes  $\geq$  4,00 mm /  $\geq$  160 mil

or gold plated



В

В

S

В

В

В

В

В

ø3,9 ø3,5 **GLR 103** 0,25 solderable 22 GLR 103S 24,5 solder cup ø3,05 <u>ø</u>3,9 DR 103-02 DR 103-05 5 2 DR 103-03

### **Technical Data**

Recommended minimum centers:	4,00 mm
Recommended working stroke:	4,80 mm
Maximum stroke:	6,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	150 g
Alternative:	80 g
	300 g
	500 g

### Hole size without receptacle

Drills: Ø2,99 - Ø3,00

### Hole size with receptacle

Drills: Ø3,49 - Ø3,50





### Ordering example:

Serie	S	<u>Tip Style</u>					Spring Force			
GLP 1(	03	3 B 10			4(	100 150			G	
Material B=BeCu S=Steel					Tip Ø	) mm			Plating G=Gold N=Nickel	

3

3

5,3

27,3

### Available Tip Styles



*Collar Height	Total Length
2	27,3
5	30,3
10	35,3



## Technical Data

Øs.tbl.

ø1,8

ø3

ø2,65

4,00 mm
4,00 mm
5,30 mm
5,0 - 8,0 A
<30 mΩ
-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated or stainless steel
Receptacle:	Brass, gold plated

## Spring Force (g ±20%)

Spring force:	150 g
Alternative:	200 g
	300 g
	500 g

### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

### Hole size with receptacle

Drills: Ø2,99 - Ø3,00





Material B=BeCu S=Steel									Plating G=Gold		
Series <u>P=Plastic</u> <u>Tip</u>					Гір Ø r	nm	_		N=Ni	ckel	
GLP 113	-2	2	В	01 230			15	50	G		
Collar Height				Tip Style	-	Spr	ing	For	ce		







Recommended minimum centers:	4,00 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,50 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated or stainless steel
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	150
Alternative:	200
	300
	500

### Hole size without receptacle

g

g

g

g

Drills: Ø2,64 - Ø2,65

### Hole size with receptacle

Drills: Ø2,99 - Ø3,00





Series		Tip Style		Spring	Force	
GLP 114	В	01	230	15	50	G
	Materia B=BeCu S=Steel P=Plastic	l	Tip Ø mm			Plating G=Gold N=Nickel



## GLP 133/16

ICT/FCT Standard Probes  $\geq$  4,00 mm /  $\geq$  160 mil

### Available Tip Styles





## Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	9,00 mm
Maximum stroke:	11,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Stainless steel
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	400 g
Alternative:	150 g
	300 g
	500 g

### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

### Hole size with receptacle

Drills:

Ø2,99 - Ø3,00





### Ordering example:

Series		Tip Style		Spring	Force	
GLP 133/16	В	03	230	4(	00	G
 N B <sup>:</sup> S: P:	lateri =BeCu =Steel =Plastic	al	Tip Ø mm	l		Plating G=Gold N=Nickel



### All dimensions are in millimeters - Specifications subject to change without notification

plated

### Available Tip Styles

Material	Tip Style	ømm
В	01	2,30 3,00 4,00
B S	02	1,80
B P	03	2,30 3,00 4,00
В	04	1,80 2,50 4,00
В	08	1,80 2,50 4,00
В	10	4,00 6,00
В	21	1,80 2,50 4,00
В	31	1,80



### Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	12,00 mm
Maximum stroke:	14,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold
Barrel:	Brass, gold plated
Spring:	Stainless steel
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	400 g
Alternative:	150 g
	300 g
	500 g

### Hole size without receptacle

Ø2,64 - Ø2,65

### Hole size with receptacle

Drills:

Drills:

Ø2,99 - Ø3,00







Series		Tip Style		Spring	Force	
GLP 133/19	В	21	230	4(	00	G
N B Si P	/ateri =BeCu =Steel =Plastic	al	Tip ø mm			Plating G=Gold N=Nickel

## GLP 133/23

ICT/FCT Standard Probes  $\geq$  4,00 mm /  $\geq$  160 mil

## Available Tip Styles





## Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	15,00 mm
Maximum stroke:	17,50 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Stainless steel
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	400 g
Alternative:	150 g
	300 g
	500 g

### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

### Hole size with receptacle

Drills: Ø2,99 - Ø3,00





Series		Tip Style	Spring Force				
GLP 133/23	В	08	250	4(	00	e	6
	lateri BeCu Steel Plastic	al	Tip Ø mm	I		Plati G=Gc N=Ni	ng old ckel







Recommended minimum centers:	4,00 mm
Recommended working stroke:	15,00 mm
Maximum stroke:	17,50 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Stainless steel
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force:	400 g
Alternative:	150 g
	300 g
	500 g

### Hole size without receptacle

Ø2,64 - Ø2,65

### Hole size with receptacle

Drills: Ø

Drills:

Ø2,99 - Ø3,00





Series			Tip Style		Spring	Force	
GLP 133/2	27	В	04	230	4(	00	G
	Ma B=B	teria eCu	al	Tip ø mm			Plating G=Gold
	S=St P=Pl	eel: lastic	2				N=Nickel



## GLP 133/37ICT/FCT Standard Probes $\geq$ 4,00 mm / $\geq$ 160 mil

### Available Tip Styles





## Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	15,00 mm
Maximum stroke:	17,50 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu o
Barrel:	Brass,
Spring:	Stainle
Receptacle:	Brass,

BeCu or Steel, nickel or gold plated Brass, gold plated Stainless steel Brass, gold plated

## Spring Force (g ±20%)

Spring force:	400 g
Alternative:	150 g
	300 g
	500 g

### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

### Hole size with receptacle





### Ordering example:





40



Material	Tip Style	ømm
Р	03	3,00

	4,5	_	øs. tbl.
	11,5		Ø1,8
	4 4* 1		ø3
55		LENN WWW	
		WWA	
		-	_ø2,65

*Collar	Total
Height	Length
2	55
4	55

### **Technical Data**

Recommended minimum centers:	4,00 mm
Recommended working stroke:	9,20 mm
Maximum stroke:	11,50 mm
Operating temperature range:	-20° up to +50°

### Materials

BeCu or Steel, nickel or gold plated Plunger: Barrel: Brass, gold plated Stainless steel Spring: Receptacle:

Brass, gold plated

### Spring Force (g ±20%)

Spring force: 500 g

### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

### Hole size with receptacle

Drills: Ø2,99 - Ø3,00





### ø3,2 øЗ GLR 113 0,2 23 solderable \_ <u>ø</u>2,7 <u>ø</u>3,2 DR 113-01 DR 113-03 ..... 3 1 DR 113-02 DR 113-05 5

Ser	ies		N P	Aateria Plastic	terial astic <u>Tip ø mm_</u>					Plating G=Gold	
GLP	416	-4	ļ	Р	0	3	30	0	50	00	G
	(	Colla Teig	nr ht	Tip Style				Sp	oring	For	ce

Available Tip Styles				
Material	Tip Style	ø mm		
В	01	1,50 3,96		
B S	02	1,50		
В	03	1,50 3,96		
В	04	1,50 3,96		
В	05	1,50 3,96		
В	08	1,50 3,96		
В	10	3,96		
В	11	2,54		
В	21	1,50 2,54 3,96		
В	88	3,00		



Recommended minimum centers:	4,75 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	7,0 - 8,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

## Spring Force (g ±20%)

Spring force:	200 g
Alternative:	100 g
	300 g

## Hole size for receptacle

Drills for press ring as a stop:	Ø2,69 - Ø2,70
Drills for press ring insert:	Ø2,75 - Ø2,78





Series		Tip Style		Spring	Force	
GLP 4	В	10	396	20	00	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel







Recommended minimum centers:	4,75 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	10,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

### Spring Force (g ±20%)

Spring force:	400 g
Alternative:	200 g
	500 g
	600 g

### Hole size for receptacle

Drills for press ring as a stop:	Ø3,54 - Ø3,55
Drills for press ring insert:	Ø3,58 - Ø3,63





Series		Tip Style		Spring	Force	
GLP 5	В	11	396	20	00	G
	Materia B=BeCu	l	Tip Ø mm			Plating G=Gold
	S=Steel					N=Nickel







## Technical Data

Recommended minimum centers:	4,75 mm
Recommended working stroke:	8,00 mm
Maximum stroke:	10,00 mm
Current rating:	10,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

## Spring Force (g ±20%)

Spring force:	400 g
Alternative:	200 g
	500 g
	600 g

## Hole size for receptacle

Drills for press ring as a stop:	Ø3,54 - Ø3,55
Drills for press ring insert:	Ø3,58 - Ø3,63





Series		Tip Style		Spring	Force	
GLP 5L	В	11	396	20	)0	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel





Material	Tip Style	ømm
В	03	2,50 4,00 6,50
В	04	3,00 4,00
В	08	3,00 4,00
В	10	4,00



### Technical Data

Recommended minimum centers:	5,08 mm
Recommended working stroke:	4,40 mm
Maximum stroke:	5,50 mm
Current rating:	10,0 - 12,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

## Spring Force (g ±20%)

Spring force:300 gAlternative:500 g

### Hole size without receptacle

Drills: Ø3,49 - Ø3,50

### Hole size with receptacle

Drills: Ø3,99 - Ø4,00







Series <u>T</u>		Tip Style		Spring	Force		
GLP	150	B 08 400		300		G	
Material B=BeCu S=Steel			I	Tip Ø mm			Plating G=Gold N=Nickel

D ICT/FCT Standard Probes ≥ 5,08 mm / ≥ 200 mil

### Available Tip Styles





## **Technical Data**

Recommended minimum centers:	5,08 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	4,50 mm
Current rating:	10,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### **Materials**

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force: 300 g Alternative: 500 g

### Hole size without receptacle

Drills: Ø2,66 - Ø2,67

### Hole size with receptacle

Drills: Ø2,99 - Ø3,00





without GLR 114



Series <u>T</u>		Tip Style		Spring			
GLP	614	В	50	500	3(	00	N
Material B=BeCu S=Steel			I	Tip Ø mm			Plating G=Gold N=Nickel





When we talk about High Currents, we normally don't think of the electrical testing sector, where most of the job is done working around 3 Amperes. Our standard Spring Contact Probes can work at 5 Amperes.

Tecon's High Current Spring Contact Probes can work with currents of up to 100 Amperes, during electrical tests lasting a few seconds at the most.

Sometimes, there are situations in which the Spring Contact Probe needs to be more performing, such as in testing equipment for a longer period of time. In this case, it is necessary to carry out specific manufacturing processes, according to the project requirements, to optimize performance in such testing conditions.

## Recommended minimum centers (grid-pitch)

The standard installation pitch for our High Current Spring Contact Probe ranges from 2.54 mm to 10.00 mm.

## Current rating

By using different techniques during the manufacturing process and performing the silver plating of the barrel and the spring, our standard High Current Probes can withstand currents ranging from 10A to 30A. With our special High Current Probes, the tolerated current load is up to 100A.

## Typical contact resistance

The choice of materials, the design specifications, the silver plating of components and the precision in assembly, allow our High Current Spring Contact Probes to have a low-contact resistance, not exceeding  $10m\Omega$ .

## Types of High Current Probes

High Current Probes can be of two types:

- Standard: The main difference between High Current Probes and standard Probes is the type of material and the type of galvanic treatment they undergo. This will allow the High Current Probe to have a very low electrical resistance and consequently a higher rated current. In addition, the spring force is increased to ensure better contact.
- Continuous plunger: in this case the plunger comes out of the barrel from both sides. The wiring is directly connected at the end of plunger. This allows the current to flow only through the plunger and the barrel, not the spring. This solution enables our High Current Probes to withstand a greater current flow for a longer period of time. In alternative, the wiring can be soldered on the barrel.

## Materials and plating

The materials used in making High Current Probes are very important in order to guarantee the lowest possible electrical resistance: The barrel can be made of:

- Bronze, material with good hardness and good malleability
- Brass, material with excellent electrical conductivity and malleability, but not as hard as bronze

The barrel is silver or gold plated.

The spring is made of:

- music wire (Harmonic steel) with a spring force ranging from 100 to 1300 gr

The spring is plated with silver to improve electrical conductivity.

The plunger is made of: - Beryllium-Copper (Be-Cu) The plunger can be plated in gold.

Silver Plating significantly improves electrical conductivity of the components and ensures the lowest possible electrical resistance.

## Receptacle

For our standard High Current Probes series (HCP3/HCP4/HCP5) the receptacles are the same as those used for standard Spring Contact Probes for ICT (In-Circuit Test):

- Solder, to solder the wire directly on the receptacle
- Crimp, for crimping the wire inside the receptacle
- Wire-Wrap, to wrap the wire around the square end of the receptacle
- Round Post, to insert the end of the receptacle directly into the assembly hole

For High Current Probes with continuous plunger

- the receptacle for this type of probe is open on both ends to allow for the passage of the plunger and to solder directly the wire on the probe.

## Head Shape

The greater the contact surface, the lower is the risk of electric arc and wear of the High Current Spring Contact Probes. For this reason, the head Styles most frequently used for High Current are nr. 01, 03, 04, 08, 10, 11, 21. These geometries guarantee excellent contact surface.

## Summary of High Current Probes

Test probes version	Series	Pitch size (≥mm)	Working stroke (mm)	Max. stroke (mm)	Current rating (A)	Spring f	orce (g)	Installat v	ion heigh = variab	nts (mm) le	Page
						min	max	min	max	V	
	HCP 912	2,54	4,00	5,30	20	150	300	10,30	31,30	v	69
	HCP912M	2,54	4,00	5,30	20	150	300	10,30	10,50	-	70
	HCP 3	3,18	4,30	6,30	10 - 15	200	300	8,30	15,92	v	73
	HCP 113	4,00	4,00	5,30	15 - 30	150	500	10,30	18,70	-	75
	HCP 114	4,00	4,00	5,50	15 - 30	150	500	10,50	15,70	-	76
	HCP 33M	4,00	4,00	5,30	30	150	500	-	10,50	-	77
High current	HCP 4	4,75	4,30	6,35	10 - 20	200	300	8,89	16,51	v	80
(press-in/screw-in)	HCP 5	4,75	4,30	6,35	15 - 30	400	1300	8,89	16,51	v	81
	HCP 150	5,08	4,40	5,50	50	300	500	10,50	10,80	-	82
	HCP 150M	5,08	4,40	5,50	50	300	500	10,50	10,80	-	83
	HCP 15	6,35	4,40	5,50	75	500	1000	-	10,80	-	84
	HCP 18	7,60	4,40	5,50	100	500	1500	-	10,80	-	85
	HCP 220	7,60	6,00	9,00	40	-	1000	-	38,00	-	86
	HCP 250	10,00	6,00	9,00	50	-	1000	-	37,50	-	87
	HCP 420	2,54	3,20	4,00	10	-	100	-	13,60	-	71
	HCP 430	3,18	5,60	7,00	14	200	400	-	18,80	-	72
High current	HCP 502	3,18	5,60	7,00	12 - 15	80	500	12,00	12,20	-	74
probes with	HCP 503	4,00	5,60	7,00	10 - 15	200	300	13,00	18,25	-	78
plunger	HCP 440	4,00	6,40	8,00	16	200	400	-	22,50	-	79
P	HCP 450M	10,00	8,00	9,00	50	-	500	-	23,50	-	88
	HCP 451	10,00	8,00	9,00	100	-	1000	-	23,50	-	89



Material	Tip Style	ømm
В	01	1,00 1,80 2,00
В	03	1,00 1,80 2,00
В	04	1,00 1,80 2,00
В	05	1,80 2,00
В	08	1,00 1,80 2,00
В	10	2,00
В	11	2,00
В	13	1,00 1,80 2,00
В	21	1,00 1,80 2,00



### **Technical Data**

Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,30 mm
Current rating:	20,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, gold plated
Barrel:	Brass, silver plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

### Spring Force (g ±20%)

Spring force: 200 g Alternative: 150 g 250 g 300 g

### Hole size without receptacle

Drills: Ø1,66 - Ø1,67

### Hole size with receptacle

Drills: Ø1,99 - Ø2,00 (see page 47)

*Collar Height	Total Length	
2	32,3	Different collar heights
3	33,3 and spacers (DR) ar	and spacers (DR) are
5	35,3	total installation height
7	37,3	of the probe.
10	40,3	

### Ordering example:





A





## Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,30 mm
Current rating:	20,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	BeCu or Steel, gold plated
Barrel:	Brass, silver plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

## Spring Force (g ±20%)

Spring force: 200 g Alternative: 150 g 250 g 300 g

### Hole size without receptacle

Drills: Ø1,66 - Ø1,67

### Hole size with receptacle

Drills: Ø1,99 - Ø2,02







Series		Tip Style		Spring	Force		
HCP 912M	В	10	396	20	00	G	
N B S	/lateria =BeCu =Steel	al	Tip Ø mm			Plating G=Gold	



Material	Tip Style	ømm
S	01	1,35
S	03	1,35
S	04	1,35
S	08	1,35
S	13	1,35
S	17	1,35
S	20	1,35
S	21	1,35



### Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	3,20 mm
Maximum stroke:	4,00 mm
Current rating:	10,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	Steel, nickel or gold plated
Barrel:	Bronze, unplated
Spring:	Stainless steel
Receptacle:	Brass, gold plated

## Spring Force (g ±20%)

Spring force: 100 g

### Hole size for receptacle

Drills: Ø1,74 - Ø1,75





### HCR 420



Ser	eries <u>Tip Style</u> <u>Spring For</u>		Force				
НСР	420	S	13	135	135 100		G
		Materia S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel





## Technical Data

Recommended minimum centers:	3,18 mm
Recommended working stroke:	5,60 mm
Maximum stroke:	7,00 mm
Current rating:	14,0 A
Tipical contact resistance:	<15 mΩ
Operating temperature range:	-50° up to +100°

### Materials

Plunger:	Steel, nickel or gold plated
Barrel:	Bronze, unplated
Spring:	Stainless steel
Receptacle:	Brass, gold plated

## Spring Force (g ±20%)

Spring force:	200 g
Alternative:	400 g

## Hole size for receptacle





### HCR 430



Series		Tip Style		Spring	Force	
HCP 430	S	01	210	200		N
	Materia S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel
Available Tip Styles						
----------------------	-----------	------	--			
Material	Tip Style	ømm				
В	01	2,54				
В	03	2,54				
		2,03				
B	04	2,54				
В	05	2,54				
В	08	2,54				
	10	2,54				
В	10 00	4,00				
В	11	2,54				
В	17	2,54				
В	20	2,54				
В	21	2,54				



# Technical Data

Recommended minimum centers:	3,18 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,30 mm
Current rating:	10,0 - 15,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Nickel-silver or Brass, silver plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

# Spring Force (g ±20%)

Spring force:	200 g
Alternative:	300 g

# Hole size for receptacle

Drills for press ring as a stop:	Ø2,36 - Ø2,37
Drills for press ring insert:	Ø2,40 - Ø2,45





Series		Tip Style	Style Spring Force		
HCP 3	В	01	254	200	G
	Material Tip Ø B=BeCu		Tip Ø mm		Plating G=Gold





Ser	ies		Tip Style	Spring Force			2	
НСР	502	В	21	140	15	50	G	
		Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel	

3,18 mm

5,60 mm

7,00 mm

<10 mΩ

12,0 - 15,0 A

-50° up to +100°

1:1





2,50

4,00

1,80

Total

27,3

30,3

35,3

ø3,2

ø2,

0,2

ø3

23

Length

В

В

\*Collar

Height

2

5

10

**GLR 113** 

solderable\_

**GLR 113S** solder cup

DR 113-01

DR 113-02

21

31



#### **Technical Data**

Recommended minimum centers:	4,00 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,30 mm
Current rating:	15,0 - 30,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	150 g
Alternative:	200 g
	300 g
	500 g

Drills:

#### Hole size without receptacle

Ø2,64 - Ø2,65

# Hole size with receptacle

Drills:

Ø2,99 - Ø3,00





Plating G=Gold

N=Nickel

G

150

Spring Force

25		Orderin	g exan	nple: <sub>Materia</sub>	I		
7 ø3,2		Series	E	B=BeCu S=Steel	_ <u>T</u>	ipømn	n
DR 113-03	3	HCP 113	-2	В	01	230	
Ţ <b>-</b> -	<del></del>	C	Collar Height	_	Tip Style	Sp	) Sr
DR 113-05							

5

Available Tip Styles





# Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,50 mm
Current rating:	15,0 - 30,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force:	150 g
Alternative:	200 g
	300 g
	500 g

#### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

# Hole size with receptacle

Drills: Ø2,

Ø2,99 - Ø3,00





Serie	<u>es</u>		Tip Style	-	Spring	Force	
GLP 1	14	В	01	230	1	50	G
		Materia B=BeCu S=Steel	l	Tip Ø mm			Plating G=Gold N=Nickel





# HCP 33M High Current Probes ≥ 4,00 mm / ≥ 160 mil

#### Available Tip Styles

Matorial	Tin Style	ømm
Iviateriai	TIP Style	Ømm
В	01	2,30 3,00
В	03	2,30 4,00
В	04	2,30 3,00
В	08	2,30 3,00
В	10	4,00
В	13	3,00



# Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,30 mm
Current rating:	30,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

# Materials

Plunger:	BeCu, gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force:	150 g
Alternative:	200 g
	300 g
	500 g

#### Hole size for receptacle

Drills: Ø3,00 - Ø3,02







Series		Tip Style		Spring	Force	
HCP 4	В	10	396	20	)0	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold





# **Technical Data**

Recommended minimum centers:	4,00 mm
Recommended working stroke:	5,60 mm
Maximum stroke:	7,00 mm
Current rating:	10,0 - 15,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### **Materials**

BeCu, nickel or gold plated Plunger: Brass, silver plated Barrel: Spring: Music wire, gold plated Receptacle: Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	500 g
Alternative:	200 g
	300 g

#### Hole size without receptacle

Drills: Ø2,99 - Ø3,00

#### Hole size with receptacle

Drills: Ø3,49 - Ø3,50





<u>Seri</u>	es		Tip Style		Spring	Force	
HCP	503	В	08	400	1	50	N
		Materia		Tip ø mm			Plating
B=BeCu							G=Gold
		S=Steel					N=Nickel



5





Avai	ilab	le <sup>·</sup>	Tip	St∖	/les
	TU N		קיי	50)	103

Material	Tin Style	ømm
Iviaterial	TIP Style	ØIIIII
S	01	3,50
S	03	3,50
s	04	3,50
S	08	3,50
S	13	3,50
S	17	3,50
S	20	3,50
S	21	3,50



# Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	6,40 mm
Maximum stroke:	8,00 mm
Current rating:	16,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Steel, nickel or gold plated
Barrel:	Bronze, unplated
Spring:	Stainless steel
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force:	200 g
Alternative:	400 g

# Hole size for receptacle

Drills: Ø2,69 - Ø2,70





#### HCR 440



Series		Tip Style		Spring	Force	
HCP 440	S	20	350	2(	00	Ν
	Materia S=Steel	I	Tip Ø mm			Plating G=Gold N=Nickel

Material	Tip Style	ø mm
В	01	2,54 3,96
в	03	2,54 3,96
в	04	2,54 3,96
В	05	2,54 3,96
в	08	2,54 3,96
В	10	3,96
В	11	2,54
В	21	2,54 3,96



# Technical Data

Recommended minimum centers:	4,75 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	10,0 - 20,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, gold plated
Barrel:	Nickel-silver or Brass, silver plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

# Spring Force (g ±20%)

Spring force:	200 g
Alternative:	300 g

# Hole size for receptacle

Drills for press ring as a stop:	Ø2,69 - Ø2,70
Drills for press ring insert:	Ø2,75 - Ø2,78





Series		Tip Style		Spring	Force	
HCP 4	В	10	396	20	00	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold





Available Tip Styles			
Material	Tip Style	ømm	
В	01	3,96	
В	03	3,96	
В	04	2,10 3,96	
В	05	3,96	
В	08	2,10 3,96	
В	10	3,96	
В	11	3,96	
В	13	3,96	
В	21	2,10 3,96	



# **Technical Data**

Recommended minimum centers:	4,75 mm
Recommended working stroke:	4,30 mm
Maximum stroke:	6,35 mm
Current rating:	15,0 - 30,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Nickel-silver or Brass, silver plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

# Spring Force (g ±20%)

Spring force:	400 g
Alternative:	500 g
	600 g
	1300 g

# Hole size for receptacle

Drills for press ring as a stop:	Ø3,54 - Ø3,55
Drills for press ring insert:	Ø3,58 - Ø3,63





Series		Tip Style		Spring	Force	
HCP 5	В	11	396	20	00	G
	Materia B=BeCu S=Steel	I	Tip Ø mm			Plating G=Gold



Material	Tip Style	ø mm
В	03	2,50 4,00 6,50
В	04	3,00 4,00
В	08	3,00 4,00
В	10	4,00



# Technical Data

Recommended minimum centers:	5,08 mm
Recommended working stroke:	4,40 mm
Maximum stroke:	5,50 mm
Current rating:	50,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force:300 gAlternative:500 g

#### Hole size without receptacle

Drills: Ø3,49 - Ø3,50

#### Hole size with receptacle

Drills: Ø3,99 - Ø4,00







Series		Tip Style		Spring	Force	
HCP 150	В	08	400	30	)0	G
	Materia B=BeCu	I	Tip Ø mm			Plating G=Gold N=Nickel

# High Current Probes ≥ 5,08 mm / ≥ 200 mil

#### Available Tip Styles

Material	Tip Style	ømm
В	03	2,50 4,00 6,50
В	04	3,00 4,00
В	08	3,00 4,00
В	10	4,00



# **Technical Data**

Recommended minimum centers:	5,08 mm
Recommended working stroke:	4,40 mm
Maximum stroke:	5,50 mm
Current rating:	50,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force: 300 g Alternative: 500 g

#### Hole size without receptacle

Drills: Ø3,49 - Ø3,50

#### Hole size with receptacle

Drills: Ø3,99 - Ø4,00







Series		Tip Style		Spring	Force		
HCP 150M	В	01	254	20	00	G	
	/ateri =BeCu	al	Tip Ø mm			Plating G=Gold	3





# Technical Data

Recommended minimum centers:	6,35 mm
Recommended working stroke:	4,40 mm
Maximum stroke:	5,50 mm
Current rating:	75,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Brass, silver plated
Spring:	Music wire, gold plated
Receptacle:	Brass, silver plated

# Spring Force (g ±20%)

Spring force:	500 g
Alternative:	1000 g

# Hole size for receptacle

Drills: Ø5,52 - Ø5,54



10,8



Series		Tip Style		Spring	Force	
HCP 15	В	08	400	50	00	G
	Material B=BeCu		Tip Ø mm			Plating G=Gold







#### Technical Data

Recommended minimum centers:	7,60 mm
Recommended working stroke:	4,40 mm
Maximum stroke:	5,50 mm
Current rating:	100,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Brass, silver plated
Spring:	Music wire, gold plated
Receptacle:	Brass, silver plated

# Spring Force (g ±20%)

Spring force:	700 g
Alternative:	500 g
	1000 g
	1500 g

# Hole size for receptacle

Drills: Ø6,52 - Ø6,54







<u>Series</u>		Tip Style		Spring	Force	
HCP 18	В	03	600	7(	00	G
	Material B=BeCu		Tip Ø mm			Plating G=Gold

Material	Tip Style	ø mm
В	03	3,00 6,00 8,50
В	04	3,00
В	08	3,00 5,00
В	10	6,00 8,00



# Technical Data

Recommended minimum centers:	7,60 mm
Recommended working stroke:	6,00 mm
Maximum stroke:	9,00 mm
Current rating:	40,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Brass or BeCu, gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated

# Spring Force (g ±20%)

Spring force:	1000 g
0	0

#### Hole size

Drills: Ø6,02 - Ø6,04





Series		Tip Style		Spring	Force	
HCP 220	В	03	300	10	00	G
	Materia	I	Tip Ø mm			Plating
	B=BeCu Br=Brass					G=Gold

D High Current Probes  $\geq$  10,00 mm /  $\geq$  400 mil



Material

В

В

В

Tip Style

03

04

10

#### **Technical Data**

Recommended minimum centers:	10,00 mm
Recommended working stroke:	6,00 mm
Maximum stroke:	9,00 mm
Current rating:	50,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

ger:	Brass or BeCu, silver plated
el:	Brass, silver plated
ng:	Music wire, gold plated

# Spring Force (g ±20%)

Spring force: 1000 g

#### Hole size

Drills: Ø9,02 - Ø9,04





Series		Tip Style		Spring	Force	
HCP 250	В	10	590	10	00	S
	Materia B=BeCu Br=Brass	I	Tip Ø mm			Plating S=Silver

High Current Probes  $\geq$  10,00 mm /  $\geq$  400 mil

P 45

#### Available Tip Styles

Material	Tip Style	ø mm
В	03	5,00 10,00
В	10	5,00 10,00



# Technical Data

Recommended minimum centers: 1	10,00 mm
Recommended working stroke: 8	3,00 mm
Maximum stroke: 9	9,00 mm
Current rating: 5	50,0 A
Tipical contact resistance: <	<10 mΩ
Operating temperature range: -	50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Brass, nickel or gold plated
Spring:	Stainless steel

Stainless steel

# Spring Force (g ±20%)

Spring force: 500 g

#### Hole size

Drills: Ø4,99 - Ø5,00





Series		Tip Style		Spring	Force	
HCP 450M	В	10	500	5(	00	G
N B	/ateria =BeCu	al	Tip Ø mm			Plating G=Gold



Material	Tip Style	ø mm
В	03	10,00
В	10	10,00



# Technical Data

Recommended minimum centers:	10,00 mm
Recommended working stroke:	8,00 mm
Maximum stroke:	9,00 mm
Current rating:	100,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force: 1000 g

# Hole size for receptacle

Drills: Ø7,58 - Ø7,59





# HCR 451



Series		Tip Style		Spring	Force		
HCP 451	В	10	1000	10	00	G	i
	Materia B=BeCu	I	Tip Ø mm	l		Plati G=Gc	ng old



Battery Probes, also called Short Travel Probes, are used as battery chargers, in the lighting industry, in the medical industry and in all those conditions where limited space is available for the application.

In some applications, Spring Contact Probes are not used for ICT/FCT (In-Circuit/Functional Circuit) tests, but soldered directly on the PCB (Printed Circuit Board) or electronic devices without the use of a receptacle.

The Solderable Probes were created to meet this need. They are made with a bead for soldering at the end of the barrel. The hole on the side of the barrel allows for perfect cleaning from production remnants and to optimize the galvanic treatment.

# Recommended minimum center (grid-pitch)

Generally, the installation pitch of our Solderable Probes ranges from 2.54 mm to 6.50 mm. According to the project requirements, the grid pitch can be customized.

# Current rating

The range of Battery Probes we produce works with current ranging from 3A to 20A

# Typical contact resistance

Dimensions, manufacturing characteristics, materials and galvanic treatments define the resistance of our Battery Probes which does not exceed 50 m $\Omega$ .

# Materials and plating

The materials used to make our Battery Probe are:

The barrel is made of:

- Brass, material with excellent electrical conductivity and malleability, but not as hard as bronze The barrel is gold plated.

The spring is made of:

- music wire (Harmonic steel) with a spring force ranging from 30 to 800 gr
- stainless steel

The spring is plated with gold to improve electrical conductivity.

The plunger is made of:

- Beryllium-Copper (Be-Cu)
- Bronze
- Brass

The plunger is plated in gold or nickel.

# Types of Battery Probes

#### Battery Probes with receptacle

behaving like a normal Spring Contact Probes, it is installed inside a special receptacle, which in turn is mounted on a board. The advantage of using this type of Battery Probe is that once the work cycles is completed, it can be replaced quickly and easily.

#### Soldered Battery Probes

This type of Battery Probes is recommended in all cases where space is very limited and there is no possibility or need to use a receptacle. The Battery Probes are soldered directly on the board or fixture.

# Head Shape

The most common types of tip Styles for Battery Probes are nr. 03, 04, 06, 08 and 10.

# Summary of Short Travel, Battery & Solderable Probes

Test probes version	Series	Pitch size Working (≥mm) stroke (mm)		Max. Current stroke rating (mm) (A)		Spring force (g)		Installation heights (mm) v = variable			Page
			( )		( )	min	max	min	max	v	
	STP 502	3,00	1,50	2,20	8	-	120	3,50	3,70	-	96
	STP 502A	3,00	1,50	2,20	8	-	120	3,50	3,70	-	97
	STP 505	3,00	2,80	3,30	5 - 8	120	200	5,20	5,40	-	98
	STP 505A	3,00	1,50	2,60	9	-	120	5,20	5,40	-	99
Short travel and	STP 506	3,00	1,00	1,20	9	-	120	2,80	3,00	-	100
battery probes	STP 506A	3,00	1,00	1,20	9	-	120	2,80	3,00	-	101
	STP 507	3,00	1,00	1,20	9	-	120	-	3,00	-	102
	STP 365	6,50	3,20	4,00	8	150	800	6,00	12,00	-	105
	STP 365R	6,50	4,00	5,00	20	150	800	6,00	12,00	-	106
	STP 365L	6,50	6,00	8,00	8	150	800	11,00	17,00	-	107
	STP 611	2,54	2,30	2,40	10	-	80	2,50	7,00	v	92
	STP 625	2,54	1,80	2,00	10	-	80	2,10	6,50	v	93
Coldorable probas	STP 922	2,54	1,80	2,20	10	-	100	2,10	5,50	v	94
Soluerable probes	STP 305	3,00	2,05	2,65	2	-	50	3,00	5,50	v	95
	STP 105	3,18	1,50	2,30	10	-	65	-	6,35	-	103
	STP 119	4,00	1,50	2,30	15	-	150	-	5,70	-	104

STP 611 Solderable Probes ≥ 2,54 mm / ≥ 100 mil

#### Available Tip Styles





# Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	2,30 mm
Maximum stroke:	2,40 mm
Current rating:	10,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Brass, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated

# Spring Force (g ±20%)

Spring force: 80 g

#### Hole size without receptacle

Drills: Ø1,65 - Ø1,66





Series		Tip Style		Spring	Force		
STP 611	Br	04	102	08	80	C	3
	Materia Br=Brass	I	Tip Ø mm			Plati G=Go	ing old



Material	Tip Style	ømm
В	04	1,02

2		ø1,02
8	W	
-		ø1,57
0,75 10,25		

# Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	1,80 mm
Maximum stroke:	2,00 mm
Current rating:	10,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Brass, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated

Spring Force (g ±20%)

Spring force: 80 g

# Hole size without receptacle

Drills: Ø1,65 - Ø1,66





Series		Tip Style		Spring	Force		
STP 62	5 Br	04	102	08	80		G
	Materia Br=Brass	l	Tip Ø mm			Plat G=Go	ing old

STP 922 Solderable Probes ≥ 2,54 mm / ≥ 100 mil

#### Available Tip Styles

Material	Tip Style	ø mm
В	04	1,06
В	21	1,06



# Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	1,80 mm
Maximum stroke:	2,00 mm
Current rating:	3,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated

# Spring Force (g ±20%)

Spring force: 100 g

# Hole size without receptacle

Drills: Ø1,60 - Ø1,61





Series	_	Tip Style	tyle Spring Force				
STP 922	В	21	106	106 100		(	G
	Materia B=BeCu	I	Tip Ø mm			Plati G=Go	ing old



Material	Tip Style	ømm
В	04	1,20



# Technical Data

Recommended minimum centers:	3,00 mm
Recommended working stroke:	2,05 mm
Maximum stroke:	2,65 mm
Current rating:	2,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Brass, gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated

# Spring Force (g ±20%)

Spring force: 50 g

# Hole size without receptacle

Drills: Ø2,00 - Ø2,02





Serie	es		Tip Style	<u>p Style</u> <u>Spring Force</u>				
STP 3	05	Br	04	120	1(	00		G
		Materia Br=Brass	I	Tip Ø mm			Plat G=Go	ing old

STP 502 Short Travel and Battery Probes ≥ 3,00 mm / ≥ 118 mil

#### Available Tip Styles





# Technical Data

Recommended minimum centers:	3,00 mm
Recommended working stroke:	1,50 mm
Maximum stroke:	2,20 mm
Current rating:	8,0 A
Tipical contact resistance:	<15 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force: 120 g

#### Hole size without receptacle

Drills: Ø1,96 - Ø1,98

#### Hole size with receptacle

Drills: Ø2,28 - Ø2,29







Ser	ies	Tip Style Spring Force					
STP	502	2 В 04		130	12	20	G
Material B=BeCu		Tip Ø mm			Plating G=Gold N=Nickel		

Amagnetic Short Travel and Battery Probes ≥ 3,00 mm / ≥ 118 mil

#### Available Tip Styles





# Technical Data

Recommended minimum centers:	3,00 mm
Recommended working stroke:	1,50 mm
Maximum stroke:	2,20 mm
Current rating:	8,0 A
Tipical contact resistance:	<15 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Bronze, gold plated
Barrel:	Bronze, gold plated
Spring:	Amagnetic alloy
Receptacle:	Bronze, gold plated

# Spring Force (g ±20%)

Spring force: 120 g

#### Hole size without receptacle

Drills: Ø1,96 - Ø1,98

#### Hole size with receptacle

Drills: Ø2,28 - Ø2,29







Series <u>Tip Sty</u>				Spring	Force		
STP 502A	Bz	04	130	130 120		C	3
	Materia Bz=Bronz	al 2e	Tip Ø mm			Plat G=Go	ing old

Ρ5 Short Travel and Battery Probes  $\geq$  3,00 mm /  $\geq$  118 mil

#### Available Tip Styles





# **Technical Data**

Recommended minimum centers:	3,00 mm
Recommended working stroke:	2,80 mm
Maximum stroke:	3,30 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

gold plated

#### **Materials**

Plunger:	BeCu, nickel or gold plat
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force:	200 g
Alternative:	120 g

#### Hole size without receptacle

Drills: Ø1,96 - Ø1,98

#### Hole size with receptacle

Ø2,28 - Ø2,29 Drills:







Series	<u>Tip Style</u>		ies <u>Tip Style</u> <u>Spring Force</u>			
STP 505	B 04		102	08	30	G
	Materia B=BeCu	I	Tip Ø mm			Plating G=Gold N=Nickel

Amagnetic Short Travel and Battery Probes ≥ 3,00 mm / ≥ 118 mil



В



# **Technical Data**

Recommended minimum centers:	3,00 mm
Recommended working stroke:	1,50 mm
Maximum stroke:	2,60 mm
Current rating:	9,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

ø1,3

ø2,5

ø1,97

Plunger:	Bronze, gold plated
Barrel:	Bronze, gold plated
Spring:	Amagnetic alloy
Receptacle:	Bronze, gold plated

# Spring Force (g ±20%)

Spring force: 120 g

#### Hole size without receptacle

Drills: Ø1,96 - Ø1,98

#### Hole size with receptacle

Ø2,28 - Ø2,29 Drills:







Ser	ies		Tip Style		Spring	Force		
STP 5	505A	Bz	04	130	17	20	0	6
	-	Materia Bz=Bronz	al 2e	Tip ø mm			Plat G=G	ing old

STP 506

Short Travel and Battery Probes  $\geq$  3,00 mm /  $\geq$  118 mil

#### Available Tip Styles





# Technical Data

Recommended minimum centers:	3,00 mm
Recommended working stroke:	1,00 mm
Maximum stroke:	1,20 mm
Current rating:	9,0 A
Tipical contact resistance:	<15 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

# Spring Force (g ±20%)

Spring force: 120 g

#### Hole size without receptacle

Drills: Ø1,99 - Ø2,00

#### Hole size with receptacle

Drills: Ø2,28 - Ø2,29







Series		Tip Style		Spring	Force	
STP 506	В	04	102	08	30	G
	Materia B=BeCu	I	Tip Ø mm			Plating G=Gold N=Nickel

# STP 506A

Amagnetic Short Travel and Battery Probes ≥ 3,00 mm / ≥ 118 mil

#### Available Tip Styles





#### Technical Data

Recommended minimum centers:	3,00 mm
Recommended working stroke:	1,00 mm
Maximum stroke:	1,20 mm
Current rating:	9,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Bronze, gold plated
Barrel:	Bronze, gold plated
Spring:	Amagnetic alloy
Receptacle:	Bronze, gold plated

#### Spring Force (g ±20%)

Spring force: 120 g

#### Hole size without receptacle

Drills: Ø1,99 - Ø2,00

#### Hole size with receptacle

Drills: Ø2,28 - Ø2,29







Series		Tip Style		Spring	Force		
STP 506A	Bz	04	130	17	20	6	6
Material T Bz=Bronze		Tip Ø mm			Plat G=Go	ing old	

STP 507 Short Travel and Battery Probes ≥ 3,00 mm / ≥ 118 mil

#### Available Tip Styles





# Technical Data

3,00 mm
1,00 mm
1,20 mm
9,0 A
<15 mΩ
-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated

# Spring Force (g ±20%)

Spring force: 120 g

# Hole size without receptacle

Drills for press ring as a stop:	Ø1,98 - Ø2,00
Drills for press ring insert:	Ø2,48 - Ø2,49



Series		Tip Style		Spring	Force		
STP 507	В	04	130	12	20	Ģ	ì
	Materia B=BeCu		Tip Ø mm			Plat G=Go N=Ni	ing old ickel



Material	Tip Style	ømm
В	04	0,76



# Technical Data

Recommended minimum centers:	3,18 mm
Recommended working stroke:	1,50 mm
Maximum stroke:	2,30 mm
Current rating:	3,0 A
Tipical contact resistance:	<10 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Brass, gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated

# Spring Force (g ±20%)

Spring force: 65 g

#### Hole size without receptacle

Drills: Ø1,35 - Ø1,37





Series		Tip Style	ip Style Spring Force				
STP 105	Br	04	076	06	55	G	5
	Materia Br=Brass	I	Tip Ø mm			Plati G=Gc	ing old

SIP 119 Solderable Probes  $\geq$  4,00 mm /  $\geq$  160 mil

#### Available Tip Styles **Technical Data** Material Tip Style ø mm 2,6 Recommended minimum centers: 4,00 mm ø1,3 Recommended working stroke: 1,50 mm 04 🧹 В 1,30 Maximum stroke: 2,30 mm Current rating: 15,0 A ø2,3 Tipical contact resistance: <10 mΩ Operating temperature range: -50° up to +100° ø3<u>,9</u> Materials 0.5 BeCu, gold plated Plunger: Barrel: Brass, gold plated Spring: Music wire, gold plated 17,15 5,65 ø2,3 Spring Force (g ±20%) Spring force: 150 g Hole size without receptacle ø1,5 Ø2,28 - Ø2,30 Drills: 5,8

ø1,20





Ser	ies		Tip Style		Spring	Force		
STP :	119	В	04	130	1	50	C	3
		Materia B=BeCu	al	Tip Ø mm			Plat G=G	ing old

Short Travel and Battery Probes ≥ 6,50 mm / ≥ 260 mil



Recommended minimum centers:	6,50 mm
Recommended working stroke:	3,20 mm
Maximum stroke:	4,00 mm
Current rating:	8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

Brass or BeCu, nickel or gold plated Brass, gold plated Stainless steel Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	150 g
Alternative:	300 g
	400 g
	800 g

#### Hole size without receptacle

Drills: Ø4,96 - Ø4,97

#### Hole size with receptacle

Drills: Ø5,59 - Ø5,60







Series		Tip StyleSpring Force				
STP 365	Br	04	400	150		G
	Materia B=BeCu Br=Brass	I	Tip Ø mm			Plating G=Gold N=Nickel

# STP 365R

Short Travel and Battery Probes ≥ 6,50 mm / ≥ 260 mil



Short Travel and Battery Probes ≥ 6,50 mm / ≥ 260 mil

#### Available Tip Styles 1,5 Øs.tbl. Material Tip Style ø mm 3,00 4,00 03 В 6,00 4,00 В 04 8,5 ø4 В 4,00 06 1,50 В 07 ø6 3,00 1 4,00 В 10 6,00 8,00 3,00 В 21 4,00 32 ø4,97

# **Technical Data**

Recommended minimum centers:	6,50 mm
Recommended working stroke:	6,00 mm
Maximum stroke:	8,00 mm
Current rating:	8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	Brass or BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Stainless steel
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	500 g
Alternative:	150 g
	300 g
	800 g

#### Hole size without receptacle

Drills: Ø4,96 - Ø4,97

# Hole size with receptacle

Drills:

Ø5,59 - Ø5,60



without with R 365 R 365



Series	Tip Style Spring Force			Force		
STP 365L	Br	08	600	500		G
	Materia B=BeCu Br=Brass	l	Tip Ø mm			Plating G=Gold N=Nickel



Screw-in Probes are widely used in the automotive industry, to test connectors or in demanding testing conditions. They have a threaded barrel at one end to secure a firm seat on the fixture. In addition, a squared or hexagonal milling on the collar helps the screwing of the receptacle.

All these features have been designed to allow the perfect placing in the assembly hole, even in difficult working conditions and to avoid any possible displacement during tests.

# Recommended minimum centers (grid-pitch)

The installation pitch of the Screw-in Probes ranges from 2.54mm to 5.08mm.

# **Current Rating**

The rated current of our Screw-in Probes ranges from 3A to 12 A but can be increased according to individual requirements.

# Typical contact resistance

The typical electrical resistance of our Screw-in Probes ranges from 20 m $\Omega$  to 30 m $\Omega$ .

# Materials and plating

Our Screw-in Probes can be made of:

The barrel:

- Brass, material with excellent electrical conductivity and malleability, but not as hard as bronze The barrel is gold plated.

The spring:

- music wire (Harmonic steel) with a spring force ranging from 100 to 350 gr The spring is plated with gold to improve electrical conductivity.

The plunger:

- Beryllium-Copper (Be-Cu) The plunger can be plated in gold.

The Receptacle The receptacles for Screw-in Probes are made of gold plated brass

# Head Shape

The choice of the head style for the probe depends on the actual testing conditions and the surface to be tested. It is possible to design this probe with or without collar. The size, diameter or height of the collar will vary according to the project requirements.
## Summary of High Current Probes

Test probes version	Series	Pitch size (≥mm)	Working Max. stroke stroke (mm) (mm)	Max. stroke (mm)	Current rating (A)	Spring force (g)		Installation heights (mm) v = variable		Page	
			( )			min	max	min	max	v	
	GLP 31M	2,54	3,50	4,40	3 - 5	70	300	-	12,80	-	110
	GLP 32M	2,54	4,00	5,00	5 - 8	200	300	-	10,50	-	111
	GLP 33M	4,00	4,00	5,30	5 - 8	150	500	-	10,50	-	112
	GLP 103M	4,00	4,80	6,00	5 - 8	80	500	12,30	12,55	-	113
Scrow in probos	GLP 133/16M	4,00	9,00	11,00	5 - 8	150	500	16,00	16,20	-	114
Screw-in probes	GLP 133/19M	4,00	12,00	14,00	5 - 8	150	500	19,00	19,20	-	115
	GLP 133/23M	4,00	15,00	17,50	5 - 8	150	500	23,00	23,20	-	116
	GLP 133/27M	4,00	15,00	17,50	5 - 8	150	500	27,00	27,20	-	117
	GLP 133/37M	4,00	15,00	17,50	5 - 8	150	500	37,00	37,20	-	118
	GLP 150M	5,08	4,40	5,50	10 - 12	300	500	10,50	10,80	-	119

	T' CL L	
iviateriai	TIP Style	ømm
В	01	1,80
B S	02	0,75
В	03	0,75 1,50 1,60
В	04	0,50 0,60 0,75
В	08	1,00 1,30 1,80



### Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	3,50 mm
Maximum stroke:	4,40 mm
Current rating:	3,0 - 5,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	150 g
Alternative:	70 g
	250 g
	300 g

#### Hole size for receptacle

Drills: Ø1,66 - Ø1,70







Seri	es		Tip S	Style			Spring	Force		
GLP 3	31M	В	0	8	13	0	20	)0	G	
		Materia	l		Tip Ø	mm			Platir	ng
		B=BeCu							G=Go	ld
									N=Nic	kel

Screw-in Probes  $\geq$  2,54 mm /  $\geq$  100 mil

#### Available Tip Styles



N=Nickel





#### Technical Data

4,00 mm
4,00 mm
5,30 mm
5,0 - 8,0 A
<20 mΩ
-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	150 g
Alternative:	200 g
	300 g
	500 g

#### Hole size for receptacle

Drills:

Ø2,99 - Ø3,00







Serie	es		Tip Style		Spring	Force	
GLP 3	3M	В	10	300	15	50	G
	Ī	Materia		Tip Ø mm			Plating
	I	3=BeCu					G=Gold N=Nickel

GLP 103M Screw-in Probes ≥ 4,00 mm / ≥ 160 mil

#### Available Tip Styles

Material	Tip Style	ømm
В	01	2,30 4,00
B S	02	1,80
В	03	2,30 4,00 6,50
В	04	2,30 4,00
В	08	2,30 4,00
В	10	4,00 6,50 9,00
В	21	2,30 4,00



#### Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	4,80 mm
Maximum stroke:	6,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	150 g
Alternative:	80 g
	300 g
	500 g

#### Hole size without receptacle

Drills: Ø2,99 - Ø3,00

#### Hole size with receptacle

Drills: Ø3,49 - Ø3,50





# Ø3,9<sub>Ø3,5</sub> GLR 103MS

Series		Tip Style	o Style Spring F			
GLP 103M	В	10	400	15	50	G
Ī	Materia B=BeCu S=Steel	al	Tip Ø mm			Plating G=Gold N=Nickel

# GLP 1<u>33/16M</u>

Screw-in Probes  $\geq$  4,00 mm /  $\geq$  160 mil

#### Available Tip Styles





#### Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	9,00 mm
Maximum stroke:	11,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	300 g
Alternative:	150 g
	400 g
	500 g

#### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

#### Hole size with receptacle



Ø2,99 - Ø3,00









Series	-	Tip Style	2	Spring	Force	
GLP 133/16M	В	03	230	30	0 G	
N B:	lateri =BeCu	ial <sup>-</sup>	Γip Ø mn	n	Platin G=Gol N=Nicl	ng d kel

#### P 1 Gl <u>.33/1</u> Screw-in Probes $\geq$ 4,00 mm / $\geq$ 160 mil



#### **Technical Data**

Recommended minimum centers:	4,00 mm
Recommended working stroke:	12,00 mm
Maximum stroke:	14,00 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°
Recommended working stroke: Maximum stroke: Current rating: Tipical contact resistance: Operating temperature range:	12,00 mm 14,00 mm 5,0 - 8,0 A <30 mΩ -50° up to +100°

#### Materials

unger:	BeCu, nickel or gold plated
rrel:	Brass, gold plated
ring:	Music wire, gold plated
ceptacle:	Brass, gold plated

## Spring Force (g ±20%)

Spring force:	300 g
Alternative:	150 g
	400 g
	500 g

#### Hole size without receptacle

Ø2,64 - Ø2,65

#### Hole size with receptacle

Ø2,99 - Ø3,00 2 19 19, without GLR 133M with GLR 133M





Series		Tip Style	e Spring Force			
GLP 133/19M	В	21	230	30	)0	G
Ī	lateri	ial <sup>-</sup>	Tip Ø mn	n		Plating
B=	=BeCu					G=Gold
						N=Nickel

## <u>.P 133/23M</u>

Screw-in Probes  $\geq$  4,00 mm /  $\geq$  160 mil





#### **Technical Data**

Recommended minimum centers:	4,00 mm
Recommended working stroke:	15,00 mm
Maximum stroke:	17,50 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

#### **Materials**

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	300 g
Alternative:	150 g
	400 g
	500 g

#### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

#### Hole size with receptacle

Drills:











Ser	ies	-	Tip S	Style	<u>!</u>		Sprir	۱g	Force		
GLP	133/16M	В	0	3	23(	)		30	0	G	6
	Ī	ī	Гip Ø	mn	n			Plati	ng		
	B	=BeCu								G=Gc	bld
									N=Ni	ckel	



#### **Technical Data**

Recommended minimum centers:	4,00 mm
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Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

ass, gold plated usic wire, gold plated ass, gold plated

#### Spring Force (g ±20%)

Spring force: 300 g Alternative: 150 g 400 g 500 g

#### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

#### Hole size with receptacle

Drills:

Ø2,99 - Ø3,00





#### Ordering example:

Series		Tip Style	<u>e</u>	Spring Force			
GLP 133/27M	В	04	230	4(	00	G	
Ī	later	ial =	Tip ø mn	n		Plating	
D	-веси					G=Gold N=Nickel	

ø3,05

39,4

GLR 133MSZ

solder cup

## GLP 133/37M

Screw-in Probes  $\geq$  4,00 mm /  $\geq$  160 mil

#### Available Tip Styles





#### Technical Data

Recommended minimum centers:	4,00 mm
Recommended working stroke:	15,00 mm
Maximum stroke:	17,50 mm
Current rating:	5,0 - 8,0 A
Tipical contact resistance:	<30 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu, nickel or gold plated
Barrel:	Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	300 g
Alternative:	150 g
	400 g
	500 g

#### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

#### Hole size with receptacle



Ø2,99 - Ø3,00







Series		Tip Style	2	Spring	Force	
GLP 133/37M	В	02	180	40	00	G
	lateri =BeCu	ial	Tip ø mn	n		Plating G=Gold N=Nickel





M3

8

44

# Series Tip Style Spring Force GLP 150M B 08 400 300 G Material Tip Ø mm Plating B=BeCu G=Gold N=Nickel

GLR 150MSZ

GLR 150MMZ

ø4,05



These special probes are mainly used to detect the presence of components. The Switch Contact Probes, after a certain travel, turns on or off the contact. Usually they are threaded, to guarantee a secure fixing to the receptacle. They are available with different head styles, lengths and diameters, depending on the working conditions.

## Recommended minimum centers (grid-pitch)

The installation pitch of our Switch Probes ranges from 2.54 to 3.50mm.

## **Current Rating**

Using Switch Probes does not entail very high currents, which is why our Switch Probes can work with currents of up to 5 A. The current flow in the small internal contact must not exceed 1 A. For special requirements we are able to increase the rated current.

## Typical contact resistance

The typical contact resistance of our Standard Switch Probes is 50 m  $\!\Omega$  \!.

## Materials and plating

The materials used for our Switch Probes are different for each component:

The barrel can be made of:

- Bronze, material with good hardness and good malleability

- Brass, material with excellent electrical conductivity and malleability, but not as hard as bronze The barrel is gold plated.

The spring is made of:

- music wire (Harmonic steel) with a spring force ranging from 200 to 350 gr The spring is gold or silver plated to improve electrical conductivity.

The plunger can be made of:

- Beryllium-Copper (Be-Cu)
- Tempered Steel

The plunger can be plated in gold.

## Receptacle

Usually, they are made of gold-plated brass, to improve their conductivity and guarantee low electrical resistance:

- Threaded Switch Probes: The receptacle for this probe is threaded internally and allows the end of the Switch Probe to come out. Installation is carried out by soldering one wire to the receptacle body and one wire to the end of Switch Probes.
- Non-threaded Switch Probes: This special receptacle presents retaining marks that will guarantee a secure and adequate retaining force. Wiring is carried out by soldering a wire on the body of the receptacle and one on the end of the Switch Probe.

## Head style

The most commonly used head styles for Switch Probes are nr. 01, 03, 08, 39.

A special Head style is the P03 with insulated plastic cap, that can be useful in specific applications where the head must be isolated from the rest of the components.

## Summary of Switch Probes

Test probes version	Series	Pitch size (≥mm)	Working stroke (mm)	Max. stroke (mm)	Current rating (A)	Spring f	orce (g)	Installat v	ion heigł = variab	nts (mm) le	Page
			(11111)	()	(~)	min	max	min	max	v	
Press-in Switch	SP 32	2,54	4,00	5,00	5	100	150	10	10,2	-	122
probes	SP 33	3,50	4,20	5,20	5	200	300	10,2	10,4	-	124
Screw-in Switch	SP 32M	2,54	4,00	5,20	5	80	300	-	10,4	-	123
probes	SP 33M	3,50	4,00	5,10	5	200	350	-	10,3	-	125

Material	Tip Style	ø mm
В	01	1,80
B P	03	1,00 1,80 2,30
В	04	1,00 1,80
В	08	1,80 2,00 2,30

44,6

5,5

SP 32 /E





ø0,7

#### Technical Data

Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,00 mm
Current rating:	5,0 A
Tipical contact resistance:	<20 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:	BeCu or Steel, nickel or gold plated
Barrel:	Nickel-silver or Brass, gold plated
Spring:	Music wire, gold plated
Receptacle:	Nickel-silver or Brass, gold plated

#### Spring Force (g ±20%)

Spring force:	100 g
Alternative:	150 g

#### Hole size without receptacle

Drills: Ø1,65 - Ø1,66

#### Hole size with receptacle

Drills: Ø1,99 - Ø2,01





Ordering example:					Туре	5		
Series	_	<u>Tip Style</u> Sp		Spring F	oring Force all		rnat	ive E
SP 32	Р	03	180	200	)	G		
	Mater B=BeCu P=Plast	ial c	Tip Ø mn	n	Pl G= N=	ating =Gold =Nickel	-	



Material	Tip Style	ømm
В	01	1,80
B P	03	1,30 1,80 2,30
В	04	1,30 1,80
В	08	1,80 2,00 2,30



#### **Technical Data**

Recommended minimum centers:	2,54 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,20 mm
Current rating:	5,0 A
Tipical contact resistance:	<50 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger: BeCu, nickel or gold plated Barrel: Brass, gold plated Spring: Music wire, gold plated Receptacle: Brass, gold plated Peek Isolated part:

#### Spring Force (g ±20%)

Spring force:	200 g
Alternative:	80 g
	300 g

#### 80 g 300 g

#### Hole size for receptacle

Drills: Ø1,99 - Ø2,00







Series		Tip Style		Spring	Force	
SP 32M	В	08	180	20	00	G
	Materia B=BeCu P=Plastic	I	Tip Ø mm			Plating G=Gold N=Nickel

Material	Tip Style	ø mm
В	01	2,30
B P	03	2,30 3,00
В	08	2,30 3,00

43,2

6.5

SP 33 /E

ø1





#### Technical Data

Recommended minimum centers:	3,50 mm
Recommended working stroke:	4,20 mm
Maximum stroke:	5,20 mm
Current rating:	5,0 A
Tipical contact resistance:	<50 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:BeCu, nickel or gold platedBarrel:Brass, gold platedSpring:Music wire, gold platedReceptacle:Brass, gold plated

#### Spring Force (g ±20%)

Spring force:200 gAlternative:300 g

#### Hole size without receptacle

Drills: Ø2,64 - Ø2,65

#### Hole size with receptacle

Drills: Ø2,99 - Ø3,00





#### Ordering example: Туре Series **Tip Style** Spring Force alternative E SP 33 03 В 230 200 G Material Tip Ø mm Plating B=BeCu G=Gold P=Plastic N=Nickel



Matorial	Tip Style	amm
Iviaceriai	TIP Style	Ømm
B	01	2,30
		3,00
В		2,30
Р		3,00
		2,30
B	08 🦰 👸	3,00
		4,00
		3,00
B	39 🦯 🕔	3,50
Р		4,00
		4,50
		5 <i>,</i> 00
		5,50



#### Technical Data

Recommended minimum centers:	3,50 mm
Recommended working stroke:	4,00 mm
Maximum stroke:	5,10 mm
Current rating:	5,0 A
Tipical contact resistance:	<50 mΩ
Operating temperature range:	-50° up to +100°

#### Materials

Plunger:BeCu, nickel or gold platedBarrel:Brass, gold platedSpring:Music wire, gold platedReceptacle:Brass, gold platedIsolated part:Peek

#### Spring Force (g ±20%)

Spring force:	350 g
Alternative:	200 g
	300 g

#### Hole size for receptacle

Drills: Ø2,99 - Ø3,00







Series		Tip Style		Spring	Force	
SP 33M	В	39	400	2(	00	G
	Materia B=BeCu P=Plastic	I	Tip Ø mm			Plating G=Gold N=Nickel



Interface Probes are used to transmit power or data signals. These probes can quickly and easily connect fixtures to the electronics of the test machine.

Combining spring contacts and rigid contacts mounted on interface blocks, enables quick connection or separation of fixtures.

## Technical data: spring interface contacts

Recommended minimum center (grid-pitch) The standard installation pitch is 2.54 mm

Current Rating The rated current of the spring-loaded Interface Probe is 3 A

Typical contact resistance The typical resistance is  $50m\Omega$ 

## Materials and plating

The materials used for this type of Interface Probe are:

The barrel can be made of:

- Bronze, material with good hardness and good malleability
- Brass, material with excellent electrical conductivity and malleability, but not as hard as bronze

- Nickel silver, this alloy is widely used for its workability with punching techniques and for its good electrical characteristics The barrel is gold plated.

The spring is made of: - music wire (Harmonic steel) The spring is gold plated to improve electrical conductivity.

The plunger can be made of:

- Beryllium-Copper (Be-Cu) The plunger can be plated in gold.

#### Receptacle

It can be of various types depending on the type of connection:

- Solder, to solder the wire directly on the receptacle
- Crimp, for crimping the wire inside the receptacle
- Wire-Wrap, to wrap the wire around the square end of the receptacle
- Round Post, to insert the end of the receptacle directly in the housing hole

The height of the swelling on the receptacle (that determines the height of installation) and the position of the retaining marks or imprints (which allow for perfect and firm insertion) can be customized according to the project requirements.

## Technical data: rigid interface contacts

Recommended minimum distance (grid-pitch) The standard installation pitch for rigid contact interfaces is 2.54 mm

Current rating Depending on the design and materials used, the rated current capacity of our contacts ranges from 10 to 20 A

Typical contact resistance The typical resistance is  $50m\Omega$ 

## Materials and plating

The materials used for this type of Interface Probe are:

The barrel can be made of:

- Bronze, material with good hardness and good malleability
- Brass, material with excellent electrical conductivity and malleability, but not as hard as bronze

The barrel is gold plated.

Gold plating ensures excellent electrical conductivity and good protection from oxidation.

## Types of rigid Contact Interface

Rigid Contact Interface probes are fully customizable. Among the most common we have:



with Wire-Wrap termination 0.64 allow you to wrap the wire directly on pin



Solder

to solder the wire directly on the receptacle. These probes have a larger diameter than Wire-Wrap and as a result are often used to transmit power signals



they have an hook on the

in the assembly holes

body that allows for the fixing



Knurled

used to create interference in the assembly hole and secure a firm positioning of the interface Probe

## Head shape

For the proper fit between the spring-loaded Interface Contact blocks and rigid Interface Contact blocks, the head style of each block is designed to match;

- Rigid Interface Contacts can have a hole, a countersink or a flat head;
- Spring Contact Interfaces usually have one of these head styles: nr. 02, 04, 06, 11, 13.













#### Materials

Interface contact: Brass, gold plated

#### **Technical Data**

Tipical contact resistance: <5 mΩ

#### Hole size

 For IP 300:
 Ø1,45 - Ø1,47

 For IP 254:
 Ø1,98 - Ø1,99

















**IP 254 W 12F** Ø2,15



IP 254 W 02



# IP 279 300 L4 Ø3

#### Materials

Interface contact: Brass, gold plated

#### **Technical Data**

Tipical contact resistance: <5 mΩ

#### Hole size

For IP 254:	Ø1,98 - Ø1,99
For IP 113:	Ø3,00 - Ø3,02

## **Double Plunger Probes**



The Double Plunger Probe allows to create an interface without using of soldering.

By installing them on special grids and having the mobile part at both ends, they create a connection, for instance, between two circuit boards.

The main feature of these Probes is that they have a plunger at both ends.

The two plungers can be mounted on the same or on two separate springs, and therefore, can be identical or have different head style, size and spring force.

## Recommended minimum centers (grid-pitch)

Depending on the installation grid of the Double Plunger Probe and the connection requirements, we can adapt the design specifications accordingly.

## **Current Rating**

The dimensions of the Double Plunger Probes tend to be very small, as a result its rated current does not typically exceed 1 -3 A.

## Typical contact resistance

The typical contact resistance of a Double Plunger Probes is 50 m  $\Omega$ .

## Materials and plating

The materials used for the production of Double Plunger Probes are: The barrel can be made of:

- Bronze, material with good hardness and good malleability
- Brass, material with excellent electrical conductivity and malleability, but not as hard as bronze

- Nickel silver, this alloy is widely used for its workability with punching techniques and for its good electrical characteristics The barrel is gold plated.

The spring is made of:

```
- music wire (Harmonic steel)
```

The spring is gold plated to improve electrical conductivity.

The plunger can be made of:

```
- Beryllium-Copper (Be-Cu)
```

- Tempered Steel

The plunger can be plated in gold or nickel.

## Head Shape

The Head Style of the two plungers can be different, depending on the specific surface that needs to be tested.



Rigid Pins are used to test bare circuit boards (BBT), without mounted components and they are made of a single rigid part. Their function is to connect the PCB (Printed Circuit Board) with the electronics of the test machine. They are totally customizable (length, diameter, head style etc.).

## Recommended minimum distance

Thanks to their small diameter, Rigid Pins can be installed in very close pitches. Our rigid pins have a diameter of minimum 0.3 mm and a length of up to 90 mm.

## **Current Rating**

The rated current is up to 3A.

## Typical contact resistance

The typical contact resistance of a Rigid Pins is 30 m  $\Omega$ .

## Materials and plating

The materials used to produce our Rigid Pins are:

- Be-Cu alloy: it guarantees high conductivity, low resistance and good hardness, thus reducing the possibility of twisted pins
- Tempered steel: it provides lower electrical conductivity but greater mechanical strength, thus recording a longer life expectancy

The rigid pins are gold or nickel plated.

## Head shape

The most common Head style for the Rigid Pins are nr. 02, 05, 11, 13. The insulated plastic head (or cap) is normally used as an electrical contrast.

## **Flying Probes**

A Flying Probes test consists in examining every point of the board with a dedicated probe. With this type of test, it is possible to work on any type of PCB, even on a small scale, simply by programming a dedicated software on the testing machine (A.T.E.). The In-Circuit test uses the so called "bed of nails" mounted on a fixture. The production of the fixture and the related software for the test machine, is expensive. They are also difficult and time consuming to update, in case of a different board to test. To test standard devices, or testing on a large scale, the "bed of nails" is certainly the quickest and most convenient choice; when testing small series or prototypes, an ICT system with Flying Probes is recommended.

Moreover, thanks to the Flying Probe technology it is possible to reach precision of up to 0.2 mm. We are able to make specific Probes for any testing machine or device.

## Recommended minimum center (grid-pitch)

Our technology allows us to make Flying Probes with a 0.2 mm plunger, making it possible to work on very narrow pitches. To avoid the Flying Probe touching the adjacent points, we have a very strict policy on the plunger's tolerances and play (or wobble).

## **Current Rating**

Depending on the size, the applicable rated current of our Flying Probes ranges from 3A to 5A. The smaller is the diameter of the head, the lower is the rated current tolerated.

## Typical contact resistance

The typical contact resistance of Flying Probes is 30 m  $\!\Omega$  .

## Materials and plating

Flying Probes can be made of:

The barrel:

- Brass, material with excellent electrical conductivity and low resistance The barrel is gold plated.

The spring:

music wire (Harmonic steel) with a spring force ranging from 100 to 250 gr
 The spring force can be reduced to avoid markings on the PCB;
 The spring is plated with silver to improve electrical conductivity.

The plunger:

- Tempered Steel The plunger can be plated in gold or nickel.

## Head shape

Working in most cases with very small diameters, the recommended head style should meet this need.

## Insertion / Extraction Tools



### Fixed insertion tool for receptacles

This tool allows the receptacle to be inserted at a fixed height, either at board level or raised a few millimeters. The insertion tool has to be chosen according to the receptacle diameter.

## Adjustable insertion tool for receptacles

The adjustable insertion tool allows to place the receptacle at variable depths in order to modulate the final Spring Probe installation height. The insertion tool has to be chosen according to the receptacle's diameter.

## Insertion tool for Spring Contact Probes

To guarantee a precise and secure insertion of spring contact probes into the receptacle and to avoid damaging or bending/twisting of the test probes, we recommend to use the dedicated tool, available in different sizes depending on the probe's specifications.

## Extraction tool for receptacles

Extracting a receptacle from a fixture could be quite complicated due to the limited space and the risk of damaging other receptacles or test probes. Extraction tools makes this operation quick and easy. The correct extraction tool should be chosen according to the receptacle's diameter.

## **Extraction tool for Spring Contact Probes**

By using this tool, extraction of a spring probe can be very easy and fast, allowing replacement of test probes at the end of the working cycle or for maintenance. According to the test probe specifications there is a matching tool to use for safe and precise removal.

#### Available Tool Size

Series	Insertion height	ø Pin
PU 50	х	0,74
PU 75	х	1,02
PU 100	х	1,37



X



#### Fixed insertion tool

All receptacles with press ring can be inserted with this tool. In this case the X is the fixed height level. This value is required for ordering the correct tool.

#### Ordering example:



#### Available Tool Size

Series	Insertion height	ø Pin
PU 50R	0 - 10	0,74
PU 75R	0 - 12	1,02
PU 100R	0 - 12	1,37





#### Adjustable insertion tool

If you need to place receptacle at different installation heights, an adjustable insertion tool is recommended. This tool allows to set and change the installation height value quickly and easily.











with head.

Ordering example:

and pull out. With this extraction tool receptacles can be removed quickly, avoiding risks of damaging the support. This tool is especially useful to remove broken receptacles or in case the receptacle cannot be pushed out from the back.

